Appendix 4 – Updated EIAR Chapters

Chapter No.	**Chapter Title**
2	Project Description
5	Population and Human Health
7	Ornithology
9	Hydrology and Hydrogeology
10	Noise
11	Landscape and Visual Amenity
12	Material Assets and Other Issues
15	Air and Climate
16	Shadow Flicker
18	Interactions of the Forgoing
NTS	Non-Technical Summary

2 PROJECT DESCRIPTION

2.1 INTRODUCTION

This chapter of the EIAR provides a description of the existing site and the main components of the proposed Gortloughra Wind Farm (the Project). This EIAR provides details on the construction, operation and decommissioning of the Project in compliance with the EIA Directive. The Gortloughra Wind Farm Project consists of the following elements:

- **The Wind Farm:** which includes 8 no. wind turbines, site access tracks, Turbine Hardstands, 100 m permanent Met Mast, Wind Farm Internal Cabling, borrow pit, Temporary Construction Compound, and all site infrastructure on the Site. It also includes the provision of signage at 4 no. locations for existing cultural heritage on the Site and the provision of biodiversity improvements. This element of the Project is defined as the 'Proposed Development' and is what development consent is sought for. A full summary of the Proposed Development is outlined in section 2.4 of this chapter.
- **Grid Connection Routes and Onsite Substation and Control Building:** This chapter also provides a description of the work required along 2 no. proposed Grid Connection Routes (GCRs) Options and onsite 110 kV substation. This element of the Project will be subject to a separate planning consent process but will be assessed within this EIAR.
- **Turbine Delivery Route (TDR):** The Turbine Delivery Route nodes and the route itself will also be subject to a separate planning consent process but will be assessed within this EIAR.

Together, the works within the Redline Boundary (the Proposed Development), the Grid Connection Route Options, 110 kV Onsite Substation and Control Building and Turbine Delivery Route are defined as the Project which form the basis of the assessments presented within Chapters 5 to 17. This chapter provides details of the construction, operational and decommissioning phases.

All elements of the Project are outlined in **Figure 1.2.**

This chapter includes an overview of the Project followed by a detailed description of the main components and their method of construction. Measures that have been built into the design of the Project to reduce harmful effects on the environment, also known as 'Embedded Mitigation' measures, are set out in the various technical chapters and in this chapter. In addition to these Embedded Mitigation measures, Chapters 5 to 15 also present mitigation and enhancement measures where specifically relevant to their assessment topic.

This chapter of the EIAR is supported by supporting Figures in **Volume III** and the following Appendix documents provided in **Volume IV**:

- Construction Environmental Management Plan (CEMP) in **Appendix 2.1**
- TLI Grid Report and accompanying drawings in **Appendix 2.2**
- ESB Minimum Standard Specifications in **Appendix 2.3**
- List of Projects for Cumulative Assessment **Appendix 2.4**

Common acronyms used throughout this EIAR can be found in **Appendix 1.4**.

2.2 APPLICANT

The applicant for the Proposed Development is Gortloughra Wind Farm Limited, an entity wholly owned by Statkraft Ireland Limited, a leading company in hydropower internationally and Europe's largest generator of renewable energy. Statkraft is one of the biggest renewable energy developers in Ireland with approximately 4 GW of offshore, onshore, solar and grid services projects in the pipeline.

The Statkraft Ireland team, which is based in Cork and Tullamore, Co. Offaly, has constructed a portfolio of approximately 350 MW of wind projects across the country, operates over 500 MW, and has an established track record in wind energy in Ireland, having previously developed wind farms in counties Clare, Cork, Kerry, Donegal, Limerick, Galway, Waterford, Tipperary, Offaly and Tyrone.

2.3 STATEMENT OF AUTHORITY

This Chapter has been prepared by Shirley Holton and David Kiely of Jennings O'Donovan & Partners Ltd. (JOD).

Shirley Holton is an Environmental Scientist with over 3 years' experience in Environmental Consultancy. She graduated with a First-Class Honours Degree (BSc. Hons) in Environmental Science from the Institute of Technology, Sligo. She was also awarded with the Governing Body award for a BSc in Environmental Protection. Shirley's key capabilities include project management; using software such as WindPRO 4.1 and ArcGIS Pro; and the preparation of planning applications, Environmental Impact Assessment Reports, Feasibility Studies, Construction & Environmental Management Plans and management plans relating to surface water, peat, spoil and waste.

David Kiely is a Managing Director of JOD who holds a BE in Civil Engineering from University College Dublin and MSc in Environmental Protection from IT Sligo. He is a Fellow of Engineers Ireland, a Chartered Member of the Institution of Civil Engineers (UK) and has over 40 years' experience. He has extensive experience in the preparation of EIARs and EISs for environmental projects including Wind Farms, Solar Farms, Wastewater Projects, and various commercial developments. David has also been involved in the construction of over 60 wind farms since 1997.

2.4 SUMMARY OF THE PROJECT TO BE ASSESSED

Planning Permission is being sought by the Developer for the construction of eight wind turbines, permanent met mast and all ancillary works.

The Proposed Development will comprise of the following main components:

- Erection of eight wind turbines with an overall ground to blade tip height of 175 m consisting of a rotor diameter of 150 m; and a hub height of 100 m.
- Construction of permanent Turbine Hardstands and Turbine Foundations.
- Construction of one Temporary Construction Compound with associated temporary site offices, parking areas and security fencing.
- Installation of a Meteorological Mast with a height of 100m.
- Development of one on-site Borrow pit.
- Construction of new permanent internal site access tracks and upgrade of existing internal site access roads to include passing bays and all associated drainage infrastructure.
- Development of a permanent internal site drainage network and sediment control systems.
- All associated underground electrical power and communications cabling connecting the wind turbines to the on-site substation.
- Biodiversity enhancement measures.
- Recreational community improvements including the erection of 4 No. permanent information boards relating to cultural heritage and upgrades to amenity tracks across the site.
- All associated site development works.

A 10-year planning permission and 40 year operational life from the date of commissioning of the entire wind farm is being sought.

This EIAR also assesses the construction of an 110 kV On-site Substation and Control Building and 2 no. GCR Options along public roads:

- Option A: Dunmanway 110 kV substation or
- Option B: Carrigdangan 110 kV substation.

While not part of the planning consent for this planning application, this EIA also assesses the works at 18 No. locations along the TDR from Port of Cork to Site and the underground Grid Connection Route Options from the Site to either the Dunmanway or Carrigdangan 110 kV Substations.

2.5 SITE LOCATION AND ENVIRONS

2.5.1 Introduction / Existing Land Use

The Site is located 9.7 km north-west of Dunmanway, Co. Cork and 19 km south-east of the county boundary between Cork and Kerry. The Site is located on relatively high ground, at elevations ranging from 243 m AOD on the northern side of the site at the entrance 326 m, to 510 m AOD towards the middle of the Site and 306 m AOD on the southern side of the Site. A Site Location Map showing the Redline Boundary is detailed in **Figure 1.1**. The Project boundary, which comprises of all elements of the Project is outlined as **Figure 1.2.**

The Site is located within the townlands of an tSeithe Bheag (Shehy Beg), (Muscraí Gaeltacht), Gortloughra, Cloghboola and Inchinroe.

The townlands along which the two grid connection options transverse include:

- **Option A (Dunmanway):** an tSeithe Bheag (Shehy Beg), Gortloughra, Inchinroe, Cloghboola, Cornery, Garraí na Tórnóra (Garryantornora), Tuairín na Lobhar (Tooreenalour), Gort na Carraige (Gortnacarriga), Moneylea, Coolcaum, Coolmountain, Tullagh, Moneyreague, Togher, Cooranig, Keelaraheen, Neaskin, Ardcahan, Knockduff, Gurteennasowna and Ballyhalwick.
- **Option B (Carrigdangan):** an tSeithe Bheag (Shehy Beg), Gortloughra, Inchinroe, Cloghboola, Cornery, Garraí na Tórnóra (Garryantornora), Tuairín na Lobhar (Tooreenalour), Gort na Carraige (Gortnacarriga), Cooragreenane, Coolroe West, Gortnahoughtee, Derryleigh, Gortatanavally, Carrigdangan and Johnstown.

Temporary works along the Turbine Delivery Route will be required to accommodate the delivery of the turbine components. These temporary works are subject to a separate planning application but are assessed as part of this EIAR and are located in the townlands of Lackanashinnagh, Shanacashel, Mallow, Glan, Curradrinagh, Seanlárach (Shanlaragh), Kilnadur, Inchincurka, Carrigdangan, Johnstown, Commons, Derrygortnacloghy, Gortneadin, Carrignacurra, Cappanclare, Curraheen, Coolroe West, Cooragreenane, Gortaknockane, Gortnacarriga, Tooreenalour, Garraí na Tórnóra (Garryantornora), Cornery, Cloghboola, and Inchinroe.

The Site extends to 117.21 ha. The lands are under the ownership of third parties and the principal land use in the general area is comprised of agricultural sheep grazing, farmland and open mountain heath.

The pre-planning site investigations show that there are vast areas of shallow peat of less than 0.5 m with some isolated and deep pockets of up to 3.8 m. The presence of peat on site and other constraints (section 2.7.1) have influenced the project design. This is further detailed and assessed in **Chapter 8: Soils and Geology**.

The closest receptor, H53 (which is involved in the Project), is within 486 m of the closest turbine (T07), and experiences no shadow flicker. The closest receptor who is not involved, H10, is within 696 m of the closest turbine (T06).

2.5.2 Wind Farms in the Area (Cumulative)

There are 27 operational, consented/permitted and proposed wind farms within 20km of the Site. **Figure 2.1** shows the location of these wind farms within a 20km radius of the proposed turbines, and Table 2.1 provides further details, including turbine numbers, distances, and directions from the Site.

Of these, the majority are operational, with a smaller number classified as consented/permitted, and two proposed developments (Maughanaclea Wind Farm, located approximately 1.99km to the South-west, and Derreenacrinnig Wind Farm, located approximately 7.08km to the South-west). It is noted that Maughanaclea Wind Farm application was submitted for planning subsequent to the submission of the Proposed Development (March 2026), which was originally lodged to Cork County Council in March 2025. It is included in the EIAR for reference but has not been assessed in the cumulative assessments as it was lodged subsequent to the Application.

The nearest operational wind farm is Shehy More Wind Farm, located approximately 565m to the north-east of the Site. The closest distance between turbines within Shehy More Wind Farm and the Proposed Development is approximately 565m, measured between the westernmost turbine of Shehy More Wind Farm and T2 of the Proposed Development.

Table 2.1: Wind Farms within 20km of the Proposed Turbines

	Wind Farm	Status	No. of Turbines	Approximate Distance to Nearest Turbine [km]	Direction from the Proposed Development
1	Ballybane WF	Operational	21	18km	South-west
2	Barnadivane WF	Consented / Permitted	6	18.7km	East
3	Carrigarierk WF	Operational	5	5.22km	East
4	Carrigarierk 2 WF	Consented / Permitted	3	5.74km	East
5	Cleanrath WF	Operational	11	9.8km	North-east
6	Coomatallin WF	Operational	4	16.61km	South-east
7	Currabwee WF	Operational	7	13.05km	South-east
8	Derragh WF	Operational	6	9.79km	North
9	Derreenacrinnig WF	Proposed	7	7.08km	South-west
10	Garranareagh WF	Operational	4	19.58km	East
11	Gortyrahilly WF	Consented / Permitted	14	11.72km	North
12	Grousemount WF	Operational	38	9.89km	North-west
13	Inchamore WF	Consented / Permitted	5	18.49km	North
14	Kilgarvan II WF (Sillahertane)	Operational	10	11.75km	North
15	Kilgarvan I WF (Coomagearlahy)	Operational	15	16.63km	North-west
16	Kilgarvan II WF (Inchincoosh)	Operational	6	18.27km	North-west
17	Kilgarvan II WF (Lettercannon)	Operational	7	17.21	North-west
18	Kilgarvan Repower WF	Consented / Permitted	11	16.78km	North-west
19	Killaveenoge WF	Operational	10	12km	South-east
20	Kilvinane WF	Operational	3	17.7km	South-east
21	Midas WF (Coolknoohil)	Operational	11	14.02km	North
22	Lahanaght Hill WF	Operational	5	13.55km	South
23	Midas WF (Glanlee I)	Operational	6	15.39km	North
24	Midas WF (Inchee)	Operational	6	15.74km	North-west
25	Milane Hill WF	Operational	9	9.2km	South
26	Shehy More WF	Operational	11	0.56km	North-east
27	Maughanaclea Wind Farm	Proposed	14	1.99km	South-west

2.5.3 Other Developments (Cumulative)

A list of projects that have been included in the cumulative assessment of effects in this EIAR are included in **Appendix 2.4**. This includes all small, medium and large-scale developments within 10 km of the Site that are currently active in the planning system.

The cumulative impacts of the projects listed in **Appendix 2.4** are assessed for potential effects during the construction, operation and decommissioning of the Proposed Development. This is further detailed through chapters 5 to 17 of this EIAR.

2.5.4 Land Ownership

The Site is located on lands under the ownership of three no. third-party private landowners who have consented to the application and the Proposed Development.

2.6 WIND RESOURCE

Due to the location in the South-west of Ireland, and elevation (ranging from 243 m to 510 m AOD throughout the Site (section 2.5.1)), the Site experiences high average annual wind speeds. The Irish Wind Atlas produced by Sustainable Energy Ireland shows average wind speeds for the country and it shows that wind speeds on the Site are consistent with a windfarm development (7.7 m/sec at 30 m, 8.4 m/sec at 75 m, 8.6 m/sec at 100 m and 8.8 m/sec at 150 m).

2.7 SITE INFRASTRUCTURE AND CONSTRUCTION

Constraints-led design is a commonly used, best practice approach employed in wind farm design. Using this method, environmental sensitivities within the project study area are identified by the design team with a view to pinpointing suitable areas in which wind turbines may be located. The resulting area is known as the 'developable area'.

The Site Study Area was chosen based on its viability in terms of wind resource, land size, planning policy and the availability of a suitable connection to the national grid.

Once all known sensitive receptors within the Study Area are accurately mapped, suitable setback buffers are applied. The size of this setback buffer is related to the sensitivity of the individual receptor as set out in wind energy design guidelines and scientific best practice.

The design is fully compliant with the current 2006 Wind Energy Development Guidelines[1] (WEDGs) and the project team has committed to the setback recommendations in the draft Wind Energy Development Guidelines[2] (draft WEDGs), published in 2019. The draft WEDGs are currently being reviewed by the Government and are currently not in force.

Environmental sensitivities dictate a large proportion of design constraints. However, other considerations such as proximity to houses, existing third-party infrastructure, landscape and visual considerations, and feedback from the community has also influenced the identification of the final developable area. Additionally, setback buffers are applied to existing roads, high voltage electrical lines, telecommunication links, public roads and trails.

[1] Wind Energy Development Guidelines, Department of the Environment, Heritage and Local Government, 2006.
[2] Draft Revised Wind Energy Development Guidelines, Department of Housing, Planning and Local Government, 2019

There are further constraints associated with landscape and visuals. Particular constraints mapped include reverse zone of theoretical visibility (ZTV) from viewpoints. This technique allows the designers to understand from where particular wind turbines (or parts of them) may be visible based on ground topography and indicates the potential visual impact at these locations. From this information, 3D models and photomontages are prepared to further inform the layout of the wind farm and optimise turbine positioning in the context of landscape and visual impact.

Following the application of all known constraints, the developable area is mapped. This is the area in which wind turbines can now be sited. After placing wind turbines within the developable area, allowing for required spacing between the turbines, the resulting wind turbine layout then forms the basis for the design for the wind farm. Other elements of the wind farm design such as onsite access tracks, Turbine Hardstands, the Onsite Substation and Control Building and Temporary Construction Compound are also considered in this process.

Site walkover surveys, site investigations and other surveys (e.g., environmental studies, field surveys and consultation) have also influenced the design.

2.7.1 Proposed Layout Design

The layout of the Proposed Development 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 layout design was informed by the following constraints and buffers where possible:

- distance to watercourses of at least 50 m, where possible
- distance to land drains of at least 20 m
- distance to archaeological monuments and structures of at least 100 m
- distance from turbines to inhabited houses of at least 700 m (for those not involved in the Project)
- avoidance of ground slopes of greater than approximately 10 - 14%
- avoidance of existing telecommunications infrastructure
- distance to neighbouring Wind Farm turbines of >3 x Rotor Diameter (450 m)
- Existing high voltage overhead powerlines on the south of the site where a 500 m buffer is applied
- avoidance of sensitive habitats, e.g., wet heath/blanket bog and/or watercourses containing Freshwater Pearl Mussel (*Margaritifera margaritifera*)

A design by avoidance principle was carried out at the initial stages of the project design. The site selection process and project design will minimise new impacts through the re-use of existing proven infrastructure (i.e., existing tracks). Detailed analysis of the bearing capacity of the surrounding peatlands was carried out and are identified, assessed and mitigated for in **Chapter 8: Soils and Geology**. This includes risk of peat slide and the extensive design measures to minimise that risk.

The proposed cultural heritage information boards and associated trails are assessed in full in **Chapter 13: Cultural Heritage**.

The overall layout of the Site is shown in **Figure 1.2**. This figure shows the proposed locations of the wind turbines and associated hardstanding areas, Onsite Substation and Control Building, Met Mast, Temporary Construction Compound, internal access tracks and the site entrance. The ITM coordinates of the turbines are listed in **Table 2.2**.

Table 2.2: Turbine ITM Coordinates*

Turbine No.	ITM Easting (m)	ITM Northing (m)
T01	514007.06	559976.06
T02	514578.95	560100.43
T03	514530.43	559376.94
T04	515322.78	559654.41
T06	515804.023	560056.64
T07	514219.01	558838.91
T08	514846.27	558857.61
T09	515300.39	559150.62

*Note: Turbine 5 was omitted during the iterative design process.

2.7.2 Wind Turbine Generator

The proposed turbines will be of typical modern design and will be a three-bladed, rotor up wind of the tower, variable speed, pitched blade regulated machine. Turbine appearance will be a matt non-reflective finish in a white, off-white or grey colour.

The turbine will have a circular based tower, sitting on a reinforced concrete foundation. The tower will support the nacelle, rotor hub, and rotor blades. Commercial wind turbine towers are typically made of steel or a hybrid of steel and concrete. The nacelle is mainly metal (steel, copper, aluminium, etc.) with a metal/plastic/glass-reinforced plastic (GRP) body, while the blades can be made of a matrix of glass-fibre reinforced polyester or wood-epoxy or similar composite materials.

Each turbine will have a generator with a maximum capacity of 6MW giving an overall capacity of the wind farm of 48MW. 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 but will adhere to the parameters set out in **Table 2.3**.

The final choice of turbine model is unknown at this stage, given the competitive tender for turbines on any project commences at construction stage. The candidate turbine model is a Vestas V150 for the purposes of EIA and planning approval. At construction, the Vestas V150 or similar style will be utilised (based on availability). The dimensions outlined in **Table 2.3** of this chapter describe the proposed parameters of the turbines. A schematic drawing of the candidate turbine is shown on **Figure 1.4**.

Table 2.3: Turbine Parameters

Turbine Parameter	Assessment Envelope
Turbine Blade Tip Height	175 m
Rotor Diameter	150 m
Hub Height	100 m

2.7.3 Turbine Foundation and Turbine Hardstands

All turbine suppliers have a requirement for a Turbine Hardstand area to be constructed beside each turbine. The layout of the Turbine Hardstand is designed to accommodate the delivery, laydown, and assembly of turbine components (in particular rotor assembly) prior to turbine lifting and assembly and is shown in **Figure 2.2**. The Turbine Hardstands are needed to support the cranes during turbine construction, the operational and maintenance phase, and for decommissioning. The Turbine Hardstands will be constructed in advance of the Turbine Foundation and will be used to facilitate foundation construction, such as steel reinforcement delivery and pouring of concrete.

Construction of the Turbine and Met Mast Hardstands will require the excavation of overburden material to the noted area and depth, the laying of a geotextile material on the formation surface and placing engineered stone and a top dressing. The main Turbine Hardstands will be 4,155m^2 and will be 0.3 m in depth depending on the local bedrock profile and the varying soil depth giving a surface area of 33,240m^2 for eight turbines and a material volume requirement of approximately 9,972m^3.

The Turbine Foundations will be approximately 25.5m in diameter and have a depth of 2.25m. The Turbine Foundation design will be decided by the structural engineers at detailed design stage and is dependent on the turbine sourced at procurement stage. The central part of the foundation will be approximately 6m in diameter, will be raised from the main Turbine Foundation below ground level and will encompass cast-in bolts to connect to the bottom of the turbine tower and reinforced bar structural elements.

The volume of concrete and steel required for each Turbine Foundation will be 1,150m^3 and 86 tonnes respectively. The area around and above the Turbine Foundation will be backfilled with compacted granular material and the only portion exposed in the long term will be the central foundation section. Material will be sourced from the onsite borrow pit or from a local quarry (within 55 km) such as one of those identified in **Table 2.4** below.

Table 2.4: Local Quarries and Concrete Suppliers

Quarry	ITM (Easting)	ITM (Northing)	Distance (km)	Direction
Mid Cork Quarries	527417	563055	11.20	E
Kilmichael Quarry	529902	564136	13.6	E
McSweeney Bros	129231	050925	16	SE
Roadstone Castlemore	544615	566921	28.50	NE
Keohane Readymix Shannonvale	537623	545474	26	SE
Finbarr O'Neill Limited	551046	572626	36.5	NE
Roadstone Ballygarvan	569239	564013	53	E

Although site investigations have been carried out as part of this application and the worst-case impacts have been assessed within this EIAR; additional site investigations will be required where planning permission is granted, to facilitate a more detailed design.

Depending on the results of these further confirmatory site investigations, the possibility of less invasive construction methods such as installing rock anchors will be explored as a means of reducing the footprint and material volumes of the Turbine Foundations. Traditional gravity foundations are considered for EIA purposes as this represents a worst-case scenario due to the amounts of concrete required (c.1,150 m^3 v c.300 m^3 for rock anchors), but it should be noted that the predicted environmental effects, such as loss of habitats and/or impacts on water quality, could be reduced were rock anchor foundations to be used for some of the Turbine Foundations where there is solid competent rock at the foundation level.

Based on the results of peat probing and geotechnical assessments to date (detailed in **Chapter 8: Soils and Geology**), peat depths are not deep enough to require piling of Turbine Hardstands. Therefore, the construction method for all the Turbine Hardstands will be via excavated approach.

The construction methodology for the Turbine Foundations will depend on the strength and depth of the substrata (layers of rock or soil beneath the surface) specific to each location. Turbine Foundations will need to be taken down to competent bearing strata by excavating through the peat / soil, subsoil and rock if necessary.

The method of construction for gravity Turbine Foundation is summarised as follows:

- Set out turbine foundations and required finish levels etc.
- Construct formation and/or supporting structures e.g. piles or rock upfill.
- Construct drainage as required.
- Provide a minimum of 100 mm concrete blinding.
- Place bottom mat of steel reinforcing.
- Place turbine base anchor cage.
- Fix cable ducting and foundation earthing.
- Complete reinforcing steel.
- Fix shuttering to base sidewalls.
- Fix ducts and earthing wires between insert and walls of base.
- Carry out any corrective works as directed by Engineer.
- Check weather conditions and schedule concrete deliveries.
- Place concrete and take quality control slumps and cubes.
- Concrete surface finishing.
- Apply curing and protection of concrete.
- Strip formwork.

- Placing of any earthing wires around and over the base.
- Backfill base sides and place overburden.
- Confirm that cube results are satisfactory[3].
- Grout the top flange.

The method of construction for rock anchor Turbine Foundation is summarised as follows:

- Set out turbine foundations and required finish levels etc.
- Construct temporary coring drilling platform
- Drill cores for rock anchors to the required levels.
- Insert rock anchors and grout into position.
- Construct drainage as required.
- Provide a minimum of 100 mm concrete blinding.
- Place bottom mat of steel reinforcing.
- Place free issue turbine base insert or anchor cage.
- Fix cable ducting and foundation earthing.
- Complete reinforcing steel.
- Fix shuttering to base sidewalls.
- Fix ducts and earthing wires between insert and walls of base.
- Carry out any corrective works as directed by Engineer.
- Check weather conditions and schedule concrete deliveries.
- Place concrete and take quality control slumps and cubes.
- Concrete surface finishing.
- Apply curing and protection of concrete.
- Strip formwork.
- Placing of any earthing wires around and over the base.
- Backfill base sides and place overburden.
- Confirm that cube results are satisfactory.
- Grout the top flange.
- Stress rock anchors.
- Install protective caps to top of rock anchors.

2.7.4 Turbine Delivery Route ("TDR") and Access to the Site

While not part of this planning application, this EIA also assesses the works at 18 No. locations along the TDR from Port of Cork (Ringaskiddy) to Site.

[3] Concrete cubes made during the pouring of the base are crushed to confirm that the required concrete strength has been reached.

Temporary works will be required to accommodate the delivery of the turbine components. These temporary works are subject to a separate planning application but are assessed as part of this EIAR and are located in the townlands of Lackanashinnagh, Shanacashel, Mallow, Glan, Curradrinagh, Seanlárach (Shanlaragh), Kilnadur, Inchincurka, Carrigdangan, Johnstown, Commons, Derrygortnacloghy, Gortneadin, Carrignacurra, Cappanclare, Curraheen, Coolroe West, Cooragreenane, Gortaknockane, Gortnacarriga, Tooreenalour, Garraí na Tórnóra (Garryantornora), Cornery, Cloghboola, and Inchinroe.

There will be two turbine blade staging areas (e.g. where turbine blades are switched between trailer to a blade lifter) on either side of Crookstown and a blade lifter will be used to facilitate tight movements through Crookstown and bends in the road to Beal na Bláth.

The site access will be from an existing entrance on the L8544 which will be upgraded to allow vehicles to turn in and out. This is further described and assessed in **Chapter 14: Traffic and Transport**. This entrance will be used for delivery of both turbine components and building materials such as rock (where required) and concrete. The site entrance is shown on **Figure 2.3**.

It is proposed that the turbine nacelles, tower hubs and rotor blades will be landed in the Port of Cork. From there, they will be transported to the Site via the N28, N40, N22, R585, R587 and the L8544 to the upgraded site entrance.

The delivery of the turbines will require co-ordination with Cork County Council and An Garda Síochána. The process has been set out in the Transport Management Plan contained in **Appendix 14.2** which will be implemented in full and will be further developed prior to the commencement of construction by the Contractor. The proposed haul route is shown on **Figure 2.4**.

There are 18 No. areas on the haul route that will require works in third party lands. These are shown on **Table 2.5**.

Table 2.5: Areas of Works on Haul Route in Third Party Lands

TDR Locations	Location Notes	Location Coordinates (ITM)
Location No. 7	Overrun Area=512 m^2 Area to be cleared for Oversail, Land Ownership to be Determined, Boundary Vegetation To be Trimmed	E:523246 N:559558

TDR Locations	Location Notes	Location Coordinates (ITM)
Location No. 12C	Overrun Area=167 m^2 Area to be cleared for Oversail, Land Ownership to be Determined, Bridge Widening &Loadbearing Area to be Constructed	E:523777 N:565003
Location No. 14	Overrun Area=167 m^2 Area to be cleared for Oversail, Land Ownership to be Determined, Boundary Vegetation To be Trimmed,	E:522064 N:565137
Location No. 17A	Overrun Area=270 m^2 Area to be cleared for Oversail, Land Ownership to be Determined, Bridge Parapet to be Modified to Allow Oversail	E:519425 N:564233
Location No. 17C	Overrun Area=349 m^2 Area to be cleared for Oversail, Land Ownership to be Determined	E:518813 N:563759
Location No. 17D	Overrun Area=59 m^2 Area to be cleared for Oversail, Land Ownership to be Determined	E:518599 N:563727
Location No. 18B	Overrun Area=70 m^2 Area to be cleared for Oversail, Land Ownership to be Determined,	E:517474 N:563425
Location No. 19	Overrun Area=85 m^2 Area to be cleared for Oversail, Land Ownership to be Determined, Boundary Vegetation to be Trimmed	E:517137 N:563211
Location No. 19A	Overrun Area=201 m^2 Land Ownership to be Determined	E:516480 N:562950
Location No. 20	Overrun Area=540 m^2	E:515804 N:562521
Location No. 20A	Overrun Area=300 m^2 Area to be cleared for Oversail, Land Ownership to be Determined,	E:514912 N:561795
Location No. 20B	Overrun Area=90 m^2 Boundary Vegetation to be Trimmed Land Ownership to be Determined,	E:514461 N:561642
Location No. 21	Overrun Area=255 m^2, Area to be cleared for Oversail, Land Ownership to be Determined,	E: 514148 N:561110
Location No. 21A	Overrun Area=345 m^2 Area to be cleared for Oversail, Land Ownership to be Determined,	E:513671 N:560837
Location No. 22	Overrun Area=940 m^2 Area to be cleared for Oversail, Land Ownership to be Determined,	E:513395 N:560551
Location No. 28	Blade Laydown Area Area=12000 m^2	E:543962 N:566922
Location No. 29	Blade Laydown Area Area=12000 m^2	E:539792 N:563872
Location No. 30	Blade Laydown Area Area=12000 m^2	E:506514 N:556534

2.7.5 Site Access Tracks

The site access tracks are necessary to allow access for cranes and delivery trucks during construction of the Proposed Development and also during servicing/repairs to the wind turbines once operational. The existing access track from the L8544 will be upgraded and used to minimise additional land take. The site access tracks will be upgraded and constructed so that the width will be 5 m but will be wider at bends where a width of 5.5 m is to be provided. The maximum gradient on the Site will be approximately 15.7% with the exception of the access track to the Met Mast which has a gradient of approximately 17.3%. A stone layer will be provided so as to provide a good grip during wet weather. Gradients above 12-14% will usually require components to be towed by a specialist towing vehicle. Considering the maximum gradient on Site, as mentioned above, the towing of delivery vehicles is likely to be required.

Approximately 3,790m of the existing site access track length will be used for the Proposed Development. Site access tracks are shown on **Figure 1.2(a)**. The upgraded site access tracks will be approximately 17,055m^2 in surface area and will require approximately 7,675m^3 of stone material. This is further detailed in the Spoil Management Plan in **Appendix 2.1: Construction Environmental Management Plan** and throughout EIAR Chapters 5 – 17.

There will also be 2,040m of new site access tracks required for the Proposed Development. These will be constructed to provide a width of 4.5m and will cover an area of 9,180 m^2 and require c.4,131m^3 of rock. These roads will be excavated to firm bearing strata and constructed using rock from the turbine foundation excavations, the proposed borrow pit or imported to Site from a nearby quarry as outlined in **Table 2.4**.

The site access track layout follows the existing access track into the Site as far as possible, avoids environmental constraints, and follows the natural contours of the land. Every effort has been made to minimise the length of track necessary.

The site access tracks will be upgraded to carry a minimum 12 tonne axle construction loading. The design will consist of 150mm of 50mm Down Quarried Rock / Gravel Pavement on an average of 400mm Down Crushed Run Rock. The proposed site access track construction detail is shown in **Figure 2.5.** Passing bays and road widening will allow vehicles to safely pass each other. This is highlighted in **Drawing No. 6460-JOD-GLWF-XX-DR-C-0202 and 6460-JOD-GLWF-XX-DR-C-0205**.

The surface of the site access tracks will be maintained during the construction phase. Harmful constituents such as hydrocarbons pose a risk of environmental contamination and also a risk to human health if found in drinking water sources. All imported stone to the Site will have undergone appropriate quality testing to Transport Infrastructure Ireland (TII) specifications.

The pre-existing unpaved tracks on site traverse over several rivers and small drains which flow through culverts beneath the unpaved tracks at the Site. This is further detailed and assessed in **Chapter 9: Hydrology and Hydrogeology**. In addition to the pre-existing crossings at the Site, new access tracks will also be constructed to facilitate access to turbine and hardstand positions. The newly constructed access tracks will not cross any additional EPA mapped rivers or streams which have been deliberately avoided through the design process. There are numerous small man-made and natural drainage channels at the Site which are identified on **Figure 9.7**. Due to the large quantity of small drains existing at the Site, the turbine access road layout could not avoid intersecting several drainage channels at the Site. Many of the drainage channels at the Site are man-made and were dug out in relatively straight lines to improve land drainage. Some of the small drains will be diverted whilst others will be culverted with appropriately sized culverts as set out in the Surface Water Management Plan attached to **Appendix 2.1**.

The site access tracks will only be used temporarily during construction and will be used very infrequently during the operational phase for occasional maintenance activities. The volume of water in the small drains at the Site is generally minimal, many of these drains are ephemeral and dry out completely during dry spells, they are not classified as rivers or streams by the EPA or Tailte Éireann.

Careful planning of culvert sizing and the drainage diversion methodology detailed in the Surface Water Management Plan will see that the crossing of small drains at the Site will result in an anticipated negligible flood risk posed at site access tracks crossing over drainage channels.

No significant risk of flooding has been identified as a result of the Proposed Development due to the elevated nature of the Site relative to the surrounding area.

2.7.6 Met Mast

As part of the grid code[4] requirements, all wind farms with an installed capacity of greater than 10 MW are required to supply continuous, real-time data for the wind farm location. The data required is the wind speed and wind direction at turbine hub height, air temperature and air pressure. The data required for the Proposed Development will be provided by a dedicated Meteorological Mast of 100 m in height (location as detailed in **Figure 1.1**).

The Met Mast will be located on the southwest of the Site as detailed in **Figure 1.2** and will be a free-standing lattice type structure as shown in **Figure 2.7**. The Met Mast foundation will be approximately 12 m by 12 m, with a depth of 2.25 m and will be designed and constructed similar to the Turbine Foundations. It will encompass a cast-in insert or bolts to connect to the bottom of the Met Mast and reinforced bar structural elements. The area around and above the foundation will be backfilled with compacted granular material (gravel like material). The Met Mast will be linked to the Onsite Substation and Control Building via buried Internal Cabling for power and communication and will be required for the full operational duration of the Proposed Development.

2.7.7 Electrical Substation, Control Building and Associated Compound

It is proposed to construct a 110 kV Electrical Substation on the Site, as shown on **Figure 1.2**. This will provide a connection point between the proposed wind farm and the proposed Grid Connection Route Options at either Dunmanway or Carrigdangan 110 kV substations. Electricity transmitted between the turbines and the substation on the Site will be at 33 kV.

The substation will serve two main functions:

1) provide housing for switchgear, control equipment, monitoring equipment, and storage space necessary for the proper functioning of the wind farm; and
2) provide a substation for metering and for switchgear to connect to the national grid.

The construction and electrical components of the Onsite Substation and Control Building will be to ESB specifications within the parameters assessed. ESB specifications are published yearly on the ESB Networks website. The substation compound will be c. 5,550 m^2 and will be 0.3 m in depth and will be constructed from engineered stone material using similar construction techniques as for the crane hardstands, subject to Eirgrid specifications at the construction phase. The overall compound will be enclosed by a 2.65 m high palisade fence and will contain a single building, ancillary equipment, including the transformers,

[4] EirGrid (13 March 2023). EirGrid Grid Code Version 12

switch gear, fault protection, metering, car parking and other ancillary elements necessary for the operation of the Proposed Development.

The Onsite Substation building will contain control elements for the Proposed Development. The control components housed at the Onsite Substation and Control Building will include metering equipment, switchgear, the central computer system and electrical control panels. The control building will be a single story pitched roof structure with traditional rendered finishes and measure approximately 15.275m x 6.12m with a floor area of approximately 93.48m^2, subject to Eirgrid specifications at the construction phase. Details of the Onsite Substation and Control Building are shown on **Figure 2.8**. The appearance and finish of the substation building will be similar to an agricultural building with a slated roof and nap plaster finished proposed. It will have a suitably sized footpath around it and an adjacent parking area. The final finish of the control building will be an off-white or grey colour which best fits into the rural Irish landscape.

The Onsite Substation and Control Building will also contain an Eirgrid control building, control room, switchgear room, small store, an office and toilet.

There will be two lightning monopole protection masts which will be approximately 15 m in height, subject to Eirgrid specifications at the construction phase and associated site works. Warning / health & safety signage will be displayed as is normal practice for such installations. Motion sensitive lighting only will be used. Lighting is assessed in **Chapter 6: Biodiversity** and **Chapter 11: Landscape and Visual Amenity**. It is proposed to install a rainwater harvesting system as the source of water for toilet and welfare facilities and potable water being brought onsite in bottles. Wastewater from the staff welfare facilities in the control building will be collected in a sealed storage tank, fitted with a high-level alarm. This is a device installed in a fuel storage tank that is capable of sounding an alarm, during a filling operation, when the liquid level nears the top of the tank. All wastewater will be tankered off-site by a licensed waste collector to the Ballingeary wastewater treatment plant, which is located approximately 7.3km north of the Proposed Development. There will be no onsite treatment of wastewater.

A telecommunication antenna will be fixed externally to the substation control building for communication and control purposes (e.g. for the Supervisory Control and Data Acquisition (SCADA) System) for the Developer, turbine suppliers and ESB networks. There will be a small area outside the compound and adjacent to the access track that will be a hard-surfaced area for operation and maintenance for parking spaces, subject to Eirgrid specifications at the construction phase.

2.7.8 Transformers and Wind Farm Internal Cabling

The power generated by each wind turbine will be transmitted via underground Wind Farm Internal Cabling to the new 110 kV Onsite Substation and Control Building, at 33 kV, as will the communication signals whose cables will be installed in the same trench. The Wind Farm Internal Cabling network will be installed in trenches approximately 0.6 m wide by 1 m in depth and there will be approximately 5,530 m of Wind Farm Internal Cable trenching (giving a surface area of approximately 3,320 m²). The cable ducting will be installed to ESB Networks Limited requirements as per the design. A cross-sectional drawing is shown in **Figure 2.9**.

The electrical and fibre-optic cables running from the turbines to the Onsite Substation and Control Building compound will be run within the site access tracks and/or their verges. Where the cables are located in blanket bog habitat, they will be laid in the existing and proposed site access tracks themselves to minimise land take and disruption in this habitat. This will be the case for the cables between T6, T7, T8 to the site entrance at L8544. The potential effects on blanket bog habitat are identified, addressed and mitigated against in **Chapter 6: Biodiversity**. The potential effects associated with peat and the risk of peat slippage are identified, assessed and mitigated against in **Chapter 8: Soils and Geology**.

The Wind Farm Internal Cabling routes will be bedded in surplus excavated soil material. Danger tape, incorporating a metallic strip, will be laid during backfilling. Where the Wind Farm Internal Cabling is to cross site access tracks, suitable electrical ducting will be provided. Permanent posts up to approximately 0.5 m in height will mark the trenches at regular intervals and at all changes in direction. An as built layout plan showing the location of underground Wind Farm Internal Cabling will be on permanent display within the control building.

Clay plugs or concrete cut offs will be installed at regular intervals in the cable ducting trenches where they are located on slopes to prevent the trenches from becoming preferential flow paths for runoff from the Site.

Transformers will be located inside each turbine.

Excavated material will be temporarily stored uphill of the trench excavations which will prevent any sediments from being washed downhill as they will be contained in the trench. Silt fences will be installed downgradient of the excavations on steeper slopes to prevent silt runoff. Peat spoils will be used for remediation and restoration. Other spoil will be permanently stored in the on-site borrow pit. This is further detailed in the Spoil Management Plan in **Appendix 2.1: Construction Environmental Management Plan** and fully assessed in **Chapter 8: Soils and Geology**.

2.7.9 Grid Connections

This chapter provides a description of the work required along 2 no. proposed Grid Connection Route (GCR) Options and Onsite Substation and Control Building. This element of the Project will be subject to a separate planning consent process but will be assessed within this EIAR.

Connection will be sought from the grid system operators by a separate application to ESB Networks Limited. TLI assessed possible connection options for the Proposed Development. The Onsite Substation and Control Building will connect via underground 110 kV cable to either the Dunmanway (Option A) or Carrigdangan (Option B) ESB 110 kV substations. The overall length of Option A GCR between the substation and the existing Dunmanway 110 kV substation is approximately 28 km, of which, approximately 3.98 km is within the Site with the remainder located along the L8776 and the R587. The overall length of Option B between the substation and the existing Carrigdangan 110 kV substation is approximately 22 km, of which, approximately 3.98 km is within the Site with the remainder located along the L8776 and the L4607. The grid connection can be summarised as follows:

- **Option A - Underground Grid Connection to Dunmanway 110kV Substation** utilising sections of UGC in public road, primarily regional roads, and private lands. [28 km]
- **Option B - Underground Grid Connection to Carrigdangan 110kV Substation** utilising sections of UGC in public road, primarily regional roads, and private lands. [22 km]

The GCR Options are provided in **Figure 2.10.** The grid feasibility studies carried out by TLI can be found in **Appendix 2.2**.

The chosen Grid Connection will be constructed to the requirements and specifications (CDS-GFS-00-001-R1) of EirGrid or most recent specification. The electricity will be transmitted as a three-phase power supply meaning there will be three individual conductors in each cable circuit. The three conductors will be laid in separate ducts which will be laid in accordance with EirGrid functional specifications (CDS-GFS-00-001-R1[5] or most recent specification) for 110 kV underground cables. The width of a 110 kV cable trench with a trefoil formation will be 600 mm. The depth of the trench for 110 kV cables is 1 m. A separate duct will be provided within the trench for fibre optic communications. (Please see **Appendix 2.3**).

The following is a summary of the main activities for the installation of ducts:

- All relevant bodies i.e. ESB Networks Limited, Gas Networks Ireland, Eir, Cork County Council, Uisce Éireann etc. will be contacted and up to date drawings for all existing services will be sought so that the grid connection ducting does not damage or interfere with existing services. This will be rechecked by the Contractor prior to excavations taking place.
- Immediately prior to construction taking place, the area where excavation is planned will be surveyed by CATSCAN (sub-surface survey technique to locate any below-ground utilities) and all existing services will be verified. Temporary warning signs will be erected.
- Clear and visible temporary safety signage will be erected all around the perimeter of the live work area to visibly warn members of the public of the hazards of ongoing construction works.
- A silt fencing filtration system will be installed on all existing drainage channels for the duration of the cable construction to prevent contamination of any watercourse.
- A 13-tonne rubber tracked 360-degree excavator will be used to excavate the trench to the dimensions of 600 mm wide by 1.22 m deep.
- Excavated road surface material will be taken to a designated recycling facility licensed to accept this type of material[6].
- Excavated stone and soil will be taken off site for recycling/disposal at a licensed facility.
- Once the trench is excavated, a 50 mm depth base layer of sand (in road trench) or 15 n/mm^2 CBM4 concrete will be installed and compacted. All concrete will be offloaded directly from the concrete truck into the trench.
- uPVC ducts will be installed on top of the compacted base layer material in the trench.

[5] https://www.eirgridgroup.com/site-files/library/EirGrid/110kV-Underground-Cable-Functional-Specification-General-Requirements.pdf
[6] Or may be reused as part of an innovative scheme which has been used in Cork in 2022 where material can be recycled. Road recycling mixes material from the existing road pavement with bitumen and emulsion for the new surface leading to a reduction in emissions, a reduction on haulage of materials and a conservation of resources, providing substantial environmental benefits.

- Once the ducts are installed, couplers (a device used for joining pipes) will be fitted and capped to prevent any dirt entering the unjointed open end of the duct.
- The as-built location of the installed ducts will be surveyed and recorded using a total station/GPS before the trench is backfilled to record the exact location of the ducts.
- The co-ordinates will be plotted on as-built record drawings for the grid connection cable operational phase.
- When ducts have been installed in the correct position on the trench base layer, sand (in road trench) or Lean-mix CBM4 (CL1093) (off road trench) will be carefully installed in the trench around the ducts so as not to displace the duct and will be compacted.
- Timer spacer templates will be used during installation so that the correct cover of duct surround material is achieved above, below and at the sides of the duct in the trench.
- A red cable protection strip will be installed above duct surround layer of material and for the full length of the cable route.
- A layer of Lean-mix CBM4 (CL1093) (in road) will be installed on top of the duct surround material to a level 300 mm below the finished surface level.
- Yellow marker warning tape will be installed for the full width of the trench, and for the full length of the cable route, 300 mm from the finished surface level.
- The finished surface of the road will then be reinstated on a temporary basis to the requirements of the Guidelines for Managing Openings in Public Roads, 2017[7].
- Precast concrete cable joint bays together with communications chambers will be installed within the excavated trench.
- The joint bays will be backfilled and the finished surface above the junction box reinstated on a temporary basis as per the requirements of the Guidelines for Managing Openings in Public Roads, 2017. The cable junction boxes will be re-excavated a second time during cable pulling and jointing, after which the finished surface above the joint bays will be reinstated again to its original condition. When trenching and ducting is complete, the installation of the grid connection cable will commence between the Onsite Substation and Control Building and the existing 110 kV substation at either Dunanway or Carrigdangan.
- The underground cable will be pulled through the installed ducts from a cable drum set up at one joint bay and using a winch system which is set up at the next joint bay, the cable will be pulled through.
- The cables will be jointed together within the precast concrete cable junction box (Joint Bay).

[7] https://www.gov.ie/en/publication/eda1ae-guidelines-for-managing-openings-in-public-roads-2017/

- The joint bays will be filled with sand to meet specific resistivity properties and concrete covering slabs installed.
- The finished surface above each cable joint bay is reinstated on a permanent basis to the requirements of the Guidelines for Managing Openings in Public Roads, 2017.

2.7.9.1 Joint Bays

Joint Bays are pre-cast concrete chambers where individual lengths of cables will be joined to form one continuous cable. A joint bay is constructed in a pit. Each joint bay will be 6 m long x 2.5 m x 2.3 m deep and placed approximately every 700 m – 850 m along the route A reinforced concreted slab will be constructed on top of the bay.

The joint bay locations have been dictated by suitable terrain, spacing requirements, and access to facilitate the operation of cable pulling equipment at any phase of the Proposed Development and future operation of the installation in accordance with the EirGrid specifications (CDS-GFS-00-001-R1[8]).

The joint bays will be filled with sand to meet specific resistivity properties and concrete covering slabs installed.

Communication chambers, which are similar to small manholes, will be installed at the joint bay locations to facilitate connection of fibre-optic communication cables.

2.7.9.2 Directional Drilling Works

Appendix 2.2 shows details of the Grid Connection Routes and the locations of the HDD crossings for each GCR Option. There are 22 no. watercourse crossings along the GCR Option A and 18 no. watercourse crossings along GCR Option B. Directional drilling is the practice of drilling holes in a non-vertical direction for the laying of ducts which contain cables beneath features such as watercourse and this is what is proposed to traverse watercourse crossings. The directional drilling commences at the launch pit which is the entry point for pipes and ducts to be placed. Pipes and ducts are brought through the drilled hole to a receiving pit on the opposite side of the hole to the launch pit. The crossings will comprise 4 x 110mm High Performance Polyethylene (HPPE) pipes/ducts each directionally drilled. Two separate excavations will be made to a depth of 2 metres to accommodate the directional drilling launch and reception pits in the road on either side of the crossing (no third-party lands either side of the road are anticipated to be required). Spoil arisings will be

[8] CDS-GFS-00-001-R1 110 kV, 220 kV and 400 kV Underground Cable Functional Specification, Engineering & Asset Management Department (Eirgrid Group), 2021.

loaded onto trucks for disposal off-site as soil is excavated. The excavation launch and reception pits will be reinstated using compacted layers of crushed stone on completion of drilling and jointing operations.

The Drill head will be placed in the open excavation (launch pit) and it will be guided in by the operator for the first 1-2 metres. A series of drill rods will be connected to the head as it travels further along the shaft.

The drill position is always known to the operator and the drill can be manoeuvred in 3 planes / axis. A surveyor will monitor drilling works to ensure that the modelled stresses and collapse pressures are not exceeded. A drilling lubricant will be required, and this will be delivered directly to the drill head by hydraulics. The lubricant will be chemically inert bentonite slurry mixture which lubricate the drill head and remove the drilled earth and stone. Once the conduit is completed, the drill head is exposed at the reception pit and removed. Once the first pilot hole has been completed a hole-opener or back reamer will be fitted in the exit pit and will pull a drill pipe back through the bore to the entry side. The drill rods are connected to the duct pipe and the drill is reversed pulling the pipe back through the conduit.

A spoil volume of 5 m^3 will be excavated for each 100 m run of 4 pipes. This spoil will be largely subsoil material. This material will exit the launch pit within the bentonite slurry mixture. A mobile bunded tank will be located next to the launch pit into which the material/slurry mixture will be pumped. This will be stored outside of the 20 m watercourse buffer zone.

Mitigation measures are set out in the Construction Environmental Management Plan (**Appendix 2.1**) and in EIAR Chapters **8: Soils and Geology** and **9: Hydrology and Hydrogeology**.

2.7.10 Borrow Pit

One borrow pit is being proposed to enable on site stone extraction for the construction of part of the site access tracks and the Turbine Hardstands. It will be located to the north of the Site, between the Temporary Construction Compound and T1. The location is shown in **Figure 1.3**. Spoil will initially be excavated and stockpiled locally or for re-use for site remediation purposes.

Rock breaking equipment will be employed for borrow pit stone extraction. This will involve the use of a 40-60 tonne 360-degree hydraulic excavator with a rock breaker. The rock breaker is supported by a smaller 30-40 tonne rock breaker which breaks the rock down further for feeding into the rock crusher machine. The larger rock breaker breaks out the rock in a progressive manner from the borrow pit (similar to that of the Turbine Foundations) and the smaller rock breaker breaks it down further. Rock breaking is fully assessed in **Chapter 10: Noise and Vibration** and **Chapter 8: Soils and Geology**. No blasting will be carried out on site, either for borrow pit excavation or for excavation of Turbine Foundations.

The broken-down rock will be loaded into an on-site mobile crusher using a wheeled loading shovel machine and crushed down into the correct grade for use in the civil construction of site access tracks and Turbine Hardstands. Where the borrow pit area becomes exhausted or impractical to extract due to physical site constraints, physical excess stone requirements will be imported to the Site from a nearby quarry as shown on **Figure 2.4**.

2.7.11 Turbine Foundation Rock Breaking

Weaker rock will be extracted using a hydraulic excavator and a ripper. Upon the completion of further confirmatory site investigation, where stronger rock is encountered and cannot be extracted using an excavator, then rock breaking equipment will be employed. This will involve the use of a 40-60 tonne 360-degree hydraulic excavator with a rock breaker. The rock breaker is supported by a smaller 30-40 tonne rock breaker which breaks the rock down further for feeding into the rock crusher machine. The larger rock breaker breaks out the rock in a progressive manner from the Turbine Foundations and the smaller rock breaker breaks it down further.

The broken-down rock is loaded into mobile crusher using a wheeled loading shovel machine and crushed down into the correct grade for use in the civil construction of site access tracks and Turbine Hardstands.

2.7.12 Onsite Drainage

The surface water runoff contained within natural and artificial drainage channels includes stream and river waterbodies, drainage ditches, and other minor natural and artificial manmade drainage features.

Drainage measures will be provided to attenuate runoff, guard against soil erosion, soil compaction, and safeguard local water quality. Details of the drainage system are shown on **Figure 2.11-2.13** and outlined in detail in the Surface Water Management Plan, part of the CEMP attached as **Appendix 2.1** and full details are provided in **Chapter 9: Hydrology and Hydrogeology.**

Watercourses on site consist of manmade drainage channels and headwaters of the Inchiroe and Shehy Beg Rivers, some of which are ephemeral. Sustainable Urban Drainage System (SuDS) principles will be employed as follows:

Source controls for surface water

- Interceptor drains, vee-drains, diversion drains, flume pipes, erosion and velocity control measures such as use of sandbags, oyster bags filled with gravel, filter fabrics, and other similar/equivalent or appropriate systems
- Small working areas, covering stockpiles with geotextiles layering to protect against water erosion and runoff in rainy weather, and/or cessation of works in certain areas such as working on a high gradient during wet and windy weather.

In-line controls for surface water

- In line controls are controls which are directly applied to the surface water body, including interceptor drains, vee-drains, oversized swales, erosion and velocity control measures such as check dams, sandbags, oyster bags, straw bales, flow limiters, weirs, baffles, silt bags, silt fences, sedimats, filter fabrics, and collection sumps, temporary sumps/attenuation lagoons, sediment traps, pumping systems, settlement ponds, temporary pumping chambers, or other similar/equivalent or appropriates systems

Treatment systems for surface water:

- Temporary sumps and attenuation ponds, temporary storage lagoons, sediment traps, and settlement ponds, and proprietary settlement systems such as Siltbusters and/or other similar/equivalent or appropriate systems.

When heavy rainfall is forecasted, then works will be suspended and postponed to when better weather conditions are forecasted.

Further details on drainage management and mitigation can be found in **Chapter 9: Hydrology and Hydrogeology** and the Surface Water Management Plan attached in the CEMP as part of **Appendix 2.1.**

2.7.13 Table of Key Development Infrastructure Metrics

The Key Development Infrastructure Metrics are contained in **Table 2.7**. This table is provided for ease of reference for EIAR chapter authors and for readers of this EIAR.

Table 2.7: Key Development Infrastructure Metrics

Description	Length [m]	Width [m]	Depth [m]	No.	Area [m^2]	Volume of Excavation [m^3]
Upgraded Site Access Track	3,790	4.5	0.45	-	17,055	7,675
New Site Access Track	2040	4.5	0.45	-	9,180	4,131
Internal Cabling (power & communications)	5,530	0.6	1.00	1	3,320	3,320
Turbine Hardstands – Access Road	1425	-	0.3	8	7,125	2,138
Turbine Hardstands – Hardstand Areas	-	-	0.3	8	33,240	9,972
Turbine Foundations (25.5m diameter)	-		2.25	8	4,090	9,200
Turning Heads	-	-	0.45	4	2,330	1,050
Junctions	-	-	0.45	-	9,130	4,108
Met Mast foundation	13	12	2.25	1	156	350
Electrical Substation	97.44	56.97	0.3	1	5,550	1,665
PP Compound at Substation	34.78	56.97	0.3	1	1,980	595
TDR Road Widening Overrun Area	-	-	0.45	-	3,480	1,555

Description	Length [m]	Width [m]	Depth [m]	No.	Area [m²]	Volume of Excavation [m³]
Borrow Pit	-	-	1.5	1	8,150	12,225
Site Compound	80	35	0.3	1	2,800	840
110kV Cable Grid Connection (Option A and B) Up to Site Entrance	3,715	0.825	1.315	1	3,065	4,030
110kV Cable Grid Connection (Option A) Site Entrance to End	17,961	0.825	1.315	1	14,818	19,485
110kV Cable Grid Connection (Option B) Site Entrance to End	18,020	0.825	1.315	1	14,867	19,549

Taking the above figures into consideration, the land take from the Proposed Development will be 125,298 m^2 (12.5 ha) which is the sum of the figures above which are to be retained following construction e.g. site access tracks, Turbine Foundations, Met Mast Foundation, Turbine Hardstands, Met Mast Hardstand and 110 kV Onsite Substation and Control Building. The Grid Connection Routes will involve works on 14,818 m^2 for Option A or 14,867 m^2 for Option B (**Table 2.7**) of area on the public roads to be reinstated following the laying of the ducts and so is classed as temporary land take.

2.7.14 Site Signage

Signs will be placed (in accordance with any planning conditions issued) on the L8544 showing directions to the Site in the English and Irish languages. Additional signage can also be placed on the public road, warning of construction vehicles entering and egressing the Site for road safety measures.

Within the Redline Boundary, the Site entrance on the L8544 will have a sign confirming that it is the entrance to the Site and the speed limit of 30 km/h. There will also be additional signs during the construction phase confirming that construction works are taking place and proper precautions must be taken by anyone entering the Site. There will be no entry to unauthorised persons or the general public during construction. Additional details can be found in **Chapter 14: Traffic and Transport.**

Four no. information boards will be erected on site which will provide information about the local archaeological and cultural heritage of the Site. This is further detailed in **Drawing No.'s 6460-JOD-GLWF-XX-DR-C-0205, 6460-JOD-GLWF-XX-DR-C-0206, and 6460-JOD-GLWF-XX-DR-C-0208;** and in **Chapter 13: Cultural Heritage**.

2.7.15 Peat and Spoil Management

2.7.15.1 Spoil Quantities

The quantities of spoil likely to be generated at the Proposed Development have been calculated by Jennings O'Donovan & Partners. It is estimated that based on site surveys carried out by EcoQuest Environmental using peat probes that the amount of peat spoil predicted to be generated during construction of the wind farm is approximately 55,806 m^3 of peat spoil.

The total amount of cut material below the peat layer estimated from the Proposed Development is approximately 210,000 m^3 with the amount of fill being estimated at 196,000 m^3. This means 14,000 m^2 of additional material will be needed which will be sourced from Turbine Foundation excavations and the borrow pit.

2.7.15.2 Landscaping & Reinstatement

The levels of peat on site are generally low. Berms or large designated storage areas for the storage of spoil will not be permitted. However, any peat spoil will be used to safely and appropriately to reinstate exposed areas around infrastructure such as slopes/graded ground around site access tracks and Turbine Hardstands and on the Turbine Foundations or where there is degraded bog that can be enhanced by depositing peat on it. This will be done under the supervision of the Site Engineer and Ecological Clerk of Works and is assessed in both **Chapter 6: Biodiversity** and **Chapter 8: Soils and Geology** of this EIAR.

Peat that cannot be used for reinstatement around the Site, will be taken into the borrow pit. The designated borrow pit area measures 8,150 m^2 (0.8 ha) and a capacity of approximately 12,225 m^3 assuming that spoil can be stored up to a total height (for safety reasons) of approximately 1.5 m. This will allow the total estimated amount of spoil to be stored taking into account a bulking factor of 10% (total of approximately 13,448 m^3). These areas are shown on **Figure 1.2(b)** and the existing site conditions are shown in **Plates 2.1** and **2.2**.

2.7.15.3 Non-Peat Spoil

It is envisaged in the design that all the non-peat material won on Site can be used as fill on site and in the following places:

- Subsoil to be used around the blade laydown areas where load capacities required are less; and
- Rock won from excavations to be used within site access track and Turbine Hardstand build up.

There will also be spoil generated from the Grid Connection Route Options works. This will be in the form of tarmacdam/asphalt, compacted rock fill material and subsoils. The total amount of spoil material from the Grid Connection Route Options works is estimated to be 10,775 m^3 for Option A or 10,812 m^3 for Option B. Asphalt will be re-used where possible or placed on the market for new construction projects as recommended by the Environmental Protection Agency[9]. The remaining material will need to be taken off site and recycled/disposed of at Benduff Landfill Site which is an appropriate licenced facility to deal with inert waste.

2.7.16 Ecological Enhancement

An area of land of approximately 20 ha has been designated within the Site that will be used as a habitat enhancement area. The target habitat occurring in the HMP Management Lands are wet heath and montane heath habitat. It is noted that none of the lands currently included in the c. 20 Ha of HMP Management Lands are managed under any nature conservation schemes, and thus there are no restrictions to land management practices, which is evident by virtue of excessive livestock grazing pressure, throughout the Site, in within areas of lower elevation and level ground within the HMP Management Lands. The implementation of this HMP as part of the overall Gortloughra Wind Farm project provides an opportunity to manage and conserve the area of wet and montane heath habitat occurring within the HMP Management Lands, as well as the HMP Restoration Lands for the lifetime of the Proposed Development. The land use restrictions that would be required for habitat restoration in this area will comprise:

1. Fencing of Habitat Management Plan (HMP) lands that will be treated for the establishment and enhancement of heath habitat – this point applies to areas of the

[9] https://www.epa.ie/news-releases/news-releases-2023/epa-publishes-national-criteria-that-allow-for-the-safe-reuse-of-site-won-asphalt-road-planings-as-a-by-product.php [Accessed 14/11/2024]

construction phase footprint that will be treated with the aim of returning the vegetation to heath habitat.

2. Restriction of livestock in lands subject to Point 1 and for at least the initial 3 years to allow of establishment of heath vegetation in these areas.
3. Where monitoring indicates that it is suitable to allow grazing after year 3 in lands subject to Point 1, then grazing will can commence. If the results of monitoring indicate failure of establishment of heath vegetation, then grazing restriction may need to be extended while remedial habitat management actions, such as seeding with heather etc., are undertaken.
4. Grazing in the HMP landholding should be by sheep only once grazing is allowed.
5. Monitoring would be ongoing for the lifetime of the wind farm e.g. years 1 – 3, 5, 7, 10, 15, 20 ,25, 30. Additional more localised measures where relevant could also be specified in the HMP e.g. drain blocking etc.

Further details on biodiversity enhancement can be found in **Chapter 6: Biodiversity and Appendix 6.5: Habitat Management Plan**.

2.7.17 Archaeology and Cultural Heritage

There is an enclosure (CO093-078003-) located 5 m south of an area of fill to be introduced on the south side of the track to reduce the gradient of a steep slope in this area. This will not require any ground excavation work within the fill area.

A hut site (CO093-078001-) is 12 m south of an area of fill to be introduced to reduce the gradient of a steep slope on the south side the existing track. This will not require any ground excavation work fill area.

An second hut site (CO093-078002-) is 10 m south of an area of fill to be introduced to reduce the gradient of a steep slope on south side of existing trackway to the north. This will not require any ground excavation work within the fill area.

A third and final hut site (CO093-078004-) is 5 m south of an area of fill to be introduced to reduce the gradient of a steep slope on south side of existing trackway to the north. This will not require any ground excavation work within the fill area.

These sites are fully assessed in **Chapter 13: Cultural Heritage**.

2.8 CONSTRUCTION

The construction phase will begin with site preparation works and will be complete when the turbines are built and ready for commissioning, and when all wastes have been removed from the Site. For this Proposed Development, it is envisaged that the construction phase will last approximately 16-18 months. An indicated construction programme is set out at **Table 2.8**.

Table 2.8: Indicative Construction Programme

Activity	Month															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Site Establishment/ Fencing off	X															
Internal Access Road Upgrade & Construction and Turbine Delivery Route works		X	X	X	X											
Substation & Compound Construction				X	X	X	X									
Substation Electrical Works									X	X	X	X	X	X		
Substation Commissioning										X						
Excavation & Construction of Turbine Foundations & Hardstands		X	X	X	X	X	X	X	X							
Internal Cabling Installation								X	X	X						
Turbine Delivery and Erection										X	X					
Grid Connection									X	X	X	X	X			
Energisation														X		
Turbine Commissioning															X	X
Site Restoration															X	X

2.8.1 Construction and Environmental Management Plan (CEMP)

A CEMP is appended to the EIAR in **Appendix 2.1**. The CEMP includes all the mitigation measures proposed within the EIAR and the NIS. A Summary of the mitigation measures is also included in **Appendix 18.1**. In the event that planning permission is granted for the Proposed Development, the CEMP provides a commitment to mitigation and monitoring and reduces the risk of pollution whilst improving the sustainable management of resources. The environmental commitments of the Proposed Development will be managed through the CEMP and will be secured in contract documentation and arrangements for construction and later phases, such that there will be a robust mechanism in place for their implementation. The CEMP addresses the construction phase, and will be continued through to the commissioning, operation and final decommissioning phases (refer to Decommissioning Plan as part of the CEMP in **Appendix 2.1**). An Ecological Clerk of Works (ECoW) with experience in overseeing wind farm construction projects will be appointed by the Developer for the duration of the construction phase so that the CEMP is effectively implemented. The Contractor will be required to appoint an Environmental Manager.

2.8.2 Refuelling

Vehicles will be refuelled off-site where possible. For vehicles that require refuelling on-site, fuels will be stored in the Temporary Construction Compound and bunded to at least 110% of the storage capacity of fuels to be stored. Refuelling will take place via a mobile double skinned fuel bowser. The bowser will be a double axle refuelling trailer which will be towed to the refuelling locations by a 4x4 vehicle. The 4x4 will carry, a drip tray, spill kit and absorbent mats in case of any accidental spillages. Only designated competent personnel will refuel plant and machinery on the Site. This is further assessed in **Chapter 9: Hydrology and Hydrogeology**.

2.8.3 Concrete

There will be no concrete batching on the Site. Rather, it will be transported to the Site as it is required. A dedicated, bunded area will be created to cater for concrete wash-out and this will be within the Temporary Construction Compound located north of the Site entrance. This will be for the wash-out of the chutes only after the pour has been completed. Concrete trucks will then exit the Site and return to the supply plant to wash out the mixer itself.

The main concrete pours at the turbine locations will be planned in advance and proposed mitigation measures are detailed in **Chapter 9: Hydrology and Hydrogeology**. The potential effects associated with concrete are identified, assessed and mitigated against in **Chapter 9** and demonstrates how the protection of the environment has further influenced the project design.

The chutes wash out on-site will require a small volume of water. This water will be directed to the concrete washout area which will be a temporary lined impermeable containment area or a siltbuster type washout unit[10] or similar. The unit catches solid concrete and filters and contains the washout liquid for pH adjustment and solid separation. The residual liquids

[10] https://www.siltbuster.co.uk/solutions/concrete-washwater/

and sediments will be disposed of at an appropriately licenced facility, namely Ballingeary Water Treatment Plant.

If a temporary lined impermeable containment area is used, it will be constructed using straw bales and lined with an impermeable geotextile membrane. An example is shown on **Plate 2.1**. An alternative construction method would be to dig a hole in the ground and place an impermeable geotextile membrane in the hole so that no wastewater can penetrate the cover and seep into the soil and groundwater.

Plate 2.1: Example of a Temporary Concrete Washout Area

The washout area is covered when not in use during periods when wet weather is forecast to prevent ponding of rainwater. During periods of dry weather, the area can be left uncovered to allow evaporation of water. Once concrete pours have been completed, the remaining water will be tankered off site to a licenced facility for disposal. Solid concrete can be broken up and disposed of at a licenced facility along with other construction waste. It is estimated that there will be approximately 1-2 m^3 of solid concrete waste per Turbine Foundation pour that will need to be disposed of, or a maximum of 18 m^3 in total.

It is expected that the Turbine Foundations will be left in-situ during decommissioning and so will not require breaking up and disposal.

Deliveries of concrete for Turbine Foundation construction are generally carried out outside of normal working hours to limit impacts on traffic and local road users. The noise impacts of these deliveries have been assessed in detail in **Chapter 10: Noise and Vibration**. Each turbine pour can take place in a single day, so over eight days in this case.

The concrete trucks will not be washed out on site but will be washed out on return to the batching plant. The Transport Management Plan (TMP) specifies the routes and arrangements for concrete delivery as well as outlining emergency measures to be taken. Refer to TMP in **Appendix 14.2**. Quarries and concrete suppliers in the area are shown on **Figure 14.1**.

2.8.4 Waste Generation

During construction a number of types of waste will be generated from the Proposed Development. The types and estimated quantities are shown in **Table 2.9**. A detailed Waste Management Plan accompanies this EIAR in **Appendix 2.1: CEMP**.

Table 2.9: Types of Waste from Construction

Waste Type	Estimated Quantities
General (segregated wastes from canteen, plastic, cardboard, etc.)	1 skip/month
Concrete	18 m^3
Plastic (10kg/turbine blade)	240 kg
Cable Offcuts	1 tonne
Timber Pallets	20 - 30
Timber Cable Drums	30 - 40
Oils/Fluids	N/A
Metals	1 skip/month

The Contractor will avoid or minimise the volume of waste generated.

Waste will be stored a minimum of 50 m from nearby watercourses or drains at the Site.

Waste storage and disposal will be carried out in a way which prevents pollution in compliance with legislation.

All waste to be transported off-site to a licensed disposal site. The nearest licenced waste facility is 9 km to the east of the Site in Dunmanway (Civic Amenity Services). Excavated material along the Grid Connection Route will be removed to a licenced waste facility.

All oil storage facilities will have secondary containment facilities of 110% storage capacity (e.g., bund, enclosure, drip tray). All of these will be regularly inspected for visual signs of leaks or something that would impact on their capacity – e.g., a drip tray full of rainwater. This is further detailed in **Appendix 2.1: Construction Environmental Management Plan**.

Waste storage areas will be clearly located and signed. Key waste streams will be separated.

Cable drums will be collected onsite for reuse, while cable offcuts will be transported off-site to be recycled at an appropriately licensed facility such as at the Ashgrove Recycling & Waste Management Centre, which is located approximately 50 km east of the site in Cork City. Metals will be recycled at an appropriately licensed facility such as KWD Recycling in Killarney.

All waste will be transported from Site at appropriate frequency by a registered waste contractor to prevent over-filling of waste containers.

Frequency of Checks. The contractor will see that all storage facilities are checked on a weekly basis.

Only trained operatives will handle hazardous substances. Any and all stored hazardous waste (e.g., 17 05 03* soil and stones containing hazardous substances) will be clearly labelled.

During operation, it is not anticipated that significant quantities of waste will be generated from the Proposed Development. Should a turbine blade need to be replaced (due to damage), then some plastic waste will be generated, which can be expected to be similar to the construction phase, that is approximately 10 kg of plastic waste per blade.

2.8.5 Dust Suppression

During periods of dry and windy weather, there is potential for dust to become friable and cause nuisance to nearby residences and users of the local road network. This is further assessed in **Chapter 15: Air and Climate**, **Chapter 14: Traffic and Transport** and **Chapter 12: Material Assets**. Damping down (wetting of the surface) may be required to provide that dust does not become friable. A wheel cleaning facility will be employed onsite where mud and debris will be removed from vehicles egressing the Site and reduce mud and debris from getting onto the local road network, in particular the L8776, by which all traffic to the Proposed Development will access the Site, where it could dry out, become friable and potentially cause a nuisance. HGVs entering the Site carrying aggregates will be covered to prevent dust generation. A road sweeper will be available for use on the approach roads to the Proposed Development in case of any mud or debris making it onto the public road network.

2.8.6 Construction Hours

It is estimated that the Proposed Development will have approximately 92 construction workers during the peak construction phase. Working hours for construction will be from 07:00 to 19:00 on weekdays, with reduced working hours at weekends, from 08:00 to 13:00 on a Saturday. No work will be carried out on Sundays or Public Holidays. 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 Cork County Council prior to the commencement of Turbine Foundation construction. A detailed Traffic Management Plan ("TMP") (**Appendix 14.2**) will be implemented for the construction phase, which shall be agreed during the planning compliance stage with the Planning Authority so that strict controls as described herein are in place with all suppliers coming to the Site.

2.8.7 Construction Compound and Temporary Works Area

The Temporary Construction Compound will be set up upon commencement of the construction phase. The proposed location for the Temporary Construction Compound is found in the northern portion of the Site, at the site entrance as shown in **Figure 1.2(a)** and the layout is shown in **Figure 2.14**. The compound will be 80 m by 35 m and approximately 0.3 m in depth [2,800 m² / 840 m³]. The compound will be used as a secure storage area for construction materials and to contain temporary site accommodation units for sealed type staff welfare facilities. The compound will contain cabins for office space, meeting rooms, canteen area, a drying room, parking facilities, and similar personnel type facilities.

Temporary widening of the site access tracks and provision of passing bays will allow vehicles to pass each other safely during the construction phase.

An area within the compound will be used for the storage of fuel and oils and this will be suitably bunded. The bund will be lined with an impermeable membrane in order to prevent any contamination of the surrounding soils, vegetation and water table. Double protection containers / equipment will be used along with drip trays and details are included in the CEMP, included as **Appendix 2.1**.

During the construction phase, water will be supplied by a water bowser. The maximum wastewater production is estimated to be the same as the maximum water consumption (up to 2,000 litres per day). The Project will include an enclosed wastewater management system at the Temporary Construction Compound capable of handling the demand during the construction phase with 92 construction workers on site at peak. A holding tank is proposed for wastewater management. Wastewater will be removed off-site and disposed of at an appropriately licensed Wastewater Treatment Plant such as Ballingeary Wastewater treatment plant (D0431-01).

2.8.8 Construction of Turbine Hardstands and Turbine Foundations

The construction method for all the Turbine Hardstands will be via excavated approach to approximately 0.3 m depth. Each Turbine Hardstand will be approximately 85 m by 65 m. Foundations will be taken down to competent bearing strata by excavating through the soil, subsoil, and rock if necessary.

The locations of Turbine Hardstands and Turbine Foundations were designed on a constraints-based approach during the feasibility stage of the Project so that the placement of turbines is optimised from an environmental and production perspective. Peat was avoided in this process.

The method of construction for turbine foundation is also described below:

- Install temporary drainage around perimeter of excavation
- Excavate soil and rock
- Form a level working area to build foundation
- Install formwork and reinforcement
- Pour concrete
- Cure concrete
- Once the concrete has set and the earthing system is in place, backfill the foundation with rock
- Use soil to build up the area around the turbine base

2.8.9 Construction Turbine Assembly

Once on Site, the wind turbine components will follow a detailed route and plan to minimise manoeuvring. Components will be placed on Turbine Hardstands prior to assembly. It is proposed that a 'just in time' delivery strategy will be in place for turbine blades to reduce the need for temporary set down areas. Typically, one large crane (750-1,000 tonnes) will be required for erecting the turbines, assisted by a smaller crane (150-200 tonnes). Similar cranes will also be required for maintenance during the operational phase. As with all other vehicles, refuelling of cranes will be carried out in accordance with site procedures to minimise the risk of spillage or pollution.

The towers will be delivered in sections, and work on assembly will not start until a suitable weather window is available, e.g., Wind Gust Speed Threshold of less than 6 m/s. The bottom tower section will be bolted onto the concrete foundations. The mid tower section will then be lifted into position and bolted to the bottom tower section. Finally, the top tower section will be lifted into position and bolted to the mid tower section. One of the three following methods can be used to attach the blades:

1. The blades can be attached to the nacelle and hub on the ground. The hub and blades are then lifted as one.

2. The hub can be attached to the nacelle and the two blades attached to the hub while the nacelle is on the ground – the "bunny lift". The nacelle is then lifted into position and the third blade lifted into place separately. This requires manoeuvring of several components on the ground and usually the repositioning of cranes.

3. Lifting the nacelle and hub as one unit, as described above and then attaching the blades one at a time, rotating the hub between lifts. The blade lifting operations do not require repositioning of the crane.

The most appropriate method from the three described above, will be decided by the lifting contractor and the turbine manufacturer, prior to turbine erection. Risk of accidents has been assessed in **Appendix 2.1: Construction Environmental Management Plan** (Emergency Response Plan) and in **Chapter 17: Major Accidents and Natural Disasters**.

2.8.10 Construction Traffic

It is estimated in **Chapter 14: Traffic and Transport**, that during civil construction, 8,017 fully loaded Heavy Goods Vehicle trips will be required for the Proposed Development. This breaks down to 668 loads per month or an average of 21 to 23 loads per day.

The peak number of deliveries per day will occur during the concrete pour for Turbine Foundation construction. An estimated 100 concrete deliveries will be required per Turbine Foundation. Other materials will also be delivered on such days, so a realistic estimation of peak deliveries is 110 deliveries per day (for 8 separate days in the construction programme when the Turbine Foundations will be poured). On these concrete pour days, 14-18 deliveries per hour will be required.

The total amount of spoil material from the grid connection works on the public road network is estimated to be 10,775 m^3 if Option A is chosen or 10,812 m^3 if Option B is chosen. This material will need to be taken off site and recycled/disposed of at an appropriate licenced facility, in this case Dunmanway Civic Amenity Centre and this will lead to 1,201 (Option A) or 901 (Option B) HGVs travelling from the grid connection works to the disposal site.

Prior to construction commencing on site, the Traffic Management Plan (TMP) will be developed by the Contractor and submitted to Cork County Council for agreement. This Plan will contain details of all proposed signage on the L8544 warning of the entrance to the construction site/wind farm. Please see **Appendix 14.2** for TMP. In the event planning permission is granted for the Proposed Development, the final TMP by the Contractor will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned.

2.8.11 Construction and Management of Site Drainage

Drainage measures will be implemented to the Proposed Development to attenuate runoff, guard against soil erosion, soil compaction, and safeguard local water quality. Details of the proposed drainage system are shown on **Figure 2.11** to **2.13**. Please note that the drainage plan will be subject to a detailed design process at pre-construction phase but will conform to the parameters set out in the EIAR. Full details are provided in **Chapter 9: Hydrology and Hydrogeology**.

A buffer zone of 50 m will be in place for natural streams where possible. The main watercourse is the Shehy Beg River which runs along the Redline Boundary on the east of the Site. Best practice Sustainable Urban Drainage System (SuDS) principles will be employed as follows:

- Source controls for surface water:

  - Interceptor drains, vee-drains, diversion drains, flume pipes, erosion and velocity control measures such as use of sandbags, oyster bags filled with gravel, filter fabrics, and other similar/equivalent or appropriate systems.
  - Small working areas, covering stockpiles, weathering off stockpiles, cessation of works in certain areas or other similar/equivalent or appropriate measures.
- In-line controls for surface water:
  - Interceptor drains, vee-drains, oversized swales, erosion and velocity control measures such as check dams, sandbags, oyster bags, straw bales, flow limiters, weirs, baffles, silt bags, silt fences, sedimats, filter fabrics, and collection sumps, temporary sumps/attenuation lagoons, sediment traps, pumping systems, settlement ponds, temporary pumping chambers, or other similar/equivalent or appropriates systems.
- Treatment systems for surface water:
  - Temporary sumps and attenuation ponds, temporary storage lagoons, sediment traps, and settlement ponds, and proprietary settlement systems such as Siltbusters and/or other similar/equivalent or appropriate systems.

If heavy rainfall is predicted, then works will be suspended or scaled back.

Further details on drainage management and mitigation can be found in **Chapter 9: Hydrology and Hydrogeology**.

2.8.12 Watercourse Crossings

There are 3 no. watercourse crossings required on the proposed site access tracks. There is one crossing on Unnamed Stream (20_392) at the access track within the eastern portion of the Site which will be upgraded for the increased site access track widths to allow heavier vehicles to traverse it for the Proposed Development. The remaining two crossings are located to the southeast namely the Order 2 Shehy Beg stream (20_397) and one to the west which is an unnamed order 1 stream (21_655). Both are of small streams on site and culverts will be constructed using precast bottomless culverts of approximately 4 m width. Crossings will be constructed in accordance with the NRA (now TII) Guidance[11]. Proposed crossing designs are shown on **Figures 2.6 (a), (b) & (c)**.

[11] *'Guidelines for the crossing of watercourses during the construction of national road schemes'* *(*National Roads Authority*, 2008)*

2.8.13 Construction Supervision and Monitoring

The construction activities will be monitored by a Geotechnical Engineer, a qualified archaeologist, a Structural Engineer and an ECoW. The Geotechnical Engineer will be contracted for the detailed design phase and their services retained throughout the construction and reinstatement phases. The Geotechnical Engineer will oversee all earthworks and excavation activities and monitor for issues such as ground stability, water ingress into excavations etc.

The ECoW will be employed prior to the commencement of the construction phase and will monitor the working corridor (the area inside which construction works and plant and equipment manoeuvring will take place) and review the pollution control measures and working practices during construction and have input into site remediation. The ECoW will have stop work authority if, for example, a sensitive habitat feature is encroached upon or there is the possibility of silt/pollution runoff to natural watercourses. This is further discussed in **Chapters 6: Biodiversity** and **9: Hydrology and Hydrogeology**.

The potential exists for the presence of unrecorded, sub-surface archaeological features within green field locations in proposed construction areas within the Site. A series of pre-construction and construction phase archaeological investigations under licence by the National Monuments Service will be carried out by a suitably qualified archaeologist. The archaeologist will have responsibility for providing that potential archaeological features are protected should any be discovered during excavations. If any potential archaeological features are discovered, the archaeologist will inform the National Monuments Service (NMS). The Site will be accessible to the appointed archaeologist at all times during working hours and the nominated archaeologist will monitor all invasive works.

In the event that any sub-surface archaeological remains are identified during pre-construction site investigations or the construction phase, excavation works will cease and the remains will be recorded and left to remain *in situ* within cordoned off areas while the National Monuments Service are notified and consulted in relation to appropriate future mitigation strategies, which may entail preservation *in situ* by avoidance or preservation by record by archaeological excavations. This role is further discussed in **Chapter 13: Cultural Heritage**.

Monitoring of watercourses is detailed in **Appendix 2.1: Construction Environmental Management Plan** and in **Chapter 9: Hydrology and Hydrogeology**. Regular weekly inspections of the installed drainage system will be undertaken, especially after heavy rainfall events, to check blockages and see that there is no build-up of standing water in any part of the system where is it not designed to be. A report will be produced monthly during the consultation phase detailing the results of the water quality monitoring.

Excess build-up of silt will be removed at check dams, attenuation/settlement ponds or any other drainage feature by scraper or excavator and under the supervision of the ECoW.

During the construction phase, field testing and laboratory analysis of a range of parameters with relevant regulatory limits and Environmental Quality Standards (EQSs) will be undertaken for each watercourse close to the Site, and specifically following heavy rainfall events (i.e. weekly, monthly and event based).

The CEMP will be further developed in more detail once the Contractor has been appointed. This will set out the proposed site organisation, sequencing of works, methodologies, mitigation measures and monitoring measures. Furthermore, a schedule of mitigation and monitoring measures for all phases of the Project has been included as **Appendix 18.1**.

Daily monitoring of excavations by the Geotechnical Engineer will occur during the construction phase. If high levels of seepage inflow occur, excavation work will immediately be stopped, and a geotechnical assessment undertaken. This is further detailed in **Chapter 8: Soils and Geology**.

A structural engineer will also be contracted onsite to supervise foundation construction for the 8 no. turbines.

The L8776 and R585 and R587 near the Site used to transport construction materials will be monitored during construction, so that any damage caused by construction traffic associated with the Proposed Development can be identified and repaired, as soon as possible, depending on the level of damage / inconvenience, to avoid issues for other road users. It is envisaged that depending on the quality of the rock (only known after extraction), stone will be taken from excavations for Turbine Foundations and site access tracks and Turbine Hardstands and/or the on-site borrow pit. However, if the rock on site (either from excavations or the borrow pit) is unsuitable, aggregates will be sourced from a local quarry and concrete may be sourced from further afield such as Cork City, depending on the supplier. This is assessed in **Chapter 14:Traffic and Transportation**.

2.8.14 Reinstatement and Monitoring

Following completion of construction, all plant and machinery will be removed from the Site. The temporary works areas needed for the construction period such as blade laydown areas, will be reinstated using the original spoil material removed and stockpiled close to the location from where it was excavated. Stockpiles will be restricted to less than 2 m in height and located outside of the surface water buffer zones. All stockpiling locations will be subject to approval by the Site Manager and Project Ecological Clerk of Works (ECoW). This is fully assessed in **Chapter 8: Soils and Geology** and **Chapter 9: Hydrology and Hydrogeology**. The Temporary Construction Compound will be reinstated to its previous land use. The chosen Grid Connection Route Option will be reinstated to its original condition. Joint bays will be reinstated as per the Forestry Road Manual (Guidelines for the design, construction and management of forest road).

All rubbish and waste/excess materials will be removed from Site to Dunmanway Civic Amenity Site which is an appropriate licenced facility from where it will be reused/recycled, where possible, or disposed of accordingly.

Peat and spoil materials excavated during construction of the infrastructure will be used to reinstate any areas of temporary infrastructure such as blade laydown areas and for landscaping around infrastructure such as Turbine Hardstands and site access tracks. Peat turves will be removed in layers with the vegetated side up. The top vegetated turves will be placed on top of reinstated / restored areas so that the turves can 'knit' together effectively and form areas of restored peatland habitat in accordance with the Habitat Management Plan in **Appendix 6.5**.

The on-site installed drainage network will be left in place. This will be periodically monitored to see that it is operating to its stated design purpose. This is further detailed in **Chapter 9: Hydrology and Hydrogeology** and will be agreed upon with the planning authority where consent of this application is given. Water monitoring on nearby natural watercourses will be undertaken during and post construction to determine if any pollution event has occurred, and if so, implement measures to rectify the impact which will be agreed with IFI. In addition to this, an Emergency Response Plan and a Water Quality Monitoring Plan can be found in **Appendix 2.1**.

2.8.15 Construction Sequencing

It is envisaged that the following will be the sequence of construction for the Proposed Development:

1. Temporary Construction Compound and welfare facilities
2. Site Preparation
3. Site access tracks
4. Crane hardstands & Onsite Substation and Control Building
5. Turbine Foundations
6. Wind Farm Internal Cabling
7. Installation of the Grid Connection Route Option
8. Erection of wind turbines
9. Commissioning and Energisation

The Onsite Substation and Control Building will be constructed in parallel with Turbine Hardstands, Turbine Foundations and Wind Farm Internal Cabling. The first step will be to construct the Temporary Construction Compound and welfare facilities. Access to the area will be via the existing site entrance off the L8544. The next step will be to prepare the areas of the Site where Site infrastructure is to be located by marking out the construction works corridor and the relevant environmental buffer zones as required.

Site access tracks will be constructed up to the proposed Onsite Substation and Control Building and the foundations for the IPP and Eirgrid control buildings will be excavated to firm bearing strata. Then shuttering will be erected around the foundation area, and this will be filled with concrete imported to Site. Once the concrete has cured, then the walls can be erected using blocks and the pitched style roofs can then be erected. Finally, the electrical and control equipment can be installed.

Following the Site preparation, the site access tracks and associated drainage will be constructed according to the Vestas specifications within the parameters of the EIAR. The next step will involve construction of the crane hard-standing areas for the eight No. turbines according to the Vestas specifications. The eight Turbine Foundations can then be excavated and Turbine Foundations constructed using reinforcing bar (rebar) and imported concrete. No concrete batching will take place on site. Following the construction of the Turbine Foundations, Wind Farm Internal Cabling from the turbine locations to the Onsite Substation and Control Building will be laid in trenches along or in the constructed site access tracks.

The chosen Grid Connection Route Option, which is subject to a separate planning consent, will then be constructed. If Grid Connection Route Option A is chosen, the connection line will be constructed from the Site to Dunmanway 110 kV ESB Substation through the local road network via underground cable duct for a length of 24 km. For Grid Connection Route Option B, the connection line will be constructed from the Site to Carrigdangan 110 kV ESB Substation through the local road network for a length of 21.8 km.

The last step will be to erect the eight no. wind turbines on the Turbine Foundations using two cranes. Commissioning and testing of the turbines can then proceed. Energisation will then follow once complete.

2.8.16 Construction Employment

It is estimated that approximately 92 construction workers will be employed on-site at peak.

2.9 COMMISSIONING

Wind farm commissioning can take in the region of 2 months to complete from the erection of the final turbine to the commercial exportation of power to the national grid. It involves commissioning engineers working through an entire schedule of SCADA (Supervisory Control and Data Acquisition) and electrical and mechanical testing and control measures to check that the wind farm will perform and export power to the national grid, as designed.

2.10 AERONAUTICAL LIGHTING

Any specified turbine or obstacle 100 m or greater will be installed with a warning light system under direct specification and in accordance with International Civil Aviation Organisation (ICAO) Annex 15 requirements or as per the lighting requirements agreed with the IAA prior to construction.

The following data will be supplied to the IAA:

- The WGS84 coordinates (In degrees, minutes and seconds) for each turbine.
- Height above ground level (to blade tip) and elevation above mean sea level (to blade tip) in both meters and feet.
- Horizontal extent (rotor diameter) of turbines and blade length where applicable in both meters and feet.
- Lighting of the wind farm, which turbine(s) is/are lit, and what type of lighting.

2.11 COMMUNITY BENEFIT

2.11.1 Financial Contributions

Gortloughra Wind Farm Limited will set up a community benefit fund which will allocate funds from the wind farm to community groups in the area should the wind farm be granted planning and be successful under the Government's Renewable Electricity Support Scheme

(RESS) support programme. This is further detailed in section 1.7.2 of **Chapter 1: Introduction**.

2.11.2 Archaeological/Amenity Enhancements

There are existing agricultural tracks across the Site which are occasionally utilised by members of the local community to obtain access to archaeological features on site. During the construction phase of the Proposed Development, all access to these tracks will be limited for health and safety purposes. Following the completion of construction of the Proposed Development, it is proposed to provide that the site access tracks are available for use by the public as an amenity which will connect into the historic 'Butter Road' that passes to the south of the Site. This road was used by local farmers for generations to transport butter to the Butter Exchange in Cork City. There are a number of archaeological features on the Site as detailed in **Chapter 13: Archaeology & Cultural Heritage** and it is proposed to include 4 no. information boards around the Site outlining the location and information about the features. The locations of these information boards have been noted on **Drawings 6460-JOD-GLWF-XX-DR-C-0205**, **6460-JOD-GLWF-XX-DR-C-0206**, and **6460-JOD-GLWF-XX-DR-C-0208**.

2.12 OPERATION AND MAINTENANCE

During the operation of the wind farm, the turbine manufacturer, the wind farm operator, or a service company will carry out regular maintenance of the turbines. In addition, operation and monitoring activities will be carried out remotely with the aid of computers connected via a telephone broadband link. Routine inspection and preventative maintenance visits will be necessary to provide for the smooth and efficient running of the wind farm and Onsite Substation and Control Building.

2.13 DECOMMISSIONING

The Applicant is applying for a consent for a period of 40 years. Cranes of similar size to those used for construction will disassemble each turbine using the same crane hardstands. The towers, blades and all components will then be removed from Site and reused, recycled, or disposed of in a suitably licenced facility. The turbine transformers will also be removed from Site. There is potential to reuse turbine components, while others can be recycled.

Underground cables will be removed while the ducting will be left in-situ. The Turbine Foundations will remain in-situ.

Turbine Hardstand areas will be remediated to match the existing landscape as closely as possible. Access tracks will be left for use by the landowner.

Any structural materials suitable for recycling will be disposed of in an appropriate manner. The financial costs of decommissioning, at current material values, will be more than met by the recycling value of the turbine components.

Prior to wind turbine removal, due consideration will be given to any potential impacts arising from these operations. Some of the potential issues could include:

- Potential disturbance by the presence of cranes, HGVs, and personnel on-site;
- On-site temporary compound would need to be located appropriately; and/or
- Time of year and timescale (to be outside sensitive periods).

Prior to the decommissioning work, a comprehensive plan will be drawn up that takes account of the findings of this EIAR and the contemporary best practice at that time, to manage and control the component removal and ground Reinstatement.

Further details can be found in the Decommissioning Plan in the CEMP in **Appendix 2.1** which will be agreed with the Planning Authority prior to the commencement of decommissioning works.

5 POPULATION AND HUMAN HEALTH

5.1 INTRODUCTION

5.1.1 Background and Objectives

This chapter of the EIAR assesses the impacts of the Project on Population and Human Health including the proposed grid connection and turbine delivery routes assessed as part of this EIAR (**Chapter 2: Project Description**). This chapter includes a description of the existing environment in respect of population and human health and considers the likely effects arising from the Project during the construction, operation and decommissioning under the following headings:

- Population and Settlement Patterns
- Economic Activity
- Employment
- Land Use and Topography
- Tourism
- Human Health
- Property Value

This chapter of the EIAR is supported by figures provided in **Volume III**. A glossary of common acronyms can be found in **Appendix 1.4** in **Volume IV** of this EIAR.

Table 5.1: Common Acronyms

Glossary of Common Acronyms	
EIAR	Environmental Impact Assessment Report
BSc	Bachelor of Science
BSc (Hons)	Bachelor of Science (Honours Degree)
C_6H_6	benzene
Cd	Cadmium
CDP	County Development Plan
CH_4	methane
CO	carbon monoxide
CO_2	Carbon dioxide
CSO	Central Statistics Office
dB	Decibel (s)
DoEHLG	Department of Environment, Heritage and Local Government
ED	Electoral Division
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement (now known as EIAR)

Glossary of Common Acronyms	
ELF	Extremely low frequency
EMF	Electromagnetic Fields
EPA	Environmental Protection Agency
EU	European Union
GCR	Grid Connection Route
GDP	Gross Domestic Product
GIS	Geographical Information Systems
ICNIRP	International Commission on Non-Ionising Radiation Protection
km	Kilometer(s)
kV	KiloVolt
m	Meter(s)
MD	Municipal District
MSc	Master of Science
MW	MegaWatt(s)
Ni	Nickel
NITP	Northern Ireland Tourist Board
NO	Nitrogen Oxide
NO_2	Nitrogen Dioxide
NOx	Nitrous oxides
NPF	National Planning Framework
O_3	Ozone
PM	Particulate matter
PM_{10}	Particulate matter (less than 10 micrometers)
$PM_{2.5}$	Particulate matter (less than 2.5 micrometers)
PPE	Personal Protective Eqipment
RSES	Regional Spatial and Economic Strategy
SCADA system	Supervisory Control and Data Acquisition system
SO_2	Sulphur dioxide
SOx	Sulphur oxides
SuDS	Sustainable Drainage Systems
TDR	Transport Delivery Route
TWh	TeraWatt hour(s)
UK	United Kingdom
WEDG	Wind Energy Development Guidelines

5.1.2 Statement of Authority

This Chapter has been prepared by David Kiely, Shirley Holton and Kathlyn Feeney, of Jennings O'Donovan & Partners Ltd. (JOD).

David Kiely is a Director of JOD who holds a BE in Civil Engineering from University College Dublin and MSc in Environmental Protection from IT Sligo. He is a Fellow of Engineers Ireland, a Chartered Member of the Institution of Civil Engineers (UK) and has over 40 years' experience. He has extensive experience in the preparation of EIARs and EISs for environmental projects including Wind Farms, Solar Farms, Wastewater Projects, and various commercial developments. David has also been involved in the construction of over 60 wind farms since 1997. David is the key technical reviewer in the preparation of this EIAR.

Shirley Holton is an Environmental Scientist with over 3 years' experience in coordinating EIARs for renewable energy developments. She graduated with a First-Class Honours Degree (BSc. Hons) in Environmental Science from the Institute of Technology, Sligo. She was also awarded the Governing Body award for a BSc in Environmental Protection. Shirley's key capabilities include project management; using software such as WindPRO 4.1 and ArcGIS Pro; and the preparation of planning applications, Environmental Impact Assessment Reports, Feasibility Studies, Construction & Environmental Management Plans and management plans relating to surface water, peat, spoil and waste.

Kathlyn Feeney is a Graduate Environmental Scientist with a First-Class Honours Degree (BSc. Hons) in Environmental Science from Atlantic Technological University, Sligo. She forms part of the Environmental team responsible for preparing the EIARs. Kathlyn's main responsibilities include supporting more senior consultants in report writing, GIS, Feasibility Studies and Shadow Flicker analysis.

5.1.3 Relevant Legislation and Guidance

The Population and Human Health section of this EIAR is carried out in accordance with legislation and guidance contained in **Chapter 1: Introduction, Scoping and Consultation** and **Chapter 4: Planning Policy Context**.

<u>Safety, Health & Welfare at Work</u>

The design and construction of the Project including the installation of associated equipment such as switchgear and Onsite Substation and Control Building etc. is governed by the

Safety, Health and Welfare at Work Act 2005 (as amended)[1], the Safety, Health and Welfare at Work (General Application) (Amendment) (No. 2) Regulations 2021[2] and also by the Safety, Health and Welfare at Work (Construction) Regulations 2013 (as amended)[3].

Assessment of Effects on the Environment

The Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment Section 1.2.2 of the Directive states that:

"It is intended that the consideration of the effects on populations and on human health should focus on health issues and environmental hazards arising from the other environmental factors, for example water contamination, air pollution, noise, accidents, disasters, and not requiring a wider consideration of human health effects which do not relate to the factors identified in the Directive".

Wind Energy Development Guidelines

The Wind Energy Development Guidelines (DoHLG, 2006) offer advice to planning authorities on planning for wind energy through the development plan process and in determining applications for planning permission. Planning authorities are to have regard to same. The guidelines are also intended to provide a consistency of approach throughout the country in the identification of suitable locations for wind energy development and the treatment of planning applications for wind energy developments.

The Draft Wind Energy Development Guidelines (WEDGs) were published in 2019, however the current version dated 2006 remain valid until the revised, final version of the Draft WEDGs (DOHLGH, 2019) are adopted by the government. The draft guidelines set out how wind energy is to be delivered in accordance with best practice and in particular, in partnership with people living in areas local to proposed developments. The Draft guidelines, provide a roadmap as to how Ireland's 2030 climate commitments can be met and ultimately move the country towards a position of net zero emissions by 2050. The key aspects for the draft proposed wind energy guidelines involving population and human health include the following:

[1] Safety, Health and Welfare at Work Act 2005 https://www.irishstatutebook.ie/eli/2005/act/10/enacted/en/print
[2] the Safety, Health and Welfare at Work (General Application) (Amendment) (No. 2) Regulations 2021 https://www.irishstatutebook.ie/eli/2021/si/619/made/en/print#:~:text=The%20Regulations%20amend%20the%20Safety,as%20part%20of%20work%20practices.
[3] S.I. No. 291/2013 - Safety, Health and Welfare at Work (Construction) Regulations 2013 https://www.irishstatutebook.ie/eli/2013/si/291/

- Effects on tourism and recreational activities
- A visual amenity setback of 4 times the turbine height between a wind turbine and the nearest residential property, subject to a mandatory minimum distance of 500 metres
- The elimination of shadow flicker
- The application of a more stringent noise limit, consistent with World Health Organisation standards
- The introduction of new obligations in relation to community engagement with local communities along with the provision of community benefit measures.

<u>EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects, Fáilte Ireland, July 2023.</u>

'The consideration of tourism projects within the Population and Human Health is extensive, with impacts ranging from rural employment population impacts of seasonal tourism, to the health impact of air pollution from increased traffic in urban areas.

The impact upon tourism can be considered within this section through the sensitivities of Hospitality, Safety and Pace of Life. Changes in population can impact the perception of pace of life or safety in a particular location. Impacts upon these issues in areas which rely heavily on tourism or have a particular sensitive tourism generator should be considered in this section. The EPA guidelines makes reference to amenity " which may be relevant under 'Population and Human Health' and 'Landscape'".'

5.1.4 Assessment Structure

In line with the EIA Directive, and EPA guidelines 'Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)[4]' (published May 2022) the structure of this chapter is as follows:

- **Assessment Methodology and Significance Criteria** – a description of the methods used in Baseline surveys and in the assessment of the significance of effects
- **Baseline Description** – a description of the socio-economic profile of the local area of the Project i.e., local electoral areas and County Cork, based on a desk-based study using Central Statistics Office (CSO) data
- **Assessment of Potential Effects** –identifying the ways in which the population and human health of the area could be affected by the Project

[4] https://www.epa.ie/publications/monitoring--assessment/assessment/guidelines-on-the-information-to-be-contained-in-environmental-impact-assessment.php

- **Mitigation Measures and Residual Effects** – a description of measures recommended to avoid, prevent, reduce or, if necessary, offset any potential significant adverse effects and a summary of the significance of any residual effects of the Project after mitigation measures have been implemented
- **Cumulative Effects** – identifying the potential for effects of the Project to combine with those from other developments to affect the population and human health
- **Summary of Significant Effects**
- **Statement of Significance**

Section 1.2.2 of the EIA Directive (outlined in **section 5.1.3** of this chapter) amalgamates the findings of other assessments as part of the EIA process. Potential interactions with the effects identified in the following chapters have been assessed:

- **Introduction, Scoping and Consultation** in **Chapter 1**
- **Soils and Geology** in **Chapter 8**
- **Hydrology and Hydrogeology** in **Chapter 9**
- **Noise** in **Chapter 10**
- **Traffic and Transportation** in **Chapter 14**
- **Air and Climate** in **Chapter 15**
- **Shadow Flicker** in **Chapter 16**

Where appropriate, mitigation measures have been proposed to avoid, prevent, reduce or, if necessary, offset any identified significant adverse effects.

All activities carried out by the appointed Contractor on the Proposed Development will be in accordance with the requirements of the Safety, Health and Welfare at Work Act 2005 as amended and Regulations made under this Act.

5.1.5 Scope of the Assessment

The effect of a development on population and human health includes the following areas of investigation:

- Population and Settlement Patterns
- Economic Activity and Tourism
- Employment
- Topography and Land Use
- Health Impacts of Wind Farms
- Property Value

- Natural Disaster and Major Accidents (see also **Chapter 17: Major Accidents and Natural Disasters**).

Where a significant negative impact can be foreseen, it is prevented, reduced, avoided or, if necessary, offset by way of practical mitigation measures. This assessment considers the following factors:

- Sensitive receptors in the area
- Existing land use in the area
- General amenities in the area
- Potential effects from water, noise, shadow flicker, air quality and traffic.
- Effects on the linguistic and cultural heritage of the Gaeltacht including the promotion of Irish as the community language

5.2 ASSESSMENT METHODOLOGY

In line with the EIA Directive, EPA guidelines (2022) and IEMA EIA guidelines (2022)[5] this chapter includes the following elements:

- Details of Methodologies utilised in the context of legal and planning frameworks.
- Baseline Descriptions
- Assessment of Potential Effects (construction, operational and decommissioning stages)
- Detailed Mitigation Measures
- Assessment of Cumulative Impacts
- Summary of Significant Effects and Statement of Significance

Criteria for the determination of sensitivity (e.g. 'high', 'medium' or 'low') or of importance (e.g. 'international', 'national', 'regional', or 'authority area') have been established based on prescribed guidance, legislation, statutory designation and or professional judgement.

The statutory criteria (EPA 2022) for the assessment of impacts require that impacts are described with respect to their magnitude, nature (e.g. negative, positive, or neutral), transboundary nature (if applicable), intensity and complexity, probability, duration, frequency, reversibility, cumulation and possibility of reducing the effects). The descriptors used in this chapter are those set out in Guidelines on the information to be contained in Environmental Impact Assessment Reports, 2022.

[5] Institute of Environmental Management and Assessment (IEMA) Guidelines to: Determining Significance for Human Health in Environmental Impact Assessment. November 2022.

Baseline Conditions:

A desk study was undertaken to describe the Baseline conditions of the receiving environment across a range of Population and Human Health factors and are presented in section 5.3 of this chapter. Where Central Statistics Office (CSO) data is available, these data are assessed by Study Area; within the locality of the Proposed Development and compared with both the County and National CSO data. These Study Areas are described in section 5.2.2 of this chapter. This assessment has been carried out using latest available Central Statistics Office (CSO) data[6], information and maps from the current Cork County Development Plan 2022-2028. Consideration was also given to the 2015[7] report produced by the EPA entitled the '*Investigation into the Assessment of Health Impacts within National Environmental Regulation Processes*' that outlines how human health impacts are dealt with, throughout the European Union (EU) by environmental regulators with an emphasis on the role at the planning / environment interface.

The following items were assessed in this EIAR chapter:

- Population and Settlement Patterns
- Economic Activity
- Employment
- Land Use and Topography
- Tourism
- Human Health
- Property Value

Assessment of Potential Effects:

The potential impacts of the Proposed Development are assessed as documented in section 5.4 of this chapter. The potential impacts are classified as outlined in **Table 1.6** of **Chapter 1: Introduction, Scoping and Consultation** (as prescribed in the EPA Guidelines, 2022). Typically, for each impact assessed the quality of the impact, for example, positive or negative, the significance of the impact, for example, slight or moderate and the duration of the impact, for example, short-term, medium-term, long-term are assigned. If potentially significant adverse effects are identified, the proposed practical mitigation measures assessed to prevent, reduce, avoid or, if necessary, offset such effects are documented in section 5.5 of this chapter.

[6] CSO (2022) Census Interactive Map. Available online at: https://visual.cso.ie/?body=entity/ima/cop/2022 [Accessed on 16 July 2024]

[7] Golder Associates (2015) *Investigation into the Assessment of Health Impacts within National Environmental Regulation Processes*. Available online at: http://www.epa.ie/pubs/reports/research/health/assessmentofhealthimpactsreport.html [Accessed on 09 May 2024]

5.2.1 Definition of Study Areas

Four geographical Study Areas have been outlined for this assessment. Data from Study Area 1 (District Electoral Divisions which include the townlands in the vicinity of the Project are used to assess local impacts within this chapter, as it is these areas that will be impacted the most by the Proposed Development. The local Study Area 1 lies within Study Area 2 (County Cork). Study Area 3, The Southwest Region, has been included is this assessment as Study Areas 1 and 2 fall within this Strategic Planning Area of the Southern Regional Assembly. Study Area 4 (Republic of Ireland) provide national baseline statistical data for this chapter.

The four Study Areas are described in more detail below:

Study Area 1: The Project and Environs – Electoral Divisions (EDs) Bealanageary, Douce and Garrown (153 km^2).

In order to make inferences about the population and other statistics in the vicinity of the Site, Electoral Divisions (EDs) were analysed.

The majority of the Proposed Development falls under the Municipal District (MD) of West Cork, the remainder come under the MD of Macroom. The location of the Site falls within the Electoral Divisions of Bealanageary, Douce and Garrown, while the Grid Connection Route options (as part of the Project) fall within the EDs mentioned above and also Bealock, Coolmountain, Aultagh, Manch, Carrigboy and Dunmanway South EDs. The 18 areas along the Turbine Delivery Route (TDR) (also part of the Project) which require works in third party lands fall within Aultagh and Kealkill EDs. Each ED can be separated into distinct townlands.

The Proposed Development is predominantly situated within An Seithe Bheag (Shehy Beg), Gortloughra, Cloghboola and Inchiroe townlands.

Grid Connection Route Options and Onsite Substation and Control Building

While not part of this planning application, two Grid Connection Route Options and an Onsite Substation and Control Building have been included in the assessment of the overall project. The Onsite Substation and Control Building is located within the Red Line Boundary although it is subject to a separate planning consent process.

The Grid Connection Route Options are as follows: (Option A) Dunmanway 110 kV Substation or (Option B) Carrigdangan 110 kV Substation.

In order to assess potential impacts on population and human health along the Grid Connection Route Options, a review of properties and planning applications in the vicinity of the proposed works was carried out, with the majority of developments along the routes comprising one-off houses.

The land-use along both Grid Connection Route Options comprise mainly transport, and surrounding land use is mainly agriculture with some areas of peat harvesting and forestry. There is an existing 110 kV overhead line which runs south and east from Grid Connection Route Option A. The active construction area for either of the Grid Connection Route Options will be small and transient in nature as the construction itself is a rolling operation of opening the road, laying the joint bays and cable and closing the road behind the cable- further information is contained in **Chapter 2: Project Description**.

Turbine Delivery Route

While not part of this planning application, this EIA also assesses the works at 18 No. locations along the TDR from Port of Cork (Ringaskiddy) to the Site.

To assess potential impacts on human beings and human health along the TDR, a review of properties and planning applications in the vicinity of the TDR was carried out (**Appendix 2.4**). Most developments along the TDR comprise one-off houses. The nearest Large-Scale Development to the TDR is for quarrying activities at an existing quarry (Cork County Council Ref 205074) which is located approximately 0.42 km from the N22 at its nearest point. The land-use along the TDR is comprised mainly of transport infrastructure, and surrounding land use is mainly agriculture with some areas of peat harvesting and forestry.

Study Area 2: **Cork County** (7,316 km^2).

County Cork was chosen as a study area to examine and conclude the extent of effects (if any) on the population and human health within the county as a result of the Project.

Study Area 3: The Southwest Region[8] (12,120 km^2)

Study Area 2 falls within Study Area 3: The Southwest Region. The Southwest Region consists of Cork City, Cork County and Kerry County. The Southwest Region is a Strategic Planning Area of the Southern Regional Assembly.

Study Area 4: **Ireland** (70,273 km^2).

[8] https://www.southernassembly.ie/the-assembly [Accessed: 02 Oct 2024]

Study area 4, Ireland, provides a national baseline of statistical data for this chapter.

Descriptive terminology for impact assessment follows the systematic method of description of the EPA Guidelines (2022), as outlined in **Chapter 1: Introduction, Scoping and Consultation**, **Table 1.4**.

5.2.2 Consultation

Consultation with relevant organisations was initiated during the initial stage of the EIA to identify any effects that could be initiated by the Proposed Development. A summary of the findings is detailed in **Table 5.2**.

Table 5.2: Summary of Consultation response on Human Health

Consultee	Type and Date	Summary of Consultee Response
Environmental Health Service (Dept. of the HSE)	Email in Response to Scoping Report received on 11/01/2022 (**Appendix 1.3**)	Response Received 11/01/2022: Recommendations were made on *Assessment of Consideration of Alternatives, Noise and Vibration, Shadow Flicker, Air Quality, Climate, Surface and Ground Water Quality* and *Geological Impact. (*Addressed respectively in Chapters 3, 10, 12, 8 and 9). The Environmental Health Service (EHS) recommended that the matters of Public Consultation and Decommissioning Phase were included and assessed in the EIAR (Addressed in Chapter 1). A section on *public consultation* further recommended that the applicant develop a dedicated website for the proposed wind energy project. All correspondence, maps, project updates and documentation, including the EIAR, should be uploaded to this site (Addressed in Chapter 1). A section on *Opportunity for Health Gain* recommended that the proposed development should be assessed with a view to the potential to include opportunities for health gain within the site of the proposed wind farm by including greenways, cycle-paths or walking trails within the development site. A section on *Ancillary Facilities* recommended that the EIAR should include details of the location of all site

Consultee	Type and Date	Summary of Consultee Response
		office, construction compound, fuel storage depot, sanitary accommodation and canteen, First Aid facilities, disposal of wastewater and the provision of a potable water supply to the site canteen (Addressed in **Chapter 2: Project Description**). A section on *Cumulative Impacts* recommended that the EIAR should include a detailed assessment of any likely significant cumulative impact of the proposed renewable energy development (Addressed in Chapter 1 and in the relevant technical assessment chapters of the EIAR).
Irish Water (Now operating as Uisce Éireann)	Email in Response to Scoping Report received on 10/05/2024 (**Appendix 1.3**)	The following aspects of Water Services should be considered in the scope of an EIA where relevant; a) Where the development proposal has the potential to impact an Uisce Éireann Drinking Water Source(s), the applicant shall provide details of measures to be taken to ensure that there will be no negative impact to Uisce Éireann's Drinking Water Source(s) during the construction and operational phases of the development. Hydrological / hydrogeological pathways between the applicant's site and receiving waters should be identified as part of the report. b) Where the development proposes the backfilling of materials, the applicant is required to include a waste sampling strategy to ensure the material is inert. c) Mitigations should be proposed for any potential negative impacts on any water source(s) which may be in proximity and included in the environmental management plan and incident response. d) Any and all potential impacts on the nearby reservoir as public water supply water source(s) are assessed,

Consultee	Type and Date	Summary of Consultee Response
		including any impact on hydrogeology and any groundwater/ surface water interactions. e) Impacts of the development on the capacity of water services (*i.e. do existing water services have the capacity to cater for the new development*). This is confirmed by Uisce Éireann in the form of a Confirmation of Feasibility (COF). If a development requires a connection to either a public water supply or sewage collection system, the developer is advised to submit a Pre-Connection Enquiry (PCE) enquiry to Uisce Éireann to determine the feasibility of connection to the Irish Water network. All pre-connection enquiry forms are available from https://www.water.ie/connections/connection-steps/. f) The applicant shall identify any upgrading of water services infrastructure that would be required to accommodate the proposed development. g) In relation to a development that would discharge trade effluent – any upstream treatment or attenuation of discharges required prior to discharging to an Uisce Éireann collection network. h) In relation to the management of surface water; the potential impact of surface water discharges to combined sewer networks and potential measures to minimise and or / stop surface waters from combined sewers. i) Any physical impact on Uisce Éireann assets – reservoir, drinking water source, treatment works, pipes, pumping stations, discharges outfalls etc. including any relocation of assets.

Consultee	Type and Date	Summary of Consultee Response
		j) When considering a development proposal, the applicant is advised to determine the location of public water services assets, possible connection points from the applicant's site / lands to the public network and any drinking water abstraction catchments to ensure these are included and fully assessed in any pre-planning proposals. Details, where known, can be obtained by emailing an Ordnance Survey map identifying the proposed location of the applicant's intended development to datarequests@water.ie k) Other indicators or methodologies for identifying infrastructure located within the applicant's lands are the presence of registered wayleave agreements, visible manholes, vent stacks, valve chambers, marker posts etc. within the proposed site. l) Any potential impacts on the assimilative capacity of receiving waters in relation to Uisce Éireann discharge outfalls including changes in dispersion / circulation characterises. Hydrological / hydrogeological pathways between the applicant's site and receiving waters should be identified within the report. m) Any potential impact on the contributing catchment of water sources either in terms of water abstraction for the development (*and resultant potential impact on the capacity of the source*) or the potential of the development to influence / present a risk to the quality of the water abstracted by Uisce Éireann for public supply should be identified within the report. n) Where a development proposes to connect to an Uisce Éireann network and that network either abstracts water from or discharges wastewater to a

Consultee	Type and Date	Summary of Consultee Response
		"protected"/ sensitive area, consideration as to whether the integrity of the site / conservation objectives of the site would be compromised should be identified within the report. o) Mitigation measures in relation to any of the above ensuring a zero risk to any Irish Water drinking water sources (Surface and Ground water).
Cork County Council	Email in Response to Scoping Report received on 11/04/2022 (**Appendix 1.3**)	<u>Environment</u> *The following are the requirements of the Council's Environment Officer:* • *A map of the site showing all occupied dwellings within the 500m zone and the 1000m zone of the wind turbines.* • *Within the 500m zone and the 1000m zone of the wind turbines, the applicant should provide details of the predicted noise levels — noise levels should be 43dB or less.* • *A Waste management Plan giving details of the management of waste at the site during the construction phase shall be included*
Transport Infrastructure Ireland (TII)	Response to Scoping Report received on 06/01/2022 (**Appendix 1.3**)	The developer/scheme promoter should have regard, inter alia, to the following: • It appears that the proposed windfarm site accesses the local and regional road network prior to access to the national road network. Access to the road network shall be developed in accordance with official policy and road safety considerations, as outlined above. Consultations should be had with the relevant Local Authority/National Roads Design Office with regard to the locations of existing and future national road schemes.

Consultee	Type and Date	Summary of Consultee Response
		• TII would be specifically concerned as to potential significant impacts the development would have on the national road network (and junctions with national roads) in proximity to the proposed development. • The developer should assess visual impacts from existing national roads. • The developer should have regard to any EIAR/EIS and all conditions and/or modifications imposed by An Bord Pleanála regarding road schemes in the area. The developer should, in particular, have regard to any potential cumulative impacts. • The developer, in preparing EIAR, should have regard to TII Publications (formerly DMRB and the Manual of Contract Documents for Road Works). • The developer, in preparing EIAR, should have regard to TII's Environmental Assessment and Construction Guidelines, including the 'Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes' (National Roads Authority (NRA), 2006). • The EIAR/EIS should consider the 'Environmental Noise Regulations 2006' (SI 140 of 2006) and, in particular, how the development will affect future action plans by the relevant competent authority. The developer may need to consider the incorporation of noise barriers to reduce noise impacts (see 'Guidelines for the Treatment of Noise and Vibration in National Road Schemes' (1st Rev., NRA, 2004)). • It would be important that, where appropriate, subject to meeting the appropriate thresholds and criteria and having regard to best practice, a Traffic and Transport Assessment (TTA) be carried out in accordance with relevant guidelines, noting traffic volumes attending the site and traffic routes to/from

Consultee	Type and Date	Summary of Consultee Response
		the site, with reference to impacts on the national road network and junctions of lower category roads with national roads.

Public Consultation has been outlined in **Chapter 1: Introduction, Scoping and Consultation** and further detailed in **Appendix 1.2: Public Consultation Report**.

The decommissioning phase has been assessed throughout the entire EIAR and a Decommissioning Plan accompanies **Appendix 2.1 Construction Environmental Management Plan** as **Management Plan 6**.

Siting and location of turbines is discussed in **Chapter 3: Alternatives Considered** and **Chapter 2: Project Description**.

Human health is assessed within this chapter and in the below:

- **Chapter 8: Soils and Geology** (Geological Impacts)
- **Chapter 9: Hydrology and Hydrogeology** (Surface and Groundwater Quality)
- **Chapter 10: Noise & Vibration**
- **Chapter 15: Air Quality**
- **Chapter 14: Traffic and Transportation**
- **Chapter 16: Shadow Flicker**

With respect to the EIA Directive as amended, Section 1.6.2 (outlined in Section 5.1.3 and the Proposed Development, this amalgamates the findings of other assessments undertaken as part of the EIA process.

The cumulative impacts of the projects listed in **Chapter 2: Project Description** at **Appendix 2.4: List of Projects for Cumulative Assessment** have been assessed throughout the entire EIAR.

Where appropriate, mitigation measures have been proposed to avoid, prevent, reduce or, if necessary, offset any identified significant adverse effects.

5.2.3 Impact Assessment Methodology

Descriptive terminology for impact assessment follows the systematic method of description of the EPA Guidelines (2022), as outlined in **Chapter 1: Introduction, Scoping and Consultation**, **Table 1.6**. The sensitive receptors in this Population and Human Health study are primarily people and where they reside. This is best measured by using habitable dwellings and community areas.

There are 73 receptors within the shadow flicker Study Area. The coordinates of each sensitive receptor, along with its distance to the nearest proposed turbine, are provided.

As demonstrated in the cumulative scenario presented in **Table 16.3** of **Chapter 16 Shadow Flicker**, a total of 44 out of 73 receptors are predicted to experience some degree of shadow flicker, while the remaining 29 receptors will experience none.

A minimum separation distance of four times the turbine tip height has been achieved between turbines and occupied dwellings, where possible. This is in accordance with the Draft 2019 Wind Energy Development Guidelines (WEDGs), which recommend a minimum setback distance of four times the tip height from a proposed turbine. In cases where receptors are located within this distance, written consent has been obtained.

The closest receptor, H53 (which is associated with the Project), is located 486 m from the nearest turbine (T07) and is not predicted to experience shadow flicker. The nearest non-associated receptor, H10, is located 696 m from the closest turbine (T06).

Four receptors, H7, H8, H9, and H51, are affected only by the operational Shehy More Wind Farm and will not experience shadow flicker from the Proposed Development. These receptors are shown in **Figure 1.3** of **Chapter 1: Introduction, Scoping and Consultation**.

5.3 BASELINE DESCRIPTION – RECEIVING ENVIRONMENT

5.3.1 Population and Settlement Patterns

Study Area 1: The Project and Environs (EDs Bealanageary, Douce and Garrown)

According to the 2022 census, there are no defined community settlements with a population greater than 2,500 people within a 10 km radius of the Proposed Development. Béal Átha An Ghaorthaidh (Ballingeary), the nearest settlement to the Proposed Development, is located approximately 6.3 km north of the Site and has a population of 235[9] (CSO). Inchigeelagh which is located 8.5 km northeast has a population of 136[10] (CSO). Kealkill which is located 9.5 km west has a population of 362[11] (CSO) and Dunmanway which is located 10 km southeast has a population of 1,964[12] (CSO). The nearest centre of population to the Site, as defined **in Chapter 1: Introduction**, is Cork

[9] https://visual.cso.ie/?body=entity/ima/cop/2022&boundary=C04160V04929&guid=b0015ff8-cedd-4702-b5c9-31c3f351e4e4
[10] https://visual.cso.ie/?body=entity/ima/cop/2022&boundary=C04160V04929&guid=9e527851-3b3e-498f-8e45-3a46cef7613f
[11] https://visual.cso.ie/?body=entity/ima/cop/2022&boundary=C04172V04943&guid=4c07d11d-fc45-851d-e053-ca3ca8c0ca7f
[12] https://visual.cso.ie/?body=entity/ima/cop/2022&boundary=C04172V04943&guid=4c07d11e-02d8-851d-e053-ca3ca8c0ca7f

City, which is located approximately 48 km east. According to the CSO 2022 census, there were 222,526 persons living in Cork City in 2022.

The surrounding area is comprised of agricultural sheep grazing, farmland and open mountain heath. Nearby settlements include the villages of Béal Átha An Ghaorthaidh (Ballingeary) (6.3 km north), Inchigeelagh (8.5 km northeast), Kealkill (9.5 km west) and Dunmanway (10 km southeast). The Site and a section (3.1 km) of both potential grid connection routes are located in An Gaeltacht Mhúscraí (the Múscraí Gaeltacht). This Gaeltacht is made up of four native Irish speaking communities Baile Mhúirne (Ballyvourney), Béal Átha an Ghaorthaidh (Ballingeary), Cúil Aodha (Coolea) and Oileán Cléire (Clear Island). It covers an area of 626 km^2. The Cork Gaeltacht, or Múscraí as it is known locally, has a population of 3,530 people, which is 4 per cent of the total Gaeltacht population. It covers a geographical area of 262 km squared. This represents 6% of the total Gaeltacht area.[13]

There are five windfarms within Study Area 1, namely Shehy More Wind Farm, Carrigdangan Wind Farm, Curraglass Wind Farm, Barrboy Wind Farm and Dromleena Wind Farm. Proximity of these wind farms to the Proposed Development is discussed in **Chapter 2: Project Description** and a full list of cumulative windfarms is available in **Appendix 2.4**.

Planning permissions in Study Area 1 include one off housing, alterations to existing dwelling houses, development of new housing and agricultural buildings, all of which have either been constructed or have expired. A full list of projects and plans for cumulative assessment has been included in **Appendix 1.2**.

An application of note, due to its proximity to the Proposed Development, within Study Area 1 is a planning permission for the provision of car parking for access to existing hill-walking routes at Shehy Mountain (Planning Reference: 2374). The description is as follows:

'(i) construction of parking area for bicycles, cars and small buses at Shehy Beg, Dunmanway, Co. Cork, (ii) installation of 5 no. road signs along public roads in Glanycarney, Dunmanway, Co. Cork. (iii) installation of 1 no. road sign along public road at Derragh, Dunmanway, Co. Cork and (iv) ancillary site works at Shehy Beg, Dunmanway, Co. Cork'

[13] https://www.askaboutireland.ie/learning-zone/primary-students/looking-at-places/cork/rivers-and-mountains-of-c/cork-places/the-cork-gaeltacht/

The application was granted on 9th of May 2023 and has since been constructed. The hill-walking routes at Shehy Mountain will be closed temporarily during the construction phase of the Proposed Development, which will have an **imperceptible, short-term** impact on the local community. Although, the closure of these trails will ensure the safety of the local community, avoiding an active construction site.

The 2022 Census statistics note that between the three Electoral Divisions within Study Area 1 there is a total population of 761 and 273 occupied residences. There were 403 No. males and 358 No. females. The population density of Study Area 1 is 5 persons per km^2.

The closest receptor, H53 (which is involved in the Project), is within 486 m of the closest turbine (T07), and experiences no shadow flicker. The closest receptor who is not involved, H10, is within 696 m of the closest turbine (T06) as shown on **Figure 1.3.**

Grid Connection Route Options

In order to assess potential impacts on population and human health along the Grid Connection Route (GCR) Options, a review of properties and planning applications within 500 m of each option was carried out, with the majority of developments along the routes comprising one-off houses. The land-use along the GCR options comprises mainly roads and transport, while the surrounding land use is mainly peat, agriculture and forestry. The active construction area for the chosen GCR will be small and transient in nature as it moves along the route. The GCR options associated with the Project (subject to a separate planning application) are not envisaged to have any long-term negative impacts on population or settlement patterns as all works along the GCR are temporary, as discussed further in **Chapter 2: Project Description**.

Turbine Delivery Route (TDR)

To assess potential impacts on human beings and human health along the TDR, a review of properties and planning applications within 50m either side of the proposed TDR was carried out. The majority of developments along the route comprises one-off houses and agricultural buildings. The land-use along the TDR is comprised mainly of transport infrastructure, and surrounding land use is mainly agriculture with some areas of small scale peat harvesting and forestry.

The TDR passes through three defined settlements - Cork City, Farran, and Crookstown. However, all TDR works are proposed outside of defined settlement areas. The active construction areas for the road works along the TDR will involve only surface-level earthworks (removal of soil and unconsolidated rock, targeted strengthening of key road edges) and will be temporary in nature. There are two areas along the TDR where works are required for two blade transfer stations, namely Shanavalla and Castlemore. These areas can be used and reinstated with grass during operation and reactivated at decommissioning. The TDR works associated with the Project will not have any long-term negative impacts on population, human health or settlement patterns, as discussed further in **Chapter 10: Noise**, **Chapter 14: Traffic and Transport** and **Chapter 15: Air and Climate**.

Study Area 2: Cork County

The total population in the 2022 CSO for County Cork was 584,156 of which males numbered 288,845 and females were 295,311. There has been an 8% increase in the population since 2016. The population density is 79 persons per km^2. The total number of households was 240,942 in 2022, a 5% increase since 2016. Average size of households (in persons) has generally remained the same at approximately 2.8-2.9 persons per household over the past two census reports.

Cork is the largest county in Ireland with a land mass of 7,316 km^2 including Cork City. The economic performance of Cork is strong and plays a critical role in both our regional and national economies. Cork contributes 19% to the national GDP.

The extent of County Cork can be seen in **Figure 5.2**. There are a number of medium sized towns and villages geographically spread throughout County Cork. These settlements number 102 and provide essential services for the local communities and the rural hinterlands. The different settlement tiers perform differing roles with the result that no area in the county is significantly peripheral or isolated.

The increase in rural population over a 5-year period from 2011 to 2016 in Cork County was 6,946. In 2022, the towns of Carrigaline (18,239), Cobh (14,148), Midleton (13,906) and Mallow (13,456) are the most populated within the County.

Study Area 3: Southwest Region

The Regional Spatial and Economic Strategy (RSES) for the Southern Regional Assembly 2040[14] outlines the assembly's aim of reversing of town/village and rural population decline, by encouraging new roles and functions for buildings, streets and sites amongst other

[14] Southern Regional Assembly, *'Regional Spatial & Economic strategy 2020-2040 (RSES)'*. Available at: https://www.southernassembly.ie/regional-planning/rses- [Accessed 09/05/2024]

things. The National Planning Framework (NPF)[15] projects a population growth for the southern region of between 340,000 to 380,000, during this period, with an additional 225,000 people in employment.

RSES notes that the population living in '*aggregate rural area'* (i.e. persons living in the open countryside or in settlements of less than 1,500) are home to almost 49.15% of this region's population, and as such represent a sizeable cohort of the population. Population growth needs to be matched by the delivery of critical enabling infrastructure and services, thus enabling these places to grow as successful significant employment centres and service locations not only for the urban areas themselves but, importantly, for their extensive hinterlands that include smaller towns, villages and rural areas. The RSES outlines the importance for the energy sector being a regional driver of the rural economy (White Paper-Irelands transition to a Low Carbon Energy Future 2015-2030[16]). The RSES outlines a key objective relating to supporting enterprise and employment in rural areas, as set out in the Department of Heritage, Regional, Rural and Gaeltacht Affairs Action Plan for Rural Development[17], which includes the support of sectoral growth through roll out of initiatives to develop the renewable energy sector in rural Ireland.

Study Area 4: Ireland

Ireland has experienced rapid population growth in recent years with an improved standard of living and infrastructure growth resulting in a net inflow of population. The country has seen a population increased by 8% since 2016 from 4,761,865 to 5,149,139 as per the 2022 census[18]. The Irish population is at its highest figure since 1841, and it is the first time the population has been recorded over 5 million since 1851[19]. The National Planning Framework (NPF) (2018) has set out its intention to facilitate a significant growth in Ireland's population by 2040. Full achievement of the targets set out in the 'Project Ireland 2040 National Planning Framework would accommodate around 1.1 million additional people residing in Ireland by 2040.

[15] The Department of Housing Planning and Local Government, on behalf of the Government, 'Project Ireland 2040 - The National Planning Framework' published February 2018. Available at: https://npf.ie/project-ireland-2040-national-planning-framework/ [Accessed 09/05/24]]
[16] The Department of Communications, Energy & Natural Resources, 'Ireland's Transition to a Low Carbon Energy Future, 2015-2030' published June 2020. Available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.gov.ie/pdf/?file=https://assets.gov.ie/77389/e5aa9f25-da81-43eb-804d-57309615681e.pdf [Accessed 14/01/2025]
[17] The Department of Rural and Community Development 'Action Plan for Rural Development' Available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://assets.gov.ie/10916/951861650a4142b3a5bd0b4339f19509.pdf [Accessed 14/01/2025]
[18] Central Statistics Office (CSO), 'Census 2022 Reports'. Available at: https://www.cso.ie/en/statistics/population/censusofpopulation2022/censusofpopulation2022-summaryresults/ - [Accessed 09/05/24]
[19] The Department of Housing Planning and Local Government, on behalf of the Government, 'Project Ireland 2040 - The National Planning Framework' published February 2018. Available at: https://npf.ie/project-ireland-2040-national-planning-framework/ - [Accessed 09/05/24]

5.3.2 Economic Activity

5.3.2.1 Primary sectors

Study Area 1: Gortloughra and Environs (DEDs Bealanageary, Douce and Garrown)

The main sectors in this Study Area are professional services followed by commerce and trade. Bealanageary and Garrown have the highest proportion of the working population in the professional services, with 21% and 24% respectively. This is then followed by commerce, which employs 17% of the working population in Baelanageary and 21% of the working population in Garrown. Douce has higher portions of the population working in the agriculture, forestry and fishing sector, employing 24% of the working population. This is then followed by the building and construction sector, which employs 19% of the working population in Douce[20].

Study Area 2: Cork County

The economy of County Cork is broadly based and diverse with strengths in the areas of agriculture/agri-tech, marine, food production, tourism, services, energy and in technology-based manufacturing in sectors such as electronics and life sciences. The Manufacturing sector accounted for the largest number of workers in the county at almost 42,700. The Wholesale and Retail Trade sector was the next largest, with nearly 32,000 workers followed by Human Health and Social Work Activities with almost 29,400 workers.

Cork also has a very significant agriculture and food sector. It has the most people employed in agriculture in the state. In 2010, the recorded numbers on farms in Cork was 14,222. This was 5.5% higher than the next highest at 13,445 in Galway[21], with a number of indigenous enterprises having a significant international presence including Dairygold and Midleton Distillery. Danone and Kerry Foods are also present in Cork and together produce approximately 8% of the world infant milk formula[22].

Study Area 3: The Southwest Region[23]

There is a total number of 331,968 persons included in the industry data for the Southwest region. The main sectors in Study Area 3 include Professional services at 24% (80,825), Commerce and trade at 22% (71,758) and Manufacturing industries at 16% (53,603).[24]

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[20] CSO (2022) 'Census Interactive Map' https://visual.cso.ie/?body=entity/ima/cop/2022&boundary=C04167V04938&guid=2ae19629-1f4d-13a3-e055-000000000001 [Accessed online: 16/07/2024]

[21] Life in 1916 Ireland: Stories from statistics https://www.cso.ie/en/releasesandpublications/ep/p-1916/1916irl/economy/ag/ [Accessed online 09/05/2024]

[22] County Development Plan Review, Economy and Employment, Background Document No.6, Planning Policy Unit, Cork County Council (2019), chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.corkcoco.ie/sites/default/files/2022-04/economy-and-employment-pdf.pdf [Accessed online 09/05/2024]

[23] https://www.southernassembly.ie/the-assembly [Accessed: 02 Oct 2024]

[24] CSO (2022) 'Census Interactive Map' https://visual.cso.ie/?body=entity/ima/cop/2022&boundary=C03880V04631&guid=604546A1-A856-4B9B-AD46-E88B27C27155&theme=13 Accessed online: 25/10/2024

Study Area 4: **Ireland**

There is a total number of 2,320,297 persons included in the industry data for the State. The main sectors in Study Area 4 include Professional services at 24% (568,105) and Commerce and trade at 24% (552,642). 'Other' accounts for 16% (365,716) and Manufacturing industries account for 12% (273,102). Agriculture only accounts for 4% of Ireland (82,228).[20]

5.3.3 Employment

Study Area 1: Gortloughra and Environs (EDs Bealanageary, Douce and Garrown)

Bealanageary: The number of employed people (over the age of 15) in Bealanageary in 2022 is 108; an increase of 21.3% from 2016 (90). There are 27 people retired, a decrease of 44.4% from 2016 (39).

Douce: The number of employed people (over the age of 15) in Douce in 2022 is 100; an increase of 11.1% from 2016 (89). There are 44 people retired, a decrease of 25.7% from 2016 (35).

Garrown: The number of employed people (over the age of 15) in Garrown in 2022 is 131; an increase of 10.1% from 2016 (119). There are 36 people retired, an increase of 33.3% from 2016 (27).

It is assumed that the majority of those residing within Study Area 1 travel outside of it for employment.

Study Area 2: Cork County

According to the CSO 2022 there were 470,500 persons over 15 years of age in the labour force in Cork County of which 264,400 were in employment, an overall increase of 15% since 2016.

The leading employment sectors are manufacturing, health, wholesale and social work sectors which employ approximately 104,100 persons[25]. Of the 113,556 persons aged 15 years and over who were outside the labour force, 27.3% were students, 18.3% were

[25] Press Statement Census 2022 Results Profile 7 - Employment, Occupations and Commuting Cork, https://www.cso.ie/en/csolatestnews/pressreleases/2023pressreleases/pressstatementcensus2022resultsprofile7-employmentoccupationsandcommutingcork/ [Accessed online 10/05/2024]

looking after the home/family and 40% were retired. **Table 5.3** sets out labour force status in Cork County in 2022.

Table 5.3: Cork County Labour Force Status (2022)

Principal Economic Status	No. Persons
At work	161,174
Looking for first regular job	1,682
Long term unemployed	5,233
Short term unemployed	3,537
Student	31,048
Looking after home/family	20,833
Retired	45,484
Unable to work due to permanent sickness or disability	12,562
Other	1,947
Total	**567,100**

Study Area 3: The Southwest Region

There are 598,191 persons over the age of 15 years recorded in the 2022 Census for Principal Economic Status in the Southwest Region. Of this, 55% (331,968 persons) are 'at work'. There is a record of 16% (98,516 persons) retired and 11% (66,852 persons) in education. A further 7% (41,263 persons) are looking after the home/family and 5% (29,364) are unable to work due to permanent sickness or disability. There is a population of 26,141 persons (4%) which are short-term unemployed, long-term unemployed or looking for their first regular job.

Study Area 4: **Ireland**

Employment Rate in Ireland increased to 74.40 percent in the second quarter of 2024 from 73.80% in the first quarter of 2024. Employment Rate in Ireland averaged 67.23% from 1998 until 2024, reaching an all-time high of 74.40% in the second quarter of 2024 and a record low of 59.30% in the first quarter of 2012.[26]

[26] Central Statistics Office (CSO) Available: https://www.cso.ie/en/index.html [Accessed 29th October 2024)

Ireland's seasonally adjusted unemployment rate fell to 4.3% in August 2024, down from a 28-month high of 4.7% in the previous month as the number of unemployed fell by 9,800 to 124,600.[27]

5.3.4 Land Use and Topography

Study Area 1: Gortloughra and Environs (EDs Bealanageary, Douce and Garrown)

Bealanageary:

Study Area 1 consists of lands which are upland, peatland, agriculture and forestry. Corine 2018[28] denotes most of the Study Area as 'Peat bogs'.

The Site, as defined in **Chapter 1: Introduction, Scoping and Consultation**, is located on relatively high ground, at elevations ranging from 243 m Above Ordnance Datum (AOD) on the northern side of the Site, 326 m at the entrance, to 510 m AOD towards the middle of the Site and 306 m AOD on the southern side of the Site. Further information on the composition of the lands in which the Proposed Development resides is found in **Chapter 8: Soils and Geology**.

Chapter 11: Landscape and Visual Amenity has included a full assessment of the Project. The Landscape Character Assessment (LCA) has located Study Area 1 in the Landscape Character Type '15a Ridged and Peaked Upland' landscape character type. The Ridged and Peaked Upland landscape type is described as having High landscape sensitivity and value. This Landscape type (according to Cork County Development Plan) is described as:

'The ridged, peaked and forested upland landscape type flanks much of the mid-western boundary of County Cork, from the vicinity of Bantry in the south to Millstreet in the north. This landscape type has been glaciated and comprises a fairly rugged and rolling mountainous topography at a relatively high elevation. The area around the Cousane Gap provides a good example of this landscape type which is inclined towards the rugged whereas the southern slopes of the Boggeragh Mountains further to the north in type 15B are a somewhat smoother example, thus adding to the openness of the moorland. These are often delineated by tight gorse hedgerows, walls, banks or post and wire fencing and punctuated by coniferous or broadleaf shelterbelts around small farmsteads. The landscape, with its rapid and steep rising and falling, seems to tumble down along the valleys. The rugged and diverse landcover, involving moorland, heath and scrub, lends a

[27] Trading Economics. Available: https://tradingeconomics.com/ireland/unemployment-rate#:~:text=Irish%20Unemployment%20Rate%20Falls%20From,and%20females%20decreased%20to%204.3%25. [Accessed 29th October 2024]

[28] Environmental Protection Agency Maps https://gis.epa.ie/EPAMaps/ [Accessed Online 10/05/2024]

strong sense of the naturalistic. Urban settlements tend to be located on lower ground and include Ballingeary, Inchigeelagh.'

There are nine scenic routes designated in the Cork County Development Plan (2022-2028) within this landscape type. Scenic routes are discussed further in **Chapter 11: Landscape and Visual Amenity.**

Further information on landscape is found in **Chapter 11: Landscape and Visual Amenity**.

Study Area 2: Cork County

The county of Cork has long east-west ridges forming uplands and hills. Less than one-third of its area is rough pasture, and farmlands climb as high as 245 m. In east and central County Cork are broad valleys and lowlands, which give way in the west to narrower valleys with coastal lowlands backed by high mountains.[29]

Study Area 3: The Southwest Region

Study Area 3 is made up of Cork City, County Cork and County Kerry.

Kerry is bounded by the Atlantic Ocean or its inlets to the south, west, and north. Composed of sandstone, the principal highlands of Kerry are among the highest mountains in Ireland. Three, and part of a fourth, of the six Atlantic peninsulas of southwestern Ireland are in Kerry.

These consist of mountainous ridges, in places intersected by deep valleys and generally surrounded by lowlands. The four peninsulas are the Kerry Head peninsula, the Dingle Peninsula, the Iveragh Peninsula, which continues the line of hills (Macgillycuddy's Reeks) from western County Cork to Valencia Island; and the Beara Peninsula, the most southerly one, which Kerry shares with Cork.

The highest elevations on the peninsulas include Baurtregaum (853 m) and Brandon Mountain (953 m) on the Dingle Peninsula and Mangerton (840 m) and Carrantuohill (1,041 m) on the Iveragh Peninsula. The latter peak is the highest point in the country.[30]

Study Area 4: Ireland

[29] Britannica, 2024. Accessed 29th October 2024. [Available: https://www.britannica.com/place/Cork-county-Ireland]
[30] https://www.britannica.com/place/Kerry

Ireland has a diverse landcover, including forestry, peat bogs, grassland, sand dunes, mud flats, salt marsh, bracken, hedgerows and more, as well as man-made structures and cultivated fields.[31]

Carrauntoohil is the highest point in Ireland. The peak lies in County Kerry and is 1,041 m high. Carrauntoohil is the central peak of Mackgillycuddy's Reeks range. The lowest point in Ireland is the North Slob in County Wexford. This is an area of mudflats. The area was reclaimed in the 19th century when a sea wall was built and has an area of 1,000 hectares.[32]

5.3.5 Tourism

5.3.5.1 Tourist Attractions

Study Area 1: **The Project and Environs – Electoral Divisions (EDs) Bealanageary, Douce and Garrown**

The Site is located approx. 3 km northeast of the Bandon River Valley and 5 km south of the Lee River Valley. Cork County Council has held public consultation in May 2024 in relation to developing a Greenway, which may be used for cycling or walking, on sections of the Bandon River, which is hoped to '*encourage visitors to come and explore the local heritage and scenic areas of West Cork*'[33]. Both these areas are recognised as nationally significant tourism assets within the Cork County Development Plan[34]. Both valleys are important for recreational amenity, heritage and as fishery areas.

Sections of the Cork City-Beara-Gougane Barra Cycling Route traverse the northwestern side of the Site. It is a 318[35] kilometre-long route which commences in Cork City and finishes at the Beara Peninsula (Inchigeelagh) via Gougane Barra. It is a moderate 8-day (318 km) cycling route which can be broken up into ideal smaller half day (40 km) stages. This route is joined by the Pass of Keimaneigh to the west of the Site and the Beara to Breifne Way to the north.

The Beara to Breifne Way, Ireland's longest national waymarked walking/cycling trail runs 7 km north of the Site. The Way runs almost the length of the country and takes the walker and cyclist to some of its most beautiful and least explored areas; along the coast of the Beara Peninsula, across six mountain ranges, along the banks of the River Shannon and

[31] https://www.tailte.ie/en/blog/a-new-national-landcover-map-for-ireland.html#:~:text=The%20landcover%20of%20the%20Republic,made%20structures%20and%20cultivated%20fields.
[32] https://www.worldatlas.com/articles/the-most-extreme-points-of-ireland.html
[33] https://www.corkcoco.ie/en/news/public-consultation-now-open-for-the-bandon-sections-of-the-west-cork-greenway
[34] https://www.corkcoco.ie/sites/default/files/2022-06/volume-1-main-policy-material.pdf
[35] https://www.coillte.ie/site/gougane-barra-forest-park/#:~:text=Cycle%3A%20The%20318%20kilometre%2Dlong,plant%2C%20animal%20and%20bird%20life

through the lake regions of Roscommon and Leitrim. The Shehy Mountains are also located to the north of the Site, which are popular for adventure related tourist activities, with trails for walking and cycling.

Sections of the Proposed Development is located within the Múscraí Gaeltacht, the area has a rich history of traditional Irish music, poetry and dance. Known for its unspoiled landscape, there are many nature walking trails within this area, offering picturesque views of the numerous lakes and mountainous areas within the landscape. The area is of significant cultural heritage value and is frequently visited by tourists.

Grid Connection Routes (GCR) Options and Onsite Substation and Control Building

A section of GCR Option B (Carrigdangan 110 kV substation) is located along the South Lake Road designated scenic route in the Cork County Development Plan (2022-2028). This route is designated for its views of Lough Allua and surrounding mountains. The overall landscape value of the South Lake Road route is classed as Medium in the Cork CDP, meaning this landscape can accommodate development pressure although this is limited depending on scale and magnitude.

GCR Option A and the Onsite Substation and Control Building do not contain any designated scenic routes.

Turbine Delivery Route

A short section of the L8544, is designated as a scenic route (S32) which is designated for mature trees, pastoral landscape with hills in the distance. The landscape value of this route is classed as Medium.

Study Area 2: Cork County

Tourism in County Cork is an important industry based on its rich natural and built heritage. Many areas that are important to the tourism industry of County Cork owe their attraction to the exceptional quality of the landscape or particular features of the built environment[36].

There are a number of policies in the Cork County Development Plan 2022-2028 which seek to promote tourism in the county. Policy TO 1-2: Promotion of Sustainable Tourism in County Cork is '(a) *Promote a sustainable approach to the development of the tourism*

[36] County Development Plan 2022, Section 10, https://www.corkcoco.ie/sites/default/files/2022-06/volume-1-main-policy-material.pdf, [Accessed Online_27/06/2022]

sector within Cork County ….." and Policy TO 7-1: Walking/Cycling and Greenways is "*Promote the development of walking and cycling routes throughout the County as an activity for both international visitors and local tourists…*"

County Cork is home to a number of nationally recognized visitor attractions including; Blarney Castle, Fota Wildlife Park, Jameson Distillery Midleton, Charles Fort and The Titanic Experience, all of which were included in Ireland's top 50 fee charging visitor attractions according to Failte Ireland figures[37]

Study Area 3: The Southwest Region

The coastline of the Southwest offers opportunity for cliff-top walks and rambles. Inland, the landscape is scarcely less rugged: throughout the region, farmland is interspersed with rocky outcrops and bogs which break up the green vistas. The Southwest Region is also home to two of Ireland's top tourist towns, Killarney and Cork which are firm favourites for first-time visitors to Ireland.[38]

Study Area 4: Ireland

Overseas tourism to the island of Ireland continued to rebound in 2023 – the first full year of trading for tourism since the pandemic – and was worth around €6 billion. All of this helped to sustain 300,000 vital jobs in communities across the island, helping to make tourism one of the island's largest indigenous industries. [39]

5.3.5.2 Tourism: Numbers and Revenue

Study Area 1:

Tourism visitor numbers and revenue is unavailable for Study Area 1. However, Study Area 1 is within Study 2: Cork County. The revenue of Study Area 1 has contributed slightly to the revenue of Cork County tourism.

Study Area 2: Cork County

Cork is a top tourist location in Ireland with a broad tourism offering. The tourism industry is an important source of employment and economic growth in Cork.

[37] County Development Plan 2022-2028, Chapter 10, https://www.corkcoco.ie/sites/default/files/2022-06/volume-1-main-policy-material.pdf
[38] https://www.myirelandtour.com/travelguide/south-west-ireland/index.php
[39] https://www.tourismireland.com/about-us

In 2021 a Failte Ireland report[40] found that there was a total of €167 million spent by visitors to Cork, down 26% from 2019.

The same report found that Cork was one of the most popular destinations for domestic tourists as

- 75% of guests staying in Cork were Irish residents.
- 3% originated from Northern Ireland.
- 22% originated from Overseas.[41]

Study Area 3: The Southwest Region

The South-West Region which includes the Counties of Cork and Kerry has consistently been the most popular region in Ireland outside Dublin for overseas tourist and domestic visitors[42]. Regional tourism performance figures for 2018 for the South-West Region show overseas tourist numbers for the South-West Region totalled 2,335,000 in 2019 and tourist revenue accounted for €970,000,000 from overseas tourists. Domestic visitors from Ireland and Northern Ireland accounted for 2,354,000 visits to the region in 2019, with €536,000,000 in revenue generated from domestic and Northern Ireland visitors[43]. In 2023, Cork and Kerry had a combined 3,032,000 domestic visitors, with an overall spending of €835,000,000 in both counties[44]

County Cork is home to a number of nationally renowned visitor attractions including Blarney Castle and Blarney Stone, Ballycotton Cliff Walk, Cobh, Doneraile Park and Spike Island. Doneraile Park was one of the top free of charge attractions visited in 2019 with 490,000 visitors. Blarney Castle and Stone was one of the top fee charging attractions with 460,000 visitors.

Cork is also included in 'Wild Atlantic Way" which is one of the longest defined coastal routes in the world (the closest extent of this route is located 33 km south-west of the

[40] Failte Ireland, 'Irish Resident Travel by County 2019 & 2021' Accessed on: 15/01/2025. Available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/Publications/Domestic-Trips-and-Revenue-by-County-2019-and-2021.pdf?ext=.pdf

[41] Cork City Councils Local Economic and Community Plan 2023-2029 Socio-Economic Statement, Cork City Council, 2023. Available online: https://publications.corkcity.ie/view/925196156/ Accessed 29th October 2024.

[42] Cork County Council 'Cork County Development Plan 2022' Available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.corkcoco.ie/sites/default/files/2022-06/volume-1-main-policy-material.pdf

[43] Failte Ireland, Key Tourism Facts 2019, March 2021, http://docstore.kerrycoco.ie/KCCWebsite/Tourism/TourismStrategy.pdf, accessed 12/05/2021https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/Key-Tourism-Facts-2018.pdf?ext=.pdf, accessed 12/05/2024

[44] Irish Resident Travel by County 2023 chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/Publications/irish-resident-travel-by-county-2023.pdf?ext=.pdf

Project). It was devised as a new 'experience' and 'destination' by Fáilte Ireland to present the West Coast of Ireland as a compelling international tourism product. It is an over-arching brand which individual destinations and businesses can trade collectively with much greater potential visibility and clarity of message in the international marketplace[45].

Study Area 4: Ireland

In 2023, the total contribution of travel and tourism to Ireland's gross domestic product (GDP) was roughly 17.7% higher than in 2019, the year before the onset of the COVID-19 pandemic. Overall, the total contribution of these industries to the country's GDP amounted to 19.3 billion euros in 2023. This figure is expected to reach an estimated 20.4 billion euros in 2024.[46]

5.3.5.3 Tourist Attitudes to Windfarms

Wind Energy Guidelines

'The effect of wind energy development on tourism and recreational activities must be assessed. In this regard, it is desirable that the relevant regional tourist authority should be consulted. In many areas in Ireland, tourism and recreation underpin the local economy and can depend to varying degrees on the quality of the environment. Wind energy developments are not incompatible with tourism and leisure interests, but care needs to be taken to ensure that insensitively sited wind energy developments do not impact negatively on tourism potential. The results of survey work indicate that tourism and wind energy can co-exist happily.'

Tourism related consultation responses are summarised in **Table 1.6** of **Chapter 1: Introduction, Scoping and Consultation** and details of the scoping and consultation process are further included in **Appendix 1.3**. This includes Cork County Council, Department of Tourism and Fáilte Ireland. Tourism is assessed for potential effects in Section 5.4.5 and mitigation measures and residual effects are included in Section 5.5.6. The visual effects on tourism is also fully assessed in **Chapter 11: Landscape and Visual Amenity**.

Scottish Tourism Survey 2017 and 2022

BiGGAR Economics undertook an independent study in 2017, entitled 'Wind Farms and Tourism Trends in Scotland', to understand the relationship, if any, that exists between the

[45] Wild Atlantic Way1 Operational Programme 2015-2019, Failte Ireland, August 2015, https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/2_Develop_Your_Business/Key%20Projects/Wild-Atlantic-Way-Operational-Programme_1.pdf, accessed 12/05/2024

[46] https://www.statista.com/statistics/941487/travel-and-tourism-s-total-contribution-to-gdp-in-ireland/

development of onshore wind energy and the sustainable tourism sector in Scotland. In recent years the onshore wind sector and sustainable tourism sector have both grown significantly in Scotland. The findings of the report show that there is no pattern emerging that would suggest the development of onshore wind energy has a detrimental impact on the tourism sector. The report concludes by stating that 'Although this study does not suggest that there is any direct relationship between tourism sector growth and windfarm development, it does show that wind farms do not cause a decrease in tourism employment either at a local or a national level.'

In 2021, BiGGAR Economics published research findings, on research carried out in Scotland on 44 wind farms and tourism trends[47]. This research also re-examined 28 wind farms constructed between 2009 and 2015 that had been analysed in the previous 2017 study, finding that the localities in which they were based had outperformed Scotland and their local authority areas in the majority of cases. This research has analysed trends in tourism employment in the localities of the 44 wind farms developed in recent years, providing a substantial evidence base. The study found no relationship between tourism employment and wind farm development, at the level of the Scottish economy, across local authority areas nor in the locality of wind farm sites.

Fáilte Ireland Surveys 2007 and 2012

In 2007 Fáilte Ireland, in association with the Northern Ireland Tourist Board (NITB), (67 wind farms established in Ireland at the time) carried out a survey of both domestic and overseas holidaymakers to Ireland to determine their attitudes toward windfarms. The purpose of the survey was to assess whether or not the development of windfarms would impact on the visitors' enjoyment of Irish scenery. In 2012, this research was updated by Millward Browne Landsdowne on behalf of Fáilte Ireland to determine if there was any change in visitor attitudes between 2007 and 2012.

The 2007 research, presented in the Fáilte Ireland Newsletter 2008/No.3 entitled '*Visitor Attitudes on the Environment: Wind Farms'*, found that the majority of visitors felt that wind farms had either no impact (49%) or a positive impact (32%) on the landscape, whilst only 17% felt they had a negative impact. The updated study was published in the 'Fáilte Ireland Newsletter 2012/No.1 entitled '*Visitor Attitudes on the Environment: Wind Farms – Update on 2007 Research*'. The 2012 research indicated an increase in the polarisation of opinion

[47] BiGGAR 2021, Wind Farms & Tourism Trends in Scotland: Evidence from 44 Wind Farms, Available at: https://biggareconomics.co.uk/wp-content/uploads/2021/11/BiGGAR-Economics-Wind-Farms-and-Tourism-2021.pdf [Accessed 28/08/2024]

– with increased positive (47%) and negative responses (30%) and less neutral responses (23%). It was notable that those interviewed who did not see a wind farm during their trip held more negative perceptions and opinions on windfarms to those that did. Of the wind farms viewed the majority (59%) contained less than ten turbines, which was quite similar to 2007 (63%).

Despite the fact that there has been an increase in the number of visitors who have seen at least one wind farm on their holiday, there was also a slight increase (from 45% in 2007 to 48%) in the number of visitors who felt that this had no impact on their sight-seeing experience. Importantly, and as has been seen in the previous research, the type of landscape in which a wind farm is sited can have a significant impact on attitudes. Although 21% feel that wind farms have a fairly or very negative impact on sight-seeing, this figure increases substantially for wind farms in coastal areas (36%).

As part of the study, visitors were asked to rate the beauty of five different yet typical Irish landscapes: coastal, mountain, farmland, bogland and urban industrial land, and then rate the scenic beauty of each landscape and the potential impact of siting a wind farm in each landscape. As in 2012, the results indicate that each potential wind farm and site must be assessed on its own merits, due to the scenic value placed on certain landscapes by the visitor and the preferred scale/ number of wind turbines within a wind farm. Looking across all landscapes, wind farms are seen to have an enhancing effect on the landscapes seen as less beautiful, particularly urban/ industrial and bogland.

Coastal areas (91%) followed by mountain moorland (83%) and fertile farmland (81%) rated as the most scenic, and unsurprisingly resistance is greatest to wind farms in these areas. For instance, there was a greater relative negativity expressed about potential wind farms on coastal landscapes (40%), followed by fertile farmland (37%) and mountain moorland (35%). On the other hand, less than one in four were negatively disposed to the construction on bogland (24%) or urban industrial land (21%). The majority of visitors also still favour large turbines (47%) over small turbines (28%), and in smaller numbers, with the option of five turbines proving the most popular, followed by two clusters of ten and finally wind farms of 25 turbines.

Seven out of ten (or 71%) visitors claim that potentially greater numbers of wind farms in Ireland over the next few years would have either no impact or a positive impact on their likelihood to visit Ireland. Of those who feel that the potentially greater number of wind farms would impact positively on future visits, the key driver is support for renewable energy, followed by potential decreased carbon emissions. Given the scenario where more wind farms will be built in Ireland in the future, the most widely held view is that this will not impact their likelihood to visit the area again, with a slightly greater majority saying that this would have a positive rather than a negative impact.

5.3.6 Human Health

Common concerns around wind farms in terms of human health are generally associated with electromagnetic fields, shadow flicker and noise. These topics are considered in this EIAR (**Chapter 16: Shadow Flicker** and **Chapter 10: Noise and Vibration**) in addition to air quality (**Chapter 15: Air and Climate**) and water contamination (**Chapter 9: Hydrology and Hydrogeology**). Potential effects on human health are included in Section 5.4.6 and mitigation measures as well as residual effects are included in Section 5.5.7.

5.3.6.1 General Health of Population

The overall health of the population in each Study Area is summarised in **Table 5.4,** this gives an indication of the Baseline health within each Study Area prior to the Proposed Development.

Table 5.4: Population by General Health (CSO, 2022)

General Health	Study Area 1: The Project and Environs – Electoral Divisions (EDs) Bealanageary, Douce and Garrown	Study Area 2: Cork County	Study Area 3: The Southwest Region	Study Area 4: Ireland
	Percentage (%)			
Very good	51	55	54	53
Good	32	29	30	30
Fair	10	8	8	9
Bad	1	1	1	1
Very bad	<1	<1	<1	<1
Not stated	5	6	6	7

Study Area 1: The Project and Environs – Electoral Divisions (EDs) Bealanageary, Douce and Garrown

The health status of Study Area 1 (**Table 5.4**) for the majority of the population (51%) is 'Very good' or 'Good' (32%). Overall, 93% of the population have stated that their health is

'Fair' or better ('Good' or 'Very good'). Less than 2% of the population have stated that their health is 'Bad' or 'Very bad'.

Study Area 2: Cork County

The "Very Good" health status for County Cork at 55% is just above the national average (53%) and is the highest of all the Study Areas. The second highest rating for health is 'Good' at 29% of the population of County Cork. Overall, 92% of the population of Study Area 2 have stated that their health is 'Fair' or better. Less than 2 % of the population have stated that they have 'Bad' or 'Very bad' health. This is illustrated in **Table 5.4.**

Study Area 3: The Southwest Region

Study Area 3 shows health statuses similar to that of Study Area 1 and Study Area 2 (**Table 5.4**). The majority of the population for Study Area 3 consider their health to be 'Good' (30%) or 'Very good' (54%). Overall, the population consider their health to be 'Fair' or better (92%). Again, less than 2% of the population consider their health to be 'Bad' or 'Very bad'.

Study Area 4: Ireland

Human health of communities can vary greatly owing to a number of factors including susceptibility to disease, location, income inequality, access to health care etc. In 2019, the Department of Health published "Health in Ireland – Key Trends 2019" which shows population health at the national level presents a picture of decreasing mortality rates and high self-perceived health over the past ten years. Ireland has the highest self-perceived health status in the EU, with 82.9% of people rating their health as good or very good.

The 2022 census data for the general health of the population as shown in **Table 5.4** indicates the health status across three of the study areas is "Very Good" to "Good". Overall, in Ireland, the percentage of people reporting their health status as either very good or good has fallen from 87% in 2016 to 83% in 2022.

5.3.6.2 Electromagnetic Interference

Electromagnetic fields ("EMF") are invisible lines of force that surround electrical equipment, power cords, wires that carry electricity and outdoor power lines. Electric and magnetic fields can occur together or separately and are a function of voltage and current. When an electrical appliance is plugged into the wall, an electric field is present (there is voltage but no current); when that appliance is turned on, electric and magnetic fields are present (there is both voltage and current). Both electric and magnetic fields decrease with distance.

Electric fields are also dissipated by objects such as building materials. On a daily basis, people are exposed to extremely low frequency ("ELF") EMF as a result of using electricity.

National and international health and scientific agencies (as cited in EMF and You) have reviewed more than 35 years of research including thousands of studies. None of these agencies have concluded that exposure to ELF-EMF from power lines or other electrical sources is a cause of any long-term adverse effects on human, plant, or animal health. The International Commission on Non-Ionising Radiation Protection (ICNIRP) Guidelines give a limit of 100 μT for sources of AC magnetic fields. This compares to 0.13 μT for 110 kV underground cable when directly above it, 1.29 μT for 220 kV underground cable when directly above it and 11.4 μT for 400 kV AC underground cable that is one metre deep and measured directly above it. The ESB published an information booklet in 2017 called "EMF & You" which provides information about Electric & Magnetic Fields and the electricity network in Ireland[48].

5.3.6.3 Shadow Flicker

Shadow Flicker is the effect caused by the sun shining behind the rotating blades of a turbine relative to a nearby sensitive receptor which causes a momentary shadow on a window of that sensitive receptor. Currently there are no turbines in place at the Site.

5.3.6.4 Noise

A 2013 EPA study[49] in South Australia on low frequency noise near wind farms and in other environments, found that infrasound levels from wind turbines is insignificant and no different to any other source of noise, and that the worst contributors to household infrasound are air-conditioners, traffic and noise generated by people.

The turbine rotor blades will be fitted with a serrated extension of the trailing edge which will mitigate noise emission by design by effectively breaking up turbulence. Baseline noise measurements were carried out from 6th August to 3rd September 2020. A number of predictions were prepared for layout of the eight turbine development. Based on layout, potential noise-sensitive receptors, including occupied and un-occupied, were identified from maps. Receptor locations were verified through visits to the area.

[48] EMF & You, ESB, 2017 - https://esb.ie/docs/default-source/default-document-library/emf-public-information_booklet_v9.pdf?sfvrsn=0, accessed 14/05/2024

[49] EPA South Australia, 2013. Wind Farms. https://www.epa.sa.gov.au/environmental_info/noise/wind_farms [Accessed 11/02/2025]

Baseline noise monitoring was then undertaken between 21st February and 21st March 2022,

Chapter 10: Noise provides an assessment of noise in relation to the Project.

5.3.6.5 Air Quality

Environmental Protection Agency (EPA, 2016)[50], EU and World Health Organisation (WHO, 2014)[51] reports estimate that poor air quality accounted for premature deaths of approximately 600,000 people in Europe in 2012, with 1,200 Irish deaths attributable to fine particulate matter ($PM_{2.5}$) and 30 Irish deaths attributable to Ozone (O_3). These emissions, along with others including nitrogen oxides (NO_x) and sulphur oxides (SO_x) are produced during the burning of fossil fuels for energy generation, transport or home heating. There are no such emissions associated with the operation of wind turbines.

Traffic disruption to the public during the construction and decommissioning phases of the Proposed Development is likely. Transport accounts for a significant portion of pollutants in the atmosphere.

Chapter 15 provides an assessment of air quality (including the impact of dusts) in relation to the Project. **Chapter 14** provides an assessment of traffic and transport.

5.3.6.6 Water Contamination

Contaminants such as sediments arising from the Project have the potential to contaminate water bodies designated for bathing and/or drinking water purposes. Mitigations as set out in **Chapter 9: Hydrology and Hydrogeology** will prevent and reduce risk of contamination of waterbodies. The drainage design and surface water network (**Appendix 2.1 Construction Environmental Management Plan, Management Plan 3: Surface Water Management Plan**) are considered in terms of assimilative capacity. Any contaminants will be treated when water is abstracted for drinking water purposes.

Mapping and searches of the Geological Survey Ireland (GSI) well databases confirm that there are no known groundwater abstraction wells located within the Redline Boundary. The closest known groundwater well is located approximately 2 km to the northeast of the Site boundary in the townland of Coolcaum.

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[50] EPA 2016, Irelands Environment An Assessment 2016, Available at: https://epawebapp.epa.ie/ebooks/soe2016/files/assets/basic-html/page-1.html [Accessed 11/02/2025]
[51] WHO 2014, News release 25 March 2014, Available at: https://www.who.int/europe/news/item/25-03-2014-almost-600-000-deaths-due-to-air-pollution-in-europe-new-who-global-report [Accessed 11/02/2025]

Chapter 9 provides an assessment of the hydrological impacts in relation to the Project, including the potential for water contamination. A summary of potential effects has been included in Section 5.4.6.5.

5.3.6.7 Traffic

It is proposed that the turbine nacelles, tower hubs and rotor blades will be landed in the Port of Cork. From there, they will be transported to the Site via the N28, N40, N22, R585, R587 and the L8544 to the upgraded Site entrance.

To assess the impact of the Proposed Development on the existing road network when the Proposed Development is constructed and fully occupied, Baseline traffic volumes in the area are required. Jennings O'Donovan carried out classified traffic counts Wednesday 20th November 2024 to record traffic volumes and turning movements of vehicles at the R584/L4607 junction, R585/L4607 junction and at the L4607/L4608 junction.

The morning peak hour traffic period on the public road network in the vicinity of the Proposed Development are obtained from the traffic counts. The Traffic counts show that peak traffic occurs between 8.00am and 9.00am in the morning.

Chapter 14 provides an assessment of traffic in relation to the Project. A Traffic Management Plan has also been included in this EIAR as **Appendix 14.2**. A summary of potential effects has been included in Section 5.4.6.6 of this chapter.

5.3.6.8 Health Impact Studies

While there are anecdotal reports of negative health effects on people who live near wind farms there is no peer reviewed scientific research in support of these views. Several peer reviewed scientific research publications are outlined below.

A Health Service Executive (HSE) 2017 paper 'Position Paper on Wind Turbines and Public Health' concluded that:

'*Published scientific evidence is inconsistent and does not support adverse effects of wind turbines on health. However, adequate setback distances and meaningful engagement with local communities are recommended in order to address public concern.*'

Wind Energy Development Guideline (2006) setback distances have been reached for all non-involved receptors, as shown in **Table 16.2.** A multistage approach was given to public consultation comprising webinars, in person events, newspaper advertising, door to door public engagement and brochures / leaflet distributions, this is detailed further in **Chapter 1: Introduction**.

Frontiers in Public Health published a study[52] in 2014 on wind turbines and human health. This review completed a bibliographic-like summary and analysis of the science around this issue specifically in terms of noise (including audible noise, low-frequency noise, and infrasound), EMF, and shadow flicker. The study noted that:

"*Based on the findings and scientific merit of the research conducted to date, it is our opinion that the weight of evidence suggests that when sited properly, wind turbines are not related to adverse health effects. This claim is supported (and made) by findings from a number of government health and medical agencies and legal decisions*".

The National Health and Medical Research Council (NHMRC), Australia's leading medical research body, have concluded that there is no reliable or consistent evidence that wind farms directly cause human health problems as part of their Systematic Review of the Human Health Effects of Wind Farms[53] published in December 2013.

The review was commissioned to determine whether there is a direct association between exposure to wind farms and negative effects on human health or whether the association is casual, by chance or bias. Objectors to wind farms often refer to 'Wind Turbine Syndrome' as a condition that can be caused by living in close proximity to wind farms. The symptoms allegedly include sleep deprivation, anxiety, nausea and vertigo. It has been rejected by the wind industry and is further refuted by a review carried out by the NHMRC that wind turbines cause this sort of symptoms.

The review began in late 2012 and included a literature and background review of all available evidence on the exposure to the physical emissions produced by wind turbines. These emissions were noise, shadow flicker and electromagnetic radiation produced by wind turbines. The review concludes that the evidence considered does not support any direct association between wind farms and human health problems and that bias and confounding could be possible explanations for any reported association.

[52] Knopper, L. D., Ollson, C. A., McCallum, L. C., Whitfield Aslund, M. L., Berger, R. G., Souweine, K., & McDaniel, M. (2014). Wind turbines and human health. *Frontiers in public health*, *2*, 63. https://doi.org/10.3389/fpubh.2014.0006

[53] Merlin, T, Newton, S, Ellery, B, Milverton, J & Farah, C (2015). Systematic review of the human health effects of wind farms, National Health and Medical Research Council, Canberra.

In general, there are no specific health and safety considerations in relation to the operation of a wind turbine. The area surrounding the turbine base will still be available for use as normal. Noise and Shadow Flicker are operational Health and Safety issues have been addressed in **Chapter 10** and **Chapter 16**.

5.3.6.9 Turbine Safety

Turbines pose no threat to the health and safety of the general public. The Department of the Environment, Heritage and Local Government (DoEHLG)'s '*Wind Energy Development Guidelines for Planning Authorities 2006'* state that there are no specific safety considerations in relation to the operation of wind turbines. Fencing or other restrictions are not necessary for safety considerations. People or animals can safely walk up to the base of the turbines. The DoEHLG Guidelines state that there is a very remote possibility of injury to people from flying fragments of ice (ice throw) or material from a damaged blade. A study[54] carried out on the failure rates of wind turbines, which was based on ~350 offshore wind turbines located throughout Europe, estimated the minor repair requirement for blades as 0.456/turbine/year and major repair requirements as 0.01 turbine/year.

However, most blades are composite structures with no bolts or separate components and the danger is therefore minimised. The build-up of ice on turbines is unlikely to present problems. The wind turbines will be fitted with anti-vibration sensors, which will detect any imbalance caused by icing of the blades. The sensors will prevent the turbine from operating until the blades have been de-iced.

Turbine blades are made of fibre-reinforced polymer (FRP's) or unsaturated polyester, a non-conducting material which will prevent any likelihood of an increase in lightning strikes within the Site or the local area. Lightning protection conduits will be integral to the construction of the turbines. Lightning conduction cables, encased in protection conduits, will follow the electrical cable run, from the nacelle to the base of the turbine. The conduction cables will be earthed adjacent to the Turbine Foundations. The earthing system will be installed during the construction of the Turbine Foundations. In extremely high wind speed conditions, (usually at Beaufort Storm Force 10 (24.5 - 28.4m/s) or greater) the turbines will shut down to prevent excessive wear and tear, and to avoid any potential damage to the turbine components.

[54] Carroll, J., McDonald, A. and McMillan, D. (2015) 'Failure rate, repair time and unscheduled O&M cost analysis of offshore wind turbines', Wind Energy, 19(6), pp. 1107–1119. doi:10.1002/we.1887.

Health and safety issues are not covered in the Wind Energy Development Guidelines and are covered by separate legislation (Section 5.1.3).

5.3.6.10 Major Accidents and Natural Disasters

The Baseline condition of the receiving environmental with respect to Major accidents and Natural Disasters has been discussed in a separate chapter, **Chapter 17: Major accidents and Natural Disasters.** Health and safety issues are not covered in the Wind Energy Development Guidelines and are covered by separate legislation (Section 5.1.3).

5.3.7 Public Perception of Wind Energy

Sustainable Energy Ireland Survey 2003

The first wind farm in Ireland was completed in 1992 at Bellacorrick, Co. Mayo and since then wind farms have elicited a range of reactions from Irish people (Failte Ireland, 2012). In 2003, Sustainable Energy Ireland (SEI) now the Sustainable Energy Authority of Ireland (SEAI) commissioned a survey aimed at identifying public attitudes to renewable energy, including wind energy in Ireland[55]. A windfarm catchment area survey was also carried out by SEAI (formerly SEI) in order to focus specifically on people living with a wind farm in their locality or in areas where wind farms are planned.

The survey found that the overall attitude of Irish people to wind farms is very positive, with 84% of respondents rating it positively or very positively. One percent (1%) rates it negatively and 14% had no opinion either way. Additionally, approximately two thirds of respondents (67%) were found to be positively disposed to having a wind farm in their locality. Where negative attitudes were voiced towards wind farms, the visual impact of the turbines on the landscape was the strongest influence, therefore special care should be taken to ensure that wind farms respond to contextual landscape characteristics. The report also notes however that the findings obtained within wind farm catchment areas showed that impact on the landscape is not a major concern for those living near an existing wind farm.

Similar to the national survey, the surveys of those living within the vicinity of a wind farm found that the findings are generally positive towards wind farms. Perceptions of the impact of the development on the locality were generally positive, with some three-quarters of interviewees believing it had impacted positively. In areas where a wind farm development had been granted planning permission but was not yet under construction, three quarters

[55] Sustainable Energy Ireland (2003), Attitudes towards the Development of Wind Farms in Ireland, Dublin

of the interviewees expressed themselves in favour of the wind farm being built in their area. Four per cent were against the development. The reasons cited by those who expressed themselves in favour of the wind farm included the fact that wind energy is clean (78%), it would provide local jobs (44%), it would help develop the area (32%) and that it would add to the landscape (13%).

Survey Update 2017

Additionally, a survey[56] carried out by Interactions in October 2017, published by the SEAI, show 47% of Irish adults polled said they were strongly in favour of wind power in Ireland while a further 38% favour it.

The SEAI survey found that the overall attitude to wind farms is very positive, with 84% of respondents in favour of the use of wind energy in Ireland. Approximately two thirds of respondents (70%) would prefer to power their home with renewable energy over fossil fuels, and 45% would be in favour of a wind farm development in their area.

The final section of the 2017 report states:

"The overwhelming indication from this study is that wind energy enjoys great support and, more specifically, that the development of wind farms is supported and welcomed. The single most powerful indicator of this is to be found among those living in proximity to an existing wind farm: over 60% would be in favour of a second wind farm or an extension of the existing one. This represents a strong vote in favour of wind farm developments — especially important since it is voiced by those who know from direct experience about the impact of such developments on their communities."

IWEA Interactions Opinion Poll on Wind Energy (2017-2022)

Interactions Research have conducted omnibus research commissioned by Irish Wind Energy Association (IWEA) (now known as Wind Energy Ireland (WEI)), in October 2017, November 2018, November 2019, November 2020 and again in December 2022 with the objective to *"measure & track perceptions and attitudes around wind energy amongst Irish adults."*

The most recent survey, conducted online in December 2022[57] sampled a representative sample of 1,017 Irish adults nationwide, together with a supplementary booster sample of 201 rural dwellers. The key findings from the survey included:

[56] Energy Research, Development and Demonstration Programme (2017), An economic analysis of wind farm externalities and public preferences for renewable energy in Ireland

[57] https://windenergyireland.com/about-wind/more-resources/annual-wind-survey

- 4 in 5 nationally (80%) are now in favour of wind power.
- 83% Agree that offshore wind farms can support Irelands energy security
- Nationally, 58% said they would be in favour of a wind farm in their area
- The top reasons for supporting wind energy were identified as:
  - Cheaper Electricity
  - Reducing CO_2 emissions
  - Good for the Environment

As a result of the ongoing research, trends in the attitudes of windfarms over the past previous years can be assessed. The survey showed that the trend in attitude amongst the nationally represented sample is increasingly positive. Despite very consistent overall satisfaction, some movement can be seen over time within the rural sample from being 'strongly in Favour' towards 'tending to favour' wind power.

Public acceptance of new renewable electricity survey 2021[58]

Ireland's 2030 targets for renewables (primarily wind, solar) in electricity generation are ambitious, essentially doubling growing from 40.7% in 2023 to 80% by 2030[59]. The electricity demand is anticipated to be between 28% and 55% higher in 2030 compared to 2018[60]. To meet the anticipated growth in electricity demand in Ireland, as well as achieve the renewable electricity policy targets, a substantial investment in electricity infrastructure is required. However, often these large new scale power system infrastructure developments face public opposition.

The result of this survey indicates that 77% of people are positively disposed to wind turbines. However, just 36% are willing to accept the development of wind farms within 5 km of their homes.

The current research shows impact of public acceptance levels for new energy infrastructure is significant. The cost of building and operating the power system could dramatically escalate if there is a sharp deterioration in the public's acceptance of new energy infrastructure. The implication for policy and the wider electricity sector is that community and stakeholder engagement should remain a top priority.

[58] Tong Koecklin, M., Longoria, G., Fitiwi, D., DeCarolis, J., and Curtis, J. (2021). Public acceptance of renewable electricity generation and transmission network developments: Insights from Ireland, Energy Policy, Vol, 151, April 2021, 112185, https://doi.org/10.1016/j.enpol.2021.112185

[59] First Look: Renewable Energy in Ireland 2023, SEAI. September 2024.

[60] https://www.esri.ie/system/files/publications/RB202105_0.pdf

Irish National Survey of Households Near New Commercial Wind and Solar Farms 2023

SEAI commissioned a national survey of the attitudes of people who live near to 50 new commercial solar or wind farm projects in Ireland. This forms part of a long-term study to understand the effects of government policies under the Renewable Electricity Support Scheme (RESS) on the public's support for Ireland's energy transition. In 2022, surveyors conducted in-person interviews on the doorstep across rural Ireland. They surveyed 1,764 households. This included 1,116 households within 5 km of a new commercial wind or solar project sites, of which 219 live within 1 km of a project site.

The results showed that 67% of respondents hold a positive or very positive view towards wind energy, while a further 73% of respondents who live <1 km of a RESS1 wind project hold positive or very positive attitudes towards wind energy. Additionally, 59% of survey respondents felt Ireland has too few wind farms.

Respondents were asked their attitudes towards wind farms planned or under development in their area (<5 km), in total 50% of those surveyed had positive or very positive attitude toward wind farm development. Of those within <1 km of a RESS1 site, 58% felt positive or very positive towards a local wind energy development, compared to 45% of those who live within 1-2 km of a potential wind energy development.

Public Consultation

Public consultation was carried out from 2019 for the Proposed Development. A detailed report on this has been appended to this EIAR as **Appendix 1.2**.

5.3.8 Property Value

There is currently only one study within the context of Ireland detailing the effect of wind farms on property values. This section provides a summary of this paper by the Centre for Economic Research on Inclusivity and Sustainable (CERIS), as well as summaries on the largest and most recent studies from the United States and Scotland.

In 2023 CERIS published a working paper entitled '*Wind Turbines and House Prices Along the West of Ireland: A Hedonic Pricing Approach*[61]'. This paper looked at wind turbine developments in Donegal, Leitrim, Sligo, Mayo, Galway, Kerry and Cork and associated property values. This working paper utilised satellite imagery to identify individual turbines

[61] Centre for Economic Research on Inclusivity and Sustainability (2023) Wind Turbines and House Prices Along the West of Ireland: A Hedonic Pricing Approach. <https://www.universityofgalway.ie/media/researchsites/ceris/files/WP-2023-01.pdf>

and sourced its housing data from www.daft.ie. In total, this working paper studied 1,342 individual turbines and 90,469 housing listings from www.daft.ie, with an average of 74 houses per studied electrical division. While the published price on Daft is not equivalent to the final agreed sale price, it was assumed that the listing and transaction prices are correlated. The findings demonstrate the rural nature of wind farms in Ireland as the distance from turbine bands (0-5 km and 5-15 km bands) shows the uneven distribution of houses, with respect to proximity of the nearest turbine, with a limited number of houses within 2-3km of an individual turbine, and even fewer numbers found within 1 km of a turbine location. While the results of this study identified a potential negative price effect of -14.7% on property values within 0-1 km of a wind turbine, this was only in comparison to houses located between 5-15 km distance from the same turbine location and is only seen for properties whose housing listing is updated within 5-10 years of the turbines connection date into the national grid. Also, this effect was found only on a limited subset of studied houses and these effects were not persistent and diminished over the operational lifetime of the turbines.

The largest study of the impact of wind farms on property values has been carried out in the United States. '*The Impact of Wind Power Projects on Residential Property Values in the United States: A multi-Site Hedonic Analysis*[62]', December 2009, was carried out by the Lawrence Berkley National Laboratory (LBNL) for the U.S Department of Energy. This study collected data on almost 7,500 sales of single-family homes situated within ten miles of 24 existing wind farms in nine different American states over a period of approximately ten years. The conclusions of the study are drawn from eight different pricing models including repeat sales and volume sales models. Each of the homes included in the study was visited to demonstrate the degree to which the wind facility was visible at the time of the sale, and the conclusions of the report state that "The result is the most comprehensive and data rich analysis to date on the potential impacts of wind energy projects on nearby property values."

The main conclusion of this study is as follows:

"Based on the data and analysis presented in this report, no evidence is found that home prices surrounding wind facilities are consistently, measurably, and significantly affected by either the view of wind facilities or the distance of the home to those facilities. Although the analysis cannot dismiss the possibility that individual or small numbers of homes have been

[62] Hoen, Ben & Wiser, Ryan & Cappers, Peter & Thayer, Mark & Sethi, Gautam. (2009). The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis. Journal of Real Estate Research. 33. 10.2172/978870.

or could be negatively impacted, if these impacts do exist, they are either too small and/or too infrequent to result in any widespread and consistent statistically observable impact."

This study has been updated by LBNL who published a further paper entitled 'A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States[63]', in August 2013. This study analysed more than 50,000 home sales near 67 wind farms in 27 counties across nine U.S. States yet was unable to uncover any impacts to nearby home property values. The homes were all within 10 miles of the wind energy facilities - about 1,100 homes were within 1 mile, with 331 within half a mile. The report is therefore based on a very large sample and represents an extremely robust assessment of the impacts of wind farm development on property prices. It concludes that: "Across all model Specifications, we find no statistical evidence that home prices near wind turbines were affected in either the post-construction or post announcement/pre-construction periods."

Both LBNL studies note that their results do not mean that there will never be a case of an individual home whose value goes down due to its proximity to a wind farm – however if these situations do exist, they are considered to be statistically insignificant. Therefore, although there have been claims of significant property value impacts near operating wind turbines that regularly surface in the press or in local communities, strong evidence to support those claims has failed to materialise in all the major U.S. studies conducted thus far.

A further study was commissioned by RenewableUK and carried out by the Centre for Economics and Business Research (Cebr) in March 2014. The findings of the study were produced in a report titled 'The Effect of Wind Farms on House Prices' and its main conclusions are:

- Overall, the analysis found that the county-wide property market drives local house prices, not the presence or absence of wind farms.
- The econometric analysis established that construction of wind farms at the five sites examined across England and Wales has not had a detectable negative impact on house price growth within a five-kilometre radius of the sites.

[63] Hoen, Ben & Brown, Jason & Jackson, Thomas & Thayer, Mark & Wiser, Ryan & Cappers, Peter. (2014). Spatial Hedonic Analysis of the Effects of US Wind Energy Facilities on Surrounding Property Values. The Journal of Real Estate Finance and Economics. 51. 10.1007/s11146-014-9477-9.

A study issued in October 2016 'Impact of wind Turbines on House Prices in Scotland[64]' (2016) was published by Climate Exchange. Climate Exchange is Scotland's independent centre of expertise on climate change which exists to support the Scottish Governments policy development on climate and the transition to a low carbon economy.

The report presents the main findings of a research project estimating the impact on house prices from wind farm developments. It is based on analysis of over 500,000 property sales in Scotland between 1990 and 2014.

The key findings from the study are:

- No evidence of a consistent negative effect on house prices: Across a very wide range of analyses, including results that replicate and improve on the approach used by Gibbons (2014), we do not find a consistent negative effect of wind turbines or wind farms when averaging across the entire sample of Scottish wind turbines and their surrounding houses. Most results either show no significant effect on the change in price of properties within 2km or 3km or find the effect to be positive.
- Results vary across areas: The results vary across different regions of Scotland. Our data does not provide sufficient information to enable us to rigorously measure and test the underlying causes of these differences, which may be interconnected and complex.

In September 2023, the Energy Policy Journal published '*Commercial wind turbines and residential home values: new evidence from the universe of land-based wind projects in the United States*[65].' This study targeted urban counties in the United Stated with populations over 250,000 persons, and found that on average, after a commercial wind energy project is announced, houses located within 1 mile of a proposed wind energy project experience a decrease in value of 11% relative to homes located within 3-5miles of the proposed wind energy project. The decline in property values was found to recover post construction with property value impacts becoming relatively small (~2%) and statistically insignificant 9 years or more after project announcement (roughly 5 years after operation begins). This suggests that the housing market is reacting negatively to the expectation of likely impacts (after announcement) and the heightened activity during construction, but after operation begins, those negative perceptions and related home price impacts appear to fade.

[64] ClimateExhange (2016) Impact of wind turbines on house prices in Scotland. Available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://scotlandagainstspin.org/wp-content/uploads/2019/08/Impact-on-house-prices-in-Scotland-2016.pdf

[65] Energy Policy (2023) Commercial wind turbines and residential home values: new evidence from the universe of land-based wind projects in the United States. Available at: https://www.sciencedirect.com/science/article/pii/S0301421523004226

Although there have been no empirical studies carried out in Ireland on the impacts of wind farms on property prices, the literature described above demonstrates that at an international level, wind farms have potential to impact property values in local areas; however, it is important to note that this impact is proven to reduce throughout the operational phase of a wind farm.

It is a reasonable assumption based on the available international literature, that the provision of a wind farm at the proposed location would not impact on the property values in the area.

5.4 ASSESSMENT OF POTENTIAL IMPACTS

As outlined in Section 5.2.3, the potential impacts of the Project on the Population and Human Health factors, is measured from the perspective of the receptors. The receptors for this study are habitable dwellings and community area. In this study sensitive receptors are those dwellings and amenities/ communities (67 dwellings) within 2 km of a proposed turbine location and receptors within 100 m of GCR Options works.

Turbine Delivery Route: The active construction areas for the road works along the Turbine Delivery Route outside the redline will involve only surface-level earthworks (removal of soil and unconsolidated rock) and will be temporary in nature. The proposed Turbine Delivery Route works associated with the Proposed Development are **negligible** and will not have any long-term negative effects on the factors considered in this section.

Grid Connection Route Options: The Grid Connection works (Option A or Option B) associated with the Proposed Development will potentially impact on the Human Health and Population factors considered within this section, both by means of the construction phase and the operation phase, where general maintenance of the grid connection infrastructure such as Junction Boxes will be carried out when required over the life span of the Wind Farm. For these works, traffic management plan will be agreed with the Local Authority and access priorities given to local residents where possible. The effect of the proposed Grid Connection Route works (Option A and Option B) have been included in the assessment of the construction and operational phase of the Proposed Development within the following subsection. Viewed independently however, the Grid works are considered **negative, long-term** and **not significant/ imperceptible**.

5.4.1 Population and Settlement Patterns

The Proposed Development does not contain a housing or services element and is not considered to have any direct positive or negative impact on the local or regional population levels. However, construction workers who are not based locally may temporarily relocate to the region, this is more likely for the initial construction and decommissioning phase than for the operational phase. The overall impact is considered to be **imperceptible** in terms of population.

The predicted effect on the immediate settlement patterns and social patterns is also **slight to non-existent**. There is however the benefit which would accrue 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, green energy supply could potentially be attractive for companies looking to develop in County Cork and be located in the vicinity of the Site.

During the construction phase, there is the potential for limited impacts on the residential amenity of the local population. These would be short-term impacts relating primarily to an increase in construction traffic causing noise, dust, and an increase in traffic volume. The levels been defined as **slight negative** in the construction and decommissioning phases and **imperceptible** in the operational phase. The impacts of construction traffic are assessed and outlined in more detail in **Chapter 14: Traffic and Transport.**

The Site is located within the Múscraí Gaeltacht area. While the construction phase will see the arrival of construction workers to the area, this will be a short-term occurrence and will not result in permanent settlement of the area by non-Irish speakers. The Project is, therefore, predicted to result in a negligible, indirect, not significant impact on the Irish language during the construction phase. Please see **Chapter 13: Cultural Heritage** for more details.

While this is not likely to result in a marked increase in settlement in the area, or a change in social patterns in the area, it should provide the provision of a secure, renewable energy source which would prove attractive to industry. This is dependent on national and global economic conditions, as well as the types of industry which may locate in the region.

The overall impact 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 impact 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.

5.4.2 Economic Activity

Construction Phase

During the construction phase, there would be economic effects resulting from the expenditure on items such as Site preparation, site access tracks, purchase and delivery of materials, plant, equipment and components. According to Institute for Sustainable Futures document[66] (2015), 3.2 jobs are created per MW of wind energy development during the

[66] Institute for Sustainable Futures (2015) 'Calculating Global Energy Sector Jobs: 2015 Methodology Update' Available at: https://opus.lib.uts.edu.au/bitstream/10453/43718/1/Rutovitzetal2015Calculatingglobalenergysectorjobsmethodology.pdf [Accessed 17th July 2024]

construction and installation phase. Based on this employment estimate, and an approximate 18-month construction phase, approximately 154 jobs could be created during the construction phase (for an installed capacity of approximately 48 MW.). Some of these workers would be sourced from the local labour market in Study Area 2, but professional and skilled personnel may be required to be sourced from areas inclusive of Study Area 3 or even further afield.

During the construction phase, 154 no. jobs are likely to be created. Local employment will be provided, as well as employment on local, national and international levels both directly and indirectly. Throughout the project lifetime, employment will be both created and maintained on local, regional, national and international levels.

It is envisaged that labour and materials will be sourced from the local area during construction where possible. Natural resources used for the construction of the Project will be sustainably sourced from properly recognised and licensed facilities. Ready-mix concrete and any crushed stone required will also be sourced from a local supplier, again subject to authorisation, and to quality and quantity being available.

Employees involved in the construction of the Proposed Development will most likely use local shops, restaurants and hotels/accommodation. Therefore, overall, there will be a **slight, positive impact** on employment in the Region.

Operational Phase

Employees also involved in the subsequent operation of the Proposed Development (see Section 5.4.3) will use local shops, restaurants and hotels/accommodation. The number of employees required during the operational phase is significantly less than that of the construction and decommissioning phases and will therefore have a negligible effect on the Region.

Decommissioning Phase

During the decommissioning phase, similar effects to those in the construction phase are envisaged.

5.4.2.1 Capital Expenditure

In 2017 BVG Associates carried out extensive assessments, on behalf of Scottish Power Renewables, on the economic benefits from eight onshore wind farms in Southwest

Scotland[67]. Each contract value was assigned to one or more relevant elements of a supply chain. Capital expenditure (CAPEX) was found to relate to turbine, civil works and electrical works supply chains, whereas the operational expenditure (OPEX) relates to transmission operations, Maintenance and Service (OMS) supply chain, the windfarm OMS and also the decommissioning supply chain.

Based on this research and the largest capacity being installed, the CAPEX for the Proposed Development is estimated to be approximately €90 million. This expenditure will result in economic benefit at a national, regional and local level. The OPEX (based on a conservative 24-year period) in nominal terms is estimated to be €105 million. The BVG report found, for the eight projects studied, that 66% of the total project spend (CAPEX & OPEX) was retained within the National economy, 17% of the total was retained in the local region hosting the project.

Cork County Council will benefit from payments under both the Development Contribution Scheme and from the annual rate payments. The Applicant is also committed to a Community Benefit Fund, which is detailed further in **Chapter 1: Introduction, Scoping and Consultation**. This package will be advertised annually and managed by the local community or an independent body by the local community. The purpose of the community fund is to enable the local community to share in the benefits of the Proposed Development. Statkraft's community benefit funds typically support local projects, with funds allocated to projects from all aspects of the community.

During the operational phase, the land value would increase as a result of the Proposed Development, resulting in a minor beneficial effect on land use within the Site.

The overall impact is predicted to be a **moderate, positive, short-term** impact during the construction phase of the Proposed Development and **moderate, positive and long-term** during the operational phase.

5.4.3 Employment

The employment effects that are attributable to the Project can be outlined as direct, indirect and induced.

Direct: Employment and other economic outputs that are directly attributable to the delivery of the Project. These include any new jobs that are created to manage and supervise the construction phase, operational and decommissioning phases of the Project and that are

[67] Economic Benefits from onshore wind farms, September 2017, BVG Associates, accessed 18/05/24

filled by employees of the Developer or the appointed Contractor (or sub-contracted employees).

Indirect: Employment and other outputs created in other companies and organisations that provide services to the Project, (i.e. procurement and other supply chain effects). Most manufactured materials like towers, blades and subcomponents are assumed to be imported (import intensity of 66%) with major infrastructure delivery through Port of Galway; fewer indirect manufacturing jobs will be generated domestically in Ireland.

Induced: Additional jobs and other economic outputs that are created in the wider economy, as a result of the spreading of employee incomes and other ripple effects that occur as a result of the direct and indirect effects of the Project.

Sustainable Energy Authority of Ireland (SEAI) researched the flow of investment and sales revenue from onshore wind and the transmission grid through the different industrial sectors in the supply chain required for input–output macro-analysis (**Table 5.6**).

Table 5.6: Capital Investment breakdown for onshore wind supply (Source SEAI, 2015[68])

	Industrial Sectors
€192 million average annual capital investment to reach 2020 NREAP/NEEAP targets	Manufacturing (70%): turbines, blades, towers, gearbox, generator, electrical equipment, transformer etc.
	Construction (12%)
	Electricity Supply Services (10%)
	Transport (2.5%)
	Finance (2.5%)
	Professional Services (3%)

In terms of its capacity to capture capital investment domestically, Ireland has strong indigenous feasibility, planning, foundations and engineering expertise, with the skills and knowledge base to potentially supply niche markets in controls and instrumentation, albeit the bulk of heavy manufacturing (blades, towers) is imported. Similarly, the Irish supply chain is very well positioned in all of the preliminary design and operational aspects of the electricity grid, providing a significant boost to local employment. However, some

[68] SEAI (2015) A Macroeconomic Analysis of Onshore Wind Deployment to 2020. Available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.seai.ie/sites/default/files/publications/A-Macroeconomic-Analysis-of-Onshore-Wind-Deployment-to-2020.pdf

manufactured materials such as cables, underground pipes, insulators and conductors are sourced from abroad.

According to SEAI[69], there are approximately 0.34 new long-term jobs per MW, which falls in line with European Wind Energy Association (EWEA) estimates for direct employment in Europe. In the case of the Proposed Development, this translates to an estimated 16 for a 48 MW powered installation.

The Proposed Development will create the most employment during the construction phase. It is estimated that 92 construction workers (not at the same time) will be employed directly during this phase. An estimated breakdown of the potential construction employment is shown in **Table 5.7**.

Table 5.7: Estimated Employment breakdown during the construction phase of the Proposed Development

Occupation/Task	No. of People (Employment Period)
Foundation team	eight (10 weeks)
Tracks & Hardstands (truck drivers)	eight (36 weeks)
Plant drivers	four (52 weeks)
Foreman	one (56 weeks)
Engineer	one (56 weeks)
Engineer	two (12 weeks)
Substation Civils	ten (10 weeks)
Substation electrical	sixteen (16 weeks)
Foreman	two (15 weeks)
General operatives	three (56 weeks)

During the peak of the construction phase of civil engineering of site access tracks, Turbine Hardstand, Turbine Foundation, and Onsite Substation and Control Building construction, 92 persons will be employed. These numbers will be somewhat less for the turbine delivery, assembly and commissioning activities. A mixture of skills will be required, including unskilled/semi-skilled/skilled manual (construction labour and machine operators), non-manual (administration roles), managerial and technical (civil, electrical, mechanical

[69] SEAI 'A Macroeconomic Analysis of Onshore Wind Deployment to 2020' Available at: https://www.seai.ie/publications/A-Macroeconomic-Analysis-of-Onshore-Wind-Deployment-to-2020.pdf [Accessed: 17th July 2024]

technical and engineering) and professional roles (legal, business and accounting). The manual roles will be site-based with the other roles being predominately office-based, with site visits as and when required. During construction, personnel will be at the Site over a number of months and during these times will likely use local accommodation and restaurants and other facilities.

The benefits of increased business, although temporary, can allow businesses to invest in improvements that would not otherwise be affordable, leading to a long-term enhancement.

Whilst overall effects on the tourism economy are considered to be negligible and not significant, the benefits to individual businesses will be substantial and significant.

The Proposed Development 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 wind farm, 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 Proposed Development and will provide continuous employment for the lifetime of the wind farm. A general outline of the employment associated with the operational phase of the wind farm is outlined in **Table 5.8.**

Table 5.8: Parties involved during the operational phase[70]

Maintenance Contracts	Financial and Services Contracts	Other Stakeholders
Project Manager	Lenders	Local Community
Asset Management	PPA Provider	Local Authority (incl. rates payments)
Turbine Contractor • Transport Companies • Crane Hire • Plant and Vehicle Hire • Site Facilities	Landowner Agreements	Construction and Maintenance material suppliers: • Local shops • Food providers

[70] Irish Wind Energy Association (2019) *Life-cycle of an Onshore Wind Farm.* Ionic Consulting. Available online at: https://windenergyireland.com/images/files/iwea-onshore-wind-farm-report.pdf [Accessed 23/05/2024]

Maintenance Contracts	Financial and Services Contracts	Other Stakeholders
		• Accommodation providers
	Insurance	Plant Hire companies
	Accountancy	Telecom provider
	Safety Consultants	
	Community Liaison Officer	
Electrical Works Contractor	Environmental Monitoring • Noise • Ornithology • Habitat Management	
Civil Works Contractor		
Utility		

The persons fulfilling these roles may live and work anywhere in Ireland, visiting the Site as and when required, to operate and maintain the plant and equipment. During major service operations, personnel may be at the Site over several days and during these times may use local accommodation and restaurants.

Therefore, overall, there will be a **slight positive short-term** impact on employment in the area.

5.4.3.1 Embedded measures

The Developer has a long track record of developing wind farms domestically and internationally with a globally installed onshore wind generation capacity of 4.5 TWh[71]. The Developer's experience from previous wind farm construction projects is that expenditure in local goods and services is widely spread and makes a difference to existing businesses. The Developer is committed to employing good practice measures regarding maximising local procurement and will adopt measures such as those set out in the Renewables UK Good Practice 2014: 'Local Supply Chain Opportunities in Onshore Wind' (Renewable UK, 2014).

The Developer will work with a variety of contractors who will be actively encouraged to develop local supply chains throughout the local area, and work with subcontractors to invest in training and skills development.

[71] https://www.statkraft.com/what-we-do/wind-power/

At this stage in the development process, it is not possible however, to quantify economic benefits in respect of individual supply chain companies, as contracts would not be let until consent is granted. However, it is evident from the Developer's recent experience that local and regional suppliers of a wide range of goods and services will benefit from such a Proposed Development (in this case, Cork and Ireland as a whole).

5.4.4 Land Use and Topography

Chapter 8: Soils and Geology found that with the use of the mitigation measures proposed, the Project is not predicted to have a significant effect on the environment. It is recommended that suitable monitoring programmes are proposed and implemented to see that there is adherence to the Construction Environmental Management Plan (**Appendix 2.1**) and to the mitigation measures outlined here during construction, operation and decommissioning of the wind farm.

5.4.5 Tourism

Fáilte Ireland published guidelines[72] in 2011 for the treatment of tourism in an EIS (Environmental Impact Statement, now known as Environmental Impact Assessment Report, EIAR), which describes the effects of projects on tourism. Many of the issues covered in the report are similar to those covered in this EIAR, for example, scenery is assessed in **Chapter 11: Landscape and Visual Amenity**.

Fáilte Ireland published a study on 'Visitor Attitudes on the Environment' in 2012[73] to assess the perceived impacts of windfarms on potential future visits to an area. The study found that 12% of those surveyed, responded that windfarms would have 'a strong positive impact' on their decision to visit Ireland, with 27% responding it would have a 'slight positive impact', whilst 38% said it would have 'no impact'. 7% of respondents stated it would have a 'strong negative impact' and 15% stated it would have a 'slight negative impact'. The survey also found that windfarms were noted as more favourable than other forms of development such as housing, mobile phone masts or electricity pylons.

Based on historical examples and findings of the BiGGAR Economics report (mentioned in **Section 5.3.5.3**) there is not expected to be any direct relationship between the tourism sector growth and this Proposed Development.

[72] Failte Ireland (2011) 'Guidelines on the treatment of tourism in an Environmental Impact Statement'
[73] Fáilte Ireland (2012) Visitors Attitudes on the Environment – Wind Farms - https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/4_Visitor_Insights/WindFarm-VAS-(FINAL)-(2).pdf?ext=.pdf [Accessed on 13/05/2024]

Landscape impacts on the S29 scenic route, as designated under Cork County DP 2022, are predicted to be substantial to moderate, but will not be significant and therefore, it can be predicted that tourism impacts on the scenic route will be moderate, negative. More information on landscape impacts can be found in **Chapter 11: Landscape and Visual Amenity.**

Based on the findings of the collective assessments, it was considered that the Proposed Development will not give rise to any significant effects. Overall effects of the Proposed Development with regards to tourism are considered to be, **slight, negative** during the construction, operational and decommissioning phases.

5.4.6 Human Health

5.4.6.1 Electromagnetic fields

National and international health and scientific agencies (as cited in EMF and You) have reviewed more than 35 years of research including thousands of studies. None of these agencies have concluded that exposure to ELF-EMF from power lines or other electrical sources is a cause of any long-term adverse effects on human, plant, or animal health.

As outlined in section 5.3.6.2, the International Commission on Non-Ionising Radiation Protection (ICNIRP) Guidelines give a limit of 100 μT for sources of AC magnetic fields. Given the limit of 100 μT for sources of AC magnetic fields, a comparison of between 0.02 μT and 0.41 μT arises when turbines operate under "high wind" scenarios, indicating that electromagnetic activity from wind turbines are extremely low.

In 2014 a study was undertaken in Canada[74], measuring electromagnetic fields around wind farms and the impact on human health. The study from Canada found that:
"there is nothing unique to wind farms with respect to EMF exposure; in fact, magnetic field levels in the vicinity of wind turbines were lower than those produced by many common household electrical devices and were well below any existing regulatory guidelines with respect to human health".

Electromagnetic fields from wind farm infrastructure, including the Grid Connection Route Option A and Option B to Carrigdangan or Dunmanway 110 kV substation, are very localised and are considered to be **imperceptible, long-term** impact.

[74] Lindsay C McCallum, *et al.* (2014) *Measuring electromagnetic fields (EMF) around wind turbines in Canada: is there a human health concern?*

5.4.6.2 Shadow flicker

The Developer has committed that The Proposed Development will not generate any Shadow Flicker. The implementation of mitigation to cease operation of the turbines during periods of potential shadow flicker will ensure that no shadow flicker effects are experienced at any sensitive receptor within the Study Area. It is therefore considered that Gortloughra Wind Farm will comply with the Draft 2019 Guidelines.

Chapter 16 provides an impact assessment of the potential for shadow flicker from the Proposed Development.

5.4.6.3 Noise

A Baseline assessment of the existing background noise conditions was carried out, the results of which are presented in **Chapter 10** of the EIAR. A noise assessment of the operational phase of the Proposed Development has also been carried out through modelling of the Proposed Development using noise prediction software. The predicted noise levels for the Proposed Development have been compared with the existing background noise levels and the guidance levels for noise emissions from wind farms as set out by the 2006 Wind Energy Development Guidelines WEDGs[75]. The Draft Revised Wind Energy Development Guidelines of December 2019 propose noise restriction limits consistent with World Health Organisation Guidelines[76], proposing a relative rated noise limit of 5 dB(A) above existing background noise within the range of 35 to 43 dB(A), with 43 dB(A) being the maximum noise limit permitted, day or night. In summary, the noise assessment found that no properties in the Study Area are predicted to experience noise levels above 40 dB, therefore the potential effects of noise caused by the Proposed Development are considered **not significant.**

5.4.6.4 Air Quality

Chapter 15 provided an assessment of air quality in relation to the Project. The impact assessment is concluded that:

- The Project has been assessed as having the potential to result in slight, negative, temporary/short-term effects during construction.
- Potential cumulative effects were assessed as being of a **slight, negative, short-term** impact. Given that only effects of significant impact or greater are considered "significant" in terms of the EIA Regulations, the potential effects of the Proposed Development on air quality are considered **not significant**.

[75] Department of Environment, Heritage and Local Government: Wind Energy Development Guidelines, Guidelines for Planning Authorities 2006 Energy
[76] WHO (2018) Environmental Noise Guidelines - https://www.who.int/europe/publications/i/item/9789289053563 [Accessed on 23/05/2024]

- There will be slight, long term, positive effects on air quality because of the wind farm during operation.

5.4.6.5 Water Contamination

Chapter 9: Hydrology and Hydrogeology provides an assessment of the hydrological impacts in relation to the Project, including the potential for water contamination. The conclusion is referenced at **Section 9.6** and states that:

"During both the construction and operational phases of the proposed Development, activities will take place at the Site that will have the potential to significantly affect the hydrological regime or water quality at the Site or its vicinity. These significant potential impacts generally arise from sediment input from runoff and other pollutants such as hydrocarbons and cementitious substances, with hydrocarbons or chemicals spills to surface waters having the most potential for impact…

…The implementation of mitigation through avoidance principles, pollution control measures, surface water drainage measures and other preventative measures have been incorporated into the project design in order to minimise potential significant adverse impacts on water quality at the Site…

…This in turn will reduce the potential for adverse impacts on downstream designated Sites…

…Implementation of the control measures outlined in this EIAR are considered to result in a likely, neutral to negative, imperceptible to slight significance"

5.4.6.6 Traffic

Chapter 14: Traffic and Transport provides an assessment of the traffic impacts in relation to the Project. The conclusion is referenced at Section 14.7 and states that:

- The quality of effects has been assessed as neutral with increased traffic flows during the construction and decommissioning of the project with no permanent changes to the geometry of the public road network and its associated junctions.
- The duration of effects relating to grid connection works, enabling works on the turbine delivery route and delivery of turbine components have been assessed as short-term lasting less than one year. Grid connection works on the local road network requiring road closures have been assessed as negative due to the short-term disruption for public road users.

- The significance of the effects has been assessed as slight on the public road network where traffic management / two-way traffic flows can be maintained during enabling works and moderate / significant on local roads where road closures will be required to carry out the grid connection works.

The potential effects of the project are considered to be **Moderate to Significant** on the local road network and **Moderate** on the regional road network during the construction of the Proposed Development. The potential effects of the project on traffic during the operation of the Proposed Development 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 Proposed Development are considered to be **Moderate to Significant** on the local road network and **moderate** on the regional road network

5.4.6.7 Accidents/Disasters (incorporating Health & Safety)

The design of the Project has considered the susceptibility to natural disasters. The proposed site drainage will mitigate against any potential flooding risk due to run off with the use of Sustainable Drainage Systems (SuDS). Construction drainage will be left in-situ for the lifespan of the project through to decommissioning.

The Contractor's fire plans are reviewed and updated on a regular basis. A nominated competent person shall carry out checks and routine maintenance work to ensure the reliability and safe operation of firefighting equipment and installed systems such as fire alarms and emergency lighting. A record of the work carried out on such equipment and systems will be kept on site at all times.

Chapter 17: Major Accidents provides an assessment of the vulnerability of the Project to major accidents and natural disasters. Possible risks associated with the Project during the construction, operation and decommissioning phases are outlined and assessed. These risks have the potential to directly or indirectly impact Population and Human Health. The consequence ratings assigned to each potential risk assumes that all proposed mitigation measures and safety procedures have failed to prevent the major accident and/or disaster. All scenarios when assessed were considered "low risk".

5.4.7 Property Value

The effects to Property values are introduced in Section 5.3.8. Based on the evidence from a number of these published studies, the operation of the Project is considered to not significantly affect property values in the area. The Project will have a **medium-short-term imperceptible** impact on property values.

5.5 MITIGATION MEASURES AND RESIDUAL EFFECTS

Although no negative impact of significance has been established, there are a number of measures, which may be implemented for the safety of workers and the public during the construction, operational and decommissioning phases.

5.5.1 Embedded Mitigation

The Project, as described in **Chapter 2: Project Description**, incorporates good practice measures for limiting the adverse effects of the construction works. The principal potential effects arising from works tend to relate to construction traffic affecting the use of national roads, local primary roads and access roads by the general public. Measures are set out in **Chapter 14: Traffic and Transport** relating to how delivery of goods and services would be managed during works to minimise impacts on the road network. The proposed mitigation measures have been further developed in the CEMP (**Appendix 2.1**).

5.5.2 Population and Settlement Patterns

Given that no negative impacts have been identified, no additional mitigation measures are proposed.

5.5.3 Economic Activity

Allowing for the implementation of embedded mitigation, no significant effects have been identified in respect of socio-economic receptors arising from the construction of the Project and therefore no mitigation measures are required to reduce or remedy any adverse effect.

5.5.4 Employment

Given that potential impacts of the Project at construction, operation and decommissioning phases are predominantly positive in respect of socio-economics, employment and economic activity, no mitigation measures are considered necessary.

5.5.5 Land Use and Topography

Mitigation measures for land use have been incorporated into the preliminary design stage. This has allowed for the prevention of unnecessary or inappropriate ground works or land use alterations. The construction and operational footprint of the Proposed Development has been kept to the minimum necessary to avoid impact on existing land uses and habitats.

The construction and decommissioning works will be planned and controlled by a CEMP (**Appendix 2.1**). This provides details on day to day works and methodologies. As part of these works, the public and other stakeholders will be provided with updates on construction activities which will affect access to lands. This will be communicated to members of the public through a community liaison officer employed for the duration of the construction period and on the dedicated Project website (www.gortloughrawindfarm.ie).

5.5.6 Tourism

Mitigation measures for recreation, amenity and tourism are primarily related to the preliminary design stage of the Project, which has allowed for the prevention of unnecessary or inappropriate development to occur that will significantly affect any recreational or tourist amenity. In designing the Project, careful consideration was given to the potential impact on landscape amenity, as discussed in **Chapter 11: Landscape and Visual Amenity**.

The main tourist attractions at the Site and surrounding area was identified as cultural heritage, visual amenity, trail walking and hiking.

In providing for public safety, appropriate signage and safety measures will be put in place and the Site will be closed to the public during construction and decommissioning activities. The Project is partially located within the Múscraí Gaeltacht area and any signage erected within Gaeltacht areas of the public realm during the construction phase will include Irish and English text.

Further detailed mitigation measures are also included in **Chapter 13: Cultural Heritage**.

5.5.7 Human Health

5.5.7.1 Accidents/Disasters (incorporating Health & Safety)

Accidents to Personnel

Potential risks to personnel were identified in Section 5.4.6. Current legislation relating to the Safety, Health and Welfare of persons at work and industry specific Codes of Practice / Guidance documents, are designed to assist in the management of risks associated with the construction, operation, maintenance and decommissioning phase of windfarm projects.

The construction of the Project shall be managed in accordance with the Safety, Health and Welfare at Work Act 2005 (as amended), the Safety, Health and Welfare at Work (General Application) Regulations 2007 (as amended), and the Safety Health and Welfare at Work (Construction) Regulations 2013 (as amended).

As required under the Safety, Health and Welfare at Work (Construction) Regulations 2013 (as amended), Gortloughra Wind Farm Limited shall appoint a Project Supervisor for the

Design Process (PSDP) and a Project Supervisor for the Construction Stage (PSCS). The PSDP shall compile a Preliminary Safety and Health Plan (PSHP), which details general information about the project and envisaged health and safety risks. The PSHP shall be made available to the PSCS. The PSCS shall develop a Construction Stage Health and Safety Plan (CSHSP) which incorporates the information contained in the PSHP and details how safety and health will be managed during the construction of the project. Pending approval of the application, the PSCS may also further develop/update the following documents during the pre-construction stage of the Proposed Development, for implementation during the construction stage:

- Construction Environmental Management Plan (CEMP) (**Appendix 2.1**)
- Emergency Response Plan (**Appendix 2.1**)
- Detailed Traffic Management Plan (**Appendix 14.2)**

Accidents to Infrastructure

The PSDP shall see that the General Principles of Prevention, outlined under the safety design advice provided by the Health and Safety Authority (HSA), are taken into account for all designs relating to the project.

On very rare occasions, the structural integrity of wind turbines has failed. This is an extremely rare occurrence and given that the turbines will be designed and installed by an experienced turbine contractor and are located well away from public roads and dwellings in line with the 2006 Wind Energy Development Guidelines and the DoEHLG Draft Revised Wind Energy Development Guidelines (2019), it is not considered (in the unlikely event of an accident of this type) that it would result in any significant impacts to population or human health.

Potential accidents, such as a risk of incident during haulage, a fire on site or the risk of a turbine structural failure is assessed to be a **slight, negative, long-term** effect.

Further detailed mitigation measures have been included in **Chapter 17: Major Accidents and Natural Disasters**.

5.5.7.2 Operation

For operation and maintenance staff working at the proposed wind farm, appropriate site safety measures will be utilised during the operational phase by all permitted employees. All personnel undertaking works in or around the turbines will be fully trained and will use appropriate Personal Protective Equipment (PPE) to prevent injury. An Operational Controller will manage and monitor all work, and only personnel who have received a site induction and who have the appropriate training will be permitted to work on the Site.

Equipment within high voltage substations presents a potential hazard to health and safety. The proposed Onsite Substation and Control Building will be enclosed by palisade fencing and equipped with intruder and fire alarms in line with ESB and EirGrid standards.

A Supervisory Control and Data Acquisition ("SCADA") system will monitor the Proposed Development's performance. SCADA is a system of software and hardware elements that allows organizations to control and monitor industrial processes by directly interfacing with plant-floor machinery and viewing real-time data. If a fault occurs, then a message is automatically sent to the operations personnel preventing emergency situations.

Access to the turbines inner structure will be locked at all times and only accessed by licenced employees for maintenance.

In line with the Health Service Executive's Emergency Planning recommendations, any incident which may occur at the Site which requires emergency services, incident information will be provided in the 'ETHANE' format:

- Exact location
- Type of incident
- Hazards Access and egress
- Number of casualties (if any) and condition
- Emergency services present and required

The design of the Proposed Development has considered the susceptibility to natural disasters. The proposed site drainage will mitigate against any potential flooding risk due to run off with the use of Sustainable Drainage Systems (SuDS). Construction drainage will be left in-situ for the lifespan of the project through to decommissioning.

The Contractor's fire plans are reviewed and updated on a regular basis. A nominated competent person shall carry out checks and routine maintenance work to ensure the reliability and safe operation of firefighting equipment and installed systems such as fire alarms and emergency lighting. A record of the work carried out on such equipment and systems will be kept on site at all times.

Shadow flicker detection systems will be installed on all turbines to manage occurrence of shadow flicker on nearby receptors.

The noise emissions from the Proposed Development are predicted to be compliant and well within the WEDG 2006 guideline limits, so it is not envisaged that curtailment of any turbines will be required. However, if any exceedances were to occur, then some of the turbines could be operated in noise reduced modes of operation to protect residential amenity.

The wind farm system shall include a kill switch that can be operated at any time with an overriding manual shutdown system in case of an emergency.

Warning signs and security infrastructure will be in place around the onsite switchgear and control building to provide for public safety. The Project is partially located within the Múscraí Gaeltacht area and any signage erected within Gaeltacht areas of the public realm during the construction phase will include Irish and English text.

5.5.7.3 Residual Risk

Once the above mitigations are taken into account, the residual risk of effects on population and human health is assessed to be an **imperceptible, long-term** effect.

5.5.8 Cumulative Effects

The nearest operational wind farm to the Site is Shehy More Wind Farm, comprising 11 turbines, located approximately 0.56km to the North-east of the Proposed Development. The next nearest operational wind farm is Carrigarierk Wind Farm, comprising 5 turbines, located approximately 5.22km to the East of the Proposed Development.

The nearest proposed wind farm is Maughanaclea Wind Farm, comprising 14 turbines, located approximately 1.99km to the South-west of the Proposed Development (submitted for planning in March 2026).

The Proposed Development, in combination with other existing, consented, and proposed renewable energy developments in the surrounding area, represents a positive contribution to Ireland's transition to low-carbon energy generation. This transition constitutes a significant positive effect in terms of climate, in accordance with EIA Regulations, and will contribute to Ireland's legally binding greenhouse gas reduction targets. The Proposed Development will also contribute to the displacement of fossil fuel use, with associated potential positive effects on human health.

The Landscape and Visual Impact Assessment **(refer to Chapter 11: Landscape and Visual Amenity, Section 11.6.6)** indicates that the cumulative landscape and visual impact of the Proposed Development is predicted to be **moderate (medium)**. However, it is concluded that there will be **no significant adverse landscape, visual, or cumulative effects** arising from the Proposed Development.

The cumulative impact of the Proposed Development is predicted to result in a **slight, short-term negative effect** on tourism and amenity during the construction phase. Conversely, there will be a **short-term moderate positive effect** in terms of **employment generation** associated with the construction of the Project.

5.6 Summary of Significant Effects

The assessment has not identified any likely significant effects from the Project on population and human health.

5.7 Do Nothing Scenario

The potential for any likely and significant adverse environmental impacts arising from the construction, operational and decommissioning phases of the Project would not arise. However, similarly the potential for any likely and significant positive impacts on population and human health arising from the construction, operational and decommissioning phases of the Project would also not arise.

The local economy would not experience the direct and indirect positive effects of the construction phase of Project, including employment creation. The local construction sector and associated industries and services would be less viable than they might otherwise be.

The status of the receptors described throughout this EIAR document would be likely to remain unchanged.

5.8 Statement of Significance

This chapter has assessed the significance of potential effects of the Project on population and human health. The Project has been assessed as having the potential to result in effects of a **slight positive, long-term impact** overall. Through the implementation of mitigation measures, the cumulative effects associated with the Project are predicted to be not significant.

7 ORNITHOLOGY

7.1 INTRODUCTION

This chapter has been prepared by Fehily Timoney and Company (FT) to examine the potential effects that the Proposed Development (described in **Chapter 2**) may have on the avifauna of the study area. This assessment considers the potential effects with regard to each phase of the development: construction phase, operational phase, and decommissioning phase. Appropriate mitigation measures are described to avoid, or/reduce potential negative effect(s). The mitigation measures detailed within this chapter should be read in conjunction with mitigation measures contained in **Chapter 6: Biodiversity** and those contained in the CEMP (**Volume IV, Appendix 2.1**).

A detailed description of the project assessed in this EIAR is provided in **Chapter 2** and is comprised of the following main elements:

- The wind farm site (referred to in this EIAR as 'the Site');
- The grid connection routes (referred to in this EIAR as the 'GCR');
- The turbine delivery route (referred to in this EIAR as the 'TDR' or 'Haul Route');

This Chapter of the EIAR is supported by the following Appendix documents provided in **Volume IV**:

- **Appendix 7.1:** VP flightline figures
- **Appendix 7.2:** Collision Risk Model Report
- **Appendix 7.3:** Survey Details, Dates and Weather Conditions
- **Appendix 7.4:** Survey Results
- **Appendix 7.5:** Survey Figures

Common acronyms used throughout this EIAR can be found in **Appendix 1.4**.

The wind farm Site includes the wind turbines, site access tracks, Turbine Hardstands, the permanent Meteorological Mast, Onsite Substation and Control Building, Internal Wind Farm Cabling, Temporary Construction Compound, drainage infrastructure and all associated works related to the construction of the wind farm.

The chapter also considers the potential effect of the 2 no. proposed Grid Connection Routes (GCR's) Options and Onsite Substation and Control Building. This element of the Project will be subject to a separate planning consent process but will be assessed within this EIAR.

- Option A - Underground Grid Connection to Dunmanway 110kV Substation utilising sections of UGC in public road, primarily regional roads, and private lands. [28 km]
- Option B - Underground Grid Connection to Carrigdangan 110kV Substation utilising sections of UGC in public road, primarily regional roads, and private lands. [22 km]

The Onsite Substation and Control Building (also subject to a separate consent process) will connect via underground 110 kV cable to either the Dunmanway (Option A) or Carrigdangan (Option B) ESB 110 kV substations. The overall length of Option A GCR between the Onsite Substation and Control Building and the existing Dunmanway 110 kV substation is approximately 28 km, of which, approximately 3.98 km is within the Site with the remainder located along the L8776 and the R587. The overall length of Option B between the Onsite Substation and Control Building and the existing Carrigdangan 110 kV substation is approximately 22 km, of which, approximately 3.98 km is within the Site with the remainder located along the L8776 and the L4607.

While not part of the planning consent for this planning application, this chapter also assesses the works at 18 No. locations along the TDR from Port of Cork to Site including proposed temporary accommodation works to facilitate the delivery of wind turbine components.

Bird surveys of the study area following SNH (2017) guidance were carried out over 5 years during the winters of 2019/2020, 2020/2021, 2021/2022, 2022/2023 and 2023/2024, as well as the summers of 2020, 2021, 2022, 2023, and 2024.

Bird surveys and contributions towards this chapter were completed by Aidan Duggan (Senior Ornithologist), Ben O'Dwyer (FT Ecologist, BSc (Hons) Wildlife Biology), Éimear Stephenson (FT Ecologist, BSc (Hons) Marine Science, MSc (Hons) Biodiversity and Conservation), Kate O'Regan (BSc (Hons) Zoology; MSc (Hons) Marine Biology), Rebecca Furlong (FT GIS Technician; BSc Earth and Ocean Sciences, Cert. Geographic Information Systems, MEngSc Civil and Environmental Engineering), Jack Glennon (MSc Marine Biology from University College Cork and a first-class BSc in Wildlife Biology from Munster Technological University) Jon Kearney (FT Director Ecologist; BSc. Applied Ecology MSc. Ecological Management and Biological Conservation), Orla Cummins (Graduate Ecologist first-class BSc Ecology and Environmental Biology), etc.

Background information and biographies of personnel listed above are detailed in Table 7.1:

Table 7.1: Biographies

Surveyor	Responsibility	Biography
Aidan Duggan	Senior Ornithologist Surveyor	Aidan has been a consultant ecologist specialising in wind farm ornithology surveys from 2006 to present. He has completed Hen Harrier Vantage Point Surveys, Hinterland Surveys, Breeding Merlin Surveys, Red Grouse Surveys, Hen Harrier Nest Monitoring, White-tailed Eagle Roost Watches, Hen Harrier Roost Watches, Breeding Bird Surveys, Wintering Bird Surveys, Countryside Bird Surveys at numerous wind farms site throughout the county. He has also completed bird surveys of proposed routes for power grid and gas pipelines. Aidan is a former voting member of the Irish Rare Bird Committee (IRBC), the recognized national expert group on bird identification.
Ben O'Dwyer	Co-Author EIAR Ornithology Chapter	Ben is a Senior Project Ecologist with Fehily Timoney with over 8 years' experience in ecological assessment and holds a BSc (Hons) in Wildlife Biology from Institute of Technology Tralee (now MTU). Ben has prepared EcIAs, EIAR Biodiversity chapters, AA Screening reports and Natura Impact Statements for numerous large scale infrastructure projects in the renewable energy, commercial, waste management and transport sectors. He is an experienced and versatile field surveyor and his experience across a broad range of habitats and projects in Ireland has given him an extensive knowledge of protected sites and species across the country.
Éimear Stephenson	Co-Author EIAR Ornithology Chapter	Éimear Stephenson is a Project Ecologist with Fehily Timoney and Company and has ca. 3 years' experience in the environment sector. Éimear's work focuses on the survey and assessment of proposed wind and solar energy development sites. She has been the lead author on a multitude of reports, and has carried out a variety of surveys including bat, otter, general mammal, botanical, white-clawed crayfish, freshwater pearl mussel, and habitat surveys. Éimear is highly experienced in the use of QGIS and ArcGIS, and is proficient in analysing bird surveys and writing relevant ornithological reports. She holds a BSc in Marine Science from the University of Galway, where she graduated top of her class with a 1:1. She also received an academic scholarship to attend the University of Dublin, Trinity College Dublin, where she graduated with an MSc in Biodiversity and Conservation.
Jack Glennon	Co-Author Ornithology	Jack Glennon is a Graduate Ecologist with Fehily Timoney and Company and has over 2 years of experience in the environmental sector. He holds a MSc in Marine Biology from University College Cork and a first-class BSc in Wildlife Biology from Munster Technological University. Jack has produced a variety of technical reports, including AA Screening Reports, Natura Impact Statements, Biodiversity Enhancement Management Plans, Invasive Species Management Plans, and Ornithology Reports. His field experience encompasses a wide range of ecological surveys, such as bird, habitat, mammal, otter, marsh fritillary, and bat surveys. Jack is skilled in data analysis and proficient in GIS mapping tools, including QGIS and ArcGIS, for ecological data visualisation.
Jon Kearney	Co-Author / Reviewer EIAR Ornithology Chapter and CRM	Jon Kearney is the Technical Director (Ecologist) with FT with over 19 years' experience in both the UK and Ireland. He has extensive experience in Project Management and is a specialist in Ornithological surveys and assessments. His skills include an in-depth knowledge of field survey techniques and methodology, ornithological surveys,

Surveyor	Responsibility	Biography
		mitigation design, water quality assessment, Appropriate Assessment and Ecological Impact Assessment. Jon has extensive experience of ornithological, mammal, reptile and amphibian surveying, habitat surveying, botanical surveying and invertebrate sampling techniques and identification. Jon has completed ecological assessments, biodiversity chapters and Natura Impact Statements for a wide variety of projects in Ireland including numerous solar and wind farm sites. Jon has provided expert witness testimony as the ecology/ornithology discipline lead at several an Bord Pleanála oral hearings. He has considerable experience of EIAR, AA and ecological constraints work, which often includes extensive reference to, and interpretation of, Article 6(3) of 'The Habitats Directive', and to other EU, UK and Irish conservation legislation.
Kate O'Regan	Author Collision Risk Model Assessment (Appendix 7.2)	Kate O'Regan is a Project Ecologist with Fehily Timoney and Company. She holds a first-class MSc in Marine Biology and first-class BSc. in Zoology from University College Cork. Since joining Fehily Timoney, she has prepared Appropriate Assessments and Ecological Impact Assessments for waste facilities and road improvement schemes along with ornithological reports and collision risk models for renewable energy projects. Kate has previous experience in data management, statistical analysis, mapping and technical report writing. Kate has also completed a wide range of fieldwork including ornithological, bat, freshwater aquatic, intertidal, subtidal, insect and mammal surveys.
Orla Cummins	Co-Author Ornithology	Orla Commins is a Graduate Ecologist with Fehily Timoney and Company. She holds a first-class BSc in Ecology and Environmental Biology from University College Cork. Since joining Fehily Timoney. She has prepared AA screening reports and NIS's for numerous projects and has completed ornithological reports, field work and data management.
Rebecca Furlong	GIS Analyst	Rebecca is responsible for the co-ordination of all environmental department geographic information systems (GIS) projects. She is experienced in many aspects of environmental risk/impact assessment modelling in GIS including database design, database management, data conversion/projection, raster spatial analysis / Heat Mapping, ArcGIS Story maps and management of ArcGIS online, data modelling and data processing utilising all main GIS software packages (including ArcGIS, QGIS, MapInfo). Rebecca has experience with various GIS and surveying software packages including Collector, Survey 123.

7.2 METHODOLOGY

7.2.1 Relevant Guidance

The methodology for this appraisal has been devised in consideration of the following relevant guidance published by the Environmental Protection Agency (EPA) '*Guidelines on the information to be contained in Environmental Impact Assessment Reports*' (EPA, 2022) and '*Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment*' (DoHPLG, 2018) and the Chartered Institute of Ecology and

Environmental Management (CIEEM) '*Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (Version 1.1)*' (CIEEM, 2018 and revisions).

Additional guidance available from the EU such as '*Guidance document on wind energy developments and EU nature legislation*' (2020) and '*Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment*' (2013) has also been considered. The Heritage Council publication '*Best Practice Guidance for Habitat Survey and Mapping*' (Smith *et al*., 2011) is also referenced.

Relevant guidance from Scottish Natural Heritage (SNH) in relation to birds such as SNH *Recommended bird survey methods to inform impact assessment of onshore windfarms (2017)*. 'Survey Methods for use in assessing the impacts of onshore wind farms on bird communities (2005 & 2010)' and *'Assessing the cumulative impact of onshore wind energy developments (2012)'* have also been utilised.

Documentation available from Cork County Council (CCC) such as the "Cork County Development Plan 2022 – 2028" has been reviewed and utilised where relevant.

7.2.2 Legislative Context

All birds are protected under the Wildlife (Amendment) Act, 2000 (as amended).

The conservation of birds and their habitats in Ireland has been expanded by EU law, most notably by the EU Birds Directive and EU Habitats Directive, which provide bird protection legislation.

Species listed in Annex I and migratory species are subject to special conservation measures to protect their habitat, through the establishment of Special Protection Areas (SPAs), under Directive 2009/147/EC on the Conservation of Wild Birds (the Wild Birds Directive). The Habitats Directive (Directive 92/43/EC on the Conservation of Natural Habitats and of Wild Fauna and Flora) and Birds Directive were transposed into Irish law inter alia by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011), as amended and the Planning and Development Act 2000 (as amended).

7.2.3 Consultation

For a full list of consultations and responses, please see **Appendix 1.3: Scoping Opinion** in **Volume IV**.

7.2.4 Desktop Study

A desk study was carried out to collate and review available information, datasets and documentation sources pertaining to the site's natural environment. Records available on the NPWS and the National Biodiversity Data Centre websites were reviewed, in addition to records of rare/sensitive species within the 10km grid squares overlapped by a 2 km buffer surrounding the study area was requested from NPWS (requested October 2024).

Other data sources include Ireland's Wetlands and their Waterbirds: Status and Distribution (Crowe 2005), and the Breeding and Winter Birds of Britain and Ireland Bird Atlas 2007-11 (Balmer, et al., 2014).

Other sources included:

- OSI Aerial photography and 1:50000 mapping;
- NPWS website (mapviewer) grid squares W15 and W16 flora and fauna records, accessed 12th March 2025;
- National Biodiversity Data Centre (NBDC) website and data obtained on 15th November 2024;
- Teagasc Soil area maps;
- Geological Survey Ireland (GSI) area maps, and;
- EPA website datasets (soil, surface water quality, ground water quality, designated sites).

7.2.5 Field Study

The details, dates and weather conditions are provided in **Appendix 7.3**.

Target Species

The following criteria has been utilised to select target species for the current study. Scottish Natural Heritage (SNH) guidance (SNH, 2017) on the assessment of the effects of wind farms on ornithological interests suggests that there are four important species lists from which target species can be drawn, as follows:

- Species listed on Annex 1 of the Birds Directive (EC, 2009)
- Red-listed birds of Conservation Concern
- Schedule 1 of the Wildlife and Countryside Act 1981 (not applicable in Ireland) and;
- Regularly occurring migratory species.

In addition to the above, consideration was given to species identified locally as being of conservation concern, regionally or those particularly susceptible to impact from wind farm development. Note that not all species on the above lists would be categorised as target species, e.g. most passerine species and general lowland farmland birds are not considered to be particularly susceptible to impacts from wind farms (SNH, 2017).

In the Irish context, it has been suggested that target species should be taken from species of conservation concern in Ireland (BOCCI) (Gilbert et al., 2021), those likely to occur within the vicinity of the proposed wind farm, and those most at risk from particular impacts such as disturbance and displacement (Nairn, R. and Partridge, K., 2013).

'Birds of Conservation Concern in Ireland' (BoCCI) are classified into three separate lists: red, amber, and green. Red-listed species are of high conservation concern, Amber-listed species are of medium conservation concern and Green-listed species are considered to be of no conservation concern (Gilbert et al., 2021).

To date four BoCCI lists have been published with the current list by Gilbert et al., (2021) superseding the three former lists by Colhoun and Cummins (2013), Lynas et al., (2007), and Newton et al., (1999). The conservation status of bird species found in this study was assessed using the most recent (2021) BoCCI List (Gilbert et al., 2021).

Additionally, a review of the bird species listed on Annex I of the EU Birds Directive (2009/147/EC) was undertaken in assessing the conservation status of birds. Annex I species are afforded additional protection through the designation of Special Protection Areas (SPAs) throughout EU countries in addition to existing National legislation.

Overview of methods of surveys

Initial walkovers of the site were carried out to enable the identification of suitable survey locations.

Field surveys were undertaken to gather detailed information on bird distribution and flight activity in order to predict the potential effects of a wind farm development on birds.

The field surveys comprised two main elements; vantage point (VP) watches and targeted distribution and abundance surveys which comprised:

- VP watches undertaken over 5 years at three VPs (winter 19/20, winter 20/21, winter 21/22, winter 22/23, winter 23/24, summer 2020, summer 2021, summer 2022, summer 2023, summer 2024).
- Transect surveys (winter 19/20, winter 20/21, winter 21/22, winter 22/23, winter 23/24, summer 2020, summer 2021, summer 2022, summer 2023, summer 2024);
- Hinterland surveys (winter 19/20, winter 20/21, winter 21/22, winter 22/23, winter 23/24, summer 2020, summer 2021, summer 2022, summer 2023, summer 2024).
- Breeding wader transects (summer 2020, summer 2021, summer 2022, summer 2023, summer 2024).

7.2.5.1 Vantage Point (VP) Watches / Flight Activity Surveys

Selection of VP Locations

Vantage point (VP) surveys were carried out with regard to 'Recommended bird survey methods to inform impact assessment of onshore wind farms' (SNH, 2017).

VP surveys were carried out by suitably qualified personnel over:

- Five winter seasons:
  - a six-month period spanning October 2019 to March 2020(inclusive),
  - a six-month period spanning October 2020 to March 2021(inclusive),
  - a six-month period spanning October 2021 to March 2022(inclusive),
  - a six-month period spanning October 2022 to March 2023(inclusive),
  - a six-month period spanning October 2023 to March 2024(inclusive).

- Five summer seasons:
  - a six-month period spanning April to September 2020 (inclusive),
  - a six-month period spanning April to September 2021 (inclusive),
  - a six-month period spanning April to September 2022 (inclusive),
  - a six-month period spanning April to September 2023 (inclusive),
  - a six-month period spanning April to September 2024 (inclusive).

The overall aim of these surveys was to quantify the level of flight activity and distribution over the flight activity survey area and to determine bird usage of the site. The flight activity survey area was taken to be that area encompassing 500m circular buffers drawn around the location of each proposed turbine, as required by SNH (2017) guidance. Vantage points are ideally located on elevated areas, or other areas, which provide clear views over the survey area.

Achieving maximum visibility over as much of the site as possible is important for these surveys.

SNH (2017) guidance state that vantage points should be located so as to allow full coverage of the flight activity survey area such that no point is greater than 2km from a VP. To minimise observer effect on bird behaviour, VPs should ideally be located outside the survey area but should be located as close as possible.

SNH (2017) stipulates that where VPs are located within the survey area, they should not be used simultaneously with other VPs which overlook them to minimise potential observer effect on birds. This was adhered to during the total survey period.

With regards to the proposed wind farm site, VP locations were selected to provide maximum site coverage. Vantage point locations were based on observations from walkover/reconnaissance surveys, viewshed analysis (using GIS) and collated information on known feeding and roosting sites from both desktop review and consultation. The number and location of vantage points was selected in order to achieve visibility of the entire study area and important features for birds in close proximity to the site (e.g., lakes, wetlands). The vantage points when combined cover a comprehensive viewshed of all turbine locations, and also allowed observation of the wider area surrounding the Site.

In line with recommended best practice, viewshed analysis was undertaken using ArcGIS Desktop, to calculate a theoretical zone of visibility from each vantage point. Visibility is calculated from each vantage point along an invisible layer suspended at the predicted lowermost height passed through by the rotor blade tips, using an observer height of 1.5m. We note the following from SNH guidance in respect of priority areas for viewshed analysis (emphasis added):

"*Where the key purpose is to estimate the risk of collision with turbines, **it is the visibility of the airspace to be occupied by the turbine rotors (the collision risk volume) that is of prime importance**. Therefore, it is recommended that visibility be calculated using the least visible part of this airspace, i.e. an imaginary layer suspended at the lowermost height passed through by the rotor blade tips (typically about 20-30m above ground level). Predicting visibility at this level is a simple task using GIS, however it should be noted that the baseline should take account of any forestry or other features that will potentially obstruct the view. For example, forestry may be 10-30m high and if viewshed height is taken as 20-30m ground level the visible area could be overestimated if there is forestry within the viewshed. Being able to* *view all or most of the site to ground level can be helpful in gauging overall bird activity and usage of the site but is not as important as being able to view the collision risk volume."*

The locating of the VPs within the survey area achieved visual coverage of the site in line with SNH (2017) guidance. Each VP overlaps with at least one other VP. Overlap in VP surveys conducted over the course of the survey period was avoided to reduce the risk of surveyor presence affecting bird behaviour. Surveyor presence did not affect bird behaviour during any of the VP surveys which were carried out. This was reflected in the flight paths recorded for the various target and secondary species with birds regularly recorded flying in relatively close proximity to surveyors. If observer presence influenced bird behaviour, we would expect to see alterations in flight path to avoid the surveyor. This was not the case and no obvious alterations in flight paths were observed.

Three VP locations were selected to cover the site (VP1 – VP3). These VP locations remained the same for the full 5 years of surveys.

VP surveys were carried out at the site monthly from April 2019 to September 2024 inclusive. Therefore, over the entire survey period, five summer seasons and five winter seasons were completed. Watches were 2 * 3 hours = 6 hours per VP per month. Thus, the following survey effort was completed for the following seasons:

- Winter 2019/2020: 3 VPs * 6 hours / VP / month * 6 months + additional 7 hours = 115 hours or 414,000 seconds.
- Winter 2020/2021: 3 VPs * 6 hours / VP / month * 6 months = 108 hours or 388,800 seconds.
- Winter 2021/2022: 3 VPs * 6 hours / VP / month * 6 months = 108 hours or 388,800 seconds.
- Winter 2022/2023: 3 VPs * 6 hours / VP / month * 6 months = 108 hours or 388,800 seconds.
- Winter 2022/2023: 3 VPs * 6 hours / VP / month * 6 months = 108 hours or 388,800 seconds.
- Summer 2020: 3 VPs * 6 hours / VP / month * 6 months = 108 hours or 388,800 seconds.
- Summer 2021: 3 VPs * 6 hours / VP / month * 6 months = 108 hours or 388,800 seconds.
- Summer 2022: 3 VPs * 6 hours / VP / month * 6 months = 108 hours or 388,800 seconds.

- Summer 2023: 3 VPs * 6 hours / VP / month * 6 months + an additional 6.4 hours (VP 2.3hrs, VP2 3.1hrs and VP3 1hr) = 114.1 hours or 411,840 seconds.
- Summer 2022: 3 VPs * 6 hours / VP / month * 6 months = 108 hours or 388,800 seconds.
- Spring Migration 2022: 3VPs * 6 hours / VP * 1 month = 18 hours or 64,800.
- Autumn Migration 2023: (2VPs * 6 hours / VP + 1 VP * 5.75 hours) * 1 month = 17.75 hours or 63,900.
- Spring Migration 2024: 3VPs * 6 hours / VP * 1 month = 18 hours or 64,800.

The total survey effort over the 5-year survey period (5 x summer seasons, and 5 x winter seasons) was 1,147 hours and 9 minutes or 4,129,740 seconds. Thus, the combined survey effort required for all seasons exceeds that required by SNH guidance (SNH, 2017) and the 5 years of surveys is significantly greater than the 2 years of surveys required under this guidance document.

The Irish Transverse Mercator (ITM) grid co-ordinate locations of each VP are provided in Table 7.2, below. Figures showing the location of each VP and the viewsheds from each VP in order to show the extent of site coverage are provided in **Appendix 7.5**. Full details on individual VP surveys including survey dates, times and weather conditions can be found in **Appendix 7.3.**

Table 7.2: Vantage Point Locations

VP No.	ITM Grid Co-ordinates
VP 1	515146, 559917
VP 2	513367, 560477
VP 3	515854, 561125

Viewshed Analysis of VP Locations

Viewshed analysis was undertaken for each VP location to determine visual coverage of the survey area (taken to encompass the site and the flight activity survey area). Viewsheds were set to observer height of 2m showing a view of everything over 25m height. Viewsheds encompassed a 2km radius with 360^0 view. Each viewshed was then cropped to an 180^0 arc showing the relevant direction of view.

Viewshed analysis determined that, based on the VP locations selected, visual coverage of 95.16% of the survey area was achieved, thereby ensuring near complete coverage of the flight activity survey area by VP surveys in line with SNH (2017) guidance. Figures showing the viewsheds from each VP in order to show the extent of site coverage are provided in **Appendix 7.5**.

Flight Data Recording

During VP surveys the flight behaviour of target species was recorded. Based on the precautionary principle flight behaviour of secondary species was also recorded; however, recording of secondary species was subsidiary to recording of target species (SNH, 2017). At the time of each species observation the following information was recorded:

- The time that the bird was detected;
- The flight duration (seconds) within various flight height categories: 0-10m (s), 10-20m (s), 20-30m (s), 30-50m (s), 50-100m (s), 100-185m (s), > 185m (s);
- Sex and age of the bird(s) (adult/juvenile), where possible to determine;
- Type of activity/behaviour such as hunting, flying, displaying, etc;
- Estimation of actual flight height;
- Habitat(s) where the bird was observed;
- Weather conditions at time of sighting including wind speed and direction.

Once an initial sighting was made, each target or secondary species was observed until lost from view. Flight paths were recorded as observed, including where birds travelled or were observed outside of the flight activity survey area; such that all flight activity within the broader landscape was encompassed. All surveys were conducted during suitable weather conditions.

Details on flight behaviour for each individual target/secondary species observed, including a unique map identifier code which corresponds to a mapped flight path, are provided in tabulated format in Appendix 7.4. All flight paths are provided in Appendix 7.1**.** Flight paths are mapped as both lines and polygons in figures. Polygons were provided when flight paths were complex in nature (i.e. larger flock with several individuals moving separately and provides a conservation area of activity). Note that each polygon depicts one separate observation. Summaries and monthly peak counts of all non-target species of conservation concern recorded during VP surveys are provided in **Appendix 7.4**.

7.2.5.2 Distribution and Abundance Surveys

Distribution and abundance surveys were carried out to record numbers and distributions of breeding, wintering and migrant birds using the site that might be affected either directly or indirectly by the proposed development (e.g., collision risk, habitat loss, displacement effects).

Breeding Bird Surveys

For general breeding birds the method utilised was based on the existing British Trust for Ornithology (BTO) Breeding Bird Survey (BBS or CBS; Bibby et al, 2000). The study area for this survey comprised a total of two no. c. 1 km transects which were selected and centred on different habitats present within the subject site. Birds were counted over 5 summer seasons 2020 and 2024 to coincide with the early breeding season in April to mid-May and the later part of the breeding season in mid-May to June.

Surveyors recorded all birds seen or heard as they walked methodically along the transect routes. Birds were noted in four distance categories, measured at right angles to the transect line (within 25 m, between 25 m-100 m and over 100 m from the transect line) and those seen in flight only. Recording birds in distance bands gives a measure of bird detectability and allows relative population densities to be estimated if required (BTO, 2018).

A map showing the transect survey routes within the proposed wind farm site is included in the Figures in **Appendix 7.5**. Details on each transect survey carried out including the survey date, time and weather conditions can be found in Table 7.3 (summer). Tabulated results for all species recorded during monthly transect surveys are provided in Table 7.22.

Table 7.3: Breeding Bird Transects undertaken between 2020 and 2024 (5 years).

Round	Date	Transect	Start	Finish	Weather Conditions
Early	08/05/2020	1 and 2	20:14	20:42	Cloud: 4/8 oktas; rain: none; wind: F3-4; visibility: very good
Late	27/05/2020	1 and 2	20:45	21:18	Cloud: 2/8 oktas; rain: none; wind: F2; visibility: excellent
3rd round	16/06/2020	1 and 2	21:10	21:39	Cloud: 4/8 oktas; rain: none; wind: F3; visibility: very good
Early	13/04/2021	1 and 2	19:29	21:10	Cloud: 1/8 oktas; rain: none; wind: F3; visibility: excellent
Late	13/06/2021	1 and 2	07:42	09:00	Cloud: 2/8 oktas; rain: none; wind: F2-3; visibility: excellent

Round	Date	Transect	Start	Finish	Weather Conditions
Early	14/05/2022	2	08:01	08:28	Cloud: 8/8 oktas; rain: none; wind: F1; visibility: excellent
Early	14/05/2022	1	08:50	09:24	Cloud: 8/8 oktas; rain: none; wind: F1; visibility: excellent
Late	29/06/2022	1	07:21	07:52	Cloud: 6/8 oktas; rain: none; wind: F4; visibility: excellent
Late	29/06/2022	2	08:05	08:36	Cloud: 6/8 oktas; rain: none; wind: F4; visibility: excellent
3rd round	08/07/2022	1	07:01	09:16	Cloud: 1/8 oktas; rain: none; wind: F3; visibility: excellent
3rd round	29/07/2022	2	07:02	07:31	Cloud: 8/8 oktas; rain: none; wind: F2; visibility: excellent
4th Round	29/07/2022	1	07:48	09:36	Cloud: 8/8 oktas; rain: none; wind: F2; visibility: excellent
Early	15/05/2023	2	07:32	08:01	Cloud: 4/8 oktas; rain: none; wind: F2; visibility: excellent
Early	15/05/2023	1	08:22	08:56	Cloud: 4/8 oktas; rain: none; wind: F2; visibility: excellent
Late	27/06/2023	2	07:38	08:05	Cloud: 8/8 oktas; rain: none; wind: F1; visibility: excellent
Late	27/06/2023	1	08:21	08:52	Cloud: 8/8 oktas; rain: none; wind: F1; visibility: excellent
Early	01/05/2024	2	07:19	08:08	Cloud: 7/8 oktas; rain: none; wind: F2; visibility: excellent
Early	01/05/2024	1	08:24	09:00	Cloud: 7/8 oktas; rain: none; wind: F2; visibility: excellent
Late	10/06/2024	1	07:24	08:06	Cloud: 2/8 oktas; rain: none; wind: F4; visibility: excellent
Late	10/06/2024	2	08:17	08:58	Cloud: 2/8 oktas; rain: none; wind: F4; visibility: excellent

Winter site walkovers

Over five winter seasons 2019/2020 to 2023/2024, winter bird transect surveys were carried out at the same two transects as the breeding bird surveys with three rounds per season and one visit to each transect per round. Details on each transect survey carried out including the survey date, time and weather conditions can be found in Table 7.4 (Winter). Tabulated results for all species recorded during monthly transect surveys are provided in Table 7.21.

Table 7.4: Winter Bird Transects undertaken between 2019 and 2024 (5 years).

Round	Date	Transect	Start	Finish	Weather Conditions
1st	09/12/2019	TR1	10:46	11:10	Cloud: 4/8 oktas; rain: none; wind: F1; visibility: good
1st	20/12/2019	TR2	09:55	10:40	Cloud: 7/8 oktas; rain: none; wind: F0-1; visibility: excellent
2nd	30/01/2020	TR1 and TR2	10:15	12:40	Cloud: 8/8 oktas; rain: none; wind: F1-3; visibility: moderate
3rd	11/03/2020	TR1 and TR2	11:30	14:30	Cloud: 6-8/8 oktas; rain: rain & hail; wind: F6-8; visibility: good
1st	05/10/2020	TR2	10:17	10:50	Cloud: 8/8 oktas; rain: none; wind: F3; visibility: good
1st	14/10/2020	TR1	11:28	12:06	Cloud: 8/8 oktas; rain: none; wind: F3; visibility: excellent
2nd	16/12/2020	TR1	16:24	16:57	Cloud: 8/8 oktas; rain: none; wind: F3; visibility: excellent
2nd	19/12/2020	TR2	10:01	10:29	Cloud: 7/8 oktas; rain: none; wind: F4; visibility: good
3rd	03/02/2021	TR1 and TR2	09:43	12:12	Cloud: 3/8 oktas; rain: none; wind: F1-3; visibility: excellent
1st	12/11/2021	1	15:04	15:35	Cloud: 6/8 oktas; rain: none; wind: F4; visibility: excellent
1st	19/11/2021	2	15:20	15:51	Cloud: 3/8 oktas; rain: none; wind: F0; visibility: excellent
2nd	21/01/2022	1	14:45	15:16	Cloud: 8/8 oktas; rain: none; wind: F2; visibility: excellent
2nd	25/01/2022	2	14:54	15:16	Cloud: 6/8 oktas; rain: none; wind: F1; visibility: excellent
3rd	21/03/2022	1	15:07	15:44	Cloud: 8/8 oktas; rain: none; wind: F3; visibility: excellent
3rd	29/03/2022	2	15:01	15:29	Cloud: 2/8 oktas; rain: none; wind: F2; visibility: excellent
1st	17/11/2022	2	16:15	16:43	Cloud: 2/8 oktas; rain: none; wind: F2; visibility: excellent
1st	27/11/2022	1	15:39	16:13	Cloud: 6/8 oktas; rain: none; wind: F5; visibility: excellent
2nd	28/01/2023	1	11:44	12:18	Cloud: 3/8 oktas; rain: none; wind: F4; visibility: excellent
2nd	28/01/2023	2	16:38	17:05	Cloud: 7/8 oktas; rain: none; wind: F3; visibility: excellent
3rd	18/02/2023	1	16:53	17:30	Cloud: 6/8 oktas; rain: none; wind: F5; visibility: excellent
3rd	27/03/2023	2	15:43	16:16	Cloud: 8/8 oktas; rain: none; wind: F4; visibility: excellent
1st	26/10/2023	2	14:27	15:00	Cloud: 8/8 oktas; rain: showers; wind: F4; visibility: excellent

Round	Date	Transect	Start	Finish	Weather Conditions
1st	28/10/2023	1	16:44	17:18	Cloud: 8/8 oktas; rain: showers; wind: F5; visibility: excellent
2nd	19/12/2023	1	15:30	16:02	Cloud: 4/8 oktas; rain: showers; wind: F3; visibility: excellent
2nd	20/12/2023	2	15:18	15:47	Cloud: 7/8 oktas; rain: none; wind: F5; visibility: excellent
3rd	22/02/2024	2	16:27	17:00	Cloud: 6/8 oktas; rain: showers; wind: F3; visibility: excellent
3rd	23/02/2024	1	14:35	15:21	Cloud: 6/8 oktas; rain: showers; wind: F3; visibility: excellent

7.2.5.3 Hinterland Surveys

A total of five years of monthly hinterland surveys were carried out between October 2019 and September 2024. The methodology used for wetland sites during hinterland surveys followed I-WeBS (Irish Wetland Bird Survey) methodology (Lewis et al, 2019), whereby each location was surveyed for the duration necessary to identify and obtain a count for all target species present. The same approach was adapted for non-wetland sites. Timing and details of hinterland surveys are detailed in **Appendix 7.3**.

The surveys were carried out in suitable habitats including woodlands, peatlands and wetlands in the area surrounding the proposed wind farm site. This comprised of 33 hinterland vantage points within 10 km from the Site. These hinterland vantage points (HVP) were chosen as they had suitable habitat for the following target species: raptors, waders, waterfowl, swans, geese, barn owl, wildfowl and other waterbirds. Additionally, checks were made in the general area surrounding the Site. The HVPs detailed in **Appendix 7.4**, were checked regularly across this period.

A hinterland survey for raptors was conducted in accordance with Hardey et al. (2013) to assess Hen Harrier and other raptor activity over the winter and breeding periods in the greater surroundings of the Site.

Timing and details of hinterland surveys are detailed in **Appendix 7.3**. A map showing the areas encompassed by the hinterland surveys is included in the Figures in **Appendix 7.5**.

7.2.5.4 Other Breeding Season Surveys

Breeding Wader Walkover Surveys

Five years of Breeding wader walkover surveys were undertaken in the Summers of 2020 (early May, late May, June, and July), 2021 (April, May, June and July), 2022 (May, early June and late June), 2023 (May, June and July) and 2024 (early May, late May and June) to detect the presence of breeding waders within 2km of the study area. A number of methods were combined from published literature including Bibby et al, (2000), Gilbert et al, (1998), Brown & Shepperd (1993) and SNH (2017) to estimate numbers of target species breeding within this envelope.

Methods utilised were grouped into two categories; those for breeding lapwing *Vanellus vanellus* and those for other species such as Curlew *Numenius arquata*, common Snipe *Gallinago gallinago*, redshank *Tringa totanus*, woodcock *Scolopax rusticola*, common sandpiper *Actitis hypoleucos* and ringed plover *Charadrius hiaticula*. For each species, a pre-defined matrix of suitable habitats was created and used to select target habitats for survey (**Table 7.5**).

Table 7.5: Target Species and Associated Suitable Breeding Habitat

Target Species	Suitable Breeding Habitat
Lapwing	Lowland wet grassland, arable farmland, cutover bog with pools and wet grassland
Snipe	Wet pastures, marsh, bogs (intact and cutover) and fens
Redshank	Bog
Curlew	Bog
Common Sandpiper	Streams/rivers in bog
Woodcock	Woodland, bog woodland
Ringed Plover	Cutover bog, milled peat with exposed gravel

Survey methods for lapwing followed those in Bibby et al. (2000) where the primary count unit for breeding birds is defined as an incubating female. In addition, displaying birds, birds standing guard near nests or distraction displays were also recorded as indications of occupied territories. Extensive areas of open ground were covered from roads, farm tracks or roadsides (where possible); larger areas of open ground not visible from easily accessible vantage points were walked using transects.

Surveys were carried out during the time periods recommended in Bibby et al. (2000) although territorial behaviour noted outside these periods was also utilised in the assessment. For all additional species of wader the employed method was the same and utilised transects walked through suitable habitat within three hours of dawn or dusk. Count units (Table 7.6) were predefined for each target species and included in the method statement provided to surveyors.

Table 7.6: Count Units for each Wading Species

Species	Unit
Lapwing	Incubating Bird
Common Snipe	Drumming or Chipping Bird
Redshank	Alarming Bird
Woodcock	Displaying Male
Ringed Plover	Presence or Absence/ Fledged Young late in season
Common Sandpiper	Presence or Absence/ Fledged young late in season
Curlew	Territorial Activity

All suitable habitats for waders were visited. All species encountered (seen or heard) were recorded and their abundance, behaviour, sex/age and breeding status noted. Any species occurring more than 100 m from the observer, or flying over the site and not using it, were recorded as 'additional' species to further inform the Baseline survey. **Appendix 7.3** details the survey dates and weather conditions.

A map showing the areas encompassed by the walkover survey is included **Appendix 7.5**.

Merlin Surveys

Merlin surveys were centred on suitable habitat for the species and methods used are based on previous surveys in Ireland (Lusby *et al*. 2011 and Fernandez *et al*. 2010); developed in association with Dr. John Lusby of BirdWatch Ireland. The study area for Merlin is defined as a 1km square centrally placed on suitable habitat. A map showing the areas encompassed by the walkover survey is included **Appendix 7.5**.

Three visits were undertaken to the study square, each at 4-week intervals and timed to coincide with periods of Merlin activity (April to mid-May, mid-May to late June, and July to mid-August). Note an extra fourth visit was undertaken in August, see **Table 7.7** for survey dates. Prior to the first visit, all areas within the square identified as not suitable for Merlin (open water, urban areas, farmland, enclosed pastures and areas above 700m) were be excluded from the target search area. The remaining habitat was walked using parallel transects 120m apart and intensively searched for evidence of Merlin. Features such as suitable nest sites (old corvid nests) and suitable perches (posts, hummocks, boulders, remnant peat stands and root mats) are noted and the grid reference recorded.

Transect locations are recorded on ortho-photographs of the study square. Recorded information/evidence is defined in the form of secondary Merlin evidence (whitewash, pellets, feathers), prey remains (feather spots, moth wings, prey remains etc.), nests (possible or occupied) and direct observations (calling birds, displaying birds, hunting birds, inter-specific aggression etc.). The surveyor walked along conifer forestry edge and lines of sheep wire fence posts throughout the site searching for pellets or plucking posts. Suitable prominent rocks were targeted in the moorland as they can also provide plucking points.

Table 7.7: Merlin survey dates and conditions

Date	Location	Cloud (Okta)	Precipitation	Visibility	Wind
07/05/2020	Gortloughra	8/8	Dry	3km	F3 S
05/06/2020	Gortloughra	8/8	Dry	6km	F2-4 NW
21/07/2020	Gortloughra	8/8	Dry	Good	F2 W
09/08/2020	Gortloughra	3/8	Dry	Excellent	F1-2 S

Red Grouse Surveys

Methodology from the national Red Grouse survey (2006/2007 to 2007/2008, managed by BirdWatch Ireland and financed by the NPWS) was adopted as laid out in the conditions of the licence (licence 02/2021). This methodology is laid out in Cummins *et al*. (2010)

Under the terms of the NPWS licence, surveys are required to be conducted in suitable weather conditions (no rain, no strong winds and with good visibility). Although some very light drizzle was recorded, this was very brief and did not affect visibility, nor was it considered to hamper survey results.

The national survey used national grid one-kilometre by one-kilometre squares, in which surveyors select 1 km transects, in a north-south, or east-west direction, through suitable habitat. Surveyors walk 250m apart and stop at 250m increments. The chosen Transects can be viewed in **Appendix 7.5**.

A Red Grouse tape lure was played through a megaphone at each of the five 250m intervals for thirty seconds. Surveyors stopped and scanned during this period, continuing scanning for a further thirty seconds. If no Grouse called during this period, the process was repeated once again, before surveyors continued walking to the next 250m interval.

7.2.6 Avifauna Receptor Evaluation

Avifauna resources are to be initially evaluated as to whether or not they constitute key receptors for the assessment following NRA guidance. For the purposes of impact assessment, a receptor 'importance value' or sensitivity, following published guidance as in Percival (2007), SNH (2017) and literature review of published information on birds and wind farms (Pearce-Higgins J. L., 2009; Pearce-Higgins J. S., 2012; Drewitt A. L., 2006; Drewitt and Langston, 2008 and Masden, 2009) is to be calculated. Where provided receptor values from Percival (2007) are below those recommended in guidance within the Irish context (NRA, 2009a); then the evaluation has been increased in line with the recommended Irish evaluation as a precautionary principle. Table 7.8 illustrates the combined receptor evaluation criteria used to assign sensitivity levels to key receptors:

Table 7.8: Avian Resource Evaluation Criteria

Sensitivity of key receptor	Percival 2007 criteria	NRA Resource Evaluation	NRA Criteria	Combined Criteria
Very High.	Species is cited interest of SPA. Species present in Internationally important numbers.	International Importance.	Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive	Species is cited Special Conservation Interest of SPA. Species present in Internationally important numbers. Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive
High	Other non-cited species which	National Importance	Resident or regularly occurring populations (assessed to be	Other non-cited / not a Special Conservation Interest species which

Sensitivity of key receptor	Percival 2007 criteria	NRA Resource Evaluation	NRA Criteria	Combined Criteria
	contribute to integrity of SPA. Ecologically sensitive species (<300 breeding pairs in UK) and less common birds of prey. Species listed on Annex 1 of the EU Birds Directive. Regularly occurring relevant migratory species which are rare or vulnerable		important at the national level) of the following: Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list	contribute to integrity of SPA. Ecologically sensitive species (<300 breeding pairs nationally) and less common birds of prey. Species listed on Annex 1 of the EU Birds Directive. Regularly occurring relevant migratory species which are rare or vulnerable Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list (in this case BOCCI Red list).
Medium	Species present in regionally important numbers (>1% of regional population). Species occurring within SPA's but not crucial to the integrity of the site. Species listed as priority species in the UK BAP subject to special conservation measures	County Importance	Resident or regularly occurring populations (assessed to be important at the County level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; County important populations of species. Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.	Species present in regionally important numbers (>1% of regional population). Species occurring within SPA's but not crucial to the integrity of the site. Resident or regularly occurring populations (assessed to be important at the County level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; County important populations of species. Species that are rare or are undergoing a decline in quality or extent at a national level.

Sensitivity of key receptor	Percival 2007 criteria	NRA Resource Evaluation	NRA Criteria	Combined Criteria
Low	Species covered above which are present very infrequently or in very low numbers. Any other species of conservation interest not covered above, e.g. species listed on the red or amber lists of the BoCC.	Local Importance (High Value)	Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared; Resident or regularly occurring populations (assessed to be important at the Local level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list.	Locally important populations of priority species identified in the Local BAP, if this has been prepared. Resident or regularly occurring populations (assessed to be important at the Local level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list. Amber listed species.
Negligible	Species that remain common and widespread	Local Importance (Low Value)	n/a	Species that remain common and widespread. Green Listed Species.

7.2.7 Assessing Effect Significance

Once the value of the identified ecological receptors (features and resources) was determined, the next step was to assess the potential effect of the project on the identified key ecological receptors.

Table 7.9 to Table 7.14 outline the EPA (2022) evaluation criteria utilised in this appraisal of the Environmental Factor, Ornithology. These criteria are included in the Guidelines on the Information to be contained in Environmental Impact Assessment Reports:

Table 7.9: Probability of Effects (EPA, 2022)

Likely Effects	Unlikely Effects
The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.	The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.

Table 7.10: Quality of Effects (EPA, 2022)

Quality of Effect	Description
Positive Effect	A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or removing nuisances or improving amenities)
Neutral Effect	No effects or effects that are imperceptible, within the normal bounds of variation or within the margin of forecasting error.
Negative/Adverse Effect	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).

Table 7.11: Significance of Effects (EPA, 2022)

Significance of Effect	Description
Imperceptible	An effect capable of measurement but without significant consequences
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging trends
Significant	An effect which, by its character, magnitude, duration, or intensity alters a sensitive aspect of the environment
Very Significant	An effect which, by its character, magnitude, duration, or intensity significantly alters most of a sensitive aspect of the environment
Profound	An effect which obliterates sensitive characteristics

Table 7.12: Duration of Effects (EPA, 2022)

Duration of Effect	Description
Momentary Effects	Effects lasting from seconds to minutes
Brief Effects	Effects lasting less than a day
Temporary Effects	Effects lasting less than a year
Short-term Effects	Effects lasting one to seven years
Medium-term Effects	Effects lasting seven to fifteen years
Long-term Effects	Effects lasting fifteen to sixty years
Permanent Effects	Effects lasting over sixty years

Table 7.13: Types of Effects (EPA, 2022)

Type of Effect	Description
Effect/Impact	A change resulting from the implementation of a project.
Likely Effects	The effects that are specifically predicted to take place – based on an understanding of the interaction of the proposed project and the receiving environment.
Indirect Effects (a.k.a. secondary effects)	Effects on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
Cumulative Effects	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
'Do Nothing' Effects	The environment as it would be in the future should the subject project not be carried out.
'Worst Case' Effects	The effects arising from a project in the case where mitigation measures substantially fail.
Indeterminable Effects	When the full consequences of a change in the environment cannot be described.
Irreversible Effects	When the character, distinctiveness, diversity, or reproductive capacity of an environment is permanently lost.
Reversible Effects	Effects that can be undone, for example through remediation or restoration.
Residual Effects	The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
Synergistic Effects	Where the resultant effect is of greater significance than the sum of its constituents (e.g. combination of SOx and NOx to produce smog).

Table 7.14: Definition of Terms – Source, Pathway, Receptor (EPA, 2022)

Term	Description
Source	The activity or place from which an effect originates
Pathway	The route by which an effect is conveyed between a source and a receptor.
Receptor	Any element in the environment which is subject to effects.
Effect/Impact	A change resulting from the implementation of a project

7.2.8 Assessing Effect Type and Magnitude

Assessment of effects considers construction, operational and decommissioning effects with reference to the potential for direct, indirect, and cumulative effects. The assessment also takes account of any residual effects that may persist following the implementation of any mitigation or best practice design. The characterisation of effects reflects the ecological structure and function upon which the key ecological receptors depend. Detailed assessment of effects considers the magnitude of effects affecting populations.

This EIAR uses the EPA classification of effects in order to describe the quality, significance, duration, and type of effect. Effects on avifauna are to be assessed following published guidance by Percival (2003). Once key avian receptors have been selected and assigned an evaluation of importance or sensitivity, the significance of potential effects are rated as a product of both the magnitude of the predicted effect and the sensitivity if the key receptor affected. The magnitude of effect is based on probability of the likely effect occurring.

The criteria outlined in Table 7.15 below has been developed by Percival (2003) to determine the magnitude of potential effects on a species. Methodology for assessing sites outside of European Sites (i.e. SPAs) state 'the test of significance of an impact will be whether the wind farm impact is causing a significant change to the population its range or distribution' (Percival, 2003). It is important to consider availability of alternative habitat elsewhere during this assessment (Percival, 2003).

Table 7.15: Determination of Magnitude Effects (Percival, 2003)

Magnitude	Description
Very High	Total loss or very major alteration to key elements/ features of the baseline conditions such that the post development character/ composition/ attributes will be fundamentally changed and may be lost from the site altogether. *Guide: < 20% of population / habitat remains*
High	Major loss or major alteration to key elements/ features of the baseline (pre-development) conditions such that post development character/ composition/ attributes will be fundamentally changed. *Guide: 20-80% of population/ habitat lost*
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes of baseline will be partially changed. *Guide: 5-20% of population/ habitat lost*
Low	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline condition will be similar to pre-development circumstances/patterns. *Guide: 1-5% of population/ habitat lost*
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the "no change" situation. *Guide: < 1% population/ habitat lost*

The significance of potential effects is assessed by cross tabulating the magnitude of effects and bird sensitivity to predict significance of each potential effect. Population status, distribution, and trends of potentially affected species such as migratory winter birds should be taken into consideration when undertaking the assessment. Significant ratings are interpreted as follows, **very low** and **low** should not normally be of concern however normal design care should be undertaken to minimise effects, **medium** represents a potentially significant effect that requires careful individual assessment, while **very high** and **high** represents a highly significant effect on bird populations. A significance matrix table, combining magnitude and sensitivity to assess overall significance is presented below in Table 7.16.

Table 7.16: Significance matrix: combining magnitude and sensitivity to assess significance (Percival, 2003)

Significance		Sensitivity			
		Very High	High	Medium	Low
Magnitude	Very High	Very High	Very High	High	Medium
	High	Very High	Very High	Medium	Low
	Medium	Very High	High	Low	Very Low
	Low	Medium	Low	Low	Very Low
	Negligible	Low	Very Low	Very Low	Very Low

7.3 DESCRIPTION OF THE EXISTING ENVIRONMENT

The ecology of the existing environment is described within this section.

7.3.1 Site Description

The Site is situated within Gortloughra, c. 8 km northwest of Dunmanway, Co. Cork near the Co. Cork/Co. Kerry border. The study area includes parts of the townlands of an tSeithe Bheag (Shehy Beg), (Muscraí Gaeltacht), Gortloughra, Cloghboola and Inchinroe. The redline boundary of the Site extends to 118.7 ha, and according to Tailte Éireann mapping, the habitat within the Site is primarily composed of upland blanket bog, wet heath, dry heath, wet grassland, acid grassland, exposed sliceous rock and artificial surfaces can also be found in the study area and surrounding hinterland.

The townlands along which the two grid connection options transverse include:

- **Option A (Dunmanway):** an tSeithe Bheag (Shehy Beg), Gortloughra, Inchinroe, Cloghboola, Cornery, Garraí na Tórnóra (Garryantornora), Tuairín na Lobhar (Tooreenalour), Gort na Carraige (Gortnacarriga), Moneylea, Coolcaum, Coolmountain, Tullagh, Moneyreague, Togher, Cooranig, Keelaraheen, Neaskin, Ardcahan, Knockduff, Gurteennasowna and Ballyhalwick.

- **Option B (Carrigdangan):** an tSeithe Bheag (Shehy Beg), Gortloughra, Inchinroe, Cloghboola, Cornery, Garraí na Tórnóra (Garryantornora), Tuairín na Lobhar (Tooreenalour), Gort na Carraige (Gortnacarriga), Cooragreenane, Coolroe West, Gortnahoughtee, Derryleigh, Gortatanavally, Carrigdangan and Johnstown.

Temporary works will be required to accommodate the delivery of the turbine components. These temporary works are included as part of this application and are assessed as part of this EIAR and are located in the townlands of Lackanashinnagh, Shanacashel, Mallow, Glan, Curradrinagh, Seanlárach (Shanlaragh), Kilnadur, Inchincurka, Carrigdangan, Johnstown, Commons, Derrygortnacloghy, Gortneadin, Carrignacurra, Cappanclare, Curraheen, Coolroe West, Cooragreenane, Gortaknockane, Gortnacarriga, Tooreenalour, Garraí na Tórnóra (Garryantornora), Cornery, Cloghboola, and Inchinroe.

For further information, please refer to **Chapter 6: Biodiversity**.

7.3.2 Desktop Study

7.3.2.1 Sites of International Importance

Note only Special Protection Areas (relating to birds) are addressed in this chapter. Special Areas of Conservation (relating to habitats, plants, mammals, and all other non-avian taxa of note) are covered in the **Chapter 6: Biodiversity**. The same logic applies to sites of national importance.

Special Protection Areas (SPAs)

Special Protection Areas (SPAs) are designated under the EU Birds Directive (2009/147/EC) ('The Birds Directive'). There are two SPAs within 25km of the study area. See Table 7.17 for more information.

An Appropriate Assessment (AA) Screening Report and Natura Impact Statement (NIS) have been completed in order to ascertain if the proposed development either alone or in combination with other plans or projects, will adversely affect the integrity of a European Site (SACs and SPAs); and accompanies this planning application. Table 7.17 below details the European sites protected for bird species (SPAs) within 25km of the proposed wind farm.

Table 7.17: Summary of Special Protection Areas (SPAs) within 25 km of the project

Designated Site	Site code	Qualifying Interest	Distance to site (km)
The Gearagh SPA	004109	Wigeon (*Anas penelope*) [A050] Teal (*Anas crecca*) [A052] Mallard (*Anas platyrhynchos*) [A053] Coot (*Fulica atra*) [A125] Wetland and Waterbirds [A999]	17km to wind farm 10km GCR 8km TDR
Mullaghanish to Musheramore Mountains SPA	004162	Hen Harrier (*Circus cyaneus*) [A082]	19km to wind farm 12.2km GCR 12km TDR
Killarney National Park SPA	004038	Merlin (*Falco columbarius*) [A098] Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395]	25km wind farm 26.5km GCR 25km TDR
Clonakilty Bay SPA	004081	Shelduck (*Tadorna tadorna*) [A048] Dunlin (*Calidris alpina*) [A149] Black-tailed Godwit (*Limosa limosa*) [A156] Curlew (*Numenius arquata*) [A160] Wetland and Waterbirds [A999]	30km wind farm 18.5km GCR 20km TDR
Galley Head to Duneen Point SPA	004190	Chough (*Pyrrhocorax pyrrhocorax*) [A346]	32km wind farm. 22km GCR 27.5km TDR
Courtmacsherry Bay SPA	004219	Great Northern Diver (*Gavia immer*) [A003] Shelduck (*Tadorna tadorna*) [A048] Wigeon (*Anas penelope*) [A050] Red-breasted Merganser (*Mergus serrator*) [A069] Golden Plover (*Pluvialis apricaria*) [A140] Lapwing (*Vanellus vanellus*) [A142] Dunlin (*Calidris alpina*) [A149] Black-tailed Godwit (*Limosa limosa*) [A156] Bar-tailed Godwit (*Limosa lapponica*) [A157] Curlew (*Numenius arquata*) [A160] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Common Gull (*Larus canus*) [A182] Wetland and Waterbirds [A999]	33.5km wind farm 23km GCR 19.5km TDR

7.3.2.2 Sites of National Importance

Sites of National Importance in Ireland are termed Natural Heritage Areas (NHA) and proposed Natural Heritage Areas (pNHA).

While the Wildlife (Amendment) Act 2000 has been passed into law, pNHAs will not have legal protection until the consultative process with landowners has been completed; this process is currently ongoing. For the purposes of this assessment however pNHAs have be treated as fully designated sites. There are one NHA and four pNHAs present within 10 km of the proposed wind farm.

The closest designated site to the wind farm is Lough Allua pNHA (site code 001065 – 5km northeast). The closest national site after Lough Allua pNHA is the Blackwater Conigar Bog NHA (site code 002386 – 6.5km northwest). See Table 7.18 for more information.

Table 7.18: Summary of National Sites within 10 km of the project

Designated Site	Site code	Features of Interest (Birds)	Distance to site (km)
Lough Allua pNHA	001065	The lakeshore of this pNHA supports Snipe, Sedge Warbler, Lapwing and Heron, while Great Crested Grebe, Little Grebe, Mallard and Moorhen also nest. The number of wintering waterfowl is small but up to 50 Mallard, Tufted Duck and Teal have been recorded.	5km northeast of the proposed wind farm. 1km north of the grid connection route. 200m north of the haul route.
Conigar Bog NHA	002386	This Site is designated as a NHA for peatlands. The Site Synopsis indicates this NHA supports Red Grouse.	6.5km northwest of the proposed wind farm. 7.5km northwest of the grid connection route. 8.5km northwest of the haul route.
Gouganebarra Lake pNHA	001057	This pNHA supports Grey Wagtail, Common Sandpiper and Snipe. The recent NHA survey indicates the lake is used by ducks and swans, while Peregrine Falcons breed on the cliffs.	7.5km north of the proposed wind farm. 8.5km northwest of the grid connection route. 9.5km northwest of the haul route.
Ballagh Bog pNHA	001886	This pNHA comprises a series of small, slightly raised valley bogs.	8km northwest of the proposed wind farm. 9.5km northwest of the grid connection route. 10.5km northwest of the haul route.

Designated Site	Site code	Features of Interest (Birds)	Distance to site (km)
Derryclogher (Knockboy) Bog pNHA	001873	No site synopsis available. However, this pNHA is overlapped y the Derryclogher (Knockboy Bog) SAC, which is designated for blanket bogs.	10.5km north of the proposed wind farm. 11.5km northwest of the grid connection route. 12.5km northwest of the haul route.

7.3.2.3 Other Designated Sites

Nature Reserves

There are no nature reserves within 10km of the Site.

National Parks

There are no National Parks within 10km of the Site.

Ramsar Sites

The closest Ramsar site is The Gearagh, 17km to the northeast of the wind farm site and 8km turbine delivery route, 10km northeast of the grid connection route and 8km northeast of the haul (TDR) route.

7.3.2.4 Avifauna

A desktop study was undertaken to locate any records of rare or protected avian species that have previously been recorded in the site and the surrounding area. Examination of NPWS and NBDC records indicates that there is a combined total of 169 records of avifauna within the two grid squares (W15, W16) that overlap the study area. This includes a total of 94 species, regardless of conservation status or date. Of these 94 species, 47 species are considered rare or protected.

A total of 17 records are considered to be historical records ranging from 1972 to 2001, namely Greylag Goose (*Anser anser*), Great Northern Diver (*Gavia immer*), Corn Crake (*Crex crex*), Common Coot (*Fulica atra*), Common Pochard (*Aythya ferina*), Eurasian Teal (*Anas crecca*), Tufted Duck (*Aythya fuligula*), Common Goldeneye (*Bucephala clangula*), Northern Lapwing (*Vanellus vanellus*), Common Sandpiper (*Actitis hypoleucos*), Common Swift (*Apus apus*), Great Crested Grebe (*Podiceps cristatus*), Lesser Black-backed Gull (*Larus fuscus*), Spotted Flycatcher (*Muscicapa striata*), Stock Pigeon (*Columba oenas*), Black-headed Gull (*Larus ridibundus*), and Yellowhammer (*Emberiza citrinella*).

Table 7.19 below details the 30 species recently recorded within the two grid squares that overlap the study area.

Of the 30 recently recorded species of conservation concern, eight are red-listed (Barn Owl, Common Kestrel, Common Snipe, Eurasian Curlew, Eurasian Woodcock, European Golden Plover, Red Grouse, White-tailed Eagle), 17 are amber-listed (Barn Swallow, Common Kingfisher, Common Linnet, Common Starling, Eurasian Wigeon, Great Cormorant, Hen Harrier, House Martin, House Sparrow, Mallard, Merlin, Mute Swan, Northern Wheatear, Chough, Sand Martin, Skylark, Whooper Swan), and the remaining five are green-listed (Common Grasshopper Warbler, Common Wood Pigeon, Little Grebe, Peregrine Falcon, Rock Pigeon). Kingfisher, Golden Plover, Hen Harrier, Merlin, Peregrine, Chough, White-tailed Eagle and Whooper Swan are also listed under Annex I of the EU Birds Directive.

Table 7.19: Rare and protected species of avifauna recorded historically within the 10km square (W15, W16) in which the subject site is located[1]

Species	Scientific Name	Year of last record	BoCCI status	Annex I status	Legal Status	Grid Square
Barn Owl	*Tyto alba*	29/09/2020	Red List	No	Wildlife Acts	W15, W16
Barn Swallow	*Hirundo rustica*	15/05/2020	Amber List	No	Wildlife Acts	W15, W16
Common Grasshopper Warbler	*Locustella naevia*	26/04/2020	Green List	No	Wildlife Acts	W15, W16
Common Kingfisher	*Alcedo atthis*	31/12/2011	Amber List	Yes	Wildlife Acts	W15, W16
Common Kestrel	*Falco tinnunculus*	20/12/2022	Red List	No	Wildlife Acts	W15, W16
Common Linnet	*Carduelis cannabina*	31/12/2011	Amber List	No	Wildlife Acts	W15, W16
Common Snipe	*Gallinago gallinago*	04/02/2023	Red List	No	Wildlife Acts	W15, W16
Common Starling	*Sturnus vulgaris*	31/12/2011	Amber List	No	Wildlife Acts	W15, W16
Common Wood Pigeon	*Columba palumbus*	31/12/2011	Green List	No	Wildlife Acts	W15, W16
Eurasian Curlew	*Numenius arquata*	18/09/2016	Red List	No	Wildlife Acts	W15, W16
Eurasian Wigeon	*Anas penelope*	31/12/2011	Amber List	No	Wildlife Acts	W15, W16
Eurasian Woodcock	*Scolopax rusticola*	31/12/2011	Red List	No	Wildlife Acts	W15, W16
European Golden Plover	*Pluvialis apricaria*	14/10/2018	Red List	Yes	Wildlife Acts	W16

[1] Colours correspond to BoCCI conservation status, and Annex I species are shown in bold.

Species	Scientific Name	Year of last record	BoCCI status	Annex I status	Legal Status	Grid Square
Great Cormorant	*Phalacrocorax carbo*	31/12/2011	Amber List	No	Wildlife Acts	W15, W16
Hen Harrier	*Circus cyaneus*	13/04/2020	Amber List	Yes	Wildlife Acts	W15, W16
House Martin	*Delichon urbicum*	31/12/2011	Amber List	No	Wildlife Acts	W15, W16
House Sparrow	*Passer domesticus*	31/12/2011	Amber List	No	Wildlife Acts	W15, W16
Little Grebe	*Tachybaptus ruficollis*	31/12/2011	Green List	No	Wildlife Acts	W15, W16
Mallard	*Anas platyrhynchos*	21/02/2020	Amber List	No	Wildlife Acts	W15, W16
Merlin	*Falco columbarius*	31/12/2011	Amber List	Yes	Wildlife Acts	W15, W16
Mute Swan	*Cygnus olor*	31/12/2011	Amber List	No	Wildlife Acts	W15, W16
Northern Wheatear	*Oenanthe oenanthe*	19/06/2020	Amber List	No	Wildlife Acts	W15, W16
Peregrine Falcon	*Falco peregrinus*	29/09/2020	Green List	Yes	Wildlife Acts	W15, W16
Red Grouse	*Lagopus lagopus*	26/05/2021	Red List	No	Wildlife Acts	W15, W16
Red-billed Chough	*Pyrrhocorax pyrrhocorax*	04/02/2023	Amber List	Yes	Wildlife Acts	W15, W16
Rock Pigeon	*Columba livia*	31/12/2011	Green List	No	Wildlife Acts	W15
Sand Martin	*Riparia riparia*	31/12/2011	Amber List	No	Wildlife Acts	W15, W16
Skylark	*Alauda arvensis*	08/04/2023	Amber List	No	Wildlife Acts	W15, W16
White-tailed Eagle	*Haliaeetus albicilla*	16/02/2019	Red List	Yes	Wildlife Acts	W16
Whooper Swan	*Cygnus cygnus*	31/12/2011	Amber List	Yes	Wildlife Acts	W16

7.3.3 Field Surveys

Species of conservation concern that are known to be potentially vulnerable to wind farm developments will be discussed in more detail in this section. Species have been selected for detailed discussion on the basis of conservation status, vulnerability to wind farm developments and if species sightings have been confirmed on or near the proposed wind farm site, which will indicate potential links between species recorded at the proposed site and the surrounding environment.

7.3.3.1 Target Species Observations (Flight Activity Surveys)

As per SNH guidance (2017) the Site, for the purposes of flight activity surveys (vantage point surveys) is defined not by the planning boundary for the Site but by a 500m radius circle (buffer) around the proposed wind turbine locations. The proposed turbine locations form the centre point of each of these 500m radius buffers. This study area is called the '**flight activity survey area'** and is unique to this survey type. Any target species passing within this 500m buffer from proposed turbine locations (flight activity survey area) is considered within the main wind farm site under the SNH (2017) guidance.

Target species recorded are shown below in **Table 7.20**.

Table 7.20: Target species and species of conservation concern recorded during Gortloughra vantage point surveys between October 2019 and September 2024, inclusive.

Species	BoCCI	Annex I	Summer 2020	Summer 2021	Summer 2022	Summer 2023	Summer 2024	Winter 19/20	Winter 20/21	Winter 21/22	Winter 22/23	Winter 23/24
Buzzard	Green	No	✓	✓	✓	✓	✓	✓			✓	✓
Chough	**Amber**	**Yes**	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cormorant	Amber	No	✓	✓	✓					✓	✓	
Curlew	**Red**	**No**	✓									
Dunlin	**Red**	**Yes**	✓									
Golden Plover	**Red**	**Yes**		✓		✓		✓	✓	✓	✓	✓
Great Black-backed Gull	Amber	No			✓						✓	
Grey Heron	Green	No	✓	✓	✓	✓	✓	✓		✓	✓	✓
Hen Harrier	**Amber**	**Yes**	✓		✓	✓		✓	✓	✓		✓
Kestrel	**Red**	**No**	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lesser Black-backed Gull	**Amber**	**No**	✓	✓	✓	✓	✓	✓				
Little Egret	Green	Yes										✓
Litle Grebe	Green	No								✓		
Mallard	Amber	No	✓	✓	✓	✓	✓	✓	✓	✓		✓
Merlin	Amber	Yes						✓				✓
Peregrine	**Green**	**Yes**	✓	✓	✓	✓	✓		✓		✓	✓
Red Grouse	**Red**	**No**	✓		✓			✓	✓	✓	✓	✓

Species	BoCCI	Annex I	Summer 2020	Summer 2021	Summer 2022	Summer 2023	Summer 2024	Winter 19/20	Winter 20/21	Winter 21/22	Winter 22/23	Winter 23/24
Snipe	**Red**	**No**	✓	✓	✓			✓	✓	✓		✓
Sparrowhawk	Green	No	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stock Dove	**Red**	**No**			✓							
Swift	**Red**	**No**				✓						
Teal	Amber	No	✓	✓	✓	✓	✓			✓		
Whooper Swan	**Amber**	**Yes**							✓	✓		✓

7.3.3.2 *Winter and Breeding Walkover Surveys*

Transect surveys for all species were recorded during monthly surveys of the Site over five summers and five winters. This survey captured the Baseline of avian species using the Site as well as their abundance and includes seasonal visitors of the winter (i.e. Golden Plover) and summer months.

Over the entire five-year survey period, a total of 22 bird species were recorded during winter walkovers. Of the 22 species, two are Annex I listed (Chough, Hen Harrier), five are red-listed (Kestrel, Meadow Pipit, Red Grouse, Snipe, Whinchat) and two are amber-listed (Hen Harrier, Skylark). The remaining 16 species are green-listed.

A total of 25 bird species were recorded during breeding walkovers across all five seasons. Of the 25 species, two are Annex I listed (Peregrine, Chough), four are red-listed (Grey Wagtail, Kestrel, Meadow Pipit, Red Grouse) and seven are amber-listed (Chough, Goldcrest, House Martin, Skylark, Swallow, Wheatear, Willow Warbler). The remaining 14 species are green-listed.

The species recorded during winter walkovers are provided in Table 7.21, and the species recorded during breeding walkover surveys are provided in Table 7.22.

Table 7.21: Species and species of conservation concern recorded on Gortloughra transect surveys (wintering) between Winter 2019/20, Winter 20/21, Winter 21/22, Winter 22/23, and Winter 23/24.

Species	Scientific Name	BoCCI	Annex I	Winter 19/20		Winter 20/21		Winter 21/22		Winter 22/23		Winter 23/24	
				Total	Mean	Total	Mean	Total	Mean	Total	Mean	Total	Mean
Chaffinch	*Fringilla coelebs*	Green	No	2	2			1	1	13	13	14	14
Goldfinch	*Carduelis carduelis*	Green	No	`1	1								

Species	Scientific Name	BoCCI	Annex I	Winter 19/20		Winter 20/21		Winter 21/22		Winter 22/23		Winter 23/24	
				Total	Mean	Total	Mean	Total	Mean	Total	Mean	Total	Mean
Great Tit	*Parus major*	Green	No	0	0	1	1						
Hen Harrier	***Circus cyaneus***	**Amber**	**Yes**	**1**	**1**								
Hooded Crow	*Corvus cornix*	Green	No	30	7.5	6	2	4	1.3	2	1	5	1.67
Kestrel	*Falco tinnunculus*	Red	No	1	1							1	1
Magpie	*Pica pica*	Green	No	1	1	1	1						
Meadow Pipit	*Anthus pratensis*	Red	No	43	4.8	16	2.3	12	3	18	3.6	4	1.33
Mistle Thrush	*Turdus viscivorus*	Green	No					3	3				
Peregrine	***Falco peregrinus***	**Green**	**Yes**			**1**	**1**						
Pheasant	*Phasianus colchicus*	Green	No	3	3								
Raven	*Corvus corax*	Green	No	5	1.3	9	1.8	11	3.7	3	1	2	1
Red Grouse	*Lagopus lagopus*	Red	No							6	2		
Reed Bunting	*Emberiza schoeniclus*	Green	No							2	2	7	7
Robin	*Erithacus rubecula*	Green	No	1	1	1	1	1	1				
Rook	*Corvus frugilegus*	Green	No	2	2								
Siskin	*Carduelis spinus*	Green	No			1	1						
Snipe	*Gallinago gallinago*	Red	No			2	1						
Skylark	*Alauda arvensis*	Amber	No	14	7			3	1.5	4	2	15	5
Stonechat	*Saxicola torquatus*	Green	No	1	1	1	1	2	2	2	1	1	1
Whinchat	*Saxicola rubetra*	Red	No									1	1
Wren	*Troglodytes troglodytes*	Green	No	5	1.7	2	1	3	1	1	1	2	1

Table 7.22: Species and species of conservation concern recorded on Gortloughra transect surveys (breeding) between Summer 2020, Summer 2021, Summer 2022, Summer 2023 and Summer 2024.

Species	Scientific Name	BoCCI	Annex I	Summer 2020		Summer 2021		Summer 2022		Summer 2023		Summer 2024	
				Total	Mean	Total	Mean	Total	Mean	Total	Mean	Total	Mean
Buzzard	*Buteo buteo*	Green	No	2	1							1	1
Bullfinch	*Pyrrhula pyrrhula*	Green	No					1	1				
Chaffinch	*Fringilla coelebs*	Green	No					2	1	1	1		
Chough	***Pyrrhocorax pyrrhocorax***	**Amber**	**Yes**					**3**	**3**				
Goldcrest	*Regulus regulus*	Amber	No					1	1				
Grey Wagtail	*Motacilla cinerea*	Red	No	3	1	1	1						
Hooded Crow	*Corvus cornix*	Green	No	5	2.5	2	2	3	1	5	1.25	1	1
House Martin	*Delichon urbicum*	Amber	No			1	1						
Kestrel	*Falco tinnunculus*	Red	No					3	1				
Lesser Redpoll	*Acanthis flammea*	Green	No					9	9				
Magpie	*Pica pica*	Green	No					3	1				
Meadow Pipit	*Anthus pratensis*	Red	No	48	3.7	23	7.6	62	5.6	38	5.4	32	4

Species	Scientific Name	BoCCI	Annex I	Summer 2020		Summer 2021		Summer 2022		Summer 2023		Summer 2024	
				Total	Mean	Total	Mean	Total	Mean	Total	Mean	Total	Mean
Mistle Thrush	*Turdus viscivorus*	Green	No	3	1	2	1	1	1				
Pheasant	*Phasianus colchicus*	Green	No	2	2			2	1				
Peregrine	***Falco peregrinus***	**Green**	**Yes**			**1**	**1**						
Pied Wagtail	*Motacilla alba*	Green	No	1	1			2	1				
Raven	*Corvus corax*	Green	No					5	2.5	1	1	1	1
Red Grouse	*Lagopus lagopus scotica*	Red	No	1	1								
Robin	*Erithacus rubecula*	Green	No					1	1				
Skylark	*Alauda arvensis*	Amber	No	17	1.7	3	1.5	33	3.3	17	1.6	20	2
Swallow	*Hirundo rustica*	Amber	No	3	3	3	3	26	6.5				
Wheatear	*Oenanthe oenanthe*	Amber	No	9	1.8	1	1	14	2.3	6	2	3	1.5
Willow Warbler	*Phylloscopus trochilus*	Amber	No					1	1	1	1		
Woodpigeon	*Columba palumbus*	Green	No			1	1						
Wren	*Troglodytes troglodytes*	Green	No	6	1.5	1	1	9	2.3			2	1

7.3.3.3 Breeding Wader Surveys

Transect surveys to assess the presence of breeding wader populations were completed during the summers of 2020, 2021, 2022, 2023, and 2024. A number of methods were combined from published literature including Bibby et al, (2000), Gilbert et al, (1998), Brown & Shepherd (1993) and SNH (2017) to estimate numbers of target species breeding within the study area. A total of two transects were used to sample habitat deemed suitable for breeding waders on site.

During the 2020 breeding wader surveys, no breeding waders were recorded. However, evidence of breeding passerine species Meadow Pipit, Skylark and Wheatear were detected during the breeding bird transect surveys, as detailed in section 7.3.3.2 above.

During the 2021 breeding wader bird surveys, no breeding waders were seen. However, in April 2021, three Snipe were heard calling. In May, June and July 2021, no signs of any breeding waders were found.

During the 2022, 2023 and 2024 surveys, no breeding waders were observed.

7.3.3.4 Target species recorded during VP, transects and other species-specific surveys

The following target species were recorded during vantage point (VP) surveys, transects and other species-specific survey. The records of these species during hinterland surveys have also been included to provide context in relation to connectivity to important habitats in the surrounding area outside of the Site. The study area for VP surveys is called the 'flight activity survey area' and is unique to this survey type. Any target species passing within this 500m buffer from proposed turbine locations (flight activity survey area) is considered within the proposed wind farm Site under the SNH (2017) guidance. Many of the observations of target species were outside of the flight activity survey area. However, the details of these observations were noted during the survey. The 'rotor sweep zone' is the height at which the proposed turbine blades would be rotating. It extends for the minimum tip of the blade from the ground to the maximum tip height of the blade in rotation. With a proposed hub height of 100m and a blade radius of 75m, the lower tip height is 25m and the upper tip height is 175m. Theoretically birds flying within this height range (25-175m) would be at risk of collision without the consideration of avoidance. However, the height bands used for the VP survey corresponding to this range are (20m – 185m) a more conservative range.

7.3.3.4.1 Buzzard

Buzzards were observed during surveys throughout the five-year survey period. Most records occurred within the 500m buffer zone, where Buzzards were recorded hunting and commuting at rotor-swept height. Buzzards were also recorded commuting and hunting in the wider environment. However, no breeding behaviour was detected over the course of the five-year survey period.

Vantage Point Surveys: Summer Season (2020, 2021, 2022 (summer), 2022 (spring migration), 2023, and 2024)

Buzzards were recorded on 37 occasions across all five breeding seasons. Over half of these records (27) were of birds flying wholly within or partially within the 500m buffer zone, many of which occurred within the rotor-swept height band. Some records also observed Buzzards hunting within the Site. However, no breeding behaviour was observed.

During the 2020 breeding season, a total of 13 records of Buzzard were made across VPs 1, 2 and 3. Nine flightlines occurred within the 500m buffer zone (also known as the flight activity survey area), and the remaining four occurred wholly outside of the buffer zone. 12 of the 13 observations recorded Buzzard flying within rotor-swept height band (20-185m), of which nine occurred within the 500m buffer zone. One record indicated Buzzard flew high (>185m) above heath habitats within the buffer zone in May 2020. Buzzard were predominantly recorded flying across the Site, however, two sightings of hunting behaviour occurred within the Site in August 2020. All records of Buzzards occurring within the Site during this survey season were concentrated around Turbines 1 and 5.

Buzzard were recorded on four occasions during the 2021 breeding season across VPs 2 and 3. Three of which occurred within the 500m buffer zone, whereby one Buzzard was observed flying near Turbine 5 at c. 20-30m height in June 2021; two Buzzards were observed flying near Turbines 1 and 2 at 30-100m height in June 2021; and one Buzzard was sighted flying both inside and outside the 500m buffer zone near Turbine 2 at 50-100m height in June 2021. The remaining observation occurred outside of and to the north-west of the 500m buffer zone in April 2021.

During the 2022 breeding season, Buzzards were observed on five occasions across VPs 2 and 3 in June, July and August 2022. All of which occurred within the 500m buffer zone at rotor-swept height, and predominantly recorded Buzzard hunting alone and flying in the north-west of the study area.

During the 2022 spring migration surveys, Buzzards were noted twice. Both of which occurred from VP 1 in April 2022, whereby one record noted one individual was observed being mobbed by a raven, and the other record denoted two Buzzards hunting.

During the 2023 breeding season, seven observations of Buzzard were made across VPs 2 and 3 in May, June and July 2023. Six of the seven observations indicated Buzzards were either flying over or hunting within the 500m buffer zone.

During the 2024 breeding season, six records of Buzzards were made of lone individuals. Three of which occurred within the 500m buffer zone. One Buzzard was observed flying between 30 and 100m height c. 250m from Turbine 1 in April 2024. Another Buzzard was noted in June 2024 flying over the western edge of the buffer zone c. 450m from Turbine 2, and the final record comprised one Buzzard flying over the eastern edge of the 500m buffer c. 300m from Turbine 7 in July 2024.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)
In comparison to surveys during the breeding season, very few records of Buzzards were made across the five winter flight activity survey seasons. No observations of Buzzard were made during the 2020/21 and 2021/22 winter seasons, and only six records were made across the remaining three winter survey seasons. However, three of the six records observed Buzzard within the 500m buffer zone, flying within the rotor-swept height (20-185m). Hunting behaviour was not observed during the non-breeding season.

During the 2019/20 winter season, one record of Buzzard was made. This observation occurred within the 500m buffer zone, and comprised one individual flying within the rotor-swept height (20-185m) from VP1 in March 2020.

During the 2022/23 winter season, Buzzards were recorded on two occasions. Both records observed Buzzards flying over the north of the study area alone at 50-100m height from VP 3 on February 2nd 2023, and VP 2 in March 2023.

During the 2023/24 winter season, Buzzards were observed three times. One of which recorded Buzzard flying at rotor-swept height, within the 500m buffer zone.

Summer Walkover Surveys (2020, 2021, 2022, 2023, and 2024)

Across all five seasons, Buzzards were only observed on two occasions. During the 2020 breeding season, one Buzzard was recorded flying in May. During the 2024 breeding season, one Buzzard was recorded.

Buzzards were not recorded during the 2021, 2022 or 2023 breeding seasons.

Winter Walkover Surveys (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

During the winter walkover surveys, no Buzzards were observed.

Hinterland Surveys (2020, 2021, 2022, 2023, and 2024)

Buzzards were not recorded during the first year of hinterland surveys. However, surveys that occurred in Years 2, 3, 4 and 5 detected Buzzards in the surrounding hinterland. Records were predominantly from HVP 1: An Gearagh, which is located c. 19.85km to the north-east of the Proposed Development

Buzzards were observed of on one occasion during both the winter the 2020/21 and 2021/22 non-breeding seasons, whereby one bird was recorded at HVP 1: An Gearagh. During the 2021 breeding season there was one observation each at HVP 9: Gortaloughra Valley (0.99km northwest) and HVP 12: Lough Allua (6.19km NE). During the same season there were two records at HVP 18: Shanacrane (0.82km SE). During the 2022 breeding season, two observations of single birds were recorded at HVP 1: An Gearagh in June and July 2022.

During the 2022/23 non-breeding season, Buzzards were recorded two times at HVP 1: An Gearagh in numbers of 1-2 birds and once at Bandon River (Keenrath Bridge) in March. During the 2023 breeding season, four records were made of single birds. Two of which occurred at HVP 1 in April and May 2023, and two further records occurred at HVP 18: Shanacrane in July 2023, which is situated c.0.82km to the south-east of the Proposed Development.

During the Year 5 hinterland surveys, lone individuals were recorded five times from HVPs 1, 9 (0.99km north-west of the Site), 18, and twice at 19 (3.19km north-east of the Site).

7.3.3.4.2 Chough

Chough were recorded during surveys throughout the five-year survey period. The majority of records occurred outside of the 500m buffer zone, to the north-west of the Site. Records were also recorded to the south-east outside of the Proposed Development, where successful breeding has been observed. Within the Site, no breeding, nesting or behaviours were detected. Of the few records that occurred within the 500m buffer zone, Chough were predominantly flying over / commuting through the Site.

Vantage Point Surveys: Summer Season (2020, 2021, 2022, 2023, and 2024)

Across all five breeding season surveys, 23 records of Chough were observed. Of which, four records occurred within the 500m buffer zone surrounding the turbines. The remaining 19 records predominantly occurred to the north-west of the study area, outside of the red-line boundary of the Site. These observations indicate that Chough primarily use the habitats outside of the 500m buffer zone, to the north-west of the Site, and predominantly commute or fly over grassland outside of this 500m buffer zone.

Five records occurred in summer 2020, the only observation in flight was of four individuals flying low (<25m in height) outside of the 500m buffer zone.

During the 2021 summer season, two records of Chough were made; both of which were outside of the 500m buffer zone. Two individuals were recorded over VP1 in August 2021 outside of the study area, and a flock of 16 Chough were recorded in an agricultural field to the north-west of the Site in July 2021. No flight activity within 500m of the turbines were reported during this season.

Seven records of Chough were noted during the 2022 breeding season, 5 of which were visual and one of which was auditory only. One record occurred within the 500m buffer zone, which comprised a flock of 9 birds flying along the north-western edge of the 500m buffer on 12th July 2022. The remaining five records occurred outside of the 500m buffer zone to the north-west of the Site, and were all observed from VP 2 in May 2022, July 2022 and September 2022. These records involved Chough observed alone and in flocks of up to 59 individuals, and comprised both adults and juveniles feeding.

During the 2023 survey season, Chough were observed on six occasions, one of which was a call record only. Two of these records occurred within the 500m buffer zone. In June 2023, a flock of five birds were observed flying over the 500m buffer zone, and in July 2023, a flock of four birds were observed flying over the 500m buffer zone. The remining four records occurred outside of the 500m zone, to the north-west of the Site.

During the 2024 breeding season, three records of Chough were made. Of which, only one record occurred within the 500m buffer zone whereby two individuals were observed perched in the grass c. 120m from Turbine T3.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Chough were recorded a total of 28 times across all five wintering seasons. Of which, eight observations occurred within the 500m buffer zone. The remaining 20 records occurred outside of the Site, predominantly to the north-west of the buffer zone. These observations indicate that Chough primarily use the habitats outside of the 500m buffer zone, to the north-west of the Site, and predominantly commute or fly over grassland outside of this 500m buffer zone.

During the 2019/20 winter season, seven records of Chough were made. Of which, only one occurred within the 500m buffer zone, whereby two individuals were sighted at VP 1 in February 2020 flying low (0-10m). All other records occurred outside of the buffer zone. In December 2019, the same two individuals were recorded on three occasions at VP 2 and were reported flying low (0-10m) outside of the buffer zone. In November 2019 and January 2020, surveyors heard Chough calls from VP 2 however the calls were reported outside of the 500m buffer zone.

Six records of Chough were reported during the 2020/21 winter season, four of which were call only. The two visual records occurred on 8th March 2021, and were outside of the buffer zone.

During the 2021/22 winter season, Chough was recorded once. This record occurred within the 500m buffer zone, and comprised one individual flying low (0-10m) from the centre / north of the study area in a north-easterly direction from VP 1.

During the 2022/23 survey season, Chough were recorded on six occasions. Two of which occurred within the 500m buffer zone. On 28th November 2022, two birds were identified on the track leading to VP 2, and on 28th January 2023, three birds were observed flying from heath habitats in the northern section of the Site. The remaining four records occurred outside of the 500m buffer zone, and comprised sightings from VP1 on November 28th 2022 and January 28th 2023, and from VP 2 on January 31st 2023, February 21st 2023, March 6th 2023, and March 18th 2023. All records comprised Chough alone or in small groups of two to three birds flying over, predominantly outside of and to the north-west of the Site.

During the 2023/24 winter season, eight records of Chough were made. Of which, four occurred within the 500m buffer zone.

Summer Walkover Surveys (2020, 2021, 2022, 2023, and 2024)

Across all five breeding seasons, Chough were observed on one occasion which occurred during the 2022 breeding season. In this case, three individuals were recorded flying within the

25-100m distance band. Chough were not observed during any other breeding season walkover surveys.

Winter Walkover Surveys (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)
No Chough were not observed during any of the winter walkover surveys.

Hinterland Surveys (2020, 2021, 2022, 2023, and 2024)
Chough were not recorded during the winter surveys for years 3, 4 or 5. However, a total of fifteen observations of this species across HVPs 5, 9, 16, 18 and 28, which are located c. 2.32km to the south-west, c. 0.99km north-west, c. 8km west, c. 0.82km south-east and 3.79km south-east of the Site, respectively.

Chough were recorded three times during the Year 1 hinterland surveys, two of which occurred in HVP 18: Shanacrane in December 2019 and June 2020, and one occurred in HVP 9: Gortloughra Valley in December 2019. Hinterland records indicate Chough nest near HVP 18, in Shanacrane.

During the Year 2 hinterland surveys, Chough were recorded six times. Two of which occurred at HVP 5: Cousane Gap. At this site, Chough were recorded roosting in the roof of a derelict house in December 2020. Two further records occurred at HVP 9: Gortloughra Valley. At this site, a Chough was observed with nesting material, which dictates breeding in the area. The remaining observations occurred at HVP 16: Mealagh Valley West during the 2021 breeding season.

Chough were recorded on two occasions during summer 2022 hinterland surveys. Five individuals, including two adults and three young were observed at HVP 5 (2.32km SW) on June 12th 2022, and two individuals were observed at HVP 28 (3.79km SE) on May 7th 2022. Three records of this species were made during summer 2023, all of which were noted on May 15th 2023 at HVP 5 (2.32km SW) and 16 (7.98km S). Each record found two birds in close proximity to a ruin and were considered to be breeding at both sites.

During the Year 5 surveys, Chough were recorded once, where six individuals were recorded in June 2024 at HVP 5.

7.3.3.4.3 Cormorant

Cormorant were recorded seven times across breeding and non-breeding season flight activity (VP) surveys. Over the course of the five-year survey period, only one record occurred within the 500m buffer zone, where two individuals were recorded flying through the Site. No breeding or foraging behaviour was detected within the Site. All other records recorded Cormorant on or near Lough Nambrackderg, c. 1.08km to the north of the Proposed Development. Cormorant were also recorded throughout the existing wider environment. However, no breeding was observed.

Vantage Point Surveys: Summer Season (2020, 2021, 2022, 2023, and 2024)
Few records of Cormorant were made across all five breeding flight activity surveys, whereby a total of three observations were recorded of a single bird either on or landing on Lough Nambrackderg, which is located c. 1.08km to the north of the Site. No observations were made during the 2023 or 2024 seasons.

During the 2020 summer season, one Cormorant was observed on Lough Nambrackderg from VP3 on May 9th 2020. No flight activity was observed.

During the 2021 summer season, one Cormorant was recorded on Lough Nambrackderg from VP3 on July 26th 2021. No flight activity was observed.

During the 2022 summer season, Cormorant were observed once, whereby one bird was recorded landing on Lough Nambrackderg on July 2nd 2022 from VP 3.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)
Cormorants were only recorded on four occasions across all five winter flight activity survey seasons, and no observations were made during the 2019/20, 2020/21 and 2023/24 seasons. All records indicate Cormorant were on or flying towards / from Lough Nambrackderg.

During the 2019/20, 2020/21, and 2023/24 winter seasons, no observations of Cormorant were made.

During the 2021/22 winter season, one Cormorant was observed from VP 3 on January 14th 2022, whereby one individual flew at 20-30m height in a northerly direction outside of the 500m buffer zone.

During the 2022/23 winter season, Cormorant were recorded on three occasions. Only one record occurred within the 500m buffer zone, where, on March 6th 2023, two individuals were sighted flying from the centre / west of the study area in a northerly direction. The remaining two records occurred outside of the 500m buffer zone, near Lough Nambrackderg, which is located c. 1.08km to the north of the Site

Summer and Winter Walkover Surveys (2020, 2021, 2022, 2023, and 2024; 2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Cormorant were not observed during any breeding or any winter season walkover surveys.

Hinterland Surveys (2020, 2021, 2022, 2023, and 2024)

Cormorant were recorded during every year of Hinterland surveys. They were sighted 134 times across the five years of surveys. Records primarily comprised of individuals, however flocks of up to 35 birds were also noted. Records occurred at HVPs 1, 2, 4, 6, 7, 10, 11, 12, 14, 20 and 29. HVP 14: Lough Nambrackderg was the closest to the site located 1.08km to the north.

7.3.3.4.4 Curlew

Curlew were recorded once throughout the five years of flight activity (VP) surveys, which occurred outside of the 500m buffer zone. There were no records of Curlew within the Proposed Development. However, Hinterland surveys indicate Curlew are present in the wider environment, predominantly 19.85km away near An Gearagh, but also at Lough Nambrackderg, c. 1.08km from the Site. No breeding behaviour was observed.

Vantage Point Surveys: Summer Season (2020, 2021, 2022, 2023, and 2024)

Curlew were only observed once across all five breeding flight activity survey seasons.
This record occurred during the 2020 summer season on July 12th 2020 from VP 3 where one individual was flying outside of the 500m buffer zone.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Curlew were not observed during any of the five winter flight activity survey seasons.

Summer and Winter Walkover Surveys (2020, 2021, 2022, 2023, and 2024; 2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Curlew were not observed during any breeding or any winter season walkover surveys.

Hinterland Surveys (2020, 2021, 2022, 2023, and 2024)

Curlew were observed during each year of hinterland surveys. During these surveys, Curlew were recorded on 35 occasions.

Curlew was noted on six occasions during the year 1 Hinterland surveys. Four of which occurred during the 2019/20 non-breeding season at HVP 1: An Gearagh, c. 19.85km from the Site. In December 2019, a flock of 51 Curlew were seen, and in January 2020 a flock of 37 Curlew were observed. During the summer season 2020 two observations of Curlew were made HVP 14: Lough Nambrackderg, c. 1.08km from the Site, both observations were from July 2020 of individual birds flying over the Lough.

During year 2 Curlew were observed on six occasions all at HVP 1: An Gearagh. Five occurred during the winter season and one in September 2021 with numbers ranging from 3 to 116 individuals.

During year 3 Curlew were observed on four occasions all at HVP 1: An Gearagh. Three occurred during the winter season and one in September 2021, with numbers ranging from 2 to 33 individuals. In year 4 the species was recorded eight times at an Gearagh, six in the winter and two in the summer. Curlew were also recorded twice on the same day at HVP 17: Toon Valley 14.48km north east of the development site.

During the Year 5 surveys, Curlew were recorded eight times. All of which occurred from HVP 1. Five of the eight records occurred during the 2023/24 winter season, and the remaining three records occurred during the 2024 summer season. The average flock size recorded comprised 37 individuals, however flocks of up to 168 birds were recorded. The flock sizes were smaller during the summer survey season.

7.3.3.4.5 Dunlin

Dunlin were recorded once during the flight activity (VP) surveys, where three birds were recorded within the 500m buffer zone in September 2020. This record indicates the individuals flew over the Site, and there is no evidence of foraging or breeding within the Proposed Development. Dunlin were not observed within the flight activity survey area on any other occasion. Hinterland surveys indicate this species are not present in the immediate wider environment, however there were records c. 19.85km from the Site at HVP 1: An Gearagh. Three records occurred at

Vantage Point Surveys: Summer Season (2020, 2021, 2022, 2023, and 2024)

During the 2020 summer season, Dunlin was noted once on September 11th 2020 from VP 1 where three birds were recorded flying at rotor-swept height (25-175m) within the 500m buffer zone. This species was not observed during any other summer flight activity survey across the entire five-year survey period.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

This species was not recorded during any of the winter flight activity surveys that were conducted during the five-year survey period.

Summer and Winter Walkover Surveys (2020, 2021, 2022, 2023, and 2024; 2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Dunlin were not observed during any breeding or any winter season walkover surveys.

Hinterland Surveys (2020, 2021, 2022, 2023, and 2024)

This species was recorded every winter over the 5-year period of Hinterland surveys (winter 2019/20 to winter 2023/24), and during 2 summers (Summer 2021 and 2022). Of the 24 total records only two occurred during the summer season both of which occurred in September 2021 and 2022 at HVP 1: An Gearagh. Twenty-two records occurred at HVP 1: An Gearagh with flocks of up to 305 birds present.

Two records occurred at HVP 17: Toon Valley 14.48km north east of the development site in January 2023 and February 2024 with flocks of 50 and 68 individuals recorded respectively.

7.3.3.4.6 Golden Plover

Golden Plover were predominantly observed during the non-breeding flight activity surveys, where flocks of up to 130 individuals were recorded. All records were of Golden Plover commuting, with no evidence of foraging, roosting or breeding made. Larger flocks of up to 1,054 individuals were recorded during Hinterland surveys, all of which occurred c. 19.85km from the Site at An Gearagh.

Vantage Point Surveys: Summer Season (2020, 2021, 2022, 2023, and 2024)

Golden Plover were not recorded during the 2020, 2022 or 2024 breeding season flight activity surveys. However, this species was observed during the 2021 and 2023 breeding season surveys. Three observations were made across the five-year survey period, all of which were within the 500m buffer zone.

During the 2021 breeding season, Golden Plover were recorded on two occasions. Both records occurred in April 2021, at rotor-swept height within the 500m buffer zone. One flock of 43 birds was recorded within the buffer, and another flock of 14 birds was recorded within the 500m buffer.

During the 2023 breeding season, one record of a flock of 30 birds was recorded at rotor-swept height for 20 seconds in the north-east section of the 500m buffer zone in April 2023.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)
Golden Plover were not recorded during the 2020/21 winter season. However, 38 records were made across the 2019/20, 2021/22, 2022/23 and 2023/24 winter seasons. A total of 22 occurred within or partially intersected the 500m buffer zone over the entire 5 year period, an average of 4.4 flights per season.

During the 2019/20 non-breeding season, Golden Plover were observed 18 times. Eight observations were recorded within the 500m buffer zone surrounding the turbine locations. During this season, Golden Plover were primarily sighted in groups of three to five, and flocks of 15-50. However, one large flock of 130 birds flying within the rotor-swept height band (25-175m) was recorded within the 500m buffer zone, in February 2020. Six flight lines occurred below 25m, and one flock of 15 birds was recorded at a height of >175m. The remaining birds recorded within the 500m buffer zone flew within the rotor-swept height band.

During the 2020/21 non-breeding season, Golden Plover were recorded five times. Three of which were recorded within the 500m buffer zone. One flock of 16 birds was observed flying near Turbine 4 in March 2021, and a pair were recorded flying south of T4 in January 2021. The three remaining records were call-only, however the surveyor indicated that one of these call-only records occurred near Turbine 4.

During the 2021/22 non-breeding season, this species was recorded in flocks of 21-26 birds on four occasions. Three of which intersected within the 500m buffer zone.

During the 2022/23 non-breeding season, Golden Plover were recorded three times. Two of which occurred within the 500m buffer zone, whereby flocks of 24-37 birds were observed flying.

During the 2023/2024 winter season, eight records of Golden Plover were made. Seven were recorded from VP3 and six of which occurred within the 500m buffer zone. Flocks of between 7 and 120 individuals were recorded during this season, with an average of 40 birds per flock.

Summer and Winter Walkover Surveys (2020, 2021, 2022, 2023, and 2024; 2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Golden Plover were not observed during any breeding or any winter season walkover surveys.

Hinterland Surveys (2020, 2021, 2022, 2023, and 2024)

This species was recorded 14 times during Years 2, 3, 4, and 5 of Hinterland surveys (winter 2020/21 to winter 2023/2024). The most recent surveys indicate a large number of individuals occur at HVP 1, c. 19.85km from the Site, as flocks of up to 1,054 individuals were detected.

During the Year 2 surveys, this species was recorded five times. All five records originated from HVP 1: An Gearagh during the 2020/21 non-breeding season, and comprised flocks of eight to 132 birds.

During the Year 3 and 4 surveys, Golden Plover were recorded on nine occasions, all of which occurred at HVP 1. Records from the 2021/22 non-breeding season recorded individuals and flocks of up to 167 birds. During the 2022/23 non-breeding season, large flocks were primarily sighted with flocks between 550 and 1,054 birds being recorded at HVP 1. In April 2023, one record of 94 birds was recorded.

During the Year 5 surveys, this species was recorded once in November 2023, with 450 individuals were recorded at HVP 1.

7.3.3.4.7 Great Black-backed Gull

Great Black-backed Gull were recorded five times during flight activity surveys, two of which occurred within the 500m buffer zone. All records indicate this species was flying over / commuting through the Site, and no evidence was recorded of foraging, roosting or breeding. This species was not recorded during any other survey.

Vantage Point Surveys: Summer Season (2020, 2021, 2022, 2023, and 2024)

Great Black-backed Gull were recorded during the 2022 breeding season. During this season, one record of this species was made whereby one adult was observed flying 10-20m in height to the north of the Site, at Lough Nambrackderg, outside of the 500m buffer zone.

Additionally, during the 2022 spring migration flight activity surveys, this species was observed twice. Both of which occurred from VP 3 in April 2022. One record occurred outside of the 500m buffer zone on Lough Nambrackderg, whilst the other observed two individuals flying at rotor-swept height within the 500m buffer zone.

This species was not recorded during any other survey across the five-year survey period. As such, there are only three records of this species – two of which occurred at Lough Nambrackderg, c. 1.08km to the north of the Site, outside of the 500m buffer zone, and one of which occurred within the 500m buffer zone.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

This species was only recorded during the 2023/24 winter season, where two records of Great Black-backed Gull were made. One of which occurred at rotor-swept height, within the 500m buffer zone

Summer and Winter Walkover (2020, 2021, 2022, 2023, and 2024; 2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Great Black-backed Gull were not observed during any breeding or any winter season walkover surveys.

Hinterland Surveys (2020, 2021, 2022, 2023, and 2024)

The species were recorded during each of the last four years of Hinterland surveys. They were sighted 20 times across the five years of surveys. Records primarily comprised of individuals, however flocks of up to 4 birds were also detected. Records occurred at HVPs 1 and 12 (Lough allua 6.19 km north east). Sixteen recorded occurred at HVP 1 while four occurred at HVP 12.

7.3.3.4.8 Greenland White-fronted Goose

There was no records of this species at the proposed development site over the five years of surveys. This species was only recorded during the 2021/22 and winter 2020/21 non-breeding season hinterland surveys. All of which occurred at HVP 17, which is located c. 14.48km to the north-east of the Site. Each of the eleven records comprised single birds, four of which were juveniles.

7.3.3.4.9 Grey Heron

Grey Heron were observed 13 times across the five-year survey period. A total of 11 of these records occurred outside of the 500m buffer zone, near Lough Nambrackderg, which is situated c. 1.08km from the Site. Hinterland surveys dictate that Grey Heron are present in the wider environment.

Vantage Point Surveys: Summer Season (2020, 2021, 2022, 2023, and 2024)

Grey Heron were observed eight times across the five-year survey period. However, only two of these records intersected the 500m buffer zone. The remaining records occurred outside the buffer and predominantly associated with Lough Nambrackderg, c. 1.08km from the Site.

During the 2020 breeding season, no flight activity was observed. However, one individual was recorded on the shore of Lough Nambrackderg in July and August 2020.

During the 2021 breeding season, this species was recorded once, where one individual was recorded on the shore of Lough Nambrackderg.

During the 2022 breeding season, three records of Grey Heron were made. All bar one of which occurred outside of and to the north of the 500m buffer. One record on the 28th of June 2022 was of a single bird flight which intersected the 500m buffer.

During the 2023 breeding season, a single observation of a Grey Heron was made, consisting of a lone individual recorded intersecting of the 500m buffer zone.

During the 2024 breeding season, one Grey Heron was recorded. This occurred outside of the 500m buffer zone.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

This species was recorded five times across the five-year survey period and was primarily associated with the Lough Nambrackderg, c. 1.08km from the Site

During the 2019/20 non-breeding season, Grey Heron was observed on one occasion, where one individual was recorded on the shore of Lough Nambrackderg in December 2019.

During the 2021/22 non-breeding season, one record of this species was made of one individual sighted flying up to 20m in height outside of and to the north of the 500m buffer zone near Lough Nambrackderg.

During the 2022/23 non-breeding season, two observations of Grey Heron were made. Both of which were outside of the 500m buffer zone.

During the 2023/24 winter season, one Grey Heron was recorded. This occurred outside of the 500m buffer zone.

Summer and Winter Walkover Surveys (2020, 2021, 2022, 2023, and 2024; 2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Grey Heron was not observed during any breeding or winter season walkover surveys.

Hinterland Surveys (2020, 2021, 2022, 2023, and 2024)

Grey Heron was observed every season throughout all five years of Hinterland surveys. A total of 177 records occurred across the survey period. Records primarily comprised of individuals, however flocks of up to 12 birds were also detected. Records occurred at HVPs 1, 2, 3, 4, 7, 10, 11, 12, 14, 17, 20, 23 and 29. HVP 14: Lough Nambrackderg was the closest to the site located 1.08km to the north

7.3.3.4.10 Grey Wagtail

This species was recorded five times across the entire five-year survey period.

During the breeding bird transects, this species was recorded on three occasions during the 2020 breeding season. During the 2021 breeding season, one record of Grey Wagtail was made whereby one individual was observed flying between 0-25m from the surveyor in June 2021.

During the hinterland surveys the species was recorded during every season of surveys across 17 different hinterland sites.

7.3.3.4.11 Hen Harrier

Hen Harrier were recorded very infrequently across summer and winter flight activity surveys. These records consisted of both adults and juveniles recorded within the 500m buffer zone. However, no breeding behaviour or Hen Harrier roosts were observed within the Site. Records indicate Hen Harrier within the buffer zone were very infrequently observed commuting through the Site, and hunting.

Vantage Point Surveys: Summer Season (2020, 2021, 2022, 2023, and 2024)

Hen Harrier were observed on three occasions during the five-year survey period, with records both inside and outside of the 500m buffer zone, and records of adults and juveniles flying, commuting, hunting and circling within the Site. This species was not observed during the 2021 or 2024 breeding seasons.

During the 2020 breeding season, one record of this species was made. This record observed a ringtail (juvenile) flying within the 500m buffer zone at a rotor-swept height (25-175m) near Turbine 1, where it was seen commuting, hunting, cruising and circling.

During the 2022 breeding season, Hen Harrier was recorded on one occasion. This recorded comprised a single female hunting outside of the 500m buffer zone, along the northern edge of this study area in September 2022.

During the 2023 breeding season, one record of this species was made whereby a ringtail (juvenile) was observed in the centre / west of the 500m buffer zone, flying at a height band of 0-10m in August 2023.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

This species was recorded eight times during the five-year survey period. No evidence of winter roosting was recorded over the five-year period.

During the 2019/20 winter season, Hen Harrier were recorded on three occasions. Two of which occurred within the 500m buffer zone, consisting of a ringtail (juvenile) recorded calling and flying between 10-20m height and commuting over rough grassland and heath near Turbines 5 and 6 in January 2020, and one adult individual recorded circling close to Turbine 1 and heading towards Turbine 4 at a rotor-swept height (25-175m) in March 2020.

During the 2020/21 winter season, one individual was recorded. This record occurred outside of the 500m buffer zone, whereby one male was observed hunting to the north of the Site and flying below 10m.

During the 2021/22 winter season, one observation of Hen Harrier was made of a single male hunting outside the 500m buffer zone to the north-west of the study area up to 20m in height.

During the 2023/24 winter season, three records were made. Two of which occurred within the 500m buffer zone. Both of these records comprised one individual flying low (<20m) in October 2023.

Summer Walkover Surveys (2020, 2021, 2022, 2023, and 2024)

This species was not observed during any breeding season walkover survey.

Winter Walkover Surveys (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

During the 2019/20 non-breeding season, Hen Harrier were recorded on one occasion. This record comprised one individual flying in March 2020. No other records of Hen Harrier were made during any other winter walkover survey.

Hinterland Surveys (2020, 2021, 2022, 2023, and 2024)

Hen Harrier were only observed during the Year 2 surveys in December 2020 and February 2021. This species was not recorded during any other Hinterland survey across the five years of surveys.

During Year 2 surveys, Hen Harrier were recorded on four occasions. The first record comprised a male Hen Harrier hunting at HVP 9: Gortloughra Valley in December 2020, which is situated 0.99km to the north-west of the Site, a second record comprised a male flying across a road near HVP 25: Togher, c. 4.33 km from the Site. There were also two records of Hen Harrier in December 2020 at HVP 5 Cousan Gap 2.32km to the southwest.

7.3.3.4.12 Kestrel

Kestrel were recorded relatively frequently throughout the five-year survey period. The majority of which occurred during the breeding season. A little over half of these records intersected the 500m buffer zone, and consisted of Kestrel hunting throughout the study area. However, no breeding or roosting behaviours were observed. Hinterland surveys indicate Kestrel are also present within the wider environment.

Vantage Point Surveys: Summer Season (2020, 2021, 2022, 2023, and 2024)

Kestrel was recorded 102 times across the five breeding seasons. A total of 51 flightlines intersected the 500m buffer zone, and hunting behaviours were observed on numerous occasions. Kestrel activity within the site primarily occurred in the north of the buffer zone, where the majority of the hunting behaviour was recorded.

During the 2020 breeding season, Kestrel were recorded on 10 occasions. Three occurred within the 500m buffer zone. Two of which comprised one individual flying at rotor-swept height.

During the 2021 breeding season, Kestrel were observed 18 times. Of which, one record was call-only and 17 flight lines were recorded. 12 flight lines occurred within the 500m buffer, and the remaining records occurred outside of the 500m buffer. Kestrel were observed hunting on 13 occasions, nine of which occurred within the 500m buffer zone. Of the flight lines that occurred within the 500m buffer zone, Kestrel were recorded to fly between 10m and 185m in height.

During the 2022 breeding season, 22 records of this species were made from every VP between June and September 2022. Of which, 11 records occurred within the 500m buffer zone, where groups of 1-3 individuals were hunting in the north / north-west of the 500m buffer zone. One record sighted a male Kestrel interacting with a Sparrowhawk in August 2022.

During the 2023 breeding season, 26 records of this species were made. Of which, 14 records occurred within the 500m buffer zone. Observations primarily recorded this species alone or in numbers of two to four individuals. Hunting behaviour was detected across all 26 records.

During the 2024 breeding season, Kestrel were recorded on 26 occasions. Of which, 11 records occurred within the 500m buffer zone. Ten of these records comprised a lone individual, and one record comprised of two birds. The majority of these records observed Kestrel hunting within or near the Site.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)
Kestrel were recorded a total of 32 times during the non-breeding season flight activity surveys, Of which, 18 occurred within the 500m buffer zone, and hunting and commuting behaviours observed.

During the 2019/20 winter season, Kestrel were observed on seven occasions. Two of which recorded Kestrel flying at rotor-swept height within the 500m buffer zone. Both records observed Kestrel hunting over heath habitats. The remaining eight records indicated Kestrel were flying and hunting outside of the 500m buffer zone.

During the 2020/21 non-breeding season, Kestrel were recorded six times. Three of which occurred outside of the 500m buffer zone, and comprised lone individuals hunting to the north of the Site. The remaining three records occurred within the 500m buffer zone. Regarding the records within the 500m buffer, one pair was recorded in October 2020 flying between Turbines 3 and 4 at heights of up to 10m. Additionally, a lone individual was recorded hunting near Turbines 1 and 2 and flying at heights of 20-50m in October 2020. The final flight line that was recorded within the 500m buffer zone comprised a lone individual flying at heights of 10-20m.

During the 2021/22 non-breeding season, this species was recorded seven times. Six of these were of lone individuals hunting across the centre of the 500m buffer zone.

During the 2022/23 non-breeding season, Kestrel were recorded on four occasions. Three which occurred within the 500m buffer zone, where Kestrel were recorded flying over and hunting in the north-west and towards the south-west of the 500m buffer zone.

During the 2023/24 winter season, Kestrel were observed eight times. Of which, four occurred within the 500m buffer zone. Two of these records observed Kestrel flying within the site, and two other records recorded one individual hunting.

Summer Walkover Surveys (2020, 2021, 2022, 2023, and 2024)

Kestrel were recorded on three occasions during the 2022 breeding season. Each of the three records comprise one individual flying. Kestrels were not observed during any other breeding season walkover survey.

Winter Walkover Surveys (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

During the 2019/20 non-breeding season, Kestrel were recorded on one occasion. This record comprised one individual flying in March 2020. During the 2023/24 winter season, a single Kestrel was observed. No other records of Kestrel were made during any other winter walkover survey.

Hinterland Surveys (2020, 2021, 2022, 2023, and 2024)

Hinterland surveys across all five seasons dictate that Kestrel are present in the surrounding hinterland, as records suggest Kestrel are both flying through and hunting in these habitats.

During the Year 1 hinterland surveys, Kestrel were recorded on seven occasions. One record occurred during the 2019/2020 non-breeding season, where one individual was recorded at HVP 12: Lough Allua in December 2019. The remaining six records occurred during the 2020 breeding season. Most of these summer sightings (three) occurred at HVP 9: Gortloughra Valley, where single birds were recorded. Two of which observed Kestrel hunting over heath and bog habitats. The remaining three records occurred in HVP 5: Cousane Gap, HVP 15: Mealagh Valley East, and HVP 16: Mealagh Valley West.

Kestrel were recorded eight times during the Year 2 surveys. Of which, two observations occurred at HVP 19: Shehymore East, and one comprised a male hunting. A further three records were made at Hinterland site 16: Mealagh Valley West, two records were recorded at HVP 12: Lough Allua, and one record was made at HVP 7: Cullenagh Lake.

During the Year 3 and 4 surveys, Kestrel were recorded on 16 occasions. Three of which occurred during the 2021/22 non-breeding season, nine of which occurred during the 2022 breeding season, three occurred during the 2022/23 non-breeding season, and one during the 2023 breeding season. All records involved one individual, and occurred across a number of HVPs, namely HVP 1, 9, 12, 16, 18, 19, and 28.

During the Year 5 surveys, six observations of Kestrel were made. Four observations were made during the 2024 summer season. Two individuals were sighted at HVP 9, and the remaining five records comprised lone individuals at HVP 9 and HVP 19.

7.3.3.4.13 Lesser Black-backed Gull

Lesser Black-backed Gull was recorded primarily during the breeding season flight activity surveys. Most of which occurred outside of the Proposed Development, near Lough Nambrackberg (1.08km from the Site). However, six records were made within the 500m buffer zone, where birds were recorded flying through the Site. No foraging, roosting or breeding behaviours were observed within the site. Hinterland surveys recorded this species is present in the wider environment, particularly c. 19.85km from the Site at An Gearagh, where flocks of up to 347 individuals were recorded.

Vantage Point Surveys: Summer Season (2020, 2021, 2022, 2023, and 2024)

Lesser Black-backed Gull were observed 26 times throughout the five-year survey period. Six records occurred within the 500m buffer zone, and the remaining 20 records occurred outside of the 500m buffer zone on or near Lough Nambrackderg.

During the 2020 breeding season, this species was recorded 6 times, only five of which recorded in flight. Of these only one record occurred within the 500m buffer zone. This record comprised one individual flying within the rotor-swept height band near Turbine 2 in June 2020. The remaining records occurred outside of the 500m buffer zone.

During the 2021 breeding season, Lesser Black-backed Gull were recorded eight times. Flight activity was observed seven times, with the eight record comprising an observation of a single gull on the shore of Lough Nambrackderg (no flight activity). Three records occurred within the 500m buffer zone, consisting of one bird in flight at a height of 30-50m near Turbine 6 in June 2021, one individual flying up to 30m in height near Turbine 1 in June 2021, and one bird at a height of 20-50m near Turbine 1 in June 2021. All other observations occurred outside of the 500m buffer zone, to the north of the Site.

During the 2022 breeding season, five observations of this species were made. All of which occurred outside of the 500m buffer zone, and were primarily concentrated around Lough Nambrackderg in small numbers of 1-2 individuals.

During the 2022 spring migration survey, two observations were made of Lesser Black-backed Gulls outside of the 500m buffer zone.

During the 2023 breeding season, two observations were made. On both occasions, one individual was recorded flying outside of the 500m buffer zone.

During the 2024 breeding season, two records of this species were made. Both of which occurred at rotor-swept height within the 500m buffer zone. In May 2024, four individuals (two adults, two immature birds) were recorded, and in June 2024, a single bird was observed flying into the northern portion of the Site.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Lesser Black-backed Gull was only observed during the 2019/20 non-breeding season. During this season, two birds were recorded outside of the 500m buffer zone. This species was not recorded during any other winter season flight activity survey across the five-year survey period.

Summer and Winter Walkover Surveys (2020, 2021, 2022, 2023, and 2024; 2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Lesser Black-backed Gull were not observed during any breeding or any winter season walkover surveys.

Hinterland Surveys (2020, 2021, 2022, 2023, and 2024)

Lesser Black-backed Gull were recorded during every year of Hinterland surveys. They were sighted 81 times across the five years of surveys. Records primarily comprised of individuals, however flocks of up to 347 birds were also detected. Records occurred at HVPs 1, 2, 3, 4, 6, 7, 9, 11, 12, 14, 16, 17 and 29. HVP 9: Gortloughra Valley and HVP 14: Lough Nambrackderg were the closest to the site located 0.99km northwest and 1.08km to the north of the site respectively.

7.3.3.4.14 Little Egret

Little Egret was recorded once during the winter 2023/24 flight activity surveys, which comprised of one individual flying outside of the 500m buffer zone. No other observations of Little Egret were made during any of the other surveys within the site, across the five-year survey period.

7.3.3.4.15 Mallard

Mallard were observed across various surveys. However, there were no records of this species occurring within the flight activity survey area. All records indicate Mallard habituate Lough Nambrackderg, c. 1.08km from the Site, and do not fly through or use the habitats within the red line boundary of the Proposed Development.

Vantage Point Surveys: Summer Season (2020, 2021, 2022, 2023, and 2024)

Mallards were recorded 11 times during the summer flight activity surveys. However, the observations recorded during the breeding seasons indicate that this species did not regularly use the habitats within the Site, but rather were more commonly found on or near Lough Nambrackderg, c. 1.08km from the Site.

During the 2020 breeding season, this species was recorded on two occasions. Both of which occurred on Lough Nambrackderg in April and May 2020. In April 2020, a pair was sighted.

During the 2021 breeding season, Mallard was observed once, where a lone male was flushed en route to VP3 in May 2021.

During the 2022 breeding season, there were three records of this species on Lough Nambrackderg, outside of the 500m buffer zone.

During the 2023 breeding season, two records of this species were made outside of the 500m buffer zone.

During the 2024 breeding season, three records of Mallard were made. All of which occurred outside of the 500m buffer zone, near Lough Nambrackderg.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Similar to the breeding season surveys, the winter season flight activity surveys indicate that there are Mallard within the surrounding environment. However, they do not use the habitats within the Proposed Development and are more likely to be found on or near Lough Nambrackderg.

During the 2019/20 non-breeding season, Mallard was observed twice, whereby two pairs were recorded on Lough Nambrackderg in March 2020.

During the 2020/21 non-breeding season, five records of Mallard were made and all records occurred outside of the 500m buffer zone on Lough Nambrackderg, and sightings primarily consisted of pairs.

During the 2021/22 non-breeding season, Mallard were recorded on Lough Nambrackderg outside of the 500m buffer zone on two occasions.

This species was not recorded during the 2022/23 winter season.

During the 2023/24 non-breeding season, two records of Mallards were made on the ground outside of the 500m buffer zone.

Summer and Winter Walkover Surveys (2020, 2021, 2022, 2023, and 2024; 2019/20, 2020/21, 2021/22, 2022/23, 2023/24)
Mallard were not observed during any breeding or winter season walkover surveys

Hinterland Surveys (2020, 2021, 2022, 2023, and 2024)
Mallard are evident in the surrounding hinterland, as 213 records of up to 200 birds were recorded at a multitude of HVPs across all five seasons of Hinterland surveys.

Mallard were recorded during every year of Hinterland surveys. Records occurred at HVPs 1, 2, 3, 4, 7, 10, 11, 12, 14, 17, 20, 28 and 29. HVP 14: Lough Nambrackderg was the closest to the site located 1.08km to the north.

7.3.3.4.16 Meadow Pipit

Meadow Pipit were recorded during all five years of breeding and winter walkovers, as well as the latest year of flight activity surveys (summer 2024, and winter 2023/24).

Summer Walkover Surveys (2020, 2021, 2022, 2023, and 2024)
Meadow Pipit were observed during the summer walkover surveys. A total of 42 observations were made across this five-year survey period with records of lone individuals and flocks of up to 14 birds at the Site. These records indicate Meadow Pipit are using the Site and surrounding environment and regularly fly within the rotor-swept height band.

During the 2020 breeding season, this species was recorded on 13 occasions, with records of comprising of individuals to flocks of up to 10 birds.

During the 2021 breeding season, Meadow Pipit were observed on three occasions in flocks of three to 14 birds

During the 2022 breeding season, this species was recorded on eleven occasions in flocks of one to ten birds.

During the 2023 breeding season, seven records of Meadow Pipit were made. Each record comprised individuals or flocks of up to ten birds.

During the 2024 breeding season, Meadow Pipit were observed on eight occasions,

Winter Walkover Surveys (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)
Meadow Pipit were recorded on 26 occasions. Each record comprised individuals or flocks of up to 16 birds.

During the 2019/20 non-breeding season, Meadow Pipit were recorded in flocks of up to 16 individuals on nine occasions.

During the 2020/21 non-breeding season, eight records of this species were made. Each record comprised individuals or flocks of up to three birds.

During the 2021/22 non-breeding season, Meadow Pipit were recorded on four occasions with records of individuals or flocks of up to six birds.

During the 2022/23 non-breeding season, five records of Meadow Pipit were made of individuals or flocks of up to eleven birds.

During the 2023/24 winter season, Meadow Pipit were recorded three times, with one to two birds recorded.

7.3.3.4.17 Mediterranean Gull

During the 2023 breeding season, one individual was recorded in June 2023 at HVP1 c. 19.85km to the north-east of the Proposed Development. No other record of this species was made during any of the surveys, across all five survey seasons.

7.3.3.4.18 Merlin

Merlin were only recorded on three occasions during the five-year survey period. All three records occurred outside of the 500m buffer zone during the 2019/20 and 2023/23 winter seasons. No records of hunting or breeding were made. Merlin were not recorded during any other survey, including targeted Merlin surveys. This evidence indicates Merlin are not present within the Site, and are not well established in the wider environment.

Vantage Point Surveys: Summer Season (2020, 2021, 2022, 2023, and 2024)

During the summer season flight activity surveys across the entire five-year survey period, Merlin were not observed.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

During the 2019/20 winter season, Merlin were recorded on two occasions. Both records occurred outside of the 500m buffer zone, where a Merlin was observed on a fence post flying into a plantation in December 2019, and another Merlin was recorded flying low in March 2020.

During the 2023/24 non-breeding season, a single Merlin was observed outside of the buffer zone in February 2024.

Merlin were not recorded during any of the other winter flight activity surveys across the five-year survey period.

Summer and Winter Walkover and Hinterland Surveys (2020, 2021, 2022, 2023, and 2024; 2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Merlin were not observed during any breeding or winter season walkover or hinterland surveys.

Merlin Survey (2020)

No Merlin or signs of Merlin were recorded during the dedicated Merlin surveys that were conducted during the 2020 breeding season. Merlin were not observed across any other survey conducted during breeding seasons.

7.3.3.4.19 Peregrine

Peregrine were recorded infrequently across the five-year survey period, the predominantly brief observations consisted of Peregrine (adults and juveniles) flying over and hunting within the 500m buffer zone. However, no breeding behaviour was observed within the Site over the five year period. Hinterland surveys indicate Peregrine are present in the wider environment.

Vantage Point Surveys: Summer Season (2020, 2021, 2022, 2023, and 2024)

Peregrine were recorded a total of 13 times across the five-year survey period, either individually or in pairs. Twelve of these observations intersected the 500m buffer zone. Records consisted of both adults and juveniles. However, no breeding activity was recorded.

During the 2020 breeding season, Peregrine were recorded on seven occasions, either individually or in pairs. One record comprised two individuals perched near the ridge. The remaining observations were recorded within the 500m buffer zone. One record observed a pair of Peregrine commuting from behind the ridge at the centre of the site, and another recorded a lone individual soaring above 185m around Turbine 2. The remaining five records observed Peregrine flying within the height band 25-185m, and most of the flight lines were concentrated around Turbines 5, 6 and 9.

During the 2021 breeding season, the species was recorded twice. On one occasion, this species was recorded within the 500m buffer zone, whereby one individual was recorded flying between 100-185m in height near Turbine 2. The second record comprised a juvenile flying between 20-30m in height outside of the buffer zone.

During the 2022 breeding season, there was one record of a lone bird briefly soaring (180 seconds) within the 500m buffer zone.

During the 2023 breeding season, Peregrine were recorded once, where one individual was recorded flying over the Site, at rotor-swept height within the 500m buffer zone.

During the 2024 breeding season, this species was recorded twice. Both records occurred within the 500m buffer zone, where a single individual flew along the centre of the site June 2024, and a pair were recorded calling c. 100m west of Turbine T8 in July 2024.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Peregrine were recorded eight times during the winter season flight activity surveys, five of which intersected the 500m buffer zone, and were within the height band 25-185m (an average of one record per season). There were no records of the species during 2 winter seasons (2019/20 and 2021/22).

During the 2020/21 winter season, this species was observed five times and all observations were of lone individuals. Three of which occurred within the 500m buffer zone, near Turbines

1, 2 and 3. Birds flew at a height of 10-20m, 30-50m and 30-185m in height. The remaining two records occurred outside of the 500m turbine buffer to the north of the Site.

During the 2022/23 non-breeding season, a single observation of Peregrine was made. This record comprised one individual flying from the centre / north of the 500m buffer zone in a westerly direction between 30 – 100m for 76 seconds.

During the 2023/24 winter season, two records of Peregrine were made. Of which, one record occurred within the 500m buffer zone where a single bird was observed flying over the site between Turbines T1 and T2 predominantly below 20m in height.

Summer Walkover Surveys (2020, 2021, 2022, 2023, and 2024)

During the 2021 breeding season, Peregrine was recorded on one occasion. In June 2021, one individual was observed in flight. This species was not recorded during any other summer walkover survey.

Winter Walkover Surveys (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

During the 2020/21 non-breeding season, Peregrine was recorded on one occasion. This observation comprised one individual flying in October 2020. This species was not recorded during any other winter walkover survey.

Hinterland Surveys (2020, 2021, 2022, 2023, and 2024)

Peregrine were recorded across all five years of Hinterland surveys, except for Year 4 (winter 2022/23 to summer 2023). Records indicate both juveniles and adults are present in the surrounding hinterland habitats, and hunting was recorded on two occasions.

Peregrine were recorded twice during Year 1 Hinterland surveys. Both records occurred in September 2020. The first of which was recorded at HVP 15: Mealagh Valley East, where a juvenile was observed eating prey items, and the second record occurred at HVP 20: Ship Lough.

During the Year 2 surveys, Peregrine was recorded once, which occurred at HVP 1: An Gearagh where one individual was recorded on the ground with prey in October 2020.

During the Year 3 surveys, two individuals were recorded on two occasions at HVP 17 (14.48km north east) in November 2021.

During the Year 5 surveys, Peregrine were observed on a single occasion in December 2023 at HVP 1.

7.3.3.4.20 Red Grouse

Red Grouse were recorded 11 times during VPs throughout the five-year survey period. Most records occurred outside of the 500m buffer zone. However, this species was sighted or heard within the Site, and both males and females were observed commuting through the Site. The study is considered to hold one pair inside the 500m buffered site and one outside the buffer.

Vantage Point Surveys: Summer Season (2020, 2021, 2022, 2023, and 2024)

No evidence of this species was found during the 2021, 2023 or 2024 breeding season surveys. Red Grouse were recorded three times across the 2020 and 2022 breeding seasons. These surveys indicate both males and females are present in the area, and commute through the habitat. Two of the three records occurred within the 500m buffer zone.

During the 2020 breeding season, Red Grouse were recorded on two occasions all on the 17th of April 2020. Both of which occurred within the 500m buffer zone in April 2020, and were observed c. two minutes apart. On 17th April 2020, one male was observed flying low within the north-eastern portion of the 500m buffer zone. Two minutes later, a single female was recorded flying low in the same area in close proximity to the flight path of the male bird. Red Grouse was heard calling at VP3 on 17th April 2020.

During the 2022 breeding season, Red Grouse were recorded on one occasion. This record comprised two individuals that were flushed. This record also occurred outside of the 500m buffer zone.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Red Grouse were observed eight times across the five-year survey period. However, only two observations occurred within the 500m buffer zone.

During the 2019/20 non-breeding season, this species was recorded on three occasions. Two of which comprised observations of birds in flight. However, only one record occurred within the 500m buffer zone. This record observed one individual near Turbine 2 that was flushed, and then flew low (<25m in height) over heath habitat. The other sighting occurred outside of the 500m buffer zone to the north of the Site in December 2019, and the final record was call-only and appeared to be located to the south-west of VP 3.

During the 2020/21 non-breeding season, Red Grouse was heard calling in March 2021.

During the 2021/22 non-breeding season, a single call-only record of this species was made.

During the 2022/23 season, this species was recorded twice in October and December. Both of which were call-only records and were noted in the north of the study area.

No records were made during the 2023/24 winter season. However, during the extra migration VP surveys that were carried out in Winter 2023/24, one Red Grouse was heard calling from VP3 on the 25th of October 2023.

Summer Walkover Surveys (2020, 2021, 2022, 2023, and 2024)
During the 2020 breeding season, one individual was recorded flying in May.

Winter Walkover Surveys (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)
During the 2022/23 non-breeding season, Red Grouse were recorded on three occasions. Each record comprised of between one and three birds. Two birds were recorded along Transect 1 on the 28th of January 2023. 3 birds were recorded along transect 2 on the 17th of November 2022 and 1 bird was recorded along the same transects later than season on the 27th of March 2023. This species was not recorded during any other winter walkover survey.

Hinterland Surveys (2020, 2021, 2022, 2023, and 2024)
Red Grouse were not found during any of the Hinterland surveys.

Red Grouse Survey (2022)
During the 2022 Red Grouse surveys, there were two sightings of Red Grouse. The first sighting observed a male individual, and a second individual that was likely a female, located approximately 500m south west of T1 outside the development footprint.; whilst the second sighting consisted of a male and female approximately 390m south east of T2.

7.3.3.4.21 Redwing

Redwing have been recorded 13 times across the five years of surveys. All of which pertain to VP surveys, exclusively during the winter season. Eight of the observations were made at VP 2, four of them were made at VP 3, and the remaining observation was recorded at VP 1. The majority of records (six) were made during the 2020/21 winter season, however one was also recorded during the 2019/20 winter season, one during the 2021/22 season, two during the

2022/23 season, and three during the latest 2023/24 winter season. This species was not recorded during any other survey.

7.3.3.4.22 Ruff

Ruff was observed on five occasions during hinterland surveys only. Three of these records occurred during the 2022/23 winter season. Of the three records during this winter season, one record observed four birds at HVP 1, and two records were of one bird at HVP 17. One record occurred during hinterland surveys the 2023/24 non-breeding season, where one individual was recorded at HVP 1. Another record occurred in September 2021 at HVP 1. This species was not recorded during any of the other surveys, across all five years of survey seasons.

7.3.3.4.23 Snipe

Snipe were observed primarily during the non-breeding season. However, the majority of records are located outside of the 500m buffer zone. Over the 5 years of breeding wader surveys the species was only recorded on one occasion. On the 13th of April 2021, 3 birds were heard calling in flight but not seen prior to sunrise along transect T2 within the site.

No other evidence of breeding was detected over the course of the five-year survey period. Hinterland surveys indicate this wader is present in the wider environment, particularly at An Gearagh, c. 19.85km from the Site.

Vantage Point Surveys: Summer Season (2020, 2021, 2022, 2023, and 2024)

Snipe were recorded five times across the 2020, 2021 and 2022 breeding seasons. Records indicate this species sometimes commutes and flies through the Site.

During the 2020 breeding season, Snipe were recorded three times. However, only one record observed flight activity whereby in September 2019, one individual was recorded flying near Turbine 1 within the rotor-swept height band and within the 500m buffer zone. The other two records did not observe any flight activity, as one was call-only, and the other record comprised one bird on the ground.

During the 2022 breeding season, one individual was recorded from VP 3, whereby a single bird was flushed en route to a VP.

During the 2022 spring migration surveys, one observation was made of a single bird flying up to 30m in height in the north-east section of the study area.

No records were made in 2023 or 2024.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Snipe were recorded 19 times across the 2019/20, 2020/21, 2021/22, and 2023/24 winter seasons. No evidence of Snipe was found during the winter 2022/23 surveys. However, the results of the earlier surveys indicate Snipe were present within the wider environment occasionally use the habitats within the Proposed Development.

During the 2019/20 non-breeding season, Snipe were recorded eight times. Seven of which did not observe flight activity, as one pair was observed in November 2019, three records of lone individuals on the ground were made, and a further three call-only records were made. The remaining record, the only flight-activity record, comprised one individual commuting low across heath habitats near Turbine 5 within the 500m buffer zone.

During the 2020/21 non-breeding season, Snipe was observed on seven occasions. Three of which occurred within the 500m buffer zone, however they were flushed en route to the VP.

During the 2021/22 non-breeding season, a single observation of Snipe was made. This record occurred from VP 3 in March 22 and comprised a single bird flying outside of the 500m buffer zone, towards Lough Nambrackderg.

During the 2023/24 winter season, three records of Snipe were made all in the month of January, with two occurring on the same day. None of these records occurred within the 500m buffer zone.

Summer Walkover Surveys (2020, 2021, 2022, 2023, and 2024)

This species was not observed during any breeding season walkover survey.

Winter Walkover Surveys (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

During the 2020/21 winter walkover surveys, Snipe were observed on two occasions. Both records comprised one individual in December 2020. This species was not recorded during any other winter walkover survey.

Hinterland Surveys (2020, 2021, 2022, 2023, and 2024)

Hinterland Surveys indicate Snipe are present in the surrounding hinterland habitats, with 19 of the 22 records occurring c. 19.85km from the Site at HVP 1, and the remaining three records occurring c.5.52km from the Site at HVP 4 (2 records) and HVP 11: Inchigeelagh c. 8.18 km from the Site.

In Year 1, Snipe were recorded three times during the 2019/20 non-breeding season. Two records were made at HVP 1: An Gearagh in January and February 2020, and the remaining record was made at HVP 4: Coolkellure Lake/St. Edmunds Church in February 2020.

During the Year 2 surveys, Snipe was recorded once, consisting of a flock of 45 birds at HVP 1: An Gearagh in September 2021.

During the Year 3 and 4 surveys, Snipe were detected 13 times. Four records occurred during the 2021/22 non-breeding season, where single birds were detected twice in October and November 2021, and a flock of four birds were detected twice in April and September 2022. During the 2022/23 non-breeding season, six observations of up to 76 birds were made. Five of which occurred at HVP 1 and one of which occurred at HVP 4. The remaining three records comprised individuals and flocks of up to 3 birds at HVP 1 in April, June and July 2023.

During year 5, Snipe were recorded 5 times over the course of winter 2023/24. Four records occurred at HVP1 while one record occurred at HVP 11.

7.3.3.4.24 Sparrowhawk

Sparrowhawk were recorded 26 times over five years of flight activity surveys, where both adults and juveniles were observed on a very infrequent basis. No breeding or roosting was recorded. Hinterland surveys indicate this species is also widely present in the wider environment.

Vantage Point Surveys: Summer Season (2020, 2021, 2022, 2023, and 2024)

Sparrowhawk were recorded 15 times across the entire five-year survey period, 7 of which occurred within the 500m buffer over the five year period. Both adults and juveniles have been observed within the Proposed Development, and records indicate this species commutes and hunts on a very infrequent basis within the Site and the surrounding environment.

During the 2020 breeding season, Sparrowhawk were recorded six times, five of which occurred within the 500m buffer zone. Three of the five records occurred close to Turbine 5, one was located near Turbines 4 and 9, and one record was located near Turbine 2. Four of the five flight lines were also within 25-175m high band, whilst only one was outside of this height band as it flew at a low height (<25m). Four of the six records occurred on the same day in April 2020 within and 1.5 hour window.

During the 2021 breeding season, this species was recorded twice. In June 2021, one individual was recorded flying between 10 and 185m near Turbine 6, within the 500m buffer zone. In May 2021, one male was recorded hunting and flying low to the north-west of the Site, outside of the 500m buffer.

During the 2022 breeding season, two records of this species were made. Both of which occurred to the north-west of the study area, outside of the buffer zone. One observation in June was a female Sparrowhawk that was mobbed by a Hooded Crow, and the other observation comprised an individual hunting in at the end of August.

During the 2023 breeding season, Sparrowhawk were observed on two occasions. One record consisted of a juvenile male flying outside of the buffer zone, and the other comprised a lone individual flying along the north-western edge of the buffer zone for 20 seconds.

During the 2024 breeding season, Sparrowhawk were recorded on three occasions. None of which occurred within the 500m buffer zone.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Sparrowhawk were recorded 11 times across the five-year survey period. Five of the observations intersected the 500m buffer. These records indicate this species rarely uses the habitats within the Proposed Development.

During the 2019/20 non-breeding season, this species was recorded three times. Two of these records occurred within the 500m buffer zone, whereby one individual flew below the rotor-swept height band to the north west of the Site in November 2019, and another individual circled within the rotor-swept height band near Turbines 5 and 6 in December 2019. The final record occurred outside of the 500m buffer zone, and comprised one male to the north of the Site.

During the 2020/21 non-breeding season, Sparrowhawk were observed twice. One record occurred wholly outside of the 500m buffer zone, and comprised one lone individual flying at a height of 20-30m to the north-west of the Site. The other record occurred began outside of the 500m buffer zone, where two individuals were observed in a display fight that entered the 500m buffer zone near Turbine 1 whilst at heights of 50-100m.

During the 2021/22 non-breeding season, four observations of this species were made. One of which occurred within the 500m buffer zone. All four records comprised lone individuals, and three of the records are male. Records indicate this species was hunting primarily outside of the study area.

During the 2022/23 non-breeding season, a single observation of this species was made. This record comprised of a single Sparrowhawk flying outside of the 500m buffer zone, near Lough Nambrackderg.

During the 2023/24 winter season, one observation of Sparrowhawk was made where a single individual was recorded flying within the 500m buffer, c. 200m from Turbine T8 in February 2024.

Summer and Winter Walkover Surveys (2020, 2021, 2022, 2023, and 2024; 2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Sparrowhawk were not observed during any breeding or winter season walkover surveys.

Hinterland Surveys (2020, 2021, 2022, 2023, and 2024)

This species was recorded during every year of Hinterland surveys. Sparrowhawk were observed on 21 occasions at HVPs 1, 5, 7, 9, 11, 12, 13, 16, 18, 23 and 28 indicating that this species occurs throughout the wider hinterland. The closest record occurred at HVP 18 in March 2022, c. 0.82km to the south-east of the Proposed Development.

7.3.3.4.25 Stock Dove

During the 2022 spring migration flight activity surveys, this species was recorded on one occasion whereby two individuals were recorded as being outside of and to the north-west of the study area. Stock Dove were not recorded during any other surveys within the site across the entire five-year study period.

7.3.3.4.26 Swift

During the 2023 breeding season, a single observation of Swift was made. Two birds were observed foraging in the north-east of the study area. This species was not recorded during any other survey within the site across the entire five-year survey period.

7.3.3.4.27 Teal

Teal were observed ten times during the breeding season flight activity (VP) surveys, and once during the non-breeding season flight activity surveys. Of which, only one record of Teal was made within the 500m buffer zone, where three individuals were observed in a pool. All other records were found c. 1.08km from the Site, at Lough Nambrackderg, where successful breeding was observed. Hinterland surveys indicate this species is present in larger flocks of up to 224 individuals in the wider environment.

Vantage Point Surveys: Summer Season (2020, 2021, 2022, 2023, and 2024)
Teal were recorded on ten occasions across the five-year survey period, however all records were made outside of the 500m buffer zone, near Lough Nambrackderg. At this lough, successful breeding was recorded in 2020 and 2021.

During the 2020 breeding season, Teal were recorded three times, however no flight activity was observed. In June 2020, successful breeding of Teal was confirmed outside of the 500m buffer zone, on Lough Nambrackderg as one adult was observed with seven chicks.

During the 2021 breeding season, Teal was recorded once. However, this record occurred outside of the 500m buffer zone where one adult was observed with four young chicks on Lough Nambrackderg in July 2021.

During the 2022 breeding season, this species was observed once, outside of the 500m buffer zone.

During the 2023 breeding season, three observations of Teal were made where up to three individuals were recorded outside of the 500m buffer zone.

During the 2024 breeding season, two records were made outside of the 500m buffer zone.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)
This species was recorded once, during the 2021/22 non-breeding season, where 3 individuals were recorded in a pool within the 500m buffer zone (ITM 513932, 558554). There were no further record that season or for any of the other four winters of surveys.

Summer and Winter Walkover Surveys (2020, 2021, 2022, 2023, and 2024; 2019/20, 2020/21, 2021/22, 2022/23, 2023/24)
Teal were not observed during any breeding or winter season walkover surveys.

Hinterland Surveys (2020, 2021, 2022, 2023, and 2024)

This species was recorded during every year of Hinterland surveys. Teal were observed on 80 occasions at HVPs 1, 2, 3, 4, 11, 12, 14 and 17 indicating that this species occurs throughout the wider hinterland. The closest record occurred at HVP 14: Lough Nambrackderg, c. 1.08km to the north-east of the Proposed Development.

This species was observed six times during the Year 1 hinterland surveys. Four of which comprised records of up to 33 birds at HVP 1: An Gearagh. One additional record was made at HVP 4: Coolkellure Lake/St. Edmunds Church where five pairs were observed in January 2020, and the final observation of three Teal was made at HVP 12: Lough Allua.

During the Year 2 surveys, Teal were recorded 18 times across five different HVPs, namely 1: An Gearagh; 3: Bandon River SAC (Dunmanway); 4: Coolkellure Lake/St. Edmunds Church; 12: Lough Allua and 14: Lough Nambrackderg. Both adults and juveniles were recorded, and flocks of up to 224 individuals were detected.

During years 3 and 4, Teal were recorded 38 times across seven different HVPs, namely 1: An Gearagh; 2: Bandon River (Keenrath Bridge); 4: Coolkellure Lake/St. Edmunds Church; 11 Inchigeelagh, 12: Lough Allua; 14: Lough Nambrackderg and 17 Toon Valley. Both adults and juveniles were recorded, and flocks of up to 720 individuals (An Gearagh) were detected.

In year 5, Teal were recorded 18 times across the same seven HVPs. Both adults and juveniles were recorded, and flocks of up to 400 individuals (An Gearagh).

7.3.3.4.28 Whooper Swan

Throughout the five-year survey period, no records of Whooper Swan within the 500m buffer zone were made. Instead, most records observed Whooper Swan at Lough Nambrackderg, c. 1.08km from the Site. Both adults and juveniles were recorded at this Lough, however no breeding behaviours were observed. Hinterland surveys indicate this species is present predominantly at Lough Nambrackderg, and at An Gearagh, c. 19.85km from the Site.

Vantage Point Surveys: Summer Season (2020, 2021, 2022, 2023, and 2024)

No evidence of this species was found during the five-year survey period.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Whooper Swan were recorded six times across the five-year survey period. Both adults and juveniles were recorded. However, all sightings occurred outside of the Proposed Development, near Lough Nambrackderg.

During the 2020/21 non-breeding season, two records of this species were made. Both of which occurred outside of the 500m buffer zone, where two adults and two juveniles were recorded on Lough Nambrackderg in October and November 2021. Both records appear to comprise the same individuals.

During the 2021/22 non-breeding season, a single observation of Whooper Swan was made when a group of five birds was sighted on Lough Nambrackderg.

During the 2023/24 winter season, three records of this species was made where between two and five individuals were recorded at VP3.

No other sighting of Whooper Swan has been made across the five-year survey period,

Summer and Winter Walkover Surveys (2020, 2021, 2022, 2023, and 2024; 2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Whooper Swan were not observed during any breeding or winter season walkover surveys.

Hinterland Surveys (2020, 2021, 2022, 2023, and 2024)

The five years of Hinterland surveys indicate Whooper Swan are present in the surrounding Hinterland, as 72 observations were made across multiple HVPs. Records comprise lone individuals, males and females, adults and juveniles, and flocks of up to 148 birds (HVP 17: Toon Valley). The closest record of Whooper Swan to the Proposed Development was located c. 1.08km to the north, at HVP 14 where flocks of between 4 and 5 individuals were recorded.

During Year 1 surveys, Whooper Swan were observed on six occasions, all of which occurred during the 2019/20 non-breeding season. Three of the six observations were made at HVP 1: An Gearagh where up to 25 birds were sighted in February 2020, two adults and a juvenile were recorded in October 2019, and one single bird was recorded in December 2019. At HVP 12: Lough Allua, a flock of the same ten birds (seven adults, three juvenile) was recorded three times, in December 2019, January 2020, and February 2020.

During the Year 2 surveys, Whooper Swan were recorded 16 times at five different sites, namely 1: An Gearagh; 10: Gougane Barra; 12: Lough Allua and 14: Lough Nambrackderg and 17: Toon Valley. Both adults and juveniles were recorded, and flocks of up to 104 individuals were recorded.

During the Year 3 Hinterland surveys, this species was recorded 14 times. Of which, 13 records occurred during the 2021/22 non-breeding season and one occurred on the 2nd of April at HVP17. Flocks of up to 61 birds were detected at HVPs 1, 14, 17 and 31.

During the Year 4 Hinterland surveys, Whooper Swan were identified 21 times. Twenty observations of two to 104 individuals occurred during the 2022/23 non-breeding season at HVPs 1, 12, 17 and 31, and one record of 18 birds were made on the 2nd of April 2023 at HVP 17.

Whooper Swan were identified 14 times during year 5 at HVPs 1, 10, 12, 14 and 17.

7.3.3.4.29 Woodcock

Woodcock were only recorded once during flight activity (VP) surveys. However, this observation occurred outside of the 500m buffer zone. This species was not recorded during any summer or winter walkover surveys, and was only observed once during Hinterland surveys in November 2020. Due to the absence of woodland within and immediately surrounding the Site, the Proposed Development does not offer suitable habitat for this species.

Vantage Point Surveys: Summer Season (2020, 2021, 2022, 2023, and 2024)

No evidence of this species was found during the five-year survey period.

Vantage Point Surveys: Winter Season (2019/20, 2020/21, 2021/22, 2022/23, and 2023/24)

This species was recorded on one occasion during the five-year survey period, whereby woodcock was recorded outside of the 500m buffer zone in January 2020 during the 2019/20 non-breeding season.

Summer and Winter Walkover Surveys (2020, 2021, 2022, 2023, and 2024; 2019/20, 2020/21, 2021/22, 2022/23, 2023/24)

Woodcock were not observed during any breeding or winter season walkover surveys.

Hinterland Surveys (2020, 2021, 2022, 2023, and 2024)

This species was observed once during the Year 2 hinterland surveys. This record occurred at HVP 14: Lough Nambrackderg, whereby one individual was flushed from the hillside in November 2020. The Proposed Development does not offer suitable habitat for Woodcock due to the absence of woodland. Woodcock were not recorded during any other Hinterland survey.

7.3.3.4.30 Other Species

The following species were recorded as secondary target species during Vantage Point (flight activity), breeding transect, winter transect and / or hinterland surveys across the five years of surveys.

House Martin

House Martin were recorded on seven occasions across the five years of flight activity surveys. All of which occurred during breeding seasons. No House Martins were observed during any winter non-breeding season, and no records of House Martin were noted during the most recent year of surveys (summer 2024 to winter 2023/24). Three records occurred during the 2020 summer season (May, June and August 2020), where up to five individuals were identified at VPs 2 and 3. One record was made in July 2021, where a flock of 17 individuals were flushed en route to VP 3. One record was made in September 2022, where three House Martin were recorded at VP 3. The remaining three records occurred during the 2023 summer season, where one individual was recorded at VP 3 in May 2023, and one individual was recorded at VP 2 in September 2023. House Martin were only observed on one other occasion during any other survey across all five years of surveys, where one House Martin was recorded in June 2021 during breeding transect surveys.

Goldcrest

This species was observed once during breeding bird transects in Summer 2022, where one individual was recorded flying. This species was also recorded on 18 occasions within the wider environment during summer and winter Hinterland surveys.

Linnet

Linnet were recorded on four occasions across all five years of surveys. All records pertained to individuals recorded during flight activity surveys, exclusively during breeding seasons. One record was made during the 2021 breeding season, where one Linnet was flushed en route to VP 3. Another record was observed during the 2023 breeding season, where one individual was found at VP 2, and the final two records observed one individual at VP 3 during the 2024 breeding season. No other record of this species, across any other year or surveys, were made.

Little Grebe

This species was recorded six times across 2022, 2023 and 2024 breeding season flight activity surveys, and two records across 2021/22 and 2023/24 non-breeding season flight activity surveys. The majority of which comprised lone individuals on or near Lough Nambrackderg.

Little Grebe were not observed during any breeding or winter season walkover surveys.

Sand Martin

Sand Martin were recorded twice across all five years of surveys, whereby two records of a single Sand Martin were made from VP3 during the 2023 breeding season of flight activity surveys. This species was not observed on any other occasion.

Skylark

During flight activity surveys, Skylark were observed in groups of one to 11 birds, a total of 71 times across all five years of surveys. Of which, the majority of records (53) occurred during the breeding season.

Skylark were also observed during Winter transect surveys, where between one and seven birds were recorded 12 times during the 2019/20, 2021/22, 2022/23, and 2023/24 non-breeding seasons. All winter transect records originated along transects 1 and 2.

During the Breeding transect surveys, Skylark were recorded 48 times across all five years of surveys. Records indicate between one and eight individuals were observed at any one time, across transects 1 and 2.

Skylark were also recorded within the wider environment, where up to four individuals were recorded across six Hinterland Sites during all five breeding seasons, and the 2021/22 and 2022/23 non-breeding seasons.

House Sparrow

Sparrows were recorded once during flight activity surveys, whereby Sparrows were flushed en route to VP 2 during the 2020/21 non-breeding season. This species was also recorded during Hinterland surveys, where up to three individuals were recorded across six Hinterland sites during the 2021, 2022, and 2023 breeding seasons and the 2020/21, 2021/22, 2022/23 and 2023/24 non-breeding seasons.

Starling

Starling were observed on 18 occasions during flight activity surveys. Of which, the majority of records (15) occurred during the breeding seasons. Between one and 100 individuals were recorded during each of these observations.

Hinterland Surveys also indicate that Starling exist within the wider environment, as records of between one and 40 individuals were made across all five years of surveys.

Swallow

56 records of between one and 160 Swallows were made across VPs 1, 2 and 3, throughout all five years of breeding season flight activity surveys.

Swallows were also observed throughout the wider environment, as numerous records were made during all five breeding seasons of Hinterland surveys, where up to 60 individuals were recorded at any one time.

Wheatear

Wheatear were recorded alone or in groups of up to eight individuals, a total of 34 times during all five breeding season, and the 2019/20, 2021/22, 2022/23 non-breeding season flight activity surveys. On one occasion (in April 2020), a record of a breeding male displaying was made at VP 2.

During breeding transect surveys, 20 records of up to four individuals were made across all five breeding seasons.

Whinchat

Whinchat were recorded once during winter transect surveys, where one individual was observed during the 2023/24 winter walkovers. This species was not recorded during any other survey.

Willow Warbler

During summer transects, this species was only recorded twice, where one individual was recorded in summer 2022, and one in summer 2023.Willow Warbler were also recorded on numerous occasions during the latest four years of Hinterland surveys across 15 different HVPs.

7.4 AVIFAUNA EVALUATION

The basis of impact assessment should be a determination of which ecological resources within the zone of influence of the proposed development are of sufficient value to be material in decision making and therefore, included in the assessment (NRA, 2009a and CIEEM 2018). Table 7.23 outlines the key receptors selected for assessment and the rationale for same based on NRA guidance (NRA, 2009a); the overall importance or sensitivity evaluation for each key receptor, taken from guidance such as Percival 2007 is also illustrated.

Table 7.23: Avifauna Key Receptor Evaluations

Species	BoCCI	Annex I (Y/N)	NRA Evaluation	Receptor Evaluation for Impact Assessment (Sensitivity)	Key Receptor	Rationale
Buzzard	Green	No	Local Importance (Higher Value)	Low	Yes	This species was recorded a total of 37 times across all breeding seasons and 6 times during three winter seasons over the five-year survey period. Records indicate the Site is used to commute over / through, and as occasional hunting grounds.
Chough	Amber	Yes	County Importance	Very High	Yes	Chough were recorded across every season of the five-year survey period. Of the 51 records of Chough, only twelve occurred within the 500m buffer zone, and the remainder are predominantly concentrated to the north-west of the buffer zone. Although breeding was recorded during Hinterland surveys in Shanacrane c. 0.82km south-east of the Proposed Development, no breeding was recorded within the Site. All records within the flight activity survey area indicate Chough were flying through/over the Site.
Cormorant	Amber	No	County Importance	Medium	Yes	There is only one record of Cormorant within the flight activity study area, and the remainder are located outside of the 500m buffer zone, near Lough Nambrackderg. However, based on the precautionary principle, this species has been included as a Key Receptor.
Curlew	Red	No	National Importance	High	No	There are no records of this species within the 500m buffer zone. Due to the absence of this species within the Site, Curlew have been excluded as a Key Receptor.
Dunlin	Red	Yes	National Importance	Very High	Yes	Dunlin were recorded within the 500m buffer zone once. However, flocks of between 30 and 144 birds are present in the wider area, particularly near HVP 1: An Gearagh c. 19.85km from the Site. Based on the precautionary principle, this species has been included as a Key Receptor.

Species	BoCCI	Annex I (Y/N)	NRA Evaluation	Receptor Evaluation for Impact Assessment (Sensitivity)	Key Receptor	Rationale
Great Black-backed Gull	Green	No	Local Importance (Lower Value)	Negligible	Yes	This species was recorded twice within the 500m buffer zone. Based on the precautionary principle, this species has been included as a Key Receptor.
Goldcrest	Amber	No	County Importance	Medium	Yes	This species was observed during breeding bird transects and hinterland surveys. Based on the precautionary principle, this species has been included as a Key Receptor.
Golden Plover	Red	Yes	National Importance	Very High	Yes	41 records were made across the five years of surveys . A total of 25 occurred within or partially intersected the 500m buffer zone over the entire 5 year period, an average of 5 flights per year.
Greenland White-fronted Goose	Amber	Yes	County Importance	Very High	No	This species was only recorded on eleven occasions during the 2020/21 and 2021/22 non-breeding season. All four records occurred at HVP 17, which is located c. 14.8km from the red-line boundary of the Proposed Development. There are no records of Greenland White-fronted Geese within or adjacent to the 500m buffer zone. Due to the lack of observation over the five years of surveys, and absence from the Proposed Development, this species is not considered a Key Receptor.
Grey Heron	Green	No	Local Importance (Higher Value)	Low	Yes	Grey Heron were observed 13 times during flight activity surveys. A total of 11 of these records occurred outside of the 500m buffer zone, near Lough Nambrackderg, which is situated c. 1.08km from the Site. Based on the precautionary principle, this species has been included as a Key Receptor.
Grey Wagtail	Red	No	National Importance	High	Yes	This species was recorded during the breeding season walkover surveys. Based on the precautionary principle, this species has been included as a Key Receptor.
Hen Harrier	Amber	Yes	County Importance	Very High	Yes	There are six observations of Hen Harrier within the study area, comprising both adults and juveniles. Hen Harrier were recorded within the

Species	BoCCI	Annex I (Y/N)	NRA Evaluation	Receptor Evaluation for Impact Assessment (Sensitivity)	Key Receptor	Rationale
						500m buffer zone on a very infrequent basis consider the lack of sightings over five full years of surveys.
House Martin	Amber	No	County Importance	Medium	Yes	House Martin were observed seven times during breeding season flight activity surveys as a secondary target species. Based on the precautionary principle, this species has been included as a Key Receptor.
House Sparrow	Amber	No	County Importance	Medium	Yes	Sparrows were recorded once during flight activity surveys during the 2020/21 non-breeding season. Based on the precautionary principle, this species has been included as a Key Receptor.
Kestrel	Red	No	National Importance	High	Yes	Kestrel have been recorded 69 times within the study area across the five-year flight activity survey period. Observations have confirmed Kestrel are regularly using the Site.
Lesser Black-backed Gull	Amber	No	County Importance	Medium	Yes	Most records of this species occur outside of the 500m buffer zone. However, this species was recorded flying at rotor-swept height within the buffer zone on six occasions.
Linnet	Amber	No	County Importance	Medium	Yes	Linnet were observed four times during breeding season flight activity surveys as a secondary target species. Based on the precautionary principle, this species has been included as a Key Receptor.
Little Egret	Green	Yes	National Importance	Very High	No	This species was only observed once during flight activity surveys, where one individual was recorded outside of the 500m buffer zone in 2024. Due to the absence of records within the flight activity survey area, this species has not been seleced as a Key Receptor.
Little Grebe	Green	No	Local Importance (Higher Value)	Low	No	This species was only recorded twice. Both records occurred outside of the 500m buffer zone. Due to the absence of this species within the Proposed Development, as well as the green-listed status of this species, Little Grebe is not considered a Key Receptor.

Species	BoCCI	Annex I (Y/N)	NRA Evaluation	Receptor Evaluation for Impact Assessment (Sensitivity)	Key Receptor	Rationale
Mallard	Amber	No	County Importance	Medium	No	Mallard have been recorded 22 times across the five-year survey period. However, records show this species is typically found on Lough Nambrackderg c. 1.08km from the red line boundary of the Proposed Development. No records occurred within the 500m buffer zone. As such, due to the absence of records within the Site, this species has been excluded as a Key Receptor.
Meadow Pipit	Red	No	National Importance	High	Yes	Meadow Pipit were recorded across flight activity surveys, and winter and summer walkover surveys. As such, this species has been included as a Key Receptor based on the precautionary principle
Mediterranean Gull	Amber	Yes	County Importance	Very High	No	This species was recorded once, whereby one individual was observed c. 19.85km to the north-east of the red line boundary of the Proposed Development in June 2023. Due to the absence of records within the Proposed Development, this species is not considered a Key Receptor.
Merlin	Amber	Yes	County Importance	Very High	No	Dedicated Merlin surveys did not detect Merlin or any signs of Merlin. Additionally, this species was only recorded on three occasions, all of which occurred outside the 500m buffer zone. As this species has not been recorded within the buffer zone, and due to the absence of evidence of Peregrine in the area, this species has not been selected as a Key Receptor.
Peregrine	Green	Yes	Local Importance (Higher Value)	Very High	Yes	Peregrine were recorded infrequently across the five-year survey period, the predominantly brief observations consisted of Peregrine (adults and juveniles) flying over and hunting within the 500m buffer zone. While no breeding behaviour was observed within the Site over the five year period

Species	BoCCI	Annex I (Y/N)	NRA Evaluation	Receptor Evaluation for Impact Assessment (Sensitivity)	Key Receptor	Rationale
						this species has been included as a Key Receptor based on the precautionary principle
Red Grouse	Red	No	National Importance	High	Yes	11 records of Red Grouse were made during VPs throughout the five-year survey period, however most were call-only records, and only four observations occurred within the 500m buffer zone. Based on the precautionary principle, this species has been included as a Key Receptor.
Redwing	Red	No	National Importance	High	Yes	This species was recorded a total of 13 times during non-breeding season flight activity surveys, across all three VPs. Based on the precautionary principle, this species has been included as a Key Receptor.
Ruff	Amber	Yes	County Importance	Very High	No	Ruff has been recorded on three occasions during hinterland surveys that were conducted in the 2022/23 non-breeding season. All records are located outside of the Proposed Development. Due to a lack of on-site records, this species is not considered a Key Receptor.
Sand Martin	Amber	No	County Importance	Medium	Yes	This species was observed twice during breeding season flight activity surveys as a secondary target species. Based on the precautionary principle, this species has been included as a Key Receptor.
Skylark	Amber	No	County Importance	Medium	Yes	Skylark were observed 71 times across breeding and non-breeding flight activity surveys. They were also recorded during breeding and winter walkovers. Based on the precautionary principle, this species has been included as a Key Receptor.
Snipe	Red	No	National Importance	High	Yes	Snipe were observed primarily during the non-breeding season. However, the majority of records are located outside of the 500m buffer zone. Over the 5 years of breeding wader surveys the species was only recorded on one occasion. Based on the precautionary principle, this species has been included as a Key Receptor.

Species	BoCCI	Annex I (Y/N)	NRA Evaluation	Receptor Evaluation for Impact Assessment (Sensitivity)	Key Receptor	Rationale
Sparrowhawk	Green	No	Local Importance (Higher Value)	Low	Yes	Sparrowhawk were recorded 26 times over five years of flight activity surveys, where both adults and juveniles were observed on a very infrequent basis. No breeding or roosting was recorded.
Starling	Amber	No	County Importance	Medium	Yes	Starlings were recorded 18 times across breeding and non-breeding season flight activity surveys, where flocks of up to 100 individuals were sighted. Based on the precautionary principle, this species has been included as a Key Receptor.
Stock Dove	Red	No	National Importance	High	No	One observation of Stock Dove was made during the 2022 spring migration flight activity surveys. This record shows two individuals outside of the 500m buffer zone. Due to the limited number of records and absence from the buffer zone, this species is not considered to be a Key Receptor.
Swallow	Amber	No	County Importance	Medium	Yes	Flocks of up to 160 birds were observed 56 times during breeding season flight activity surveys. Based on the precautionary principle, this species has been included as a Key Receptor.
Swift	Red	No	National Importance	High	Yes	A single observation of this species was made in 2023, where two individuals were recorded hunting in the north-east of the study area Based on the precautionary principle, this species has been included as a Key Receptor.
Teal	Amber	No	County Importance	Medium	Yes	Teal were observed within the 500m buffer zone on one occasion. However, successful breeding of Teal has been confirmed in the surrounding environment, and flocks of up to 224 individuals have been observed in the wider hinterlands. Based on the precautionary principle, this species has been included as a Key Receptor.
Wheatear	Amber	No	County Importance	Medium	Yes	Wheater were recorded in flocks of up to eight individuals 34 times across breeding and non-breeding season flight activity surveys.
Whinchat	Red	No	National Importance	High	Yes	This species was recorded once during winter walkovers, where one individual was observed

Species	BoCCI	Annex I (Y/N)	NRA Evaluation	Receptor Evaluation for Impact Assessment (Sensitivity)	Key Receptor	Rationale
						flying during the 2023/24 non-breeding season. Based on the precautionary principle, this species has been included as a Key Receptor.
Whooper Swan	Amber	Yes	County Importance	Very High	No	This species has been recorded six times over the past five years, all of which occurred outside of the Proposed Development at Lough Nambrackderg c. 1.08km from the Site. Due to the absence of on-site records, this species is not considered a Key Receptor.
Willow Warbler	Amber	No	County Importance	Medium	Yes	Willow Warbler were observed on two occasions during breeding season walkovers. Based on the precautionary principle, this species has been included as a Key Receptor.
Woodcock	Red	No	National Importance	High	No	Woodcock have only been recorded once across the entire five-year survey period during flight activity surveys near Lough Nambrackderg, Due to the absence of on-site records, this species is not considered a Key Receptor.

The following species were recorded within the 10km grid squares W15 and W16 encompassing the study area within the last 15 years:

- Barn Owl (high sensitivity, last recorded in 2020),
- Common Grasshopper Warbler (low sensitivity, last recorded in 2020)
- Kingfisher (medium sensitivity, last recorded in 2011)
- Wigeon (medium sensitivity, last recorded in 2011)
- Mute Swan (medium sensitivity, last recorded in 2011)
- White-tailed Eagle (very high sensitivity, last recorded in 2019)

However, none of the above species were observed during the five-year study period and are consequently not listed as Key Receptors.

7.5 POTENTIAL EFFECTS ON AVIFAUNA

The effects of infrastructure such as wind farms on birds are highly variable and depend on a wide range of factors including the specification of the development, the topography of the surrounding land, the habitat affected and the numbers and species of birds present (Drewitt, A., and Langston, R., 2006). Developments such as wind farms in general have many effects on birds, including potential direct habitat loss and fragmentation, displacement due to disturbance, death, and injury due to collisions and disruption of local or migratory movements, with a consequent increase in energy expenditure (Drewitt, A., and Langston, R., 2008). However, the principal concerns in terms of adverse effects on birds are (1) disturbance / displacement, (2) collision, (3) habitat loss/change and (4) barriers to movement (Langston, R., 2010). Of these, only two are applicable during construction: 1) disturbance and / or displacement and 2) habitat loss/alteration. Habitat loss is the primary potential direct impact during constructions and although disturbance and / or displacement could be viewed as effective habitat loss, it is essentially indirect (SNH, 2017) and therefore covered under Indirect Impacts.

With regard to impacts on bird species, it is considered that the main potential source of impacts on avian fauna is the construction of the wind farm, particularly the construction of turbines and the associated road network.

The potential likely significant impact of wind turbines on birds may be considered as:

- Possible loss or deterioration of habitats; and
- Disturbance or displacement of birds.

Consideration of the survey data against Table 7.23 indicates that five 'Very High' sensitivity species have been recorded within the project study area:

- Chough (amber-listed, annex I);
- Dunlin (red-listed, annex I);
- Golden Plover (red-listed, annex I);
- Hen Harrier (amber-listed, annex I);
- Peregrine (amber-listed, annex I).

Consideration of the survey data against Table 7.23 indicates that eight 'High' sensitivity species have been recorded within the project study area.

- Grey Wagtail (red-listed);
- Kestrel (red-listed);
- Meadow Pipit (red-listed);
- Red Grouse (red-listed);
- Redwing (red-listed);
- Snipe (red-listed);
- Swift (red-listed);
- Whinchat (red-listed).

'Medium' sensitivity species recorded in the study area are also considered in this assessment, amounting to the following 13 species:

- Cormorant (amber-listed);
- Goldcrest (amber-listed);
- House Martin (amber-listed);
- House Sparrow (amber-listed);
- Lesser Black-backed Gull (amber-listed);
- Linnet (amber-listed);
- Sand Martin (amber-listed);
- Skylark (amber-listed);
- Starling (amber-listed);
- Swallow (amber-listed);
- Teal (amber-listed);
- Wheatear (amber-listed);

- Willow Warbler (amber-listed).

Four 'Low' sensitivity species are considered in this assessment:

- Buzzard (green-listed);
- Great Black-backed Gull (green-listed);
- Sparrowhawk (green-listed);
- Grey Heron (green-listed).

7.5.1 Potential Construction Effects

The Onsite Substation and Control Building will connect via underground 110 kV cable to either the Dunmanway (Option A) or Carrigdangan (Option B) ESB 110 kV substations. The overall length of Option A GCR between the Onsite Substation and Control Building and the existing Dunmanway 110 kV substation is approximately 28 km, of which, approximately 3.98 km is within the Site with the remainder located along the L8776 and the R587. The overall length of Option B between the Onsite Substation and Control Building and the existing Carrigdangan 110 kV substation is approximately 22 km, of which, approximately 3.98 km is within the Site with the remainder located along the L8776 and the L4607. The 3.98 km within the site travel along existing tracks and proposed new tracks.

The proposed Grid Connection Route Options outside the wind farm site shall be placed fully within existing roads and therefore there shall be minimal vegetation clearance or resultant habitat loss.

It is proposed that the turbine nacelles, tower hubs and rotor blades will be landed in Port of Cork. From there, they will be transported to the Site via the public road corridor to the site entrance. There are eighteen areas on the haul route (TDR) that will require works in third party lands.

Table 7.24: Areas of Works on Haul Route in Third Party Lands

No.	ITM (Easting / Northing)	Description	Habitat Loss
Location No. 7	E:523246 N:559558	Overrun Area=512 m^2 Area to be cleared for Oversail Boundary Vegetation To be Trimmed	Improved agricultural grassland - 512.54 m^2 Hedgerow – 32.7 m (length)
Location No. 12C	E:523777 N:565003	Overrun Area=167 m^2 Area to be cleared for Oversail Bridge Widening & Loadbearing Area to be Constructed.	Buildings and artificial surfaces - 59.47 m^2 Scrub - 107.53 m^2 Hedgerow - 42.13 m

No.	ITM (Easting / Northing)	Description	Habitat Loss
Location No. 14	E:522064 N:565137	Overrun Area=167 m² Area to be cleared for Oversail Boundary Vegetation To be Trimmed	Wet grassland - 41.76 m² Dense bracken - 102.52 m² Buildings and artificial surfaces - 39.67 m² Scrub - 25.39 m² Hedgerow - 37.51 m
Location No. 17A	E:519425 N:564233	Overrun Area=270 m² Area to be cleared for Oversail Bridge Parapet to be Modified to Allow Oversail	Buildings and artificial surfaces - 245.60 m² Stonewall - 24.01 m² Hedgerow - 25.12 m
Location No. 17C	E:518813 N:563759	Overrun Area=349 m² Area to be cleared for Oversail	Scrub - 349.28 m²
Location No. 17D	E:518599 N:563727	Overrun Area=59 m² Area to be cleared for Oversail	Scrub - 58.20 m²
Location No. 18B	E:517474 N:563425	Overrun Area=70 m² Area to be cleared for Oversail	Dry meadows and grassy verges - 68.36 m²
Location No. 19	E:517137 N:563211	Overrun Area=85 m² Area to be cleared for Oversail Boundary Vegetation to be Trimmed	Dry meadows and grassy verges - 85.47 m²
Location No. 19A	E:516480 N:562950	Overrun Area=201 m²	Dense bracken - 201.75 m²
Location No. 20	E:515804 N:562521	Overrun Area=540 m²	Dense bracken - 192.76 m² Buildings and artificial surfaces - 116.02 m² Buildings and artificial surfaces - 97.16 m² Scrub - 81.11 m²
Location No. 20A	E:514912 N:561795	Overrun Area=300 m² Area to be cleared for Oversail	Dry meadows and grassy verges - 237.74 m² Scrub - 59.40 m²
Location No. 20B	E:514461 N:561642	Overrun Area=90 m² Boundary Vegetation to be Trimmed	Wet heath - 90.63 m²
Location No. 21	E: 514148 N:561110	Overrun Area=255 m², Area to be cleared for Oversail	Dry meadows and grassy verges – 118.38 m² Buildings and artificial surfaces – 125.96 m² Stonewall - 12.45 m (length) Drainage ditch - 19.54 m (length)
Location No. 21A	E:513671 N:560837	Overrun Area=345 m² Area to be cleared for Oversail	Dry meadows and grassy verges – 179.97 m² Buildings and artificial surfaces – 163.14 m²

No.	ITM (Easting / Northing)	Description	Habitat Loss
Location No. 22	E:513395 N:560551	Overrun Area=940 m^2 Area to be cleared for Oversail	Dry meadows and grassy verges – 217.81 m^2 Buildings and artificial surfaces – 141.04 m^2 Improved agricultural grassland – 289.43 m^2
Location No. 28	E:543962 N:566922	Blade Laydown Area Area=12,000 m^2	Improved agricultural grassland – 12000.00 m^2
Location No. 29	E:539792 N:563872	Blade Laydown Area Area=12,000 m^2	Improved agricultural grassland – 12000.00 m^2 Hedgerow - 62.75 m
Location No. 30	E:506514 N:556534	Blade Laydown Area Area=12000 m^2	Improved agricultural grassland – 12000.00 m^2

It is noted that the construction of the proposed underground Grid Connection and along the haul route will progress in a sequential manner along both routes. Therefore, the works in any one location will be of a temporary duration only. Because the works will progress relatively quickly along a linear corridor, any fugitive noise will be highly localised, temporary and are not expected to be of sufficient magnitude to create any disturbance or displacement impacts outside of areas contiguous or adjacent to the corridor. These adjacent habitats are widespread in the surrounding area therefore any resident species can easily move in response to any temporary disturbance. It is also noted that these areas are located along existing roads which are subject to ongoing management including hedge cutting and traffic, therefore the habitats are already subject to disturbance.

7.5.1.1 Direct Effects: Habitat Loss or Alteration

Habitat loss can be direct through land take of breeding or foraging habitats for key species or indirect such as effective habitat loss through avoidance or disturbance due to the above factors. For direct effects during construction, land take of potential breeding or foraging habitat is the primary effect. This may constitute land stripping or vegetation removal affecting ground nesting birds, hedgerow removal or trimming if this takes place during the breeding season and loss of nesting or roosting sites such as trees. Some species (for example sand martin) may also be affected through material extraction requirements for construction purposes.

Effects on avifauna are to be assessed following guidance in Percival (2007). As outlined previously, key avian receptors have been assigned an evaluation of importance (or sensitivity) for assessment. Following this, the significance of potential effects are rated as a product of both the magnitude of the predicted effect and the importance value (sensitivity) of the key receptor affected, based on the probability of the likely effect occurring.

The construction of the wind farm tracks, Turbine Foundations and Turbine Hardstands, the Onsite Substation and Control Building compound, Temporary Construction Compound and other infrastructure will result in some habitat damage and loss. For further details on predicted habitat losses please see **Chapter 6: Biodiversity**.

For the purpose of the consideration of the potential effects on birds, species have been grouped into four categories namely passerines, birds of prey, game birds and waders/waterfowl.

A passerine is any bird of the order Passeriformes, which includes more than half of all bird species. A notable feature of passerines is the arrangement of their toes (three pointing forward and one back) which facilitates perching. The group are sometimes known as perching birds or, less accurately, as songbirds. Pigeon/dove belong to the order Columbidae comprised of birds with stout bodies, short necks, and slender bills which primarily feed on seed, fruits, and plants. Bird of prey are raptors that actively hunt other bird species. Gamebirds are birds that traditionally could be hunted, and terrestrial species often include pheasants and grouse, of which Red Grouse is an example. Waders are shorebirds with the majority of species eating small invertebrates picked out of mud or exposed soil. Waterfowl are swimming gamebird and are comprised of duck, geese, and swan.

Passerines/Non-target Species

The loss of habitat due to the construction of the project has the potential to affect some passerines. Habitat loss is inevitable in the development of any wind farm, especially when the development of Turbine Foundations and Turbine Hardstands, access tracks and other associated construction is considered. This can result in reduced feeding and nesting opportunities for birds. However, direct habitat loss by the development of wind farms tends to be relatively small (Drewitt and Langston 2006).

The wind farm site is predominantly comprised of Wet Heath (31.24%), as well as a mosaic of Wet Heath HH3, Siliceous Rock ER3, and Acid Grassland GS3 (26.56%). Other habitats on Site include the following: Wet Grassland GS4/Acid Grassland GS3 (12.63%), Upland Blanket Bog PB2 (9.69%), Wet Heath HH3 Siliceous Rock ER3 Mosaic (7.80%), Dry Acid Grassland (4.61%), Wet Heath HH3/Acid Grassland GS3 Mosaic (3.99%), Wet Grassland GS4 (3.42%), and Dry Heath HH1/Siliceous Rock ER3 Mosaic (0.05%).

The Proposed Development will result in the loss of the following habitats:

- Wet heath HH3: 5.73 HA, 4.88%
- Wet Heath HH3/Siliceous Rock ER3/Acid Grassland GS3 Mosaic: 2.03 HA, 2.04%
- Wet Grassland GS4/Acid Grassland GS3: 0.99 HA, 2.08%
- Upland Blanket Bog PB2: 0.99 HA, 2.73%
- Wet Heath HH3/Siliceous Rock ER3 Mosaic: 0.39 HA, 1.35%
- Dry Acid Grassland GS3: 0.69 HA, 4.00%
- Wet Heath HH3/Acid Grassland GS3 Mosaic: 2.46 HA, 16.39%
- Wet Grassland GS4: 1.08 HA, 8.39%
- Dry Heath HH1/Siliceous Rock ER3 Mosaic: 0.01%, 4.55%

Additional works along the TDR and Grid Connection will result in the removal of trees as well as the trimming of branches along the corridor of the route.

Grey Wagtail forage along watercourses and may nest in bridges and buildings. As such this species will not be subject to the direct effect of habitat loss.

Goldcrest (Percival sensitivity: Medium), and Linnet (Percival sensitivity: Medium), typically use woodland and scrub habitats. There are no woodland habitats within the site and scrub habitat is marginal. Thus, these species have a Percival effect of **Negligible** (< 1% habitat lost).

Linnet are seed-eaters, and although they do require trees and shrubs for breeding, they also need open spaces, with seed, for foraging. Looking at a worst-case scenario, there will be a loss of 14.38 Ha of open peatland, heathland and semi natural grassland habitat which equates to 3.83% of total available suitable habitat for the species. This results in a *Long-term, Slight Effect in a local context* which is *Reversible* (Criteria: EPA, 2022). Percival effect significance is **Low** (1 – 5 habitat loss for open habitats).

Meadow Pipit (Percival sensitivity: High) and Skylark (Percival sensitivity: Medium) are ground-nesting birds, that uses open habitats with some low-lying vegetative cover (typically grassland and heath) for breeding and foraging purposes. While overgrazing of these habitats within the site by sheep has greatly limited the amount of suitable habitat for these species Meadow Pipit and Skylark continue to forage and nest within the heath and grassland habitats within the Proposed Development and the greater area. Looking at a worst-case scenario, there will be a loss of 14.38 Ha of suitable habitat which equates to 3.83% of total available suitable habitat for the species. This results in a *Long-term, Slight Effect in a local context* which is *Reversible* (Criteria: EPA, 2022). Percival effect significance is **Low** (1 – 5 habitat loss for open habitats).

Wheatear (Percival sensitivity: Medium) is similar to Meadow Pipit and Skylark in that it requires open habitats with low lying vegetative cover, but with interspersed rocky areas for perching and feeding. There is a predicted loss of 3.83% of heathland, peatland and grassland. This results in a *Long-term, Slight Effect in a local context* which is *Reversible* (Criteria: EPA, 2022). Percival effect significance is **Low** (1-5% habitat loss).

Starlings (Percival sensitivity: Medium) primarily forage in grassland and open habitats, and typically nest in the eaves of old buildings, but also use cavities in mature trees and reedbeds. No nesting habitat shall be lost. However, looking at a worst-case scenario, there will be a loss of 3.83% of suitable foraging habitat for the species. Percival impact significance is **Low** (1 - 5% habitat loss for open foraging habitats), however, there is an abundance of grassland habitats in the surrounding area with ample trees and buildings for nesting, thus a *Temporary Imperceptible Effect* and *Reversible in a local context* is predicted for Starling.

House Sparrow (Percival sensitivity: Medium) breeds throughout Ireland and usually stays close to human habitation - mainly around farm buildings and built-up areas including parks and gardens. Nests in cavity in building, especially under eaves or holes formed by missing brickwork. There is an absence of suitable nesting habitats on-site, and therefore no effects are predicted in terms of nesting habitat for this species. Percival impact significance is **Low** (1 - 5% habitat loss for open foraging habitats), however, there is an abundance of grassland habitats in the surrounding area with ample trees and buildings for nesting, thus a *Temporary Imperceptible Effect* and *Reversible in a local context* is predicted for House Sparrow.

Redwing (Percival sensitivity: High) are winter visitors which uses trees and open habitats to forage in. This species has been added to the red list due to the severity of long and short-term declines in its wintering population. There will be a loss of 14.38 Ha of open habitat which equates to 3.83% of total available suitable habitat for the species. Percival effect significance is **Low** (1-5% habitat lost). Furthermore, suitable foraging habitat is generally abundant in agricultural landscapes which are commonplace in the surrounding landscape. Thus, a *Temporary Imperceptible Effect* and *Reversible in a local context* is predicted for Redwing.

Barn Swallow, House Martin and Sand Martin (Percival significance: Medium) are aerial species that forage over open habitats. Barn Swallow and House Martin require buildings for nesting, and Sand Martin typically nest in sand banks or crevices in walls or bridges. There is no suitable breeding habitat for these species on site, and as such, habitat loss is not envisaged to effect this species.

Whinchat (Percival sensitivity: High) are a seasonal visitor and are typically found in moorland habitats, as well as grass and heathlands during the breeding season. Looking at a worst-case scenario, there will be a loss of 3.83% of total available suitable habitat for the species. This results in a *Long-term, Imperceptible Effect* and *Reversible in a local context* (Criteria: EPA, 2022).

Willow Warbler (Percival sensitivity: Medium) are predominantly found along the edges of bogs and marshes, and less frequently recorded in hedgerows, woodlands and well-vegetated gardens. The potential effects are *Long-term* and *Slight* in a local context which is *Reversible* (Criteria: EPA, 2022). Percival effect significance is **Low** (1-5% habitat loss).

It is not expected that the proposed development will cause a reduction in the Baseline population of passerines as the area of nesting/foraging habitat lost will be *Imperceptible to Slight*. It is considered that the proposed effect of habitat loss will be a *Permanent Imperceptible to Not Significant Effect in a local context* which is *Reversible*. However, the trimming of vegetation along with the removal of scrub or felling of trees during the nesting season for birds could result in a *Localised Temporary Significant Reversible Effect* to nesting birds if it were to be undertaken during the bird nesting season (1st March – 31st of August).

<u>Birds of Prey, Red Grouse and Waders/Waterfowl – Other Target Species</u>

Table 7.25 below displays the direct effect character during construction as well as the significance of effects without the implementation of mitigation.

Table 7.25: Effect of habitat loss to target species

Key Receptor (Sensitivity)	Construction Direct Effect Character	Significance without mitigation
Buzzard (Low)	Buzzards were recorded on 37 occasions across all five breeding seasons. The majority of which recorded Buzzards flying wholly within or partially within the 500m buffer zone. Some records also observed Buzzards hunting within the Site. No breeding activity was detected over the course of the five-year survey period, and there are no suitable habitats to support breeding Buzzards due to the absence of mature	**Sensitivity:** Low **Magnitude:** Low (1-5% habitat loss) **Overall significance:** Very Low. (Criteria: Percival, 2003) Loss of foraging habitat will be a **Long-term Imperceptible** based on the fact

Key Receptor (Sensitivity)	Construction Direct Effect Character	Significance without mitigation
	trees. In comparison to surveys during the breeding season, very few records of Buzzards were made across the five-winter flight activity survey seasons. No observations of Buzzard were made during the 2020/21 and 2021/22 winter seasons, and only six records were made across the remaining three winter survey seasons. However, Buzzards were recorded flying over and hunting within the Site in the northern portion of the flight activity survey area, and hunting to the north-west of the Site. Looking at a worst-case scenario, there will be a loss of 14.38 Ha of suitable habitat which equates to 3.83% of total available suitable habitat for the species.	that breeding habitat is not available on site and the species is common and increasing (Criteria: EPA, 2022)
Chough (Very High)	Chough is typically associated with coastal grassland and montane habitats, such as machair, sand dunes, dry heath, vegetated cliffs and low-intensity pastoral grasslands. Chough were recorded during surveys throughout the five-year survey period. The majority of records occurred outside of the 500m buffer zone, to the north-west of the Site. Records were also recorded to the south-east outside of the Proposed Development, where successful breeding has been observed. Within the Site, no breeding or nesting behaviours were detected. Of the few records that occurred within the 500m buffer zone, Chough were predominantly flying over / commuting through the Site. Therefore, habitat loss is not envisaged to result in a significant effect this species.	**Sensitivity:** Very High **Magnitude:** Negligible **Overall significance:** Low Loss of habitat will be a **Long-term, Slight** effect, based on lack of suitable foraging and breeding habitats on-site, and due to low numbers of sightings (Criteria: EPA, 2022).
Cormorant (Low)	Cormorant were observed seven times across breeding and non-breeding season flight activity surveys. Most records occurred outside of the Proposed Development, near Lough Nambrackderg. However, this species was recorded for a total of 35 seconds within the flight activity survey area over five years of surveys, where it was observed flying to / from Lough Nambrackderg. Cormorants predominantly breed and forage along the coast and feed on fish. The streams/drainage ditches within the redline boundary are not suitable to support breeding or wintering populations of cormorant. Therefore, no significant effects of direct habitat loss are envisaged.	**Sensitivity:** Low **Magnitude:** Negligible **Overall significance:** Very Low Loss of habitat will be a **Long-term Imperceptible** effect, based on minimal sightings within the Site, and a lack of suitable breeding and foraging habitats (Criteria: EPA, 2022).
Curlew (High)	Curlew were recorded once throughout the five years of flight activity (VP) surveys, which occurred outside of the 500m buffer zone. There were no records of Curlew within the Proposed Development. This species was not recorded during breeding or winter walkovers. Curlew are ground-nesting species, that nest in rough pastures, meadows and heather. During the winter season, this species prefers a wide range of inland and coastal wetland habitats. With no records of Curlew within the Site over five years of surveys and the lack of breeding evident, the resultant habitat loss will not be significant. Due to the absence of suitable foraging and breeding habitats on-site, habitat loss is not envisaged to effect this species.	**Sensitivity:** High **Magnitude:** Negligible **Overall significance:** Low Loss of habitat will be a **Long-term, Imperceptible** effect, based on minimal sightings within the Site (Criteria: EPA, 2022).
Dunlin (Very High)	This species was not recorded during any breeding or winter walkovers; however it was noted on one occasion during the 2020 breeding season flight activity surveys. This record observed three individuals flying within the flight activity survey area, near Turbine T4. No evidence of this species	**Sensitivity:** Very High **Magnitude:** Negligible **Overall significance:** Low

Key Receptor (Sensitivity)	Construction Direct Effect Character	Significance without mitigation
	landing or using the habitats within the Proposed Development was made. This ground-nesting species typically inhabits sparse, low vegetation habitats; winters primarily in coastal areas; and feeds in muddier sections of estuarine mudflats. Due to the absence of suitable foraging and breeding habitats on-site, habitat loss is not envisaged to effect this species.	Loss of habitat will be a **Long-term, Imperceptible** effect, based on lack of suitable foraging and breeding habitats on-site, and due to low numbers of sightings (Criteria: EPA, 2022).
Golden Plover (Very High)	Golden Plover were not recorded during the 2020/21 winter season. However, 41 records were made across the five years of surveys. A total of 25 occurred within or partially intersected the 500m buffer zone over the entire 5-year period, an average of 5 flights per year. However, they were not recorded during breeding or winter walkover surveys. Golden Plover breed on open upland habitats (which includes blanket bogs, heather dominated areas and marginal grasslands), where they are known to favour areas of short vegetation (<10 cm), particularly dominated by heather mixed with grasses (Parr, 1980; Whittingham et al., 2001). The species has a restricted range in Ireland, breeding in upland areas in the north-west. There was no evidence of breeding or roosting within the study area and immediately surrounding areas during the non-breeding season. Typically the species forage in arable fields, wetlands, short-cropped heath, mainly coastal species. Looking at a worst-case scenario, there will be a loss of 14.38 Ha of suitable habitat which equates to 3.83% of total available suitable habitat for the species.	**Sensitivity:** Very High **Magnitude:** Low (1-5% habitat loss) **Overall significance:** Medium Loss of habitat will be a **Long-term Slight to Moderate** effect (Criteria: EPA, 2022).
Great Black-backed Gull (Low)	Great Black-backed Gull were only observed within the flight activity survey area on two occasions over five years of surveys. Both records observed two individuals flying during the 2023/24 non-breeding season and summer 2022. Observations exclusively were of birds flying over the Site, and no records exists of Great Black-backed Gulls landing in or using the habitats within the 500m buffer zone. Although this species nests primarily on the coast, it is also known to nest on buildings, in larger towns and cities. Birds nesting inland occur near larger waterbodies, and thus there is no scope for breeding on-site. Habitats on site are also largely unsuitable for foraging birds. Therefore, habitat loss is not envisaged to effect this species.	**Sensitivity:** Low **Magnitude:** Negligible **Overall significance:** Very Low Loss of habitat will be a **Long-term Imperceptible** effect, based on minimal sightings within the Site, and a lack of suitable breeding and foraging habitats (Criteria: EPA, 2022).
Grey Heron (Low)	Grey Heron were observed 13 times during flight activity surveys. A total of 11 of these records occurred outside of the 500m buffer zone, near Lough Nambrackderg, which is situated c. 1.08km from the Site. Habitats on site are also largely unsuitable for foraging birds. Therefore, habitat loss is not envisaged to effect this species.	**Sensitivity:** Low **Magnitude:** Negligible **Overall significance:** Very Low Loss of habitat will be a **Long-term Imperceptible** effect, based on minimal sightings within the Site, and a lack of suitable breeding and foraging habitats (Criteria: EPA, 2022).
Hen Harrier (Very High)	Hen Harrier were recorded very infrequently across summer and winter flight activity surveys. This species was recorded within the flight activity survey area six times across five years of winter and breeding season flight activity surveys. The species was observed on two occasions within the 500m buffer of the site over five consecutive breeding	**Sensitivity:** Very High **Magnitude:** Low (1-5% habitat loss) **Overall significance:** Medium

Key Receptor (Sensitivity)	Construction Direct Effect Character	Significance without mitigation
	seasons. No evidence of winter roosting was recorded over the five-year period. Hen Harrier typically forage over heath, bog, low intensively farmed grassland with well-established hedgerows and areas of scrub (Irwin et al., 2012). Heath and bog habitats are important hunting and nesting grounds for Hen Harrier. There were no records of breeding or nesting within the Proposed Development or immediate wider environment, hunting was observed. Looking at a worst-case scenario, there will be a loss of 14.38 Ha of suitable habitat which equates to 3.83% of total available suitable habitat for the species in the site boundary. However, loss of habitat types alone does not provide a complete picture and the very low number of sightings over five years of surveys reduces the potential for effects.	Loss of foraging habitat will be a **Long-term Slight to Moderate** effect due to the low number of sightings of hunting (3 observations in 5 years) within the 500m buffer of the sites (Criteria: EPA, 2022).
Kestrel (High)	Kestrel were observed a total of 51 times during the breeding season, and 18 times during the non-breeding season intersecting the 500m buffer zone over five years of surveys (an average of 13.8). This species typically breeds and forages in conifer plantation, dry heath, dry meadows, grassy verges, improved agricultural grassland, recently felled woodland and scrub - thus the species is rather flexible in its habitat needs. No breeding behaviours were observed over the course of the five-year survey period, however the site was used by commuting and foraging birds. There will be a loss of 14.38 Ha of potential foraging habitat which equates to 3.83% of total available suitable habitat for the species.	**Sensitivity:** High **Magnitude:** Low (1-5% habitat loss) **Overall significance:** Low Loss of habitat will be a **Long-term, Slight** effect, (Criteria: EPA, 2022).
Lesser Black-backed Gull (Medium)	This species was recorded a total of 25 times during breeding season flight activity surveys, and once during the winter season over five years of flight activity surveys. However, only six records in 5 years occurred within the 500m buffer zone, and the remaining 20 records occurred outside of the 500m buffer zone on or near Lough Nambrackderg c. 1.08km to the north of the Site. Breeding and roosting were not observed within the site over the five-year survey period. Although this species nests primarily on the coast, it is also known to nest on buildings, in larger towns and cities. Birds nesting inland occur near larger waterbodies, and thus there is no scope for breeding on-site. Habitats on site are also largely unsuitable for foraging birds. Therefore, habitat loss is not envisaged to effect this species.	**Sensitivity:** Medium **Magnitude:** Negligible **Overall significance:** Very Low Loss of breeding and/or foraging habitat will be a **Long-term Imperceptible** effect due to minimal sightings on site, and lack of suitable breeding and foraging habitats (Criteria: EPA, 2022).
Peregrine (Very High)	Peregrine were recorded infrequently across the five-year survey period, the predominantly brief observations consisted of Peregrine (adults and juveniles) flying over and hunting within the 500m buffer zone. However, no breeding behaviour was observed within the Site over the five year period. Peregrine were recorded a total of twelve times during breeding season flight activity surveys, and five times during non-breeding season flight activity surveys over five years of surveys. Peregrine require tall cliff-faces or man-made structures which resemble these, for breeding. No such habitats or structures occur on site. Peregrines are aerial hunters which dive on prey from above and as such are not strictly limited to any particular habitat, instead they	**Sensitivity:** Very High **Magnitude:** Negligible **Overall significance:** Low Loss of habitat will be a **Long-term, Imperceptible** effect based on a lack of suitable breeding habitat on site (Criteria: EPA, 2022)

Key Receptor (Sensitivity)	Construction Direct Effect Character	Significance without mitigation
	require sufficient numbers of avian prey. As such, there are no envisaged habitat loss impacts on the species.	
Red Grouse (High)	This species was not observed during the latest two years of breeding season flight activity surveys (2023 and 2024). However, this species was recorded 11 times during VPs. Six observations occurred within the 500m buffer zone. Many records were call-only. The site holds one pair of breeding Red Grouse located outside the footprint of the proposed development with a second pair recorded outside the site. Red Grouse require heather for both food and shelter/nesting. Overgrazing of the peatlands within the site by sheep has greatly limited the amount of suitable habitat for the species. The nesting locations recorded during surveys were confined to discrete pocket of land which were less accessible to sheep and held taller stands of heather at the time of the surveys. Neither of these nesting locations are located within the footprint of the development. Looking at a worst-case scenario, considering all peatland/heathland habitats and mosaics there will be a loss of 11.62 Ha of suitable habitat which equates to 3.9% of total available suitable habitat for the species within the site.	**Sensitivity:** High **Magnitude:** Low (1-5% habitat loss) **Overall significance:** Low Loss of breeding and/or foraging habitat will be a **Long-term Slight** effect (Criteria: EPA, 2022).
Snipe (High)	Snipe were observed five times during the breeding season flight activity surveys, and 19 times during the non-breeding season flight activity surveys. The majority (19) occurred outside the 500m buffer zone. Snipe were also recorded during the winter walkovers, however no records were made during the summer walkovers or breeding wader walkovers. Snipe are ground-nesting birds that breed in grassy tussocks in or adjacent to bog habitats. Snipe are commonly found in bog and wet grassland habitats during the breeding season, as well as wetland habitats and lowland lake shores during the non-breeding season. Although Snipe were not recorded within the Proposed Development, there are records of this species in the immediate surroundings and there is habitat on-site to support this species. Looking at a worst-case scenario, there will be a loss of 14.38 Ha of potential foraging habitat which equates to 3.83% of total available suitable habitat for the species within the site.	**Sensitivity:** High **Magnitude:** Low (1-5% habitat loss) **Overall significance:** Low Loss of breeding and/or foraging habitat will be a **Long-term Imperceptible to Not Significant** effect due to minimal sightings on site (Criteria: EPA, 2022).
Sparrowhawk (Low)	Sparrowhawk were recorded a total of 7 times during the breeding season, and 5 times during the non-breeding within the 500m buffer of the site over the 5 year survey period (an average of 2.4 sightings a year). Both adults and juveniles were observed on a very infrequent basis. No breeding or roosting was recorded. Hinterland surveys indicate this species is also widely present in the wider environment. This species requires mature trees for nesting and are commonly found in coniferous plantations. A second key requirement is an abundance of small birds, including Meadow Pipit and Skylark. Although Meadow Pipit and Skylark are present, the site does not contain habitats to support breeding Sparrowhawk. Hunting was observed on-site, however this is an aerial bird and feeds on prey caught in flight. Looking at a worst-case scenario, there will be a loss of 14.38 Ha of potential foraging habitat which equates to 3.83% of total available suitable habitat for the species within the site.	**Sensitivity:** Low **Magnitude:** Negligible **Overall significance:** Very Low Loss of habitat will be a **Long-term Imperceptible**_effect, based on minimal sightings within the Site, (Criteria: EPA, 2022).
Swift (High)	Swift were recorded once during the 2023 breeding season flight activity surveys, where two birds were recorded	**Sensitivity:** High

Key Receptor (Sensitivity)	Construction Direct Effect Character	Significance without mitigation
	hunting in the north-east of the study area. This species breeds throughout Ireland, usually in small recesses in buildings, both occupied and derelict, and less frequently in holes in trees or caves in uplands or coastal areas. Swift feed exclusively on various invertebrates (midges, flies, spiders) caught in flight. Optimal breeding habitat does not occur on site, and forages in open aerial habitats, thus habitat loss is not envisaged to be a big factor with this species.	**Magnitude:** Negligible **Overall significance:** Very Low Loss of habitat will be a **Long-term, Imperceptible** effect, based on a low number of sightings (Criteria: EPA, 2022)
Teal (Medium)	Teal were observed ten times during the breeding season flight activity (VP) surveys, and once during the non-breeding season flight activity surveys. Of which, only one record of Teal was made within the 500m buffer zone, where three individuals were observed in a pool. All other records were found c. 1.08km from the Site, at Lough Nambrackderg, where successful breeding was observed. This species usually nests near small freshwater lakes or pools and small upland streams away from the coast, and also in thick cover. Teal typically forage in similar habitats, Therefore, the site does not have potential to host breeding and foraging birds, and is unlikely to be effected by habitat loss.	**Sensitivity:** Medium **Magnitude:** Negligible **Overall significance:** Very Low Loss of foraging habitat will be a **Long-term, Imperceptible** effect, based on a low number of sightings, as well as a lack of suitable breeding/foraging habitat on site (Criteria: EPA, 2022)

7.5.1.2 Indirect Effects: Disturbance and Displacement

High levels of activity and disturbance during construction may cause birds to vacate territories close to works, especially for species vulnerable to disturbance. The displacement of birds from areas within and surrounding developments can effectively amount to habitat loss (Drewitt, A. L. and Langston, R. H., 2006). If a habitat is therefore avoided as a result of the disturbance, then effective habitat loss can occur. Examples of causes of disturbance during construction which may lead to displacement are vehicle and personnel movements, vibration and noise impacts from the construction process and visual intrusion (Drewitt, A. L. and Langston, R. H., 2006).

Additional effects may occur during the construction process due to road works along turbine delivery routes, the laying of cabling, the placement of underground cabling, re-working structures such as bridges along turbine delivery routes, and excavation of materials.

Studies both during construction (Pearce-Higgins *et al*., 2012) and during operational effects of wind farms (Pearce-Higgins *et al*., 2009) have shown that certain species (e.g. large wading species) can be affected particularly as a result of construction impacts (in that the affected species fail to recover to pre-construction densities).

Indirect effects may occur on species linked to aquatic habitats through pollution events, sediment laden runoff and dust deposition.

Table 7.26: Indirect Construction Effects on Avifauna

Key Receptor (Sensitivity)	Construction Indirect Effect Character	Significance without mitigation
Buzzard (Low)	Buzzards were recorded on 37 occasions across all five breeding seasons. The majority of which recorded Buzzards flying wholly within or partially within the 500m buffer zone. In comparison to surveys during the breeding season, very few records of Buzzards were made across the five winter flight activity survey seasons. No observations of Buzzard were made during the 2020/21 and 2021/22 winter seasons, and only six records were made across the remaining three winter survey seasons. No breeding behaviour was observed, and there are no suitable habitats on Site for such due to the absence of tall mature trees. However, Buzzards were recorded flying over and hunting within the northern portion of the flight activity survey area, and hunting to the north-west of the Site. Therefore, there is potential for noise or visual disturbance to foraging Buzzard within the Site.	**Sensitivity:** Low **Magnitude:** Medium **Overall significance:** Very Low (Percival, 2003) Disturbance and/or displacement will be a **Short term, Slight** effect (Criteria: EPA, 2022).
Chough (Very High)	Chough were recorded during surveys throughout the five-year survey period, however the vast majority of activity was situated outside of the 500m buffer zone, to the north-west of the Site. Here, foraging was observed. 2.32km to the south-west of the Site at HVP5 Cousane Gap, successful breeding was confirmed. However, breeding behaviour was observed within the 500m buffer zone. Only twelve records occurred within this flight activity survey area over five years of surveys, where Chough were recorded flying / commuting through the Site. As this species does not regularly forage or breed within on-site habitats, there is no potential for visual or noise disturbance.	**Sensitivity:** Very High **Magnitude:** Negligible (few sightings within the Site, and no evidence of regular habitat usage) **Overall significance:** Low (Percival, 2003) Disturbance and/or displacement will be a **Short term, Imperceptible** effect (Criteria: EPA, 2022).
Cormorant (Low)	Cormorant were predominantly recorded outside of the site, near Lough Nambrackderg. Only one record of this species exists within the flight activity survey area, where one individual was observed commuting over the Site. Due to the absence of suitable foraging habitats (wetlands) on-site, and absence of records of Cormorants landing on / using on-site habitats, it is unlikely that this species would be effected via noise or visual disturbance.	**Sensitivity:** Low **Magnitude:** Negligible **Overall significance:** Very Low Disturbance and/or displacement will be a **Short term, Imperceptible** effect (Criteria: EPA, 2022).
Curlew (High)	Curlew were recorded once throughout the five years of flight activity (VP) surveys, which occurred outside of the 500m buffer zone. There were no records of Curlew within the Proposed Development. This species was not recorded during breeding or winter walkovers. Curlew are ground-nesting species, that nest in rough pastures, meadows and heather. During the winter season, this species prefers a wide range of inland and coastal wetland habitats. With no records of Curlew within the Site over five years of surveys and the lack of breeding evident, the resultant habitat loss will not be significant. Due to the absence of suitable foraging and breeding habitats on-site, habitat loss is not envisaged to effect this species.	**Sensitivity:** High **Magnitude:** Negligible **Overall significance:** Low Loss of habitat will be a **Long-term, Imperceptible** effect, based on minimal sightings within the Site (Criteria: EPA, 2022).
Dunlin (Very High)	This species was observed within the 500m buffer zone on only one occasion, where birds were recorded commuting across the Site.	**Sensitivity:** Very High **Magnitude:** Negligible **Overall significance:** Low

Key Receptor (Sensitivity)	Construction Indirect Effect Character	Significance without mitigation
	This species typically feeds on small invertebrates (polychaete worms and small gastropods) in muddier sections of estuarine mudflats. Due to the absence of suitable foraging habitats on-site, there is no potential for foraging birds to be indirectly effected by noise or visual disturbance. No breeding or roosting behaviour was observed. Dunlin are ground-nesting birds, that typically breed in sparse, low vegetation and favour machair habitats. Due to the absence of suitable breeding habitats on-site, there is no potential for breeding birds to be indirectly effected by noise or visual disturbance.	Disturbance and/or displacement will be a **Short term, Imperceptible** effect (Criteria: EPA, 2022).
Goldcrest (Medium)	Goldcrest were recorded during breeding bird transects and VP surveys, as a secondary target species. This species typically uses woodland, treeline and scrub habitats to forage. As a result, due to the absence of suitable on-site habitats, it is unlikely that Goldcrest would be indirectly effected by visual or noise disturbance.	**Sensitivity:** Medium **Magnitude:** Negligible **Overall significance:** Very Low Disturbance and/or displacement will be a **Short-term, Imperceptible** (Criteria: EPA, 2022).
Golden Plover (Very High)	Human related disturbance for Golden Plover can occur at distances of up to 200-500m (NatureScot, 2025). Goodship and Furness (2022) note that disturbance studies on Golden Plover are more limited during the nonbreeding season although flocks can be disturbed on foraging and roosting grounds; Ross and Liley (2014) reported high flush rates for Golden Plover around the Humber estuary during the winter. However, the studies in question relate to breeding sites, roosting sites and established foraging habitats. There was no evidence over the 5 years of surveys of breeding or roosting onsite. All records indicate Golden Plover recorded within the Site, were exclusively commuting through the study area. As such, it is unlikely that Golden Plover would be indirectly effected significantly by visual or noise disturbance and the effects are considered to be similar to that of the worst-case scenario effect due to habitat loss.	**Sensitivity:** Very High **Magnitude:** Low (1-5% habitat loss) **Overall significance:** Medium Loss of habitat will be a **Short-term-term Slight to Moderate** effect (Criteria: EPA, 2022).
Great Black-backed Gull (Low)	This species was observed commuting through the 500m buffer zone on two occasions during flight activity surveys. This species was not observed during any other survey across the Site. Additionally, no evidence of Great Black-backed Gull foraging on site was recorded. As there are no such habitats within or near the Site, there is no potential to indirectly effect breeding birds. Therefore it is unlikely that Great Black-backed Gull would be indirectly effected by visual or noise disturbance	**Sensitivity:** Low **Magnitude:** Negligible **Overall significance:** Very Low Disturbance and/or displacement will be a **Short-term, Imperceptible** effect (Criteria: EPA, 2022).
Grey Heron (Low)	Grey Heron were observed 13 times during flight activity surveys. A total of 11 of these records occurred outside of the 500m buffer zone, near Lough Nambrackderg, which is situated c. 1.08km from the Site. Habitats on site are also largely unsuitable for foraging birds. Therefore, habitat loss is not envisaged to effect this species.	**Sensitivity:** Low **Magnitude:** Negligible **Overall significance:** Very Low Disturbance and/or displacement will be a **Long-term Imperceptible** effect, based on minimal sightings within the Site, and a lack of suitable breeding and foraging habitats (Criteria: EPA, 2022).
Grey Wagtail (High)	This species was recorded three times during breeding bird transects, and twice during Hinterland surveys. Grey Wagtail are typically associated with fast-flowing waters such as streams and rivers, however they may also be found near lakes.	**Sensitivity:** High **Magnitude:** Negligible **Overall significance:** Very Low

Key Receptor (Sensitivity)	Construction Indirect Effect Character	Significance without mitigation
	Due to the absence of such habitats on-site, lack of observations of Grey Wagtail landing in or using the habitats on-site, and lack of breeding potential on-site, noise or visual disturbance is highly unlikely to be an issue with this species.	Disturbance and/or displacement will be a **Short-term, Imperceptible** effect (Criteria: EPA, 2022).
Hen Harrier (Very High)	A non-quantitative study suggests that Hen Harrier will stay at least 188m away from human habitation (Goodship and Furness, 2022). Ruddock and Whitfield (2007) considered from expert opinion that the upper pedestrian disturbance distance limit for Hen Harrier during the breeding season is 500-750m. Hen Harrier will nest at 200 to 300m from an operational wind turbine (Madders and Whitfield 2006) or closer (Ruddock and Whitfield, 2007). Hen Harrier is most likely to be disturbed at nest sites early on in the breeding season as well as at communal roosting areas and potentially foraging grounds during the nonbreeding season. Depending on the level of habituation to disturbance, a buffer zone of 300-750m is suggested to protect both breeding and nonbreeding Hen Harriers from pedestrian and aircraft disturbance, but habituation to disturbance influences the size of the buffer required and further studies on the impacts of human disturbance are required to help inform such decisions (Goodship and Furness, 2022). The same study also noted that a buffer zone at the lower end of this range may be sufficient to protect individuals that have some habituation to disturbance. However, the studies in question relate to breeding sites, roosting sites and established foraging habitats. There was no evidence over the 5 years of surveys of breeding, roosting or regular foraging onsite. Over the 5 year period Hen Harrier were recorded a total of 11 occasions and only six of these observations occurred within 500m of a turbine. Of these 4 occurred in total across the five winter seasons and 2 occurred over the 5 breeding seasons. With no evidence of nesting, roosting or foraging within the study area the potential for noise or visual disturbance to Hen Harrier is considered to be Imperceptible.	**Sensitivity:** Very High **Magnitude:** Negligible **Overall significance:** Low Disturbance and/or displacement will be a **Short-term, Imperceptible** effect (Criteria: EPA, 2022).
House Martin (Medium)	House Martin were observed during breeding season flight activity surveys. During the breeding season, House Martin require buildings or cliffs to construct their nests. Due to the absence of suitable habitats, it is unlikely that this species breeds on-site. This bird is an aerial species that forages over open habitats, and is typically found in pastures, arable lands, villages and towns. However, it can also occur in heathland and moorland. As such, there is potential for occasional foraging House Martin on the Site. Therefore, there is possible noise/visual intrusion disturbance to foraging birds within the Site.	**Sensitivity:** Medium **Magnitude:** Medium **Overall significance:** Low Disturbance and/or displacement will be a **Short-term, Slight** effect (Criteria: EPA, 2022).
House Sparrow (Medium)	House Sparrows were only recorded once during flight activity surveys, where Sparrows were flushed en route to VP 2 during the 2020/21 non-breeding season. This species can be found in a range of habitats, including urban and sub-urban areas, pastures and arable lands, woodlands, and coastal habitats. House Sparrow breed throughout Ireland, but typically remains close to human habitation including farm buildings and built-up areas such as parks and gardens. This species nests in cavities in buildings, especially under eaves or holes formed by missing brickwork. As this species does not breed or have the potential to breed on-site, and as there is just one record, noise or visual disturbance is highly unlikely to be an issue with this species.	**Sensitivity:** Medium **Magnitude:** Negligible **Overall significance:** Very Low Disturbance and/or displacement will be a **Short-term, Imperceptible** effect (Criteria: EPA, 2022).
Kestrel (High)	Kestrel is assessed to have a low to medium sensitivity to human disturbance and Goodship and Furness, (2022) cite a buffer zone of between 100-200m during the breeding season and ≤ 50m during the non-breeding season.	**Sensitivity:** High **Magnitude:** Low **Overall significance:** Low

Key Receptor (Sensitivity)	Construction Indirect Effect Character	Significance without mitigation
	Kestrel were recorded 102 times during the breeding season flight activity surveys, and 32 times during the non-breeding season flight activity surveys. However, a little over half of these observations (69) intersected the 500m buffer zone. Included in this number are observations which partially intersected this buffer zone. The 100-200m buffer zone is suggested to protect nesting Kestrels from forestry operations. No breeding (nesting) or roosting was detected throughout the five-year survey period. However, Kestrels were observed hunting within the Site and the greater study area. Therefore, there is possible noise/visual intrusion disturbance to foraging birds within the Site. The effect is reduced however given the availability of habitat greater than the maximum 200m buffer from turbines where the majority of activity was concentrated.	Disturbance and/or displacement will be a **Short-term, Slight** effect (Criteria: EPA, 2022).
Lesser Black-backed Gull (Medium)	Lesser Black-backed Gull were primarily recorded during the breeding season, outside of the 500m buffer zone during flight activity surveys. However, there are six records of this species within the Site over 5 years of surveys. No foraging or breeding behaviours were observed, and it appears this species was commuting / flying through the Site towards Lough Nambrackderg (1.08km from the Site), where the majority of observations were made. As this species does not have the potential to breed within the Site, is unlikely to forage within the Site, and is only recorded commuting through the flight activity survey area, noise and visual disturbance is unlikely to effect this species.	**Sensitivity:** Medium **Magnitude:** Negligible **Overall significance:** Very Low Disturbance and/or displacement will be a **Short-term, Imperceptible** effect (Criteria: EPA, 2022).
Linnet (Medium)	Linnet were recorded during breeding season flight activity surveys. Breeding does not occur on-site, nor is there suitable habitat to support breeding, as this species prefers rough grasslands in upland and coastal areas with gorse. Typically this species forages in woodland, treeline and scrub habitats. However, they may forage in heathland, moorland and bogland habitats. Although there are few records of this species across the five-year survey period, there is limited potential for noise / visual disturbance to effect foraging Linnet.	**Sensitivity:** Medium **Magnitude:** Low **Overall significance:** Low Disturbance and/or displacement will be a **Short-term, Slight** effect (Criteria: EPA, 2022).
Meadow Pipit (High)	Meadow Pipit were recorded frequently across flight activity surveys, and breeding and winter walkover surveys. This is a ground-nesting species that uses open habitats with low-lying vegetation, typically grassland and heathland for breeding and foraging purposes. As such, there is potential for noise and visual disturbance to effect this species.	**Sensitivity:** High **Magnitude:** Low **Overall significance:** Low Disturbance and/or displacement will be a **Short-term, Slight** effect (Criteria: EPA, 2022).
Peregrine (Very High)	Peregrine were recorded infrequently across the five-year survey period, the predominantly brief observations consisted of Peregrine (adults and juveniles) flying over and hunting within the 500m buffer zone. Goodship and Furness, (2022) cite buffer zones to protect breeding Peregrines from forestry operations in the UK range from 200 to 600m. A safe working distance for aircraft in Scotland is considered to be 500-750m (lateral). However, no breeding or nesting has been recorded, and there is no potential for breeding within the Site given the habitats present. Therefore, the resultant potential for effects is considered to be reduced.	**Sensitivity:** Very High **Magnitude:** Negligible **Overall significance:** Low Disturbance and/or displacement will be a **Short-term, Imperceptible to Slight** effect (Criteria: EPA, 2022).
Red Grouse (High)	This species requires heather for both food and shelter/nesting, and thus can be found in heath and bog habitats, where heather is abundant (where overgrazing is not a prevalent). Pearce-Higgins et al. (2012) has found that densities of Red Grouse, were reduced on	**Sensitivity:** High **Magnitude:** Low **Overall significance:** Low

Key Receptor (Sensitivity)	Construction Indirect Effect Character	Significance without mitigation
	wind farms during construction, although Red Grouse densities appeared to recover by the first year of operation. Therefore, there is potential for noise and visual disturbance to effect this species in the short-term with the one pair within the site expected to return post construction.	Disturbance and/or displacement will be a **Short-term, Moderate** effect (Criteria: EPA, 2022).
Redwing (High)	This species favour open fields in lowland areas. However, Redwing were observed 13 times during non-breeding season flight activity surveys. While the habitat present would not be considered typically optimal for the species, it has been recorded traversing the site which may result in some localised noise or visual disturbance.	**Sensitivity:** High **Magnitude:** Low **Overall significance:** Low Disturbance and/or displacement will be a **Short-term, Imperceptible** effect (Criteria: EPA, 2022).
Sand Martin (Medium)	Only two records of Sand Martin were made during breeding season flight activity surveys. This species nests in sand banks or crevices in walls and bridges. As such there is no potential for the Site to support breeding birds. It is unlikely that this species will be effected by noise or visual disturbance.	**Sensitivity:** Medium **Magnitude:** Negligible **Overall significance:** Very Low Disturbance and/or displacement will be a **Short-term, Imperceptible** effect (Criteria: EPA, 2022).
Skylark (Medium)	Skylark are ground-nesting birds, that use open habitats with some low-lying vegetative cover (typically grassland and heath) for breeding and foraging purposes. While overgrazing of these habitats within the site by sheep has greatly limited the amount of suitable habitat for Skylark, the species continues to forage and nest within the heath and grassland habitats within the Proposed Development and the greater area. As such, there is potential for noise or visual disturbance to effect this species.	**Sensitivity:** Medium **Magnitude:** Low **Overall significance:** Low Disturbance and/or displacement will be a **Short-term, Slight** effect (Criteria: EPA, 2022).
Snipe (High)	The wind farm development site is of very limited value for waders and waterfowl. Literature suggests significant declines in densities of Snipe during construction (Pearce-Higgins et al, 2012) which may lead to density declines post construction. Snipe were also shown by Pearce-Higgins et al. (2009) to use areas of habitat within 400m of turbines less than expected, leading to an expected 48% decline in abundance within 500m of the turbines. This ground-nesting bird breeds where there are grassy tussocks within or adjacent to boggy areas, and are typically found in bog and wet grassland habitats during the breeding season, and wetland, wet habitats and lowland lake shores during the non-breeding season. Snipe were observed 24 times during the breeding and non-breeding season flight activity surveys, of which 5 occurred within the 500m buffer zone over a five year period, equating to one record every 12 months of surveys. Although there was a very low number of Snipe records within the site and no evidence of breeding within the site or the 500m buffer surrounding turbine, there are records of this species in the immediate surroundings and there is habitat on-site to support this species. However the quality of this habitat has been compromised by overgrazing currently prevalent within the site. As such, there is a small potential that Snipe may be effected by noise and visual disturbance.	**Sensitivity:** High **Magnitude:** Low **Overall significance:** Low Disturbance and/or displacement will be a **Short-term, Slight** effect (Criteria: EPA, 2022).
Sparrowhawk (Low)	Sparrowhawk were observed within the Site on 12 occasions over the 5 year period, where adults and juveniles have been observed hunting. No breeding behaviour was detected, however, and there are no suitable habitats to support breeding Sparrowhawk as they favour woodlands and require mature trees for nesting. There is potential for noise and visual disturbance to effect foraging Sparrowhawk.	**Sensitivity:** Low **Magnitude:** Medium **Overall significance:** Very Low Disturbance and/or displacement will be a **Short-term, Slight** effect (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Construction Indirect Effect Character	Significance without mitigation
Starling (Medium)	Starling were observed on 18 occasions during flight activity surveys. Of which, the majority of records (15) occurred during the breeding seasons. Between one and 100 individuals were recorded during each of these observations. However, the species was not observed during breeding of non-breeding transect surveys No breeding was recorded onsite and records indicate this species was commuting through the Site. There are no habitats to support breeding or evidence of regular foraging for Starling on-site. As such, there is a reduced potential for visual or noise disturbance to effect this species.	**Sensitivity:** Medium **Magnitude:** Negligible **Overall significance:** Very Low Disturbance and/or displacement will be a **Short-term, Imperceptible** effect (Criteria: EPA, 2022).
Skylark (Medium)	Skylark are ground-nesting birds, that use open habitats with some low-lying vegetative cover (typically grassland and heath) for breeding and foraging purposes. While overgrazing of these habitats within the site by sheep has greatly limited the amount of suitable habitat, the species continues to forage and nest within the heath and grassland habitats within the Proposed Development and the greater area.	**Sensitivity:** Medium **Magnitude:** Low **Overall significance:** Low (Criteria: Percival, 2003) Disturbance and/or displacement will be a **Short-term, Slight** effect (Criteria: EPA, 2022).
Swallow (Medium)	Swallows were recorded 56 times during the breeding season flight activity surveys, in flocks of up to 160 birds. No breeding habitat is available within the site. Swallows typically feed on insects in open habitats. As such, there is potential foraging habitats (heath and grassland) within the Site. Therefore, there is potential for noise or visual disturbance with this species.	**Sensitivity:** Medium **Magnitude:** Low **Overall significance:** Low (Criteria: Percival, 2003) Disturbance and/or displacement will be a **Short-term, Slight** effect (Criteria: EPA, 2022).
Swift (High)	Swift was recorded once within the Site, where two individuals were recorded hunting at VP3 in July 2023. As this species does not breed and does not have the potential to breed on-site, and there is only one foraging record, noise and visual disturbance is unlikely to be an issue with this species.	**Sensitivity:** High **Magnitude:** Negligible **Overall significance:** Very Low Disturbance and/or displacement will be a **Short-term, Imperceptible** effect (Criteria: EPA, 2022).
Teal (Medium)	Teal was recorded once within the flight activity survey area, where a group of three individuals were observed within a pool on-site. Successful breeding was recorded in the wider environment, however this species does not breed and does not have the potential to breed within the Site itself. There are also no records of foraging within the Site. As such, it is unlikely that this species would be effected by noise or visual disturbance.	**Sensitivity:** Medium **Magnitude:** Negligible **Overall significance:** Very low Disturbance and/or displacement will be a **Short-term, Imperceptible** effect (Criteria: EPA, 2022).
Wheatear (Medium)	Wheatear were observed 34 times during flight activity surveys, and are typically associated with heahland and moorland habitats. During breeding transect surveys, 20 records of up to four individuals were made across all five breeding seasons. As such, there is potential for this species to be effected by visual and noise disturbance.	**Sensitivity:** Medium **Magnitude:** Medium **Overall significance:** Low Disturbance and/or displacement will be a **Short-term, Slight** effect (Criteria: EPA, 2022).
Whinchat (High)	Only one record of Whinchat was made, where one individual was recorded during the 2023/24 winter walkovers. This is an unusual observation, as Whinchat are considered seasonal visitors to Ireland, and over-winter in Africa. It is unlikely that Whinchat would be recorded within the Proposed Development again. As such, noise and visual disturbances are unlikely to effect this species.	**Sensitivity:** High **Magnitude:** Negligible **Overall significance:** Low Disturbance and/or displacement will be a **Short-term, Imperceptible** effect (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Construction Indirect Effect Character	Significance without mitigation
Willow Warbler (Medium)	Willow Warbler were observed twice during summer transects. This species typically breeds along the edges of bogs and marshes, and can be found in heath and moor habitats. Although there are no records of foraging or breeding on-site, there is limited potential. As such, this species may be effected by noise or visual disturbance.	**Sensitivity:** Medium **Magnitude:** Low **Overall significance:** Low Disturbance and/or displacement will be a **Short-term, Slight** effect (Criteria: EPA, 2022).

7.5.2 Potential Operational Effects

7.5.2.1 Direct Effects: Collision Risk

Studies on operational impacts of wind farms (Pearce-Higgins *et al*., 2009) have shown that certain species do exhibit levels of turbine avoidance during operational phases which may be extrapolated to reductions in breeding bird densities; however, this may not be as significant as previously thought, certainly in comparison to impacts during construction (Pearce-Higgins *et al*., 2012). It seems that there is little evidence for consistent post-construction population declines in any species, suggesting for the first time that wind farm construction can have greater effects on birds than wind farm operation; this is supported in the literature (Devereux *et al*., 2008).

The primary cause of direct effects on birds during the operational phase of a development is collision risk. Collision risk behavioural observations of birds in relation to operational wind farms provide the basis of studies on collision risk. Fixed point observations of flight behaviour, flight lines into, through and out of the area and information about the birds' use of the area help to inform the environmental evaluation of the proposed wind farm development. Bird mortality may result from potential bird collision with turbine structures or turbine blades.

Not all bird species are equally susceptible to collision, and some species suffer proportionately high levels of collision mortality (Drewitt and Langston, 2008). Morphology, physical flight characteristics and differences in vision are all influencing factors. Martin and Shaw (2010) suggest that it is the characteristics of the section of a birds visual field that projects forward and hence 'looks' that are the key factors.

In some species the vertical extent of the forward binocular vision is reduced and therefore the bird is rendered blind, if, whilst in the process of flying, it undertakes behaviour such as the detection of conspecifics, remote food sources, etc. (Martin, 2011 and Martin and Shaw, 2010).

Other species have reduced fovea, are emmetropic (default focus is distant) or may contain blind spots in their field of vision (as an evolutionary trait) which may cause susceptibility to collision. Flight height or the flight heights which birds habitually use along either migration or local flight paths is also an influencing factor. Relative size and high wing loading (or low manoeuvrability) are influencing factors as larger birds with poor manoeuvrability are generally perceived as at greater risk of collision with structures (see Brown et al., 1992, quoted in Drewitt and Langston, 2006). Various species therefore exhibit different morphological and behavioural attributes which may contribute to collision risk.

Recent studies show that modern, larger multi-MW turbines show comparable fatality estimates with older generation models and expected increases in fatalities due to increases in rotor surface are not as expected, possibly due to increased altitude, increased distance between turbines and slower rotation speeds (Krijgsveld et al., 2009). Appraisal of collision risk for the proposed development is based on a predicted rotor envelope of 25-175m (see **Chapter 2: Project Description**).

Relatively little is known about collision as a threat to birds. One problem is that most studies rely on the number of corpses found, but this can be extremely unreliable, since it is known that corpses are quickly removed by predators. At a wind farm site in Co. Tipperary in 2011, it was found that 72% of bird corpses left out were removed after five days. At this site in Co. Tipperary in 2012, scavengers were present at a bird corpse within forty-five minutes of it being placed in the vicinity of a turbine (J. Kearney Technical Director of Ecology FT, pers. comm. 2025).

The colour, mode, intensity, and density of lighting has been shown to influence the degree to which birds (specifically, nocturnally migrating passerines) are attracted to wind turbines at night. Studies have shown that red lighting is more attractive to birds, and that steady burning lights are more attractive than flashing ones, while structures with no lighting were the least attractive (Kerlinger *et al*., 2010; Gehring *et al*., 2009). The directional intensity of lighting is also a factor in reducing the attraction of birds. As such, specification of aviation obstruction lighting to minimise effects on birds is included under operational mitigation measures.

7.5.2.2 Collision Risk Model Analysis

The Collision Risk Model Report (see **Appendix 7.2**) presents the results of collision risk modelling for the proposed Gortloughra Wind Farm, Co. Cork. This modelling used data from vantage point surveys carried out in the winters of 2019/20, 2020/21, 2021/22, 2022/23 and 2023/24 as well as the summers of 2020, 2021, 2022, 2023 and 2024. The modelling was carried out using the NatureScot Collision Risk Model (Band, 2024). The spreadsheet accompanying the NatureScot report was used to calculate collision probabilities for birds transiting through the rotors.

A total of fourteen species were selected for collision risk modelling: Buzzard, Cormorant, Chough, Dunlin, Great Black-backed Gull, Golden Plover, Heron, Hen Harrier, Kestrel, Lesser Black-backed Gull, Peregrine, Sparrowhawk, Snipe and Swift. These species have been selected because they were recorded within the 500 m buffers of the proposed turbines (the flight activity survey area) and at rotor swept heights, and are of conservation concern: i.e., they are red or amber-listed in Birds of Conservation Concern Ireland 2020-2026 (Gilbert *et al*., 2021), and/or are listed on Annex I of the Birds Directive (2009/147/EC) or green-listed and sensitive to wind farm developments (i.e., Buzzard).

For all the other species recorded but not included for collision risk modelling, the effective collision risk can be assumed to be zero as there was no activity recorded within the collision risk zone over the survey period. The following target species were never recorded within the study area over the 5 years of surveys Curlew, Little Egret, Mallard, Merlin, Stock Dove or Whooper Swan. Similarly, there were no observations of Red Grouse or Teal flying at rotor height.

As the proposed grid connection will be buried underground there is no resultant collision risk associated with this element of the wind farm project.

<u>Passerines</u>

Collision by resident passerines is not considered likely to be a significant issue as their flight activity is generally well below the height of rotor blades and the proposed impact of collision risk will be a *Long-term Imperceptible Reversible Effect*.

<u>Non-Passerines</u>

Potential collision risk to non-passerine target species is outlined in Table 7.27 below. The Collision Risk Model Report (see **Appendix 7.2**) provides further information on the predicted collision rate as a percentage of the populations of those species with a predicted collision risk per annum of 0.1 of greater, namely: Buzzard, Chough, Golden Plover and Kestrel.

The other species analysed in the CRM (Cormorant, Dunlin, Great Black-backed Gull, Heron, Hen Harrier, Lesser Black-backed Gull, Peregrine, Sparrowhawk, Snipe and Swift) are predicted to be subject to less than one collision over the proposed 40-year lifespan of the wind farm. As such the magnitude of effects for all of these species can be assessed as *Negligible*. Due to their small and declining population, an exception to this approach was made for Hen Harrier, and potential impacts on national, SPA and local populations were assessed in detail for this species based on an extreme interpretation of the precautionary principle. A similar exception was made for Peregrine falcon, which was also assessed in terms of effects on national and county populations due to it's Annex I status and because the predicted collision rate over the 40-year operational period is greater than 1 (1.22).

Table 7.27: Potential collision risk to target species

Key Receptor (Sensitivity)	Operational Direct Effect Character	Significance without mitigation
Buzzard (Low)	A total of 27 Buzzard fatalities have been recorded within the European Context, in a review of 46 wind farms up to 2004 (Hötker et al., 2006). However, this number is low in relation to the estimated European population of up to one million pairs (Gensbol, 2008) and best available knowledge suggests mortality due to wind farms is not sufficient to cause significant population declines of this green-listed species. The predicted annual collision rate for Buzzard equates to 0.007% of the national population and 0.066% of the county population. It is noted that the county population is an estimate based on the proportion of the national population split by county area, used due to lack of a county estimate. Buzzard is a green-listed species of low conservation concern due to it ongoing expansion in population size and range. The national population estimate available for the species was taken from the Article 12 report covering the period 2008-2012. As this data is more 10 years old it does not account for the continued expansion of the species range throughout Ireland and therefore certainly underestimates the current population size for this species. **Predicted number of collisions per year (assuming avoidance) is <u>0.12 per year (0.036 % of the of the county population and 0.004 % of the national population).</u>**	**Sensitivity:** Low. **Magnitude:** Negligible – based on predicted 0.12 collisions per year which is equal to 0.036% of the conservative county population estimate or 0.004% of national population. **Overall significance:** Very Low. (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible** effect (Criteria: EPA, 2022).
Chough (Very High)	While corvids are not typically the focus of avian collision studies focusing on wind farms, there are records of corvid collision fatalities attributed to turbine strikes. In a review of 46 European wind farms up to 2004 (Hötker et al., 2006), a total of 20 corvid fatalities are recorded (comprised of 2x Magpies, 1x Jackdaw, 9x Ravens, 2x Rooks, 5x Carrion Crows An 1x Crow sp.). The absence of Chough from these records is likely to be reflective of their habitat preferences being alpine and rugged coastal regions – both limiting their population size relative to other corvid species, and reducing their likelihood of encountering wind farms. The regional Chough population in West Cork has demonstrated a recent tendency to colonise inland upland areas, moving beyond their traditional habitat preference in Ireland for rocky coastlands with short open grassland foraging areas. It is considered that the tightly grazed grasslands created by intensive upland sheep farming, in addition to suitable breeding locations provided by rocky ledges and derelict buildings which occur in this region	**Sensitivity:** Very High. **Magnitude:** Negligible – based on predicted 0.06 collisions per year which is equal to 0.023% of the conservative county population estimate or 0.012% of national population. **Overall significance:** Low. (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Slight** effect (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Operational Direct Effect Character	Significance without mitigation
	makes it suitable for Chough to expand inland from their traditional coastal strongholds. Due to the limited amount of flight activity at potential collision height, and relatively low amount of flight activity overall, the predicted collision risk for Chough is 3.7 collisions over the entire operational lifespan of the wind farm (40 years). The number of confirmed breeding pairs recorded during the 2021 national Chough survey (Colhoun et al, 2024) was used to calculate the national and county populations (536 and 288 individuals respectively); however, Colhoun et al. (2024) note that the breeding population is likely to be much larger, and when probable and possible breeding pairs are also included, the national breeding population would be 12,060 birds. As such, the use of confirmed breeding pairs only to estimate population effects is highly conservative. **Predicted number of collisions per year (assuming 98% avoidance) is _0.06 per year (0.023 % of the of the county population and 0.012 % of the national population)._**	
Cormorant (Medium)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were two fatalities across 46 European wind farms (Hötker et al., 2006). Furthermore, the published avoidance rate is 98% (SNH 2010), suggesting cormorant exhibit high levels of micro-avoidance at wind farms. **The predicted collision risk for cormorant is less than one collision over the entire operational lifespan of the wind farm _(0.14 collisions over 40 years). As such, the predicted magnitude is *Negligible*._**	**Sensitivity:** Medium. **Magnitude:** Negligible. **Overall significance:** Very Low. (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible** effect (Criteria: EPA, 2022).
Dunlin (High)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were zero fatalities across 46 European wind farms (Hötker et al., 2006). Furthermore, the published avoidance rate is 98% (SNH 2010), suggesting cormorant exhibit high levels of micro-avoidance at wind farms. **The predicted collision risk for cormorant is less than one collision over the entire operational lifespan of the wind farm _(0.02 collisions over 40 years). As such, the predicted magnitude is *Negligible*._**	**Sensitivity:** High. **Magnitude:** Negligible. **Overall significance:** Very Low. (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible** effect (Criteria: EPA, 2022).
Great Black-backed Gull (Low)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were zero fatalities across 46 European wind farms (Hötker et al., 2006). Furthermore, the published avoidance rate is 98% (SNH 2010), suggesting great black-backed gulls exhibit high levels of micro-avoidance at wind farms. **The predicted collision risk for Great Black-backed Gull is less than one collision over the entire operational lifespan of the wind farm _(0.77 collisions over 40 years). As such, the predicted magnitude is *Negligible*._**	**Sensitivity:** Low. **Magnitude:** Negligible. Overall significance: Very Low. (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible** effect (Criteria: EPA, 2022).
Golden Plover (Very High)	Golden Plover have been recorded in low numbers as collision fatalities at wind farms (Hötker et al., 2006; Grunkorn 2011). The SNH guidance (SNH, 2018) does not provide a specific avoidance rate for Golden Plover, but states that for species not covered by the guidance "*we recommend a default value of 98%* ". However, the review study based on 3 years of post-construction monitoring sites included in the CRM (Appendix 7.2 and Gittings, 2022) indicates a much higher avoidance rate should be applied for non-	**Sensitivity:** Very High. **Magnitude:** Negligible (county and National Population). **Overall significance:** Low. (Criteria: Percival, 2003).

Key Receptor (Sensitivity)	Operational Direct Effect Character	Significance without mitigation
	breeding Golden Plover populations. The studies had robust survey methodologies and were carried out at wind farm sites with high levels of Golden Plover flight activity. The review considers that an avoidance rate of 99.8% is a suitable precautionary estimate for winter Golden Plover. In further support of a high micro-avoidance rate, a study in the Netherlands of three operational wind farms where Golden Plovers were both diurnally and nocturnally active found no fatalities (Krijgsveld et al., 2009). No breeding or roosting Golden Plover were recorded during surveys, reducing magnitude. While a slightly higher collision rate of 0.6 per year is predicted, the predicted effects at county and national level remain *Negligible*. **Predicted number of collisions (assuming 99.8% avoidance) is <u>0.5 per year (0.0054 % of the county population and 0.0006 % of the national population).</u>**	The proposed impact of collision risk will be a **Long-term Slight** effect (Criteria: EPA, 2022).
Grey Heron (Low)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were three fatalities across 46 European wind farms (Hötker et al., 2006). Furthermore, the published avoidance rate is 98% (SNH 2010), suggesting Grey Heron exhibit high levels of micro-avoidance at wind farms. **The predicted collision risk for Grey Heron is less than one collision over the entire operational lifespan of the wind farm <u>(0.22 collisions over 40 years). As such, the predicted magnitude is *Negligible*.</u>**	**Sensitivity:** Low. **Magnitude:** Negligible. **Overall significance:** Very Low. (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible** effect (Criteria: EPA, 2022).
Hen Harrier (Very High)	No Hen Harriers were observed breeding on site, so potential collision risk is significantly reduced due to the absence of the territorial display known as 'sky-dancing', which often occurs at heights within the predicted rotor envelope. Documented as occasionally soaring or arriving at winter roosts 'at height' (Watson, 1977), however no roosting was documented during hinterland surveys in a 10km buffer of the site. Literature suggests flying at low heights is a 'ubiquitous trait' supported by a number of studies (e.g. Whitfield and Madders, 2006). The species has a high published avoidance rate (99%) (SNH, 2017) in relation to wind turbines. The predicted collision risk for Hen Harrier is less than one collision over the entire operational lifespan of the wind farm (0.3 collisions over 40 years). Based on a national population of 95.5 birds (Ruddock et. al 2024), the predicted collision rate of 0.004 per year would result in a 0.004% population loss. The closest SPA for this species located c. 18 km north-east (outside core and maximum breeding season foraging ranges) had one breeding pair in 2022, and an extremely conservative estimate of one pair occurring locally would result in a predicted annual loss of 0.18% of the SPA or estimated local population. As such, the predicted magnitude is confirmed to be *Negligible*. **Predicted number of collisions (assuming 99% avoidance) is <u>0.004 per year (0.18 % of the Mullaghanish to Musheramore Mountains SPA or highly conservative estimated local population and 0.004 % of the national population).</u>**	**Sensitivity:** Very High. **Magnitude:** Negligible **Overall significance:** Low. (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Not Significant** effect (Criteria: EPA, 2022).
Kestrel (High)	Twenty-nine fatalities were recorded across 46 wind farms in a published review of the effects of turbine collision on birds in the European Context (Hötker et al., 2006). The published avoidance rate is 95% (SNH, 2016).	**Sensitivity:** High. **Magnitude:** Negligible, based on predicted annual loss of 0.14% of

Key Receptor (Sensitivity)	Operational Direct Effect Character	Significance without mitigation
	While Kestrel has the highest predicted collision rate (2.4 per year), this represents a loss of 0.14% of the county population (estimate based on proportion of national population split by county area, used due to a lack of a county estimate). At national level this represents an annual loss of 0.015% of the population. As such, the predicted magnitude of collision effects for Kestrel remains *Negligible*. While impacts on the local population are not possible to measure objectively due to a lack of 'local' Kestrel counts, it is likely that the local magnitude would be *Medium*. **Predicted number of collisions (assuming 95% avoidance) is <u>2.4 per year (0.14 % of the of the county population and 0.015 % of the national population)</u>**	county population and 0.015% of national population. A Medium magnitude is estimated for the 'local' population. **Overall significance:** Very Low. (Criteria: Percival, 2003). On an estimated basis, the proposed impact of collision risk could result in a **Long-term Significant** effect at local level (Criteria: EPA, 2022). The proposed impact of collision risk will be a **Long-term Imperceptible** effect at national and county level (Criteria: EPA, 2022).
Lesser Black-backed Gull (Medium)	A published review of 46 European wind farms (Hötker et al., 2006) found 45 fatalities across wind farms. However, the published avoidance rate (SNH, 2010) is 98%, suggesting birds exhibit a high level of micro-avoidance. **The predicted collision risk for Lesser Black-backed Gull is less than one collision over the entire operational lifespan of the wind farm <u>(0.91 collisions over 40 years). As such, the predicted magnitude is *Negligible*.</u>**	**Sensitivity:** Medium. **Magnitude:** Low **Overall significance:** Low. (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Slight** effect (Criteria: EPA, 2022).
Peregrine (Very High)	Evidence of collision fatality is low, with only two birds recorded in published reviews of wind farm fatalities (Hötker et al., 2006). The SNH recommended avoidance rate for collision-risk modelling is 98% (SNH, 2010), suggesting high micro-avoidance capabilities. **Predicted number of collisions (assuming avoidance) is 0.03 <u>per year (0.027 % of the of the county population and 0.003 % of the national population)</u>**	**Sensitivity:** Very High. **Magnitude:** Negligible **Overall significance:** Low. (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Not Significant** effect (Criteria: EPA, 2022).
Snipe (High)	Evidence of collision fatality is low, with only one bird recorded in published reviews of wind farm fatalities (Hötker et al., 2006). The SNH recommended avoidance rate for collision-risk modelling is 98% (SNH, 2010), suggesting high micro-avoidance capabilities. **The predicted collision risk for Sparrowhawk is less than one collision over the entire operational lifespan of the wind farm <u>(0.01 collisions over 40 years). As such, the predicted magnitude is *Negligible*.</u>**	**Sensitivity:** High. **Magnitude:** Negligible **Overall significance:** Very Low. (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible** effect (Criteria: EPA, 2022).
Sparrowhawk (Low)	Sparrowhawks are a resident species of the wind farm study area, although no breeding has been recorded within the site. Published fatality rates are low, with two fatalities from a review of 46 wind farms across Europe (Hötker et al., 2006). **The predicted collision risk for Sparrowhawk is less than one collision over the entire operational lifespan of the wind farm <u>(0.66 collisions over 40 years). As such, the predicted magnitude is *Negligible*.</u>**	**Sensitivity:** Low. **Magnitude:** Negligible **Overall significance:** Very Low. (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible** effect (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Operational Direct Effect Character	Significance without mitigation
Swift (High)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were 14 recorded fatalities across wind farms from eight European countries (Netherlands, Belgium, Spain, Sweden, Austria, Britain, Denmark, and Germany) (Hötker et al., 2006). However, the published avoidance rate is 98% (SNH 2010), suggesting birds exhibit high levels of micro-avoidance at wind farms. **The predicted collision risk for Swift is less than one collision over the entire operational lifespan of the wind farm (0.58 collisions over 40 years). As such, the predicted magnitude is *Negligible*.**	**Sensitivity:** High. **Magnitude:** Negligible **Overall significance:** Very Low. (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible** effect (Criteria: EPA, 2022).

7.5.2.3 Indirect Effects: Disturbance and Displacement

There is evidence that the rotor blades of wind turbines during operation can displace or exclude some species, which effectively results in habitat loss for these birds. Habitat loss can be direct through land take of breeding or foraging habitats for key species or indirect such as effective habitat loss through avoidance or disturbance due to factors such as perceived collision risk. Birds may therefore avoid areas proximal to turbines until habituation takes place. There are examples in the literature of habituation in species such as geese and swans (see Fijn *et al*., 2012 and Madsen and Boertmann, 2008).

Available evidence suggests that breeding passerines are not adversely affected by the presence of wind turbines, and for this reason they are omitted from Table 7.28. For example, a German study found no effect on numbers or spatial distribution of Skylarks within 1km of turbines (Langston and Pullan, 2004).

Whitfield and Madders (2006), suggest that most studies do not detect any significant displacement of raptor species by wind turbines although there are occasional notable exceptions.

Generally speaking, displacement of birds by the presence of turbines is not considered to be a significant effect on the species assemblage given the limited amount of habitat available onsite and the availability of habitat in the greater area. However, a Long-term Moderate effect may occur for Kestrel and a Long-term Slight – Moderate effect may occur for Red Grouse.

Displacement of birds by the presence of turbines is not considered to be a significant effect on the species assemblage given the limited amount of habitat available onsite and the availability of habitat in the greater area.

No further excavation works shall be required along the haul route or the proposed grid route during the operational phase. Only occasional maintenance works will be required (these shall be minimal without the need for large scale construction). No significant operational phase effects are predicted for both elements of the wind farm.

7.5.2.4 Indirect Effects: Barrier Effect

One of the potential operational effects of wind farms is avoidance where the wind farm may act as a barrier to movements (Masden *et al.*, 2009). The effect of birds altering their migration flyways or local flight paths to avoid any infrastructure is a form of displacement (Drewitt and Langston, 2006). The primary effect of barrier effect is increased energy expenditure when birds have to fly further to circumvent an obstacle.

Effects can be highly variable and range from slight 'checks' in-flight direction, height, or speed, through to larger diversions around objects. Studies have shown that birds on migration may show avoidance of wind farms (Masden, 2009) but the observed distances involved were trivial in regard to total migration distances, and hence energy expenditure.

In relation to nocturnal flight activity recent studies utilising radar on both offshore and coastal wind farms in Europe have recorded macro-avoidance rates in wildfowl at least as high, or higher at night than during the day, implying that diurnal avoidance rates are comparable to those in periods of lower visibility (Desholm, and Kahlert, 2005). In the same study migrating flocks at night were recorded increasing their distance from individual turbines once inside the wind farm and also travelling in the corridors between turbines (Desholm, and Kahlert, 2005).

Potential disturbance and barrier effects due to the operation of the proposed wind farm are outlined in Table 7.28 below:

Table 7.28: Disturbance and Barrier effect on target species

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
Buzzard (Low)	**Disturbance/Displacement:** In a review of the published impacts of wind farms on Buzzard populations (Hötker et al., 2006), it was found that overall, impacts on Buzzard populations post-construction, across both winter and breeding seasons was not significant and that Buzzards do show habituation to the presence of wind farms (Hötker et al., 2006). It should also be noted that just one case of habituation is documented in this study with a second case showing signs of a lack of habituation.	**Disturbance/Displacement:** **Magnitude:** Negligible **Sensitivity:** Low **Overall Significance:** Very Low (Criteria: Percival 2003).

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
	Considering this, in conjunction with the high amount of displacement habitats in the surrounding area, the magnitude of disturbance effect is assessed as *Negligible*. **Barrier Effect:** Barrier effects on either migration or regular flights of Buzzard has been shown at two out of six studies to date (2004) in a European context (Hötker et al., 2006). The overall barrier effect results were shown to be not significant.	Significance of effects is assessed as a **Long-term Imperceptible** (Criteria: EPA, 2022). **Barrier Effect:** **Magnitude:** Negligible **Sensitivity:** Low **Overall Significance:** Very Low (Criteria: Percival 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible to Slight; significance of daily barrier effect assessed as Imperceptible to Slight; overall significance considered a **Long-term Imperceptible - Slight** effect (Criteria: EPA, 2022).
Chough (Very High)	**Disturbance/Displacement:** There is limited information on the effects of operational wind farms on Chough. In a review of the published impacts of wind farms on Carrion Crow populations (Hötker et al., 2006), two cases of habituation vs. one case with lack of habituation are documented. While not directly applicable to Chough, these observations are of some use in giving approximate guidelines for corvids in general. The majority of literature concerned with disturbance of Chough is focused on disturbance caused by human presence, particularly recreational activities in or near areas inhabited by Chough (Norfolk and Siriwardena, 2024). The most sensitive receptors are Chough breeding sites; however, no breeding Chough were recorded in the vicinity of the proposed wind farm. There is potential for occasional human presence during operation to temporarily displace foraging Chough; however, since the majority of Chough activity and optimal foraging habitat is concentrated in the valleys to the north and south of the proposed wind farm, potential for disturbance to foraging Chough will be minimal. As such, the predicted magnitude for disturbance is *Negligible*. **Barrier Effect:** Collectively for corvids, the studies reviewed in Hötker et al. (2006) observed barrier effects in six studies, and lack of barrier effects in four studies. As such, there is potential for barrier effect to impact Chough. It is however assessed that the additional flight time required to avoid individual turbines or the whole wind farm would result in minimal additional energy expenditure. As such, the predicted magnitude for barrier effect is *Low*.	**Disturbance/Displacement:** **Magnitude:** Negligible **Sensitivity:** Very High **Overall Significance:** Low (Criteria: Percival 2003). Significance of effects is assessed as a **Long-term Not Significant** effect (Criteria: EPA, 2022). **Barrier Effect:** **Magnitude:** Low **Sensitivity:** Very High **Overall Significance:** Medium (Criteria: Percival 2003). Significance of daily barrier effect assessed as Low; overall significance considered a **Long-term Slight** effect (Criteria: EPA, 2022).
Cormorant (Medium)	**Disturbance/Displacement:** In a review of the published impacts of wind farms on birds (Hötker et al., 2006), there was no information available on Cormorant populations post-construction. There is no suitable foraging habitat within the 500m turbine buffer. The Cormorant activity observed during	**Disturbance/Displacement:** **Magnitude:** Negligible **Sensitivity:** Medium

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
	surveys confirms this species uses Lough Nambrackderg located north of the proposed wind farm to forage, but does not use any habitats within the 500m turbine buffer As such, the predicted magnitude for disturbance is *Negligible*. **Barrier Effect:** Barrier effects on either migration or regular flights of cormorant has been shown for 2/6 studies to date (2004) in a European context (Hötker et al., 2006), with the overall effect significance being non-significant. The observations of cormorant site utilisation confirm individual Cormorants or pairs use Lough Nambrackderg located north of the proposed wind farm to forage. Due to the reduced likelihood of barrier effect for this species, and the fact that turbine spacing will allow cormorant flying to or from Lough Nambrackderg to continue flying through the proposed wind farm, any additional energy expenditure required to avoid individual turbines is assessed as minimal. As such, the predicted magnitude for barrier effect is *Negligible*.	**Overall Significance:** Very Low (Criteria: Percival 2003). Significance of effects Imperceptible due to location of foraging habitat outside 500m buffer; overall significance considered a **Long-term Imperceptible** effect (Criteria: EPA 2022). **Barrier Effect:** **Magnitude:** Negligible **Sensitivity:** Medium **Overall Significance:** Very Low (Criteria: Percival 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered a **Long-term Imperceptible** effect (Criteria: EPA 2022).
Dunlin (High)	**Disturbance/Displacement:** In a review of the published impacts of wind farms on birds (Hötker et al., 2006), there was no information available on Dunlin populations post-construction. However, due to the absence of suitable habitat for Dunlin at or near the proposed wind farm, no effects in this category are predicted. As such, the predicted magnitude for disturbance is *Negligible*. **Barrier Effect:** Barrier effects on either migration or regular flights of waders as a group has been shown for 10 studies to date (2004) in a European context (Hötker et al., 2006), with the overall effect significance being non-significant. While one of the studies found no barrier effect for *Caladris* spp. (the genus to which Dunlin *Calidris alpina* belongs), no information specific to Dunlin is available. Due to the very low amount of Dunlin flight activity recorded over the 5-year survey period (a single observation of three birds), the predicted magnitude for barrier effect is *Negligible*.	**Disturbance/Displacement:** **Magnitude:** Negligible **Sensitivity:** High **Overall Significance:** Very Low (Criteria: Percival 2003). Significance of effects Imperceptible due to lack of foraging habitat in the area; overall significance considered a **Long-term Imperceptible** effect (Criteria: EPA 2022). **Barrier Effect:** **Magnitude:** Negligible **Sensitivity:** High **Overall Significance:** Very Low (Criteria: Percival 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered a **Long-term Imperceptible** effect (Criteria: EPA 2022).
Golden Plover (Very High)	**Disturbance/Displacement:** Literature suggests differences in densities pre-and post-construction of wind farms is significant (Pearce-Higgins et al., 2012); displacement is not significant but may occur up to 400 m (Sansom et al. 2016). Pearce-Higgins et al. (2009) recorded a reduced occurrence of Golden Plovers within 200m of turbines	**Disturbance/Displacement:** **Magnitude:** Negligible **Sensitivity:** Very High **Overall significance:** Low (Criteria: Percival, 2003)

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
	across 12 upland wind farms. However, Fielding and Haworth (2010) and Douglas et al. (2011) suggest that under some circumstances, Golden Plovers may be more tolerant of wind farm infrastructure. At Farr wind farm, Fielding and Haworth (2010) showed that the median distance of 16 Golden Plover nests to the nearest turbine was 168.8m, with nine nests being less than 200m and three less than 100 m from the nearest turbine. At Beinn Tharsuinn wind farm, Douglas et al. (2011) found that the distribution of breeding Golden Plovers appeared to be unaffected by proximity to turbines or tracks, with no evidence for this lack of association changing through time Depending on the level of habituation to disturbance, a buffer zone of 200-500m is suggested in Goodship and Furness (2022) to protect nesting Golden Plover as well as foraging and roosting birds during the nonbreeding season from pedestrian disturbance. However, no nesting or roosting activity was noted over the 5 years of surveys. The observations of Golden Plover activity recorded during VP surveys confirm this species commutes through the proposed site, but does not use the site for roosting or foraging. As such, the predicted magnitude for disturbance is *Negligible*. **Barrier Effect:** High published avoidance rates of wind farms (Krijgsveld et al., 2009) and changes in densities within wind farms post construction (Pearce-Higgins et al., 2012), suggests wind farms act as significant barriers to Golden Plover. Considering the periodic occurrence of Golden Plover flocks of up to 130 birds during the non-breeding season and three observations of flocks ranging from 14-43 birds during the spring migration period, there is potential for this species to be affected by barrier effect. The small scale of the proposed wind farm will however limit barrier effect to a relatively small locality. Considering these factors, the predicted magnitude for barrier effect is *Low* to *Medium*.	Due to lack of site utilisation by Golden Plover, loss of wintering and/or foraging habitat will be a **Long-term Not Significant** effect (Criteria: EPA, 2022). **Barrier Effect:** **Magnitude:** Low/Medium **Sensitivity:** Very High **Overall Significance:** Medium (Criteria: Percival 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Moderate; significance of daily barrier effect assessed as Moderate as literature suggests high published avoidance rates of wind farms; overall significance considered a **Long-term Moderate** effect (Criteria: EPA, 2022).
Great Black-backed Gull (Low)	**Disturbance/Displacement:** Of a literature review, carried out by Percival (2003), all studies which indicated gull species being significantly affected or being a species found to have collided, were identified at wind farms on coastal habitats. It is uncertain that disturbance may affect gull species inland. Furthermore, in a review of the published impacts of wind farms on bird populations (Hötker et al., 2006), it was found that common gulls do show habituation to the presence of wind farms (Hötker et al., 2006). Gulls will be more at risk from collision impacts as a result of their flight behaviour, but less sensitive to disturbance and displacement effects (Humphreys et al., 2015). **Barrier Effect:** Information on barrier effects on either migration or regular flights of Great Black-backed Gull is limited; lack of barrier effect has been shown in a single study	**Disturbance/Displacement:** **Magnitude:** Negligible **Sensitivity:** Low **Overall Significance:** Very Low (Criteria: Percival 2003). Overall significance considered be a **Long-term Imperceptible** effect (Criteria: EPA, 2022). **Barrier Effect:** **Magnitude:** Negligible **Sensitivity:** Low **Overall Significance:** Very Low (Criteria: Percival 2003).

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
	to date (2004) in a European context (Hötker et al., 2006). At the level of gulls as a grouping, 14 out of 22 studies indicated a lack of a barrier effect.	Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered a **Long-term Imperceptible** effect (Criteria: EPA, 2022).
Grey Heron (Low)	**<u>Disturbance/Displacement:</u>** In a review of the published impacts of wind farms on birds (Hötker et al., 2006), they found that typically, birds of open habitats were avoiding turbines by several hundred metres. Grey Herons were an exception to this rule and were frequently found close to or within wind farm sites, suggesting habituation. **Barrier Effect:** Hötker et al., 2006 found evidence of a barrier effect in four out of seven cases, with the remaining three showing no barrier effect. Results were deemed not significant.	**<u>Disturbance/Displacement:</u>** **Magnitude:** Negligible **Sensitivity:** Low **Overall Significance:** Very Low (Criteria: Percival 2003). Significance of effects Imperceptible due to published evidence of habituation to wind farms; overall significance considered **Long-term Imperceptible** effect (Criteria: EPA 2022). **Barrier Effect:** **Magnitude:** Negligible **Sensitivity:** Low **Overall Significance:** Very Low (Criteria: Percival 2003). Significance of daily barrier effect assessed as Imperceptible; overall significance considered to be a **Long-term Imperceptible** effect (Criteria: EPA 2022).
Hen Harrier (Very High)	**<u>Disturbance/Displacement:</u>** Considering the exceptionally low usage of the 500 m turbine buffer and that no roosts or breeding sites were detected within the 2 km turbine buffer, beyond providing habitat for the occasional foraging Hen Harrier, the Proposed Development site and surrounding area was not found to be important for Hen Harriers. Noise disturbance/visual intrusion unlikely to deter foraging as evidence suggests birds may continue to utilise wind farms post construction (Robinson et al., 2012). **<u>Barrier Effect:</u>** Although barrier effect has been documented in at least one study in the European context; recent evidence suggests that birds continue to use wind farms post construction (Whitfield and Madders, 2006) (Robinson et al., 2012) indicating wind farms may not be significant barriers.	**<u>Disturbance/Displacement:</u>** **Magnitude:** Negligible **Sensitivity:** Very High **Overall Significance:** Low (Criteria: Percival 2003). Significance of effects Not Significant to Slight due to scarcity (six in total) sightings during the total survey period; overall significance considered as **Long-term Not Significant** effect (Criteria: EPA, 2022). **<u>Barrier Effect:</u>** **Magnitude:** Negligible **Sensitivity:** Very High **Overall Significance:** Low (Criteria: Percival 2003). Significance of effects to birds in terms of energy expenditure assessed as Not Significant; magnitude of daily barrier effect assessed as Not Significant to Slight; overall significance considered **Long-term Not Significant** effect (Criteria: EPA, 2022).
Kestrel (High)	**<u>Disturbance/Displacement:</u>**	**<u>Disturbance/Displacement:</u>**

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
	Disturbance (in terms of minimal distance to wind farm) has been recorded in 14 studies on wind farms in Europe (Hötker et al., 2006). Habituation to wind farms has been recorded in one case, however the only other case recorded the opposite (Hötker et al., 2006). A case study on the impacts of wind farms on birds conducted in southern Spain (Farfán et al., 2009), found that raptors utilise the space around the wind farm with lower frequency than prior to its existence, which represented a displacement of the home range of these species. In particular, Kestrel was noted to decline sharply in the second year of operation, with other raptor species showing a decline in the first year. **<u>Barrier Effect:</u>** Barrier effects have been shown to a degree in either migrating Kestrel or regular flight paths within the European context (3 of 5 studies; Hötker et al., 2006).	**Magnitude:** Medium **Sensitivity:** High **Overall Significance:** High (Criteria: Percival 2003). Significance of effects Moderate due to published cases of disturbance and high usage of the site by Kestrel; overall significance considered **Long-term Moderate** effect (Criteria: EPA, 2022). **<u>Barrier Effect:</u>** **Magnitude:** Medium **Sensitivity:** High **Overall Significance:** High (Criteria: Percival 2003). Significance of effects in terms of energy expenditure assessed as Moderate; magnitude of daily barrier effect assessed as Slight as literature suggests low published avoidance rates of wind farms with habituation; overall significance considered a **Slight to Moderate Long-term** effect (Criteria: EPA 2022).
Lesser Black-backed Gull (Medium)	**<u>Disturbance/Displacement:</u>** Of a literature review, carried out by Percival (2003), all studies which indicated gull species being significantly affected or being a species found to have collided, were identified at wind farms on coastal habitats. It is uncertain that disturbance may affect gull species inland. Gulls will be more at risk from collision impacts as a result of their flight behaviour, but less sensitive to disturbance and displacement effects (Humphreys et al., 2015). **<u>Barrier Effect:</u>** For gull species such as Lesser Black-backed, Herring and Great Black-backed, some studies indicate evidence for attraction, whereas others for displacement, with the remainder indicating no significant response (Cook et al., 2014; Humphreys et al., 2015).	**<u>Disturbance/Displacement:</u>** **Magnitude:** Negligible **Sensitivity:** Medium **Overall Significance:** Very Low (Criteria: Percival 2003). Significance of effects is assessed as a **Long-term Imperceptible** effect (Criteria: EPA, 2022). **<u>Barrier Effect:</u>** **Magnitude:** Negligible **Sensitivity:** Medium **Overall Significance:** Very Low (Criteria: Percival 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered a **Long-term Imperceptible** effect (Criteria: EPA, 2022).
Peregrine (Very High)	**<u>Disturbance/Displacement:</u>** Possible disturbance to foraging birds through noise, visual intrusion. No displacement from breeding sites	**<u>Disturbance/Displacement:</u>** **Magnitude:** Low

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
	due to none being recorded within the proposed site boundary. Peregrine are known to nest in urban areas often in cathedrals with loud ringing bells, as well as quarries where regular rock-breaking works are undertaken. For example, Moore et al. (1997), estimated that 65 quarries were occupied in Ireland between 1991 and 1993. Thus there is evidence to suggest that the species is tolerant of noise and human activity. **Barrier Effect:** Hötker et al., 2006 report one case of barrier effect in Peregrines. Barrier effects on either migration or regular flights of Peregrine has not been shown to date in a European context (Hoetker et al., 2006). Recorded infrequent flight activity suggests the wind farm is unlikely to act as a significant barrier to a far-ranging species such as Peregrine.	**Sensitivity:** Very High **Overall Significance:** Medium (Criteria: Percival 2003). Significance of effects Not Significant to Slight due to low level of sightings within the site and evidence suggesting tolerance to noisy human activities; overall significance considered **Long-term Not Significant to Slight** effect (Criteria: EPA 2022). **Barrier Effect:** **Magnitude:** Negligible **Sensitivity:** Very High **Overall Significance:** Low (Criteria: Percival 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered to be a **Long-term Imperceptible to Not Significant** effect (Criteria: EPA, 2022)
Red Grouse (High)	**Disturbance/Displacement:** In a review of the published impacts of wind farms on grouse populations (eight different grouse species were studied) (Coppes et al., 2019), effects including spatial avoidance, displacement of nesting sites and changes in time invested in breeding vs. non-breeding behaviour were observed. Grouse were affected at up to distances of 500m by wind farm infrastructure. In six cases, a local reduction in grouse abundance was reported in areas with wind turbines, which possibly affected population size. The range of cases examined include variable, but overall approximately equal numbers of cases of grouse being affected vs. not being affected by operational wind farms. While the findings of this study are not directly specific to Red Grouse, they provide general guidance and confirm the existence of potential for effects in this category. Pearce-Higgins et al. (2012) has found that densities of Red Grouse, were reduced on wind farms during construction, although Red Grouse densities appeared to recover by the first year of operation. While good-quality Red Grouse habitat is limited within the proposed site, there is suitable habitat on the north-western ridge of Shehy Mountain (located between T02/T04/T06). While part of this area is outside the 500m turbine buffer, the majority is inside this buffer. This are of suitable habitat is located c. 200-250m from proposed turbines. Red Grouse occur in low densities on site, with a total of two birds flushed in 1km grid square W1459 and another two birds recorded in 1km grid square in W1359. There is a limited amount of	**Disturbance/Displacement:** **Magnitude:** Low **Sensitivity:** High **Overall Significance:** Low (Criteria: Percival 2003). Overall significance considered a **Long-term Slight – Moderate** effect (Criteria: EPA 2022). **Barrier Effect:** **Magnitude:** Negligible **Sensitivity:** High **Overall Significance:** Very Low (Criteria: Percival 2003). Overall significance considered to be a **Long-term Imperceptible** effect (Criteria: EPA, 2022)

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
	intact heather moorland on site would suggest that breeding, is at low densities. Considering the factors detailed above, the predicted magnitude for disturbance is *Low*. **Barrier Effect:** No evidence of barrier effect relating to grouse was identified in the studies reviewed in Coppes et al. (2019) and Hötker et al. (2006). The predicted magnitude for barrier effect is *Negligible.*	
Snipe (High)	**Disturbance/Displacement:** Possible disturbance to birds traversing or occasionally feeding within the site. Literature suggests differences in densities pre- and post-construction of wind farms has a significant impact upon Snipe within an area (Pearce-Higgins et al., 2012). Snipe were also shown by Pearce-Higgins et al. (2009) to use areas of habitat within 400m of turbines less than expected, leading to an expected 48% decline in abundance within 500m of the turbines. Snipe were observed 24 times during the breeding and non-breeding season flight activity surveys, of which 5 occurred within the 500m buffer zone over a five year period, equating to one record every 12 months of surveys. Although there was a very low number of Snipe records within the site and no evidence of breeding within the site or the 500m buffer surrounding turbine, there are records of this species in the immediate surroundings > 500m from the proposed turbines. The predicted magnitude for disturbance is *Low*. **Barrier Effect:** Recorded infrequent activity contains minimal flight activity within the 500m turbine buffer; the proposed wind farm is unlikely to act as a significant barrier to a species such as Snipe. The predicted magnitude for barrier effect is *Negligible.*	**Disturbance/Displacement:** **Magnitude:** Low **Sensitivity:** High **Overall Significance:** Low (Criteria: Percival 2003). Overall significance considered a **Long-term Imperceptible to Slight** effect (Criteria: EPA 2022). **Barrier Effect:** **Magnitude:** Negligible **Sensitivity:** High **Overall Significance:** Very Low (Criteria: Percival 2003). Overall significance considered to be a **Long-term Imperceptible** effect (Criteria: EPA, 2022)
Sparrowhawk (Low)	**Disturbance/Displacement:** In a review of the published impacts of wind farms on Sparrowhawk populations (Hötker et al., 2006), it was found that overall, effects on Sparrowhawk populations post-construction, across both winter and breeding season was not significant. Sparrowhawk do show habituation to the presence of wind farms (Hötker et al., 2006). Breeding was not proven although the activity observed and presence of juveniles suggest that this species likely breeds locally outside the site. The predicted magnitude for disturbance is *Negligible* **Barrier Effect:** Sparrowhawk is considered to be less sensitive or less willing to change their original migration direction when approaching wind farms (Hötker et al., 2006). Three	**Disturbance/Displacement:** **Magnitude:** Negligible **Sensitivity:** Low **Overall Significance:** Very Low (Criteria: Percival 2003). Overall significance considered to be a **Long-term Imperceptible** effect (Criteria: EPA, 2022). **Barrier Effect:** **Magnitude:** Negligible **Sensitivity:** Low

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
	cases of no barrier effect are reported by Hötker et al., 2006, with one case of barrier effect. The predicted magnitude for barrier effect is *Negligible*	**Overall Significance:** Very Low (Criteria: Percival 2003). Overall significance considered to be a **Long-term Imperceptible** effect (Criteria: EPA, 2022).
Swift (High)	**Disturbance/Displacement:** Studies on the impact of wind farms during both construction (Pearce-Higgins et al., 2012) and operation (Pearce-Higgins et al., 2009) have found little evidence of significant disturbance effects on passerine species. Evidence suggests that flying insects are attracted to turbines (Long, et. al, 2011; Scholz & Voigt, 2021) which in turn, attracts insectivorous birds, especially hirundines and Swifts (Ahlén, 2002). This evidence further suggests that construction of wind farms, instead of disturbing birds, may in fact actually lure such bird species into the rotor sweep zone, thus significantly increasing collision risk. Swift activity observed during surveys was limited. Swift was recorded just once within the Site, where two individuals were recorded hunting at VP3 in July 2023. The predicted magnitude for disturbance is *Low.* **Barrier Effect:** Hötker et al., 2006 found evidence of a barrier effect in Swift in two cases. However, as mentioned above, attraction of insects to turbines may further attract insectivorous bird species, which would reduce/preclude barrier effect. The predicted magnitude for barrier effect is *Low.*	**Disturbance:** **Magnitude:** Low **Sensitivity:** High **Overall Significance:** Low (Criteria: Percival 2003). Significance of effects Imperceptible due to relatively low number of sightings, lack of breeding habitat and possible attraction of wind farms to insectivorous species which feed on the wing; overall significance considered **Long-term Imperceptible** effect (Criteria: EPA, 2022). **Barrier Effect:** Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered to be a **Long-term Imperceptible** effect (Criteria: EPA, 2022).
Teal (Medium)	**Disturbance/Displacement:** Information on the disturbance of this species with respect to wind farms is lacking. This species uses Lough Nambrackderg which is located outside the 500m turbine buffer thus disturbance is not envisaged to be an issue with this species. Teal was recorded once within the flight activity survey area, where a group of three individuals were observed within a pool on-site. Successful breeding was recorded in the wider environment, however this species does not breed and does not have the potential to breed within the Site itself. There are also no records of foraging within the Site. The predicted magnitude for disturbance is *Negligible* **Barrier Effect:** Hötker et al., 2006 found evidence of a lack of a barrier effect in Teal in just one case. Barrier effect is not envisaged to be an issue with this species due to lack of recorded flight activity and the reasons outlined above.	**Disturbance:** **Magnitude:** Negligible **Sensitivity:** Medium **Overall Significance:** Very Low (Criteria: Percival 2003). Significance of effects Imperceptible due to lack of sightings in the flight activity survey area; overall significance considered **Long-term Imperceptible** effect (Criteria: EPA, 2022). **Barrier Effect:** **Magnitude:** Negligible **Sensitivity:** Medium **Overall Significance:** Very Low (Criteria: Percival 2003).

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
	The predicted magnitude for barrier effect is *Negligible*.	Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible due to lack of sightings in the flight activity survey area; significance of daily barrier effect assessed as Imperceptible; overall significance considered to be a **Long-term Imperceptible** effect (Criteria: EPA, 2022).

7.5.3 Potential Decommissioning Effects

The decommissioning phase of the proposed wind farm site poses similar risks to potential effects vis-á-vis the construction phase. However, it should be noted that the magnitude of the effect of decommissioning is normally reduced as all infrastructure is already in situ. No works will be required along the haul route as the turbine components will be broken up on site and therefore require less clearance to remove along the same haul road. Grid connection cables will be left in the ground, therefore no potential impacts during decommissioning stage are likely to occur.

7.5.3.1 Direct & Indirect Effects

The following matrix outlines the assessment of direct effects on key avifauna receptors during decommissioning, based on the criteria previously outlined.

Note: the criteria utilised in the current assessment to define duration were as follows, from published guidance (EPA, 2022):

- Momentary: seconds to minutes;
- Brief: less than a day;
- Temporary: up to 1 year;
- Short-term: from 1-7 years;
- Medium-term: 7-15 years;
- Long-term: 15-60 years; and
- Permanent: over 60 years.

It is likely that the time period for decommissioning of the project would be ca. six months.

<u>Passerines and Pigeons/Doves</u>

Decommissioning during the breeding season may result in some minimal disturbance to breeding passerine species due to increased human activity and noise. Tree trimming shall not however be carried out during the bird breeding season. There will be no further habitat loss during the decommissioning phase and the resultant impact to passerine species is a *Temporary Imperceptible Reversible Effect*.

Birds of Prey

Although no birds of prey were noted breeding or roosting on Site, there are suitable habitats to support foraging Buzzard and Kestrel. Tree trimming will not be carried out during the bird breeding season. There shall be no further habitat loss during the decommissioning phase. Decommissioning during the breeding or wintering season may result in some minimal disturbance to foraging Buzzard or Kestrel due to increased human activity and noise.

The resultant impact to birds of prey is a *Temporary Imperceptible Reversible Effect*. As no breeding or roosting of raptors was noted on site, this prediction is worst-case scenario.

Waders and Wildfowl

Two gull species were noted during surveys, namely Great Black-backed Gull and Lesser Black-backed Gull. These species do not breed on or in the vicinity of the Site. Additionally, there are no records of foraging on Site and it is unlikely that the habitats on or surrounding the Site supports foraging gulls. All records indicate Gulls were commuting through / flying past the Site. As such, no effect is anticipated for Gulls.

Similarly, Cormorant, Dunlin, and Teal were recorded on very few occasions within the flight activity survey area. Additionally, Golden Plover were noted over the winter seasons, and exclusively involved birds in flight over the Site. However, there are no suitable habitats on Site to support foraging, roosting or breeding Cormorant, Dunlin, Golden Plover, or Teal. As such, it is unlikely that these species will be effected during the decommissioning phase.

Meadow Pipit, Wheatear, Skylark and Snipe were noted as being present within and immediately adjacent to the Site. Although no breeding or foraging was observed in the case of Snipe, there are suitable habitats on-site to support such activities. As a result, the increase in human activity and noise may result in in minimal temporary disturbance to these species.

Again, as there will be no further habitat loss during the decommissioning phase, and tree trimming will not be carried out during the bird breeding season. The worst-case scenario resultant impact to waders and waterfowl is a *Temporary Imperceptible Reversible Effect*.

Red Grouse

The site holds one pair of breeding Red Grouse located outside the footprint of the proposed development with a second pair recorded outside the site.

As there will be no further habitat loss during the decommissioning phase, and tree trimming will not be carried out during the bird breeding season, the resultant impact to Red Grouse would be a *Temporary Slight Reversible Effect*.

7.5.4 Potential Cumulative Effects

There are 27 operational, consented/permitted and proposed wind farms within 20km of the Site. **Figure 2.1** shows the location of these wind farms within a 20km radius of the proposed turbines, and **Table 7.29** provides further details, including turbine numbers, distances, and directions from the Site.

Of these, the majority are operational, with a smaller number classified as consented/permitted, and two proposed developments (Maughanaclea Wind Farm, located approximately 1.99km to the South-west, and Derreenacrinnig Wind Farm, located approximately 7.08km to the South-west). It is noted that Maughanaclea Wind Farm was submitted for planning subsequent to the submission of the Gortloughra Wind Farm Proposed Development, which was originally lodged and subsequently progressed through the RFI stage.

The nearest operational wind farm is Shehy More Wind Farm, located approximately 565m to the north-east of the Site. The closest distance between turbines within Shehy More Wind Farm and the Proposed Development is approximately 565m, measured between the westernmost turbine of Shehy More Wind Farm and T2 of the Proposed Development.

Table 7.29: Consented and operational wind farms within 20km of the proposed site.

	Wind Farm	Status	No. of Turbines	Approximate Distance to Nearest Turbine [km]	Direction from the Proposed Development
1	Ballybane WF	Operational	21	18km	South-west
2	Barnadivane WF	Consented / Permitted	6	18.7km	East
3	Carrigarierk WF	Operational	5	5.22km	East
4	Carrigarierk 2 WF	Consented / Permitted	3	5.74km	East
5	Cleanrath WF	Operational	11	9.8km	North-east
6	Coomatallin WF	Operational	4	16.61km	South-east

7	Currabwee WF	Operational	7	13.05km	South-east
8	Derragh WF	Operational	6	9.79km	North
9	Derreenacrinnig WF	Proposed	7	7.08km	South-west
10	Garranareagh WF	Operational	4	19.58km	East
11	Gortyrahilly WF	Consented / Permitted	14	11.72km	North
12	Grousemount WF	Operational	38	9.89km	North-west
13	Inchamore WF	Consented / Permitted	5	18.49km	North
14	Kilgarvan II WF (Sillahertane)	Operational	10	11.75km	North
15	Kilgarvan I WF (Coomagearlahy)	Operational	15	16.63km	North-west
16	Kilgarvan II WF (Inchincoosh)	Operational	6	18.27km	North-west
17	Kilgarvan II WF (Lettercannon)	Operational	7	17.21	North-west
18	Kilgarvan Repower WF	Consented / Permitted	11	16.78km	North-west
19	Killaveenoge WF	Operational	10	12km	South-east
20	Kilvinane WF	Operational	3	17.7km	South-east
21	Midas WF (Coolknoohil)	Operational	11	14.02km	North
22	Lahanaght Hill WF	Operational	5	13.55km	South
23	Midas WF (Glanlee I)	Operational	6	15.39km	North
24	Midas WF (Inchee)	Operational	6	15.74km	North-west
25	Milane Hill WF	Operational	9	9.2km	South
26	Shehy More WF	Operational	11	0.56km	North-east
27	Maughanaclea Wind Farm	Proposed	14	1.99km	South-west

The primary wind farm of interest in terms of potential for cumulative effects is the adjacent existing Shehy More wind farm. This is due to its close proximity (c. 560m from the nearest proposed turbine location at the Proposed Development).

The identified construction and operational phase effects for other proposed, consented and operational wind farms within 10 km of the Proposed Development are discussed in Sections **7.5.4.1** and **7.5.4.2.**

The potential cumulative effects which could occur in conjunction with these projects are assessed as not having the potential to exceed the highest magnitude effects identified for any given category/species identified for the Proposed Development or any of the other wind farms identified in the cumulative assessment.

Similarly, it is assessed that the highest magnitude effects identified for the Proposed Development and/or any projects beyond 10 km will not be exceeded in magnitude by any potential cumulative effects.

7.5.4.1 Cumulative Effects During Construction

Direct effects on avifauna during construction are primarily land take related, mainly due to the loss of nesting habitats to key species. Other sources of land take as outlined above do have the potential for cumulative effects on nesting or resident upland species which use open habitats (the Proposed Development comprises heath and grassland habitats and lacks any wooded habitats). It is noted that Red Grouse were not recorded at any of the wind farm projects within 10 km, and as such a cumulative effect for this species is unlikely. Species such as Meadow Pipit and Skylark may be affected cumulatively by further loss or alteration of upland heath or grassland habitats due to farming practices, etc. Even though in-combination land take is unlikely to result in range loss of any species which frequent the subject site, mitigation may be required to neutralise the effect of the proposed wind farm. Disturbance or effective habitat loss indirectly is more difficult to quantify; especially as most species of birds may habituate to disturbance over time. It is noted that the adjacent Shehy More wind farm is operational and as such potential for cumulative effects in conjunction with Shehy More is limited at construction stage. There is some limited potential for operational phase disturbance associated with Shehy More to act cumulatively with construction phase effects from the Proposed Development, however any such effects would be minor in comparison to the non-cumulative construction effects from the Proposed Development. Any cumulative effects on birds during the construction phase would be a *Long-Term Imperceptible Cumulative Effect*.

7.5.4.2 Cumulative Effects During Operation

Direct effects on avifauna during operation which may be cumulatively added to by other existing pressures or proposed developments include collision related mortality, ongoing disturbance/displacement, and barrier effect. Flight height or the flight heights which birds habitually use along either migration or local flight paths is an influencing factor in determining whether the proposed development will combine with additional wind farms to produce additive, synergistic or antagonistic effects.

These effects include increased Barrier Effect (potentially obstructing migratory flightpaths), increased collision risk (through combined mortality in susceptible species) and increased disturbance to birds utilising foraging grounds whilst on migration. As noted above, the primary wind farm of interest in terms of potential for cumulative effects is the adjacent existing Shehy More wind farm due to it's close proximity.

The EIAR for Shehy More identified a Long-term Negligible effect arising from collision risk for Hen Harrier, based on a predicted collision rate of one collision every 143 years. This is similar to the predicted collision rate for Hen Harrier calculated for the Proposed Development (one collision every 131 years) which is assessed as a Long-term Not Significant effect. The relatively low level of activity, lack of breeding activity and low risk habitual flight patterns observed across both Shey More wind farm and the Proposed Development site are consistent in indicating that the potential for cumulative effects remains low for Hen Harrier, and as such the cumulative collision risk for this species is assessed as a ***Long-term Not Significant*** effect.

While surveys at Shehy More did not detect any migratory activity, the EIAR did identify potential for a Long-term Slight effect for migrating birds due to barrier effect. This is of relevance to Golden Plover, which has been observed flying over the Proposed Development and is assessed as being subject to a Long-term Moderate effect due to barrier effect. While Shehy More and the Proposed Development are in close proximity, it is noted that a gap of over 1 km separates the three western-most turbines of Shehy More from the remaining 11 Shehy More turbines to the north-east. This large gap, in conjunction with minimum turbine spacing of 500m at the Proposed Development and 400m at Shehy More results in reduced potential for barrier effect, both individually and cumulatively. As such, the potential cumulative barrier effect arising from both the Proposed Development and Shehy More does not increase above the magnitude identified for the Proposed Development and is assessed as a ***Long-term Moderate*** cumulative effect.

A Long-term Slight effect in terms of operational disturbance/displacement was identified for Hen Harrier, Kestrel and Sparrowhawk in the Shehy More EIAR. Effects on these species in this category identified for the Proposed Development are Long-term Not significant to Slight for Hen Harrier, Imperceptible for Sparrowhawk and Moderate for Kestrel. While a moderate effect on Kestrel was identified for the Proposed Development, this arises from the activity patterns observed there. Since Kestrel activity was assessed as relatively low in the Shehy More EIAR, the potential for a cumulative effect for Kestrel in this regard is low and is assessed as ***Long-term Slight***.

Considering the distances of the other wind farm sites within 20 km relative to the Proposed Development, in conjunction with the collision risk impacts identified for wind farms within 10 km, the cumulative collision risk on any avian receptors is assessed as ***Long-term Negligible*** to ***Not Significant*** for all species. It is noted that the Slight collision risk impact identified for Golden Plover for Cleanrath wind farm (9.8 km North-east) is applicable to the local population at that site, and as such, potential cumulative effects for this species remain at the level of ***Long-term Not Significant***. The cumulative collision risk for Golden Plover based on wind farms within 10 km for which collision risk modelling was completed is 0.95 (Keel Energy 0.45

+ Proposed Development 0.5 = 0.95), which equates to 0.010% of the county population and 0.0012% of the national population. Cumulative collision effects for Golden Plover are not predicted to exceed the threshold of 'Not Significant'.

As the predicted annual collision rate of Kestrel at the Proposed Development is 2.4 per year, this also warrants closer examination in terms of cumulative impact. The cumulative collision risk for Kestrel based on wind farms within 10 km for which collision risk modelling was completed is 2.68 (Keel Energy 0.28 + Proposed Development 2.4), which equates to 0.15% of the county population and 0.016% of the national population. Cumulative collision effects for Kestrel are will not exceed the threshold of 'Not Significant' at county level. It is not envisaged that a cumulative collision rate of this magnitude could occur for wind farms within 20 km. As such, the predicted cumulative impact of collision risk for Kestrel is considered to be a ***Long-term Slight*** at county level, and ***Long-Term Not Significant*** at national level.

7.6 MITIGATION MEASURES FOR AVIFAUNA

Mitigation measures are described below which will avoid, reduce and where possible, offset potential negative effects arising in relation to avifauna from the construction, operation and decommissioning of the site. These mitigation measures shall be implemented in full.

7.6.1 Mitigation by Avoidance and Design

See **Chapter 6: Biodiversity.**

7.6.2 Mitigation measures during the construction phase of the project

7.6.2.1 Introduction

Construction of this project is expected to cause temporary (disturbance) adverse effects on local ecological receptors, as outlined in **Section 7.5** above. The mitigation measures described below will reduce these effects significantly.

7.6.2.2 Project Ecologist/ECoW

A Project Ecologist/Ecological Clerk of Works (ECoW) with appropriate experience and expertise (in implementing ecological mitigation measures for wind farm developments) will be employed for the duration of the construction phase to ensure that all the mitigation measures outlined in relation to the environment are implemented. The Project Ecologist/ECoW will be awarded the authority to stop construction activity if there is potential for significant adverse ecological effects to occur.

7.6.2.3 Avifauna

Subject to other environmental concerns (e.g., run-off), the removal of vegetation and scrub as well as trimming of trees along the GCR, TDR and general wind farm area will be undertaken outside of the bird breeding season (March 1st to August 31st inclusive). This will help protect nesting birds.

This is in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt, A. L. and Langston, R. H., 2006).

Construction operations will take place during the hours of daylight to minimise disturbances to roosting birds, or active nocturnal bird species. This is in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt and Langston, 2006). Limited operations such as concrete pours, turbine erection and installation of the grid connection may require night-time operating hours; these works will be supervised by the project ecologist/ECoW.

Toolbox talks will be undertaken with construction staff on disturbance to key species during construction. This will help minimise disturbance. This is in line with best practice recommendations for mitigation measures with regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt and Langston, 2006).

Where/if removed or altered, re-instated hedgerows will be planted with locally sourced native species. This will result in habitat enhancement for local species of conservation importance such as Meadow Pipit. This is in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt and Langston, 2006).

A re-confirmatory survey (March/April) will be conducted of the proposed turbine locations to assess any evidence of target species activity or occupation of new territories (e.g. in the case of breeding Snipe or Red Grouse). Should any nesting locations be recorded, works at these locations will be restricted to outside the breeding season (March 1st to August 31st inclusive) or until chicks are deemed to have fledged (following monitoring).

The use of "white lights" on the turbines will not occur as these can attract night flying birds such as migrants, and insects, which in turn can attract bats. Certain turbines will be illuminated with medium intensity fixed red obstacle lights of 2000 candelas where required by the IAA Lighting will be fitted with baffles to ensure that the light is directed skywards and will not be discernible from the ground.

7.6.3 Habitat Management Plan (HMP)

A Habitat Management Plan (HMP) has been prepared for the proposed Gortloughra Wind Farm in Co. Cork (**Appendix 6.4**). This HMP has been prepared for lands occurring within the Gortloughra Wind Farm Site Redline boundary. The lands that are the subject of the habitat management actions set out in this HMP are situated to the northeast of the Site Redline Boundary consisting of an area of heathland to the North of Shehy More.

The parcels of land (referred to hereafter as the HMP lands) that will be targeted for habitat management of wet and montane heath habitat will amount to approximately 2 Ha.

The HMP lands will be managed throughout the lifetime of the wind farm with a view to restoring and maintaining wet and montane heath habitat that corresponds to structure of Annex 1 quality wet heath.

Red Grouse require a broad age-range of heather to allow for cover, shelter, nesting and feeding. Hens usually nest in mature heather adjacent to freshly cut/burnt or second year cut/burnt heather, where fresh shoots will be available for chicks. This improved micro-climate is beneficial to the reproduction of invertebrates which are a vital food source for chicks. A patchwork of old and new heather is widely considered as the best management practise for Red Grouse.

Heather burning will be avoided within the Study Area. Instead, targeted cutting (e.g., using a hand held strimmer) of short, 10 m wide strips in areas with Heather growing at heights of 30 cm or more will be considered. This practice would need to be carefully assessed and accompanied by monitoring to determine effectiveness and identify any adverse effects, with the rotation period for cutting determined by the rate of Heather re-growth. Any cutting operations will be carried out from October to March inclusive (outside the bird nesting season), with only a relatively small area cut at any one time and cut strips left surrounded by taller Heather. The proposed cutting will be monitored by an ecologist to avoid adverse effects to habitats and species.

The habitat management measures described in the HMP, notably for heath and heath mosaic habitats, are also applicable to habitat management for Red Grouse. In particular, management of heath will be required to maintain heath vegetation in favourable condition for nesting, foraging and sheltering for Red Grouse. General management prescriptions will also benefit Red Grouse; notably the prohibition of any shooting or burining within the site including the management area, and the sensitive timing of activities and/or adoption of exclusion zones to avoid effects on Red Grouse when they are likely to be most sensitive (e.g., when nesting).

7.6.4 Mitigation measures during operation

A post construction monitoring programme is to be implemented at Gortloughta in order to confirm the efficacy of the mitigation measures; the results of this will be submitted annually to the competent authority and NPWS. Published guidance on assessing the impacts of wind farms on birds from English Nature and the Royal Society for the protection of birds recommends the implementation of an agreed post development monitoring programme as a best practice mitigation measure (Drewitt and Langston, 2006).

In addition, published recommendations on swans and wind farms (Rees, 2012) suggests that systematic post construction monitoring; adapted to quantify collision, barrier, and displacement, be conducted over a period of sufficient duration to allow for annual variation or in combination effects. The following individual components are proposed:

1) Fatality Monitoring (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction)- A comprehensive fatality monitoring programme is to be undertaken following published best practice (Shawn et al., 2010; Fijn et al., 2012 and Grunkorn, 2011); the primary components are as follows:
    a. Initial carcass removal trials to establish levels of predator removal of possible fatalities.
       This is to be done following best recommended practice and with due cognisance to published effects such as predator swamping, whereby excessive placement of carcasses increases predator presence and consequently skews results (Shawn et al., 2010).
    b. Turbine searches for fatalities are to be undertaken following best practice (Fijn et al., 2012 and Grunkorn, 2011) in terms of search area (minimum radius hub height) and at intervals selected to effectively sample fatality rates based on carcass removal rates (e.g. 1 per month). To be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring to be agreed with NPWS.
    c. A standardised approach with a possible control group and/or variation in search techniques such as straight line transects/ randomly selected spiral transects/ dog searches will be undertaken. This will provide a means of robustly estimating the post construction collision fatality impact (if any).
    d. Recorded fatalities to be calibrated against known predator removal rates to provide an estimate of overall fatality rates.

Reports will be submitted to the competent authority and NPWS following each round of surveys.

2) Flight Activity Survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction) - A flight activity survey is to be undertaken during the summer and winter months to include both vantage point and hinterland surveys as Per SNH (2017) guidance:

  a. Record any barrier effect i.e. the degree of avoidance exhibited by species approaching or within the wind farm (Drewitt and Langston, 2006). Target species to be all raptors and owls, all wild goose and duck species, all swan species, and all wader species.
  b. Record changes in flight heights of key receptors post construction.

Reports will be submitted to the competent authority and NPWS following each round of surveys. This survey is to be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring requirements will be agreed with NPWS.

3) Monthly Wildfowl Census (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction). A monthly wildfowl census, following the methods utilised for the Baseline survey, is to be repeated on a monthly basis during the winter period. This aims to:
  a. Assess displacement levels (if any) of wildfowl such as swans post construction
  b. Assess overall habitat usage changes within the vicinity of the Gortloughra Wind Farm Development post construction.

This survey is to be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring requirements will be agreed with NPWS. Reports will be submitted to the competent authority and NPWS following each round of surveys.

4) Breeding Bird Survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction). A breeding bird survey (moorland breeding bird and Common Bird Census), following methods used in the Baseline survey to be repeated yearly between early April to early July. This aims to:
  a. Assess any displacement effects such as those recorded on breeding birds. Overall density of breeding birds to be annually recorded.

5) Breeding Wader Survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction). A breeding bird survey, following methods used in the Baseline survey to be repeated yearly April-May-June.
6) Red grouse survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction). following methods used in the Baseline survey

Both of the above surveys are to be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring requirements will be agreed with NPWS.

7.6.5 Mitigation Measures during the Decommissioning

The same mitigation measures will apply for the decommissioning phase as for the construction phase.

7.7 RESIDUAL EFFECTS FOR AVIFAUNA

To minimise effects on those species which the literature suggests can be negatively impacted, a re-confirmatory preconstruction survey (March/April) will be conducted of the proposed turbine locations to assess any evidence of target species activity or the occupation of new territories. Should any new nests be recorded, works at these locations will be restricted to outside the breeding season (April-July) or until chicks are deemed to have fledged (following monitoring).

A comprehensive monitoring program will also be implemented following construction of the proposed wind farm; this will monitor the degree of barrier effect, if any, on existing species as a result of the development, in addition to comprehensively monitoring any bird fatalities.

It is considered that with the implementation of mitigation, the proposed wind farm development will have an *Imperceptible to Slight Reversible Residual Effect and in the local context* on birds. It will result in a *Moderate Reversible Residual Effect* to Kestrel and *Slight Reversible Residual Effect* to Red Grouse due to disturbance/displacement during the operational phase. In relation to barrier effect a *Long-term Slight to Moderate effect in the local context* on Kestrel and Golden Plover is predicted. However, habituation over the lifetime of the wind farm is likely to reduce these effects.

7.8 BIBLIOGRAPHY

Ahlén, I. 2002. Fladdermöss och fåglar dödade av vindkraftverk. Fauna och flora 97, 14-22

Band, W. (2024). Using a collision risk model to assess bird collision risks for onshore wind farms. NatureScot Research Report 909.

Bibby, C. J., Burgess, N. D., Hill, D. A. & Mustoe, S. H. 2000. Bird census techniques (second edition). Academic Press, London.

Brown, A.F and Shepherd, K.B. (1993). A method for censuring upland breeding waders: Bird Study. Vol. 40, pp. 189-185.

CIEEM. (2006). Guidelines for Ecological Impact Assessment in the United Kingdom. CIEEM.

CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, and Coastal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester

CIEEM (2019) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine, 3rd edition. Chartered Institute of Ecology and Environmental Management, Winchester

Colhoun, K. and Cummins, S. (2013). Birds of Conservation Concern in Ireland 2014-2019. BirdWatch Ireland.

Colhoun, K., Rooney, E., Collins, J., Keogh, N.P., Lauder, A, Heardman, C. & Cummins, S. (2024). The Status and Distribution of Chough in Ireland: Results of the National Survey 2021. Irish Wildlife Manuals, No. 151. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

Cook, A.S.C.P., Humphreys, E.M., Masden, E.A. and Burton, N.H.K. (2014). The avoidance rates of collision between birds and offshore turbines. BTO.

Coppes, J., Braunisch, V., Bollmann, K., Storch, I., Mollet, P., Grünschachner-Berger, V., … Nopp-Mayr, U. (2020). The impact of wind energy facilities on grouse: a systematic review. *Journal of Ornithology*, *161*(1), 1-15.

Crowe, O. (2005) Ireland's Wetlands and their Waterbirds: Status and Distribution, Birdwatch Ireland, Newcastle, Co. Wicklow.

Department of Environment Community and Local Government [DoECLG], (2018). Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment

Desholm, M., Kahlert, J. (2005). Avian Collision Risk at an offshore windfarm.: Biology Letters, 2005, Vol.1, pp. 296-298.

Devereux, C.L., Denny, M.J.H., Whittingham, M.J. (2008). Minimal Effects of wind turbines on the distribution of wintering farmland birds. 45, Journal of Applied Ecology, 2008, pp. 1689-1694.

DHPLG (2019). Draft Revised Wind Energy Development Guidelines. Department of Housing, Planning and Local Government. December 2019

Douglas, D.J.T., Bellamy, P.E. and Pearce-Higgins, J.W. 2011. Changes in the abundance and distribution of upland breeding birds at an operational wind farm. Bird Study 58: 37-43.

Drewitt, A. L. and Langston, R. H. (2006). Assessing the impacts of wind farms on birds. Ibis, Vol. 148, pp. 29-42.

Drewitt, A. L. and Langston, R.H. (2008). Collision Effects of Wind-power Generators and Other Obstacles on Birds. 1134, Annals of the New York Academy of Sciences, pp. 233-266.

Environmental Protection Agency (September 2015): Draft - Advice Notes on Current Practice (in the preparation on Environmental Impact Statements). EPA, Wexford.

Environmental Protection Agency (September 2017): Draft - Advice Notes on Current Practice (in the preparation on Environmental Impact Statements). EPA, Wexford.

EPA, (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports Draft May 2017

European Council (2009). Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds.

European Commission 'Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment' 2013

European Commission (2020). Guidance document on wind energy developments and EU nature legislation. wind_farms_en.pdf

European Union (2013). http://ec.europa.eu/environment/eia/pdf/EIA%20Guidance.pdf Retrieved from http://ec.europa.eu.

Farfán, M.A., Vargas, J.M., Duarte, J. and Real, R., 2009. What is the impact of wind farms on birds? A case study in southern Spain. *Biodiversity and Conservation*, *18*, pp.3743-3758.

Fielding, A. and Haworth, P. 2010. Farr windfarm: A review of displacement disturbance on Golden Plover arising from operational turbines between 2005-2009. Haworth Conservation.

Fijn, R., Krijgsveld, K., Tijsen, W.I, Prinsen, H and Dirksen Sjoerd (2012). Habitat use, disturbance, and collision risks of Bewick's Swans Cygnus columbianus bewickii wintering near a wind farm in the Netherlands.: Wildfowl and Wetlands Trust, 2012, Wildfowl, Vol. 69, pp. 97-116.

Gehring, J., Kerlinger, P. and Manville, A.M., 2009. Communication towers, lights, and birds: successful methods of reducing the frequency of avian collisions. Ecological Applications, 19(2), pp.505-514.

Gensbol, B. (2008). Birds of Prey. London: HarperCollinsPublishers Ltd., 2008.

Gilbert, G., Stanbury, A., & Lewis, L. (2021). Birds of conservation concern in Ireland 4: 2020–2026. Irish Birds, 43, 1-22.

Gittings, T (2022), Ballivor Wind Farm: Golden Plover Avoidance Rates Collision Risk Assessment (pleanala.ie) Bord Pleanála Case reference: ABP-316212-23

Goodship, N.M. and Furness, R.W. (2022). Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species. A report from MacArthur Green to NatureScot.

Grunkorn, T. (2011). Proceedings: Conference on wind energy and wildlife impacts, 2-5 May 2011, Trondheim, Norway. Trondheim: NINA.

Hoetker, H., Thompson, K.H., Jeromin, H. (2006), Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats- facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation. Bergenheim: Michael-Otto-Institut im NABU.

Humphreys, E.M., Cook, A.S.C.P., Burton, N.H.K. (2015). Collision, Displacement and Barrier Effect Concept Note BTO Research Report No. 669. The British Trust for Ornithology, The Nunnery, Thetford

Irwin, S., Wilson, W., O'Donoghue, B., O'Mahony, B., Kelly, T., O'Halloran, J. (2012). Optimum senarios for Hen Harrier Conservation in Ireland; Final Report 2012. Prepared for the Department of Agriculture, Food and the Marine by the School of Biological, Earth and Environmental Sciences, University College Cork.

IWEA (2012). Best Practice Guidelines for the Irish Wind Energy Industry. Guidance prepared by Fehily Timoney and Company for the Irish Wind Energy Association.

Kerlinger, P., Gehring, J.L., Erickson, W.P., Curry, R., Jain, A. and Guarnaccia, J., 2010. Night migrant fatalities and obstruction lighting at wind turbines in North America. The Wilson Journal of Ornithology, 122(4), pp.744-754.

Krijgsveld, K.L., Akershoek, K., Schenk, F., Dijk, F. and Dirksen, S., 2009. Collision risk of birds with modern large wind turbines. Ardea, 97(3), pp.357-366.

Langston, R.H.W and Pullan, J.D. (2004). Effects of Wind Farms on Birds. Convention on the Conservation of European Wildlife and Habitats (Bern Convention). Nature and Environment, No. 139.Council of Europe Publishing, Strasbourg.

Long, C.V., Flint, J.A. Lepper, P.A., Insect attraction to wind turbines: does colour play a role? Eur J Wildl Res (2011) 57:323–331; DOI 10.1007/s10344-010-0432-7

Lynas, P., Newton, S.F. and Robinson, J.A. (2007). The status of birds in Ireland: an analysis of conservation concern. Irish Birds. 8: 149-166

Madsen, J., Boertmann, D. (2008) Animal behavioural adaptation to changing landscapes: spring-staging geese habituate to wind farms. Landscape Ecology, Vol. 23, pp. 1007-1011.

Masden, E.A., Haydon, D.T., Fox, A.D., Furness, R.W., Bullman, R., Desholm, M. (2009) Barriers to movement: impacts of wind farms on migrating birds. ICES, 2009, Journal of Marine Science, Vol. 66, pp. 746–753.

Martin, G. Understanding bird collisions with man-made objects: a sensory ecology approach. Birmingham: Ibis, 2011, Vol. 183, pp. 239-254.

Martin, G.R. and Shaw, J.M. (2010), Bird collisions with power lines: Failing to see the way ahead? Biological Conservation, Vol. 143, pp. 2695-2702.

Moore, N.P., Kelly P.F., Lang F.A., Lynch, J.M. & Langton, S.D. (1997). The Peregrine Falco peregrinus in quarries: current status and factors influencing occupancy in the Republic of Ireland, Bird Study, 44:2, 176-181, DOI: 10.1080/00063659709461053

Nairn, R. & Partridge, K. (2013). Assessing wind energy impacts on birds - towards best practice. CIEEM 2013 Irish Section Conference: Presentations.

NBDC (2025) Biodiversity Maps [online] available at: https://maps.biodiversityireland.ie/Map (accessed 13/03/2025)

NatureScot (2025). Disturbance Distances in selected Scottish Bird Species – NatureScot Guidance.

Newton, S., Donaghy, A., Allen, D. & Gibbons, D. 1999. Birds of conservation concern in Ireland. Irish Birds 6: 333-344.

NRA (2008b). Environmental Impact Assessment of National Road Schemes – A practical guide. NRA.

NRA (2008a). Guidelines for the Crossing of Watercourses during the construction of National Road Schemes. National Roads Authority.

NRA (2009a). Guideline for the Assessment of Ecological Impacts of National Road Schemes, National Roads Authority

Norfolk, D. and Siriwardena, G. (2024). Review of Chough management between populations - a comparison of the biotic and abiotic factors influencing Chough populations across the UK and Irish range. NatureScot Research Report 1291.

Parr, R., (1980). Population study of Golden Plover Pluvialis apricaria, using marked birds. Ornis Scandinavica, pp.179-189.

Percival, S. M., (2003). Birds and wind farms in Ireland: a review of potential issues and impact assessment. Report to S.E.I.

Percival, S.M. (2007) Predicting the effects of wind farms on birds in the UK: the development of an objective assessment method. [ed.] M., Janss, F.E., Ferrer, M. De Lucas. Madrid: Quercus, 7, pp. 137-152.

Pearce-Higgins, J.W., Leigh, S., Langston, R.H.W., Bainbridge, Ian P., Bullman, R. (2009). The distribution of breeding birds around upland wind farms. Journal of Applied Ecology, 2009, Vol. 46, pp. 1323-1331.

Pearce-Higgins, J.W., Stephen, L., Douse, A., Langston, R.H.W. (2012). Greater Impacts of wind farms on bird populations during construction than subsequent operation: results of a multi-site and multi-species analysis. Journal of Applied Ecology, Vol. 49, pp. 386-394.

Rees, E.C. (2012). Impacts of wind farms on swans and geese: a review. Wildfowl 62: 37-72. Wildfowl and Wetlands Trust.

Robinson, C., Lye, G. Battleby (2012). Pauls Hill Windfarm: Flight Activity and Breeding success of Hen Harrier.: Scottish Natural Heritage/Natural Power Consultants, 2012. Sharing Good Practice: Assessing the Impacts of Windfarms on Birds.

Ruddock, M., Wilson-Parr, R., Lusby, J., Connolly, F., J. Bailey, & O'Toole, L. (2024). The 2022 National Survey of breeding Hen Harrier in Ireland. Report prepared by Irish Raptor Study Group (IRSG), BirdWatch Ireland (BWI), Golden Eagle Trust (GET) for National Parks & Wildlife Service (NPWS). Irish Wildlife Manuals, No. 147. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage,

Scottish Natural Heritage (2005). Survey methods for use in assessing the impacts of onshore windfarms on bird communities. Scottish Natural Heritage Guidance. November 2005.

Scottish Natural Heritage (2000). Windfarms and Birds: Calculating a Theoretical Collision Risk Assuming No Avoiding Action. Scottish Natural Heritage.

Scottish Natural Heritage (2010). Survey methods for use in assessing the impacts of onshore windfarms on bird communities. Battleby: SNH.

Scottish Natural Heritage (2010). Avoidance Rate Information and Guidance Note. www.snh.gov.org.
[Online] http://www.snh.gov.uk/docs/B721137.pdf

Scottish Natural Heritage (2018). Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model. Scottish Natural Heritage

Scottish Natural Heritage (2012). Assessing the cumulative impact of onshore wind energy developments. Scottish Natural Heritage.

Scottish Natural Heritage (2017). Recommended bird survey methods to inform impact assessment of onshore wind farms. Version 2. Battleby: SNH.

Shawn, K. et al. (2010). Novel scavenger removal trials increase wind turbine-caused avian fatality estimates. Smallwood, 5, Journal of Wildlife Management, Vol. 74, pp. 1089-1097.

Watson, D. (1977). The Hen Harrier: T and AD Poyser,

Whitfield, D.P. and Madders, M. (2006). Upland Raptors and the Assessment of Wind farm Impacts. Ibis 148, 43-56. British Ornithologists Union.

Whittingham, M.J., Percival, S.M. and Brown, A.F., 2001. Habitat selection by Golden Plover Pluvialis apricaria chicks. Basic and Applied Ecology, 2(2), pp.177-191.

9 HYDROLOGY & HYDROGEOLOGY

9.1 INTRODUCTION

This chapter assesses the impacts of the Proposed Development (**Figure 1.2**) on the hydrology and hydrogeology resources of the Site. Where negative effects are predicted, the chapter identifies appropriate mitigation strategies therein. The assessment will consider the potential effects during the following phases of the Proposed Development:

- Construction of Gortloughra Wind Farm, including:
  - Erection of eight wind turbines with an overall ground to blade tip height of 175 m. The candidate wind turbine will have a rotor diameter of 150 m and a hub height of 100 m;
  - Construction of site access roads, Turbine Hardstands and Turbine Foundations;
  - Development of a site drainage network;
  - Internal wind farm underground power and communications cabling;
  - Erection of a permanent 100 m Met Mast for monitoring wind speeds;
  - Construction of a Temporary Construction Compound for use during construction.1 no. borrow pit;
  - Biodiversity improvements including improvement of heath habitat in fenced off lands designated for Habitat Enhancement and restriction of livestock in lands to allow establishment of heath vegetation in these areas; and,
  - Recreational community improvements including the erection of 4 No. permanent information boards relating to cultural heritage and upgrades to amenity tracks across the site.
  - A 10-year planning permission and 40-year operational life from the date of commissioning of the entire wind farm is being sought. This EIAR also assesses the construction of an on-site 110 kV substation and 2 no. grid connection route (GCR) options along public roads:
  - Option A: Dunmanway 110 kV substation or
  - Option B: Carrigdangan 110 kV substation.
  - While not part of the planning consent for this planning application, this EIA also assesses the works at 18 No. locations along the Turbine Delivery Route (TDR) from the Port of Cork to Site.
- Operation of the Proposed Development
- Decommissioning of the Proposed Development (final phase).

The Project refers to all elements of the application for the construction and operation Gortloughra Windfarm (**Chapter 2: Development Description**).

Common acronyms used throughout this EIAR can be found in **Appendix 1.2** and in **Table 9.1**.

Table 9.1: Acronyms and Descriptions

Acronym	Description
ACP	An Coimisiún Pleanála
AE	Actual Evapotranspiration
BOD	Biochemical Oxygen Demand
CEMP	Construction and Environmental Management Plan
CFRAM	Catchment Flood Risk Assessment and Management
CEnv	Chartered Environmentalist
CIRIA	Construction Industry Research and Information Association
COF	Confirmation of Feasibility
DO	Dissolved Oxygen
DFF	Depth Duration Frequency
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
ER	Effective Rainfall
EU	European Union
FM	Field Monitoring
FSU	Flood Studies Update
GCR	Grid Connection Route
GIS	Geographic Information System
GSI	Geological Survey of Ireland
GWBs	Groundwater Bodies
GWDTE	Groundwater Dependent Terrestrial Ecosystems
HDD	Horizontal Directional Drilling
IGI	Institute of Geologists of Ireland
INAB	Irish National Accreditation Board
IWEA	Irish Wind Energy Association
LiDAR	Light Detection and Ranging
MIGI	Member of the Institute of Geologists of Ireland
MIEMA	Member of the Institute of Environmental Management and Assessment
NHA	Natural Heritage Area

Acronym	Description
NPWS	National Parks and Wildlife Service
NRA	National Roads Authority
OD	Ordnance Datum
OPW	Office of Public Works
P.Geo	Professional Geologist
PCE	Pre-Connection Enquiry
PE	Potential Evapotranspiration
PFRA	Preliminary Flood Risk Assessment
RC	Recharge Coefficient
SAC	Special Areas of Conservation
SEAI	Sustainable Energy Authority of Ireland
SMD	Soil Moisture Deficits
SPA	Special Protection Areas
TDS	Total Dissolved Solids
TDR	Turbine Delivery Route
TSS	Total Suspended Solids
WFD	Water Framework Directive

This chapter of the EIAR is supported by Figures provided in **Volume III** and the following Technical Appendices provided in **Volume IV** of this EIAR:

- **Appendix 9.1** Photographic Plates;
- **Appendix 9.2** Laboratory Certificates; and
- **Appendix 9.3** Water Framework Directive Compliance Assessment.

A Construction and Environmental Management Plan (CEMP) is appended to the EIAR in **Appendix 2.1**. This document will be developed into a Site-Specific Gortloughra Windfarm CEMP post consent / pre-construction once a contractor has been appointed. The CEMP will cover the construction of the Development. It will include all of the mitigation recommended within the EIAR. For the purpose of this application, a summary of the mitigation measures is included in **Appendix 15.1**.

9.1.1 Statement of Authority

This chapter of the EIAR was prepared by David Parkinson (BSc., MIEMA, CEnv) and was reviewed by Andrew Garne. David is the Principal Environmental Consultant of EcoQuest Environmental with extensive environmental consultancy experience in Ireland and Australia. David has completed numerous hydrological and hydrogeological impact assessments, is a

Full Member of the Institute of Environmental Management and Assessment (MIEMA) and is a Chartered Environmentalist (CEnv). David's experience spans multiple industry sectors and disciplines, including numerous windfarm projects, flood alleviation schemes, infrastructure projects, transport, aviation, wastewater schemes, contaminated land and advisory on emerging contaminants. He has extensive experience in carrying out water quality assessments on major Irish rivers or their tributaries such as the Shannon, Dodder, Morell, Corrib, Broadmeadow, Finisk, Bandon, Poddle, and Garavogue rivers. In addition to nationwide water quality assessment experience, David has also assisted with water quality management of sensitive wetlands of international significance in Australia. David also has a background in water and wastewater chemistry laboratory analytical roles which help form the scientific basis of his environmental assessment expertise.

Andrew Garne (B.Sc., M.Sc., P.Geo) is an independent Engineering Geologist who specialises in hydrogeological, geotechnical and geological impact assessment. Andrew is a Full Member of the Institute of Geologists of Ireland (MIGI) and is a registered professional geologist (P.Geo). Andrew has worked on multiple EIAR impact assessments, including multiple windfarm developments, across the disciplines of hydrogeology, geology and soils. He also has extensive experience of windfarm peat stability assessments, geotechnical earthworks designs, geotechnical inspections and supervision, contaminated land assessments, slope stability assessments, site investigation design, procurement and supervision, soil and rock core logging, and writing of geotechnical advisory reports. Andrew has worked in tandem with David throughout the duration of this project, including in the field, at virtual meetings and through extensive collaboration. Andrew has provided input to, and has reviewed, this Chapter of the EIAR.

9.1.2 Assessment Structure

In line with the revised EIA Directive and current (draft) EPA guidelines, the structure of this Hydrology and Hydrogeology chapter is as follows:

- Details of methodologies utilised for both desk and field studies, in the context of legal and planning frameworks;
- Description of Baseline conditions at the Site;
- Identification and assessment of impacts to hydrology and hydrogeology associated with the Project, during the construction, operational and Decommissioning phases of the Proposed Development;
- Mitigation measures to avoid or reduce the impacts identified;
- Identification and assessment of cumulative impacts if and where applicable;

- Identification and assessment of residual impact of the Proposed Development considering mitigation measures; and,
- Summary of Significant Effects and Statement of Significance.

9.2 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

9.2.1 Assessment Methodology

The following calculations and assessments were undertaken in order to evaluate the potential impacts of the Project on the hydrology and hydrogeology aspects of the environment at the Site and Study Area:

- Characterise the topographical, hydrological and hydrogeological regime of the Site from the data acquired through desk study and on Site surveys;
- Undertake preliminary water balance calculation;
- Undertake preliminary flood risk evaluations;
- Consider hydrological or hydrogeological constraints together with development design;
- Consider drainage issues, or issues with surface water runoff quality as a result of the Development, its design and methodology of construction;
- Assess the combined data acquired and evaluate any likely impacts on the hydrology and hydrogeology aspects of the environment;
- If impacts are identified, consider measures that would mitigate or reduce the identified impact; and,
- Present and report these findings in a clear and logical format that complies with EIAR reporting requirements.

9.2.2 Relevant Legislation and Guidance

This study complies with the EIA Directive, as amended, which requires Environmental Impact Assessment for certain types of major development before development consent is granted. The EIA Directive, as amended, is transposed inter alia by the *Planning and Development Act 2000*, as amended, and by the *Planning and Development Regulations 2001*, as amended.

In addition to this planning legislation, other environmental legislation relevant to hydrological and hydrogeological aspects of the environment were referred to:

- S.I. No. 293 of 1988: European Communities (Quality of Salmonid Waters) Regulations 1988;
- S.I. No. 294/1989 - European Communities (Quality of Surface Water Intended For The Abstraction of Drinking Water) Regulations, 1989;

- S.I. No. 722 of 2003: European Communities (Water Policy) Regulations 2003;
- S.I. No. 684 of 2007: Waste Water Discharge (Authorisation) Regulations 2007;
- S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009;
- S.I. No. 296 of 2009: European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009;
- S.I. No. 9 of 2010: European Communities Environmental Objectives (Groundwater) Regulations 2010;
- European Communities (Assessment and Management of Flood risks) Regulation SI 122 of 2010;
- S.I. No. 499 of 2013: European Communities (Birds and Natural Habitats) (Amendment) Regulations 2013;
- S.I. No. 296 of 2018: European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018;
- S.I. No. 99 of 2023: European Union (Drinking Water) Regulations 2023;
- Council Directive 74/440/EEC of 16 June 1974 concerning the quality required of surface water intended for the abstraction of drinking water in the Member States;
- Council Directive 78/659/EEC of 18 July 1978 on the quality of fresh waters needing protection or improvement in order to support fish life;
- Council Directive 79/869/EEC of 9 October 1979 concerning the methods of measurement and frequencies of sampling and analysis of surface water intended for the abstraction of drinking water in the Member States;
- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy;
- Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy; and,
- Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration.

The Water Framework Directive (WFD), which was passed by the European Union (EU) in 2000, and came into legal effect in December 2015, is wide-reaching legislation which replaces a number of the other water quality directives (for example, those on Water Abstraction) while implementation of others (for example, The Integrated Pollution Prevention and Control and Habitats Directives) will form part of the 'basic measures' for the Water Framework Directive. The fundamental objective of the Water Framework Directive aims at maintaining "high status" of waters where it exists, preventing any deterioration in the existing status of waters and achieving at least "Good" in relation to all waters by 2027 (WFD).

This study has been prepared using, inter alia, the following guidance documents, which take account of the aforementioned legislation:

- Water Quality in Ireland, 2019-2024 (EPA, 2025)
- The Cork County Development Plan (2022-2028).
- EPA (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- Office of Public Works (OPW) (2019), Environmental Guidance: Drainage Maintenance and Construction;
- Department of Housing, Planning and Local Government (2019) Draft Revised Wind Energy Guidelines;
- IGI (2013) Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements;
- Irish Wind Energy Association (IWEA) (2012) Best Practice Guidelines for the Irish Wind Energy Industry;
- National Roads Authority (NRA) (2008) Guidelines on Procedures for the Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- NRA (2008) Environmental Impact Assessment of National Road Schemes – A Practical Guide – Rev 1;
- CIRIA (2006) Control of Water Pollution from Linear Construction Projects – Technical Guidance; and,
- Institute of Geologists of Ireland (IGI) (2002) Geology in Environmental Impact Statements – A Guide;

The following additional sources of information have also been reviewed as part of this assessment:

- Environmental Protection Agency, Cycle 3, HA 19 Lee, Cork Harbour and Youghal Bay Catchment Report, May 2024;
- Environmental Protection Agency, Cycle 3, HA 20 Bandon-Illen Catchment Report, May 2024;
- Environmental Protection Agency, Cycle 3, HA 21 Dunmanus-Bantry-Kenmare Catchment Report, May 2024;
- Department of Housing, Planning and Local Government (2018) River Basin Management Plan for Ireland, 2018 – 2021;

- Department of Housing, Local Government and Heritage (2024) River Basin Management Plan 2022 – 2027, The Water Action Plan 2024: A River Basin Management Plan;
- Local Authority Waters Programme (2021) Caha Priority Area for Action – Desk Study Summary;
- Local Authority Waters Programme (2021) Allua Priority Area for Action – Desk Study Summary;
- Met Éireann (2007), Technical Note 61, Estimation of Point Rainfall Frequencies, D.L. Fitzgerald, 2007;
- Met Éireann (2012) A Summary of Climate Averages 1981-2010 for Ireland, Climatological Note No.14;
- Hunter Williams, N.H., Misstear, B.D., Daly, D. and Lee, M. (2013) Development of a national groundwater recharge map for the Republic of Ireland. Quarterly Journal of Engineering Geology and Hydrogeology; and,
- Renou-Wilson, F. (2011) BOGLAND: Sustainable Management of Peatlands in Ireland (REPORT).

9.2.3 Desk Study

A desk study consisting of a review of all available datasets, information, and literature resources relevant to the Site has been completed. The most current datasets and information maintained by the Environment Protection Agency (EPA), Geological Survey of Ireland (GSI) and the Office of Public Works (OPW) were reviewed to assist in establishing the hydrological and hydrogeological characterisation of the Site. Relevant documents and datasets used to assist in compiling the desk study included EPA water quality data, topography maps and GSI hydrogeological data. Planning applications for nearby windfarm developments have also been reviewed. The following list of sources and information were utilised to establish the Baseline environment:

- Department of Housing, Planning and Local Government, National River Basin Management Plan 2018-2021[1]
- Department of Housing, Local Government and Heritage, The Water Action Plan 2024: A River Basin Management Plan for Ireland[2]
- EPA Map Viewer, Water Framework Directive (WFD), surface water and hydrogeological features[3]
- EPA HydroNet, surface water levels, flows and groundwater levels[4]

[1] https://www.housing.gov.ie/water/water-quality/river-basin-management-plans/river-basin-management-plan-2018-2021
[2] https://www.gov.ie/en/policy-information/8da54-river-basin-management-plan-2022-2027/
[3] https://gis.epa.ie/EPAMaps/Water
[4] http://www.epa.ie/hydronet/#Water%20Levels

- Office of Public Works (OPW), Preliminary Flood Risk Assessment (PFRA)[5]
- Office of Public Works (OPW), National Flood Information Portal[6]
- Ordnance Survey Ireland, Map Viewer[7]
- National Parks and Wildlife Service (NPWS), Protected Sites Map-Viewer[8]
- The Geological Survey of Ireland (GSI), groundwater data and maps[9]
- The Geological Survey of Ireland (GSI), karst features database[10]
- Myplan.ie; National Planning Application Map Viewer[11]
- Sustainable Energy Authority of Ireland (SEAI), Wind Atlas[12]
- Met Éireann Meteorological Data[13]
- Department of Housing, Local Government and Heritage, EIA Portal[14]
- Planning Reference: PL04.243486 Shehy More Windfarm EIAR[15]
- Planning Reference: 21/5372 Carrigarierk 2 Windfarm EIAR[16]

9.2.4 Field Work

Field investigation hydrological surveys to inform the Baseline hydrological conditions of the Site were undertaken by EcoQuest Environmental on 14th/15th of June 2021, 4th/5th of April 2022,13th/14th of June 2023 and 2nd/3rd of April 2024. The field investigations consisted of the following works:

- Walkover surveys of the Site to identify and record hydrological features. The locations of surface water features including rivers, drainage patterns, ditches, wetlands, flow directions and flushes etc. were recorded;
- Field hydrochemistry measurements were recorded on surface water features at multiple locations across the Site for parameters including pH, electrical conductivity (EC), dissolved oxygen (DO), total dissolved solids (TDS) and temperature. These measurements were taken to assist in informing the origin of the surface water and also to provide an overview of the Baseline water quality conditions at the Site; and
- Collection of surface water samples at representative locations across the Site and transportation to an Irish National Accreditation Board (INAB) accredited for laboratory analysis.

[5] https://www.gov.ie/en/publication/1c7d0a-preliminary-flood-risk-assessment-pfra
[6] https://www.floodinfo.ie
[7] https://www.geohive.ie/
[8] https://www.npws.ie/protected-Sites
[9] https://www.gsi.ie/en-ie/data-and-maps/Pages/Groundwater.aspx
[10] https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/understanding-irish- karst/Pages/Karst-databases.aspx
[11] https://myplan.ie/national-planning-application-map-viewer
[12] https://www.seai.ie/technologies/seai-maps/wind-atlas-map/
[13] https://www.met.ie/climate/available-data/historical-data
[14] https://housinggovie.maps.arcgis.com/apps/webappviewer
[15] http://maps.corkcoco.ie/planningenquiryv3/MainFrames.aspx
[16] https://www.carrigarierk2info.com/eiar

Upon completion of the field surveys, the data collected was reviewed and mapped for further analysis against applicable water quality screening criteria. The captured field data was overlain against the publicly available datasets listed in **Section 9.2.3** such as those from the EPA, GSI, OPW, OSI and catchments.ie.

9.2.5 Evaluation of Potential Effects

9.2.5.1 Sensitivity

Sensitivity is defined as the potential for a receptor to be significantly affected by a proposed development (EPA, 2022). The EPA provides guidance on the assessment methodology, including defining general descriptive terms in relation to magnitude of impacts, however, in terms of qualifying significance of the receiving environment, the EPA guidance also states that;

"*As surface water and groundwater are part of a constantly moving hydrological cycle, any assessment of significance will require evaluation beyond the development Site boundary.*" (EPA, 2015)

To facilitate the qualification of hydrological and hydrogeological attributes, guidance specific to hydrology and hydrogeology as set out by National Roads Authority (NRA) 2008, has been used in conjunction with EPA guidance. The following table presents rated categories and criteria for rating Site attributes (NRA, 2008).

Table 9.2: Criteria for Rating Site Attributes – Hydrology and Hydrogeology Specific

Importance	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	• River, wetland or surface water body ecosystem protected by EU legislation e.g. 'European Sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the *European Communities (Quality of Salmonid Waters) Regulations, 1988.* • Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status.
Very High	Attribute has a high quality, significance or value on a regional or national scale	• River, wetland or surface water body ecosystem protected by national legislation – NHA status • Regionally important potable water source supplying >2500 homes Quality Class A (Biotic Index Q4, Q5) • Flood plain protecting more than 50 residential or commercial properties from flooding • Nationally important amenity Site for wide range of leisure activities

Importance	Criteria	Typical Examples
		• Regionally Important Aquifer with multiple wellfields • Inner source protection area for regionally important water Source.
High	Attribute has a high quality, significance or value on a local scale	• Salmon fishery • Locally important potable water source supplying >1000 homes • Quality Class B (Biotic Index Q3-4) • Flood plain protecting between 5 and 50 residential or commercial properties from flooding • Locally important amenity Site for wide range of leisure activities • Regionally Important Aquifer • Groundwater provides large proportion of baseflow to local rivers.
Medium	Attribute has a medium quality, significance or value on a local scale	• Coarse fishery • Local potable water source supplying >50 homes • Quality Class C (Biotic Index Q3, Q2- 3) • Flood plain protecting between 1 and 5 residential or commercial properties from flooding • Locally Important Aquifer • Outer source protection area for locally important water source.
Low	Attribute has a low quality, significance or value on a local scale	• Locally important amenity Site for small range of leisure activities • Local potable water source supplying < 50 homes • Quality Class D (Biotic Index Q2, Q1) • Flood plain protecting 1 residential or commercial property from flooding • Amenity Site used by small numbers of local people • Poor bedrock aquifer.

The sensitivity of the receiving hydrological and hydrogeological environment is defined by the Baseline quality, as well as its potential to absorb change and for substitution, as defined in **Table 9.3** and **Figure 9.1**.

Table 9.3: Receptor Sensitivity Criteria

Sensitivity	Definition	Example Criteria
High	Receptor with national or international importance (i.e. SAC or SPA), a high quality and rarity on a regional or national scale and limited potential for substitution or replacement	• Surface water WFD class of "*High*" • European Commission (EC) designated Salmonid or Cyprinid waters • Drinking water protected area (DWPA) • Regionally important aquifer with abstractions for public drinking water supply • GSI groundwater vulnerability "*Extreme*" classification • Supporting a Site protected under EU habitat legislation / species protected by EU legislation • Protected bathing water area • Active floodplain • Highly Groundwater Dependent Terrestrial Ecosystems (GWDTE) • Qualifying characteristics for class 1 priority peatland habitat, all vegetation cover indicates priority peatland habitat all soils are carbon rich soils and deep peat.
Medium	Receptor with regional or county level importance with a medium quality and rarity on a regional scale and limited potential for substitution or replacement	• Surface water WFD class of "*Good*" or Moderate • GSI groundwater vulnerability "*High*" classification • Locally important aquifer • Local or regional ecological status /locally important fishery • Contains some flood alleviation features • Moderately GWDTE

Sensitivity	Definition	Example Criteria
		• Qualifying characteristics for peatland habitat, most vegetation cover indicates priority peatland habitat; all soils are carbon rich soil and deep peat.
Low	Receptor is of limited or local importance only on a Site or in proximity to a Site with low quality and rarity on a localised scale. Environmental equilibrium is stable and is resilient to changes that are greater than natural fluctuations, without detriment to its present character.	• Surface water WFD class of "*Poor*" • Fish only sporadically present • No abstractions for public or private water supplies. • GSI groundwater vulnerability "*Low*" or "*Medium*" classification • Aquifer importance is "*Poor*". • No natural flood alleviation features • Qualifying characteristics for vegetation cover does not indicate priority peatland habitat.

Considering the above categories of sensitivity and associated criteria, the diagram shown in **Figure 9.1** presents how comparison of the character of the predicted impact to the sensitivity of the receiving environment can determine the significance of the impact (EPA, 2022).

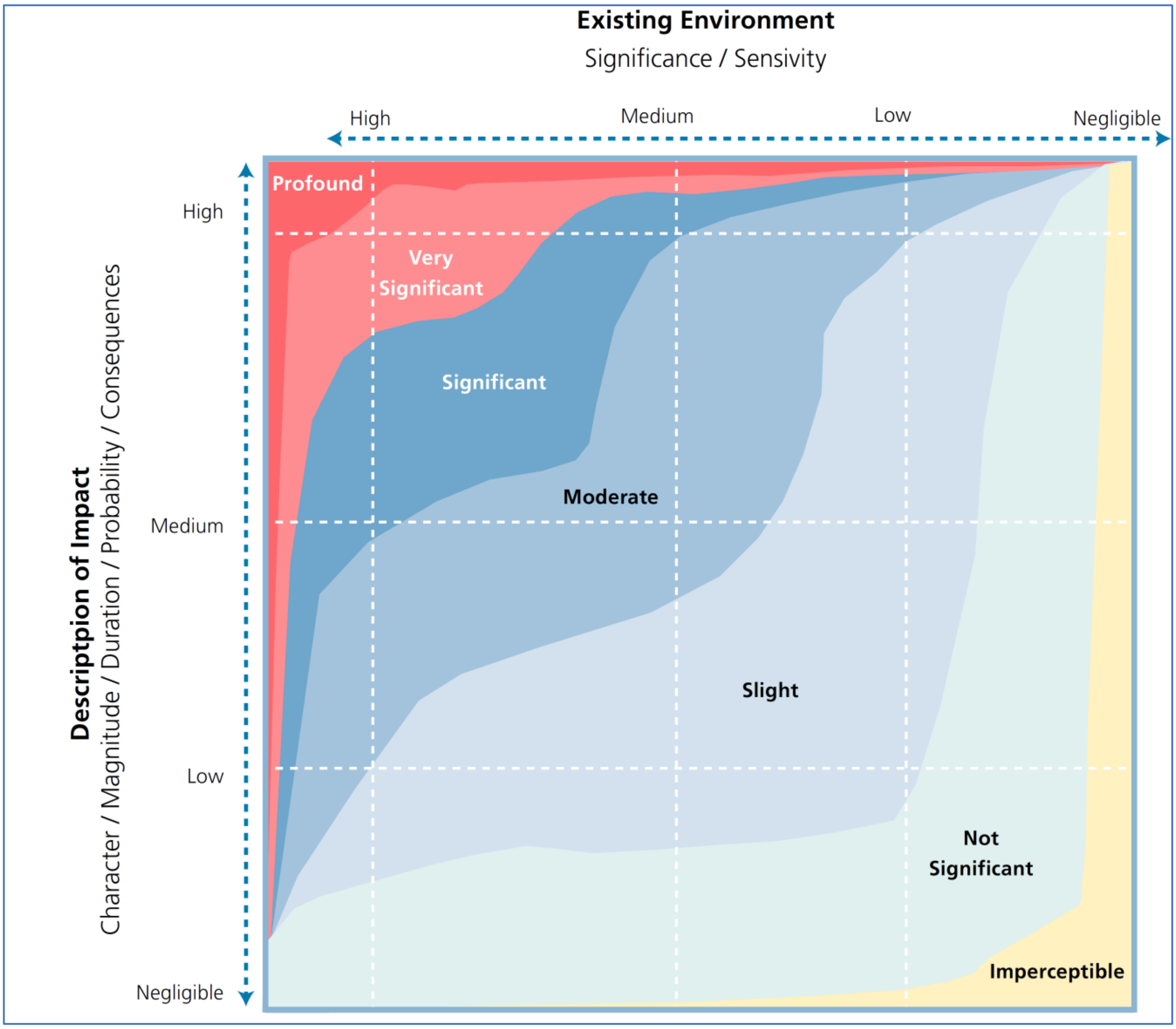


Figure 9.1: Comparison of the Character of the Predicted Impact to the Sensitivity of the Receiving Environment (EPA, 2022)

9.2.5.2 Magnitude

The magnitude of potential impacts arising as a product of the Proposed Development are defined in accordance with the criteria provided by the EPA, as presented in **Table 9.4** (EPA, 2022). These descriptive phrases are considered general terms for describing potential effects of the Proposed Development, and provide for considering Baseline tends, for example, a "*Moderate"* impact is one which is consistent with the existing or emerging trends.

Table 9.4: Describing the Magnitude of Impacts

Magnitude of Impact	Description
Imperceptible	An effect capable of measurement but without noticeable consequences.
Not significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate	An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends.
Significant	An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Very significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
Profound	An effect which obliterates sensitive characteristics.

In terms of hydrology and hydrogeology, magnitude is qualified in line with relevant guidance, as presented in the following tables (NRA, 2008). These descriptive phrases are considered development specific terms for describing potential effects of the Proposed Development, and do not provide for considering baseline trends and therefore are utilised to qualify impacts in terms of weighting impacts relative to Site attribute importance, and scale where applicable.

Table 9.5: Qualifying the Magnitude of Impact on Hydrological Attributes

Magnitude of Impact	Description	Examples
Large Adverse	Results in loss of attribute and/or quality and integrity of attribute	• Loss or extensive change to a waterbody or water dependent habitat, or • Calculated risk of serious pollution incident >2% annually, or • Extensive loss of fishery
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	• Partial reduction in amenity value, or • Calculated risk of serious pollution incident >1% annually, or • Partial loss of fishery
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	• Slight reduction in amenity value, or • Calculated risk of serious pollution incident >0.5% annually, or • Minor loss of fishery
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	• Calculated risk of serious pollution incident <0.5% annually

Magnitude of Impact	Description	Examples
Minor Beneficial	Results in minor improvement of attribute quality	• Calculated reduction in pollution risk of 50% or more where existing risk is <1% annually
Moderate Beneficial	Results in moderate improvement of attribute quality	• Calculated reduction in pollution risk of 50% or more where existing risk is >1% annually
Major Beneficial	Results in major improvement of attribute quality	• Reduction in predicted peak flood level >100mm

Table 9.6: Qualifying the Magnitude of Impact on Hydrogeological Attributes

Magnitude of Impact	Description	Example
Large Adverse	Results in loss of attribute and /or quality and integrity of attribute	• Removal of large proportion of aquifer, or • Changes to aquifer or unsaturated zone resulting in extensive change to existing water supply springs and wells, river baseflow or ecosystems, or • Potential high risk of pollution to groundwater from routine runoff.
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	• Removal of moderate proportion of aquifer, or • Changes to aquifer or unsaturated zone resulting in moderate change to existing water supply springs and wells, river baseflow or ecosystems, or • Potential medium risk of pollution to groundwater from routine runoff.
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	• Removal of small proportion of aquifer, or • Changes to aquifer or unsaturated zone resulting in minor change to water supply springs and wells, river baseflow or ecosystems, or • Potential low risk of pollution to groundwater from routine runoff.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	• Calculated risk of serious pollution incident <0.5% annually.

9.2.5.3 Significance Criteria

Considering the above definitions and rating structures associated with sensitivity, attribute importance, and magnitude of potential impacts, rating of significant environmental impacts is carried out in accordance with relevant guidance as presented in the **Table 9.7** below (NRA, 2008). This matrix qualifies the magnitude of potential effects based on weighting factors depending on the importance and/or sensitivity of the receiving environment. In terms of Hydrology and Hydrogeology, the general terms for describing potential effects **(Table 9.4: Describing the Magnitude of Impacts**) are linked directly with the development specific terms for qualifying potential impacts (**Table 9.5: Qualifying the Magnitude of Impact on Hydrological Attributes** and **Table 9.6: Qualifying the Magnitude of Impact on Hydrogeological Attributes**).Therefore, qualifying terms (**Table 9.7**) are used in describing potential impacts of the Project.

Table 9.7: Weighted Rating of Significant Environmental Impacts

Sensitivity (Importance of Attribute)	Magnitude of Impact			
	Negligible (Imperceptible)	**Small Adverse (Slight)**	**Moderate Adverse (Moderate)**	**Large Adverse (Significant to Profound)**
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant / Moderate	Profound / Significant	Profound
High	Imperceptible	Moderate / Slight	Significant / Moderate	Profound / Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

9.2.5.4 Scoping Responses and Consultation

Information has been provided by a number of consultee organisations during the assessment, and this is summarised in **Table 9.8**. The response to each point raised by consultees is also presented within the table, demonstrating where the design of the Proposed Development has addressed responses to specific issues indicated by respective consultees.

Table 9.8: Scoping Responses and Consultation

Consultee	Type and Date	Summary of Consultee Response With Relevance to This Chapter	Addressed
Uisce Éireann	Letter in response to Scoping Report Received June 2023 Updated letter response received May 2024	• *"Where the development proposal has the potential to impact an Uisce Éireann Drinking Water Source(s) the applicant shall provide details of measures to be taken to ensure that there will be no negative impact to Uisce Éireann's Drinking Water Source(s) during construction and operational phases of the development. Hydrological / hydrogeological pathways between your Site and receiving waters should be identified."* • *"Mitigation proposed for any potential negative impacts on any water source(s), which may be in proximity and included in the environmental management plan and incident response"* • *"Any and all potential impacts on the nearby reservoir as public water supply water source(s) is assessed, including any impact on hydrogeology and any groundwater/ surface water interactions."*	• Uisce Éireann's publicly available datasets have been consulted, no known Uisce Éireann assets exist at the proposed Site. An assessment of public and private water supplies that could potentially be impacted by the proposed Development is outlined in **Section 9.3.18**. Potential impacts on public or private water mains networks are expected to be negligible. The hydrological / hydrogeological pathways from the proposed Development and the locations of water supply zones, source protection areas, GSI mapped boreholes, wells and springs; relative to the proposed site and the grid connection route options, are mapped in **Figure 9.16** in **Volume III**. Further details on the hydrological / hydrogeological pathways from the proposed Development are outlined in the **Water Framework Directive Compliance Assessment** contained in **Appendix 9.3**. • Mitigation measures for potential impacts on water sources are contained in **Section 9.5** and in the Construction Environmental Management Plan in **Appendix 2.1.** • No known Uisce Éireann assets exist at the proposed Site or along the grid connection route options. Further details are provided in **Section 9.3.18**. Potential

Consultee	Type and Date	Summary of Consultee Response With Relevance to This Chapter	Addressed
			impacts on hydrogeology and groundwater / surface water interactions are addressed in **Section 9.3.19.**
		• *"Impacts of the development on the capacity of water services (i.e. do existing water services have the capacity to cater for the new development). This is confirmed by Uisce Éireann in the form of a Confirmation of Feasibility (COF). If a development requires a connection to either a public water supply or sewage collection system, the developer is advised to submit a Pre-Connection Enquiry (PCE) enquiry to Uisce Éireann to determine the feasibility of connection to the Irish Water network. All pre-connection enquiry forms are available from https://www.water.ie/connections/connection-steps/.."*	• The Proposed Development will not require a new connection to a public water or wastewater supply.
		• *"The applicant shall identify any upgrading of water services infrastructure that would be required to accommodate the proposed development."*	• The Proposed Development will not require any upgrading of water services.
		• *"In relation to a development that would discharge trade effluent – any upstream treatment or attenuation of discharges required prior to discharging to an Uisce Éireann collection network."*	• The Proposed Development will not require the discharge of any trade effluent.
		• *"In relation to the management of surface water; the potential impact of surface water discharges to combined sewer networks & potential measures to minimise/stop surface waters from combined sewers."*	• The Proposed Development will not result in discharges of surface waters to combined sewers.
		• *"Any physical impact on Uisce Éireann assets – reservoir, drinking water source, treatment works, pipes, pumping stations, discharges outfalls etc. including any relocation of assets."*	• No known Uisce Éireann assets exist at the proposed Site, those along the grid connection route options are discussed in **Section 9.3.18**.
		• *"When considering a development proposal, the applicant is advised to determine the location of public water services assets, possible connection points from the applicant's site / lands to the public network and any drinking water abstraction*	• Uisce Éireann have been consulted via submission of a data request to datarequests@water.ie. No known Uisce Éireann assets exist at the proposed Site, no

Consultee	Type and Date	Summary of Consultee Response With Relevance to This Chapter	Addressed
		catchments to ensure these are included and fully assessed in any pre-planning proposals. Details, where known, can be obtained by emailing an Ordnance Survey map identifying the proposed location of the applicant's intended development to datarequests@water.ie"	known public water supplies exist within the vicinity of the Site, those along the grid connection route options are discussed in **Section 9.3.18**. Hydrological / hydrogeological pathways have been identified in **Sections 9.3.10** and **9.3.11** in addition to the mapping of surface water features on **Figure 9.3** in **Volume III.**
		• *"Any potential impacts on the assimilative capacity of receiving waters in relation to Uisce Éireann discharge outfalls including changes in dispersion /circulation characterises. Hydrological/hydrogeological pathways between your Site and receiving waters should be identified."*	• The direct discharge of dewatered loads to surface waters will not be permitted under any circumstances as is outlined in **Section 9.5.2.2**. All discharge from the site will be via level spreaders/buffered outfalls via settlement ponds. Hydrological / hydrogeological pathways have been identified in **Sections 0, 9.3.10** and **9.3.11** in addition to the mapping of surface water features in **Figure 9.3** in **Volume III**.
		• *"Any potential impact on the contributing catchment of water sources either in terms of water abstraction for the development (and resultant potential impact on the capacity of the source) or the potential of the development to influence / present a risk to the quality of the water abstracted by Uisce Éireann for public supply."*	• Water abstraction for the Proposed Development will not be required. The potential for the Proposed Development to present a risk to the quality of water abstracted by Uisce Éireann for public supply is considered to be negligible since no known Uisce Éireann assets exist at the Site, those along the grid connection route options are assessed in **Section 9.3.18**.
		• *"Where a development proposes to connect to an Uisce Éireann network and that network either abstracts water from or discharges wastewater to a*	• The Proposed Development will not require a connection to an Uisce Éireann network.

Consultee	Type and Date	Summary of Consultee Response With Relevance to This Chapter	Addressed
		"protected"/sensitive area, consideration as to whether the integrity of the Site/conservation objectives of the Site would be compromised." • *"Mitigation measures in relation to any of the above ensuring a zero risk to any Irish Water drinking water sources (Surface and Ground water)."*	• No known Uisce Éireann assets exist at the Site, those along the grid connection route options are addressed in **Section 9.3.18.** Mitigation measures for potential impacts on water sources are contained in **Section 9.5**.
Cork County Council	Letter in response to Scoping Report Received 11 April 2022	• The response received from Cork County Council did not identify any specific issues relating to hydrology or hydrogeology.	• Not Applicable.
Irish Peatland Conservation Council (IPCC)	Letter in response to Scoping Report Received 22 February 2022	• *"The IPCC would advise any developer planning construction in, or within close proximity to peatland habitat to be familiar with the Environmental Protection Agency funded project BOGLAND (www.ucd.ie/bogland).This project recommends the best practice guidelines to ensure no damaging development occurs on, or affects peat soils and peatlands of conservation value."* • *"The Irish Peatland Conservation Council have identified a number of designated sites within the proximity of the proposed windfarm which need to be given due attention in ascertaining the impacts to biodiversity from the proposed project. In particular, developments have the potential to disrupt the hydrology of peatland and even small impacts to the water table may have disastrous consequences for specialised peatland species that live within minimal ranges of chemical and hydrological limits, such as the Vertigo whorl snails. Developers need to ensure that their project in no way affects the integrity of the habitats and qualifying interests including species of the designated sites."*	• This Project has been reviewed and the applicable best practice techniques are incorporated into **Section 9.5.** • Designated sites are assessed in **Sections 9.3.17** and **9.4.4.7.** The locations of designated sites relative to the Site and proposed grid connection route options are mapped on **Figure 9.5** in **Volume III**. Potential impacts on biodiversity are assessed in **Chapter 6:Biodiversity**.

Consultee	Type and Date	Summary of Consultee Response With Relevance to This Chapter	Addressed
		• *"In 2018 in the UK 39 of 57 Special Areas of Conservation listed on the APIS website (http://www.apis.ac.uk) exceeded the Critical Load Threshold for nitrogen. This is having negative impacts on the vegetation of the designated habitats. There are various sources of excess nitrogen such as construction (e.g. roads, developments), urban waste water (pollution) and agriculture (e.g. fertilizer/piggerys) and can enter a habitat via wet or dry deposition. The proposed development needs to account for nitrogen within pre-planning coupled with a nitrogen monitoring agenda which could highlight possible pathways of nutrient enrichment. Peatlands are naturally nutrient poor and the excessive loads can decimate botanical species."*	• Total nitrogen, nitrite as NO_2 and Nitrate as NO_3 have all formed part of the water quality monitoring programme as is discussed in **Section 9.3.9** where possible pathways for nutrient enrichment is also addressed. The same parameters would continue to be monitored during the operational phase of the water quality monitoring programmes as discussed in **Section 9.5.2.10**.
		• *"Ireland has legal obligations under the WFD to ensure that all rivers and lakes are of "Good Ecological Status" by 2027. Please ensure that the proposed development will not adversely impact on the water quality and lower Ireland's standing with our legal obligations in protecting our waterways. Silt runoff and chemical/construction pollution can be disastrous for aquatic wildlife and this should also be factored into the management and construction plans of the proposed development. IE_SW_20B020200 and IE_SW_19L030200 are of good quality and their status needs to be protected from the development. IE_SW_21O070200, IE_SW_20C010400 and IE_SW_21O040400 are all of high quality and their status also needs to be protected from the development."*	• There are no lakes located within the proposed Site boundary nor adjacent to the proposed Grid Connection route options as can be seen on **Figure 9.3** in **Volume III**. All rivers and streams within and adjacent to the Site Redlin Boundary have been mapped in addition to those located along the proposed Grid Connection route options. Mitigation measures for potential impacts on water sources are contained in **Section 9.59.5**. A water quality monitoring programme has been carried out as is discussed in **Section 9.3.9**. A **Water Framework Directive Compliance Assessment** has also been prepared and is attached to **Appendix 9.3.** With the implementation of the proposed mitigation measures, a deterioration in WFD status is not anticipated in any waterbody.

Consultee	Type and Date	Summary of Consultee Response With Relevance to This Chapter	Addressed
		• *"Wetland Surveys Ireland (www.wetlandsurveysireland.com) have identified a number of wetlands which have had or need to have an ecological survey to ascertain the biodiversity and ecological value within them"*	• The potential wetlands identified at the Site by Wetland Surveys Ireland are assessed in **Chapter 6: Biodiversity**.
Geological Survey of Ireland (GSI)	Letter in response to Scoping Report Received 18 January 2022	• *"Please find attached a list of our publicly available datasets that may be useful to the environmental assessment and planning process. We recommend that you review this list and refer to any datasets you consider relevant to your assessment"* • *"Proposed developments need to consider any potential impact on specific groundwater abstractions and on groundwater resources in general. We recommend using the groundwater maps on our Map viewer, which should include: wells; drinking water source protection areas; the national map suite - aquifer, groundwater vulnerability, groundwater recharge and subsoil permeability maps."* • *"The Groundwater Vulnerability map indicates 'High' and 'Extreme' groundwater vulnerability within the area covered. We would therefore recommend use of the Groundwater Viewer to identify areas of High to Extreme Vulnerability in your assessments, as any groundwater-surface water interactions that might occur would be greater in these areas."*	• All relevant GSI datasets have been thoroughly investigated, assessed and mapped, including aquifer vulnerability mapping (**Figure 9.14)**, groundwater body mapping (**Figure 9.15**), wells, springs, boreholes and source protection areas (**Figure 9.16**). The GSI Map Viewer has been reviewed and referenced for groundwater recharge and subsoil permeability in carrying out the water balance calculations in **Section 9.3.7.** • Groundwater abstraction and resources has been assessed in **Section 9.3.11** (Wells) and in **Section 9.3.18** (Water Resources). Mitigation measures for the protection of groundwater are outlined in **Section 9.5.2.8**. The GSI Map Viewer has been reviewed and referenced for groundwater recharge and subsoil permeability in carrying out the water balance calculations in **Section 9.3.7**. • GSI data has been utilised to produce the groundwater vulnerability map as shown on **Figure 9.14** in **Volume III** and groundwater vulnerability is assessed in **Section 9.3.12**.

Consultee	Type and Date	Summary of Consultee Response With Relevance to This Chapter	Addressed
		• *"The Groundwater Protection Response overview and link to the main report is here: https://www.gsi.ie/en-ie/programmes-and-projects/groundwater-and-geothermal-unit/projects/protecting-drinking-water/what-is-drinking-water-protection/county-groundwater-protection-schemes/Pages/default.aspx"* • *"Geological Survey Ireland also engaged in a national project on Groundwater Flooding. The data from this project may be useful in relation to Flood Risk Assessment (FRA) and management plans, and is described in more detail under 'Groundwater' above."*	• The link provided by GSI has been reviewed. A Groundwater Protection Scheme Report for both west and north Cork were not available at the time of preparing this chapter. Inner and outer source protection areas in the region have been identified and are mapped as shown on **Figure 9.16 in Volume III** with an assessment also provided in **Section 9.3.18**. • The GSI groundwater flooding data has been reviewed and assessed as part of the flood risk identification outlined in **Section 9.3.8**.

9.3 BASELINE DESCRIPTION

9.3.1 Introduction

The Proposed Development is outlined in detail in **Section 2.1** of **Chapter 2: Project Description**.

9.3.2 Site Description

The Proposed Development is located to the east of the townland of Gortloughra, approximately 9 kilometres north-west of Kealkill in west County Cork at the southern extent of the Shehy Mountains. The site is broadly split into a northern and a southern portion which are divided by the highest peak on the site, Shehy More at 546m OD (metres above Ordnance Datum). The Site is located across approximately 117.21 hectares of land which is under the ownership of third parties and the principal land use in the general area is comprised of agricultural sheep grazing, farmland and open mountain heath. The Site is located within the townlands of an tSeithe Bheag (Shehy Beg), (Muscraí Gaeltacht), Gortloughra, Cloghboola and Inchinroe. To the south and south-east of the Site are the townlands of Shanacrane West and Tooren respectively. To the north of the Site there are additional areas of blanket bog, forestry, Douce Mountain, Lough Nambrackderg, the pre-existing Shehy More Windfarm and the townlands of Shehy More, Cloghboola, Derryriordane South and Inchiroe. To the east of the Site Redline Boundary is the townland of Coolmountain and additional areas of forestry. To the west and south-west of the Site Redline Boundary are the townlands of Gortloughra, Coomclogh, Glanycrney, the Cousane Gap and the R585 road. The wider area surrounding the Site is rural in nature with low intensity agriculture in the form of pastoral grassland, peat harvesting and commercial forestry plantations being the predominant land use.

The townlands along which the two grid connection options transverse include:

- **Option A (Dunmanway):** an tSeithe Bheag (Shehy Beg), Gortloughra, Inchinroe, Cloghboola, Cornery, Garraí na Tórnóra (Garryantornora), Tuairín na Lobhar (Tooreenalour), Gort na Carraige (Gortnacarriga), Moneylea, Coolcaum, Coolmountain, Tullagh, Moneyreague, Togher, Cooranig, Keelaraheen, Neaskin, Ardcahan, Knockduff, Gurteennasowna and Ballyhalwick.
- **Option B (Carrigdangan):** an tSeithe Bheag (Shehy Beg), Gortloughra, Inchinroe, Cloghboola, Cornery, Garraí na Tórnóra (Garryantornora), Tuairín na Lobhar (Tooreenalour), Gort na Carraige (Gortnacarriga), Cooragreenane, Coolroe West, Gortnahoughtee, Derryleigh, Gortatanavally, Carrigdangan and Johnstown.

Sixteen mapped rivers or small streams were originally identified that were located either within or adjacent to the Redline Boundary at various stages of the Project design. A significant reduction in size of the Redline Boundary total area occurred during the Project design phase. This resulted in only four mapped rivers or small streams intersecting the finalised Redline Boundary. Multiple interconnecting artificial and natural drainage channels have also been surveyed at the Site, many of these ultimately connect to the larger mapped rivers and streams. Given this considerable surface water interconnectivity, and the potential for sediment laden run-off to migrate down gradient towards lower altitude watercourses, all of the sixteen mapped rivers or small streams that were originally identified have been considered in this chapter, noting that twelve of these watercourses are now located outside of the Redline Boundary.

Eight streams were identified to the north of the summit of Shehy More, these watercourses are located either within or downstream of the northern portion of the Site. These watercourses are all tributaries of the Gortloughra River, which in turn is a tributary of the Owvane River. The Owvane River flows in a south-westerly direction to the north of Kealkill before ultimately draining into Bantry Bay at Ballylickey.

Eight streams were also identified to the south of the summit of Shehy More, these watercourses are located either within or downstream of the southern portion of the Site. These watercourses are all tributaries of the River Bandon which flows to Dunmanway, before turning eastward towards the villages of Ballineen and Enniskean. It then makes its way through the centre of Bandon town, and on to Innishannon and Kilmacsimon, before draining into Kinsale Harbour.

There are no lakes within the Redline Boundary, the closest lake to the Site is Lough Nambrackderg, which is located approximately 850m northeast of the Redline Boundary at the closet extent within the pre-existing Shehy More windfarm site. There are a small number of dwellings and farm buildings located beyond the Redline Boundary which is characteristic of the wider rural setting, there are no buildings or dwellings located within the Redline Boundary. The northern portion of the site is accessible via the L8544 local road which also forms part of the Beara Gougane Barra Cycle Route, a long-distance route from Cork City to the Beara Peninsula. The southern portion of the site is accessible via the L-95853 local road from the R585 regional road, though it is not proposed to access the Site using this road.

9.3.3 Topography

The Site forms part of the southern fringes of the Shehy Mountains and is therefore generally elevated in nature. The highest peak at the Site is Shehy More (546m OD) which broadly divides the northern and southern sections of the Site. To the north of the Site is Douce Mountain (474m OD), in between Douce Mountain and Shehy More is a valley through which the L8544 local road traverses and which forms part of the northernmost extent of the Site. The northern portion of the site ranges in elevation from 200m OD with increasing steeper inclines existing to the south as far as the summit of Shehy More at 546m OD. A **Peat Stability Risk Assessment (PSRA)** and a chapter on Lands, Soils and Geology (**Chapter 8**) have been prepared to address the potential risks associated with the positioning of project infrastructure and potential peat failures.

The southern face of Shehy More is also steep with elevations reducing rapidly from 546m OD to 400m OD across an approximate lateral distance of 300m. The southernmost extent of the Site ranges in elevation from approximately 250 – 300m OD. Further south beyond the Redline Boundary, the topography is generally flat in the townland of Shanecrane East at an elevation of approximately 120m.To the west of the Site, beyond the Redline Boundary is Carrigmount with an elevation of 342m OD. To the east and south-east of the Site there are peaks ranging in elevation from 312m OD, 332m OD and 375m OD and the Cousane Gap through which the R585 regional road traverses. Elevation contours are included within a 3-D hydrological flow map outlined in **Figure 9.6** which is presented in **Volume III**.

9.3.4 Rainfall and Evapotranspiration

Long term rainfall and evaporation data for the study area were sourced from Met Éireann. The World Meteorological Organisation (WMO) recommends that climate averages are computed over a 30-year period of consecutive records. This is the same frequency adopted by Met Éireann who reference the period from 1981 to 2010 (inclusive) as the baseline 30-year period for the calculation of long-term averages. The proposed site is located in between three weather stations which include the following:

Table 9.9: Rainfall Data Available in the Vicinity of the Proposed Site

Station Name	Approximate Distance from Site	Year Opened	Year Closed	Elevation (m OD)
Coomclogh	1.4 Km southwest of the Site	1993	N/A	240
M.Ballingeary,	3.4 Km north of the Site	1948	N/A	323

Station Name	Approximate Distance from Site	Year Opened	Year Closed	Elevation (m OD)
M.Inchigeelagh,	4.4 km northeast of the Site	1948	N/A	299

There is considerable variation in the elevations of the weather stations outlined in **Table 9.9**. Many areas of the Site are located on ground exceeding 300m in elevation. The weather stations outlined in **Table 9.8** are therefore not considered to be an accurate reflection of the likely rainfall estimates for the Site since rainfall propensity generally increases with increasing altitude. This phenomenon occurs due to orographic uplift, a process in which moist air masses are forced to rise over higher terrain, such as hills or mountains. As the air rises, it cools and condenses, leading to precipitation. Therefore, utilising historic climate data from the localised weather stations listed in **Table 9.9** is not considered to be the most reliable methodology that is currently available for estimating rainfall levels at the Site.

Met Éireann has published computer modelled "*1981-2010 Rainfall Grids*" estimates of monthly, seasonal and average rainfall totals (mm) with grid references for every 1-kilometre square grid in Ireland. Methods for estimating monthly rainfall amounts and temperatures for Ireland on a 1-kilometre grid were developed using point based data from approximately 500 rainfall stations and from over 80 temperature stations. The number of stations varies each year, as stations open and close. The interpolation techniques weight the surrounding measured values to derive estimates for unmeasured locations. The modelled rainfall estimates have been developed with cognisance to "*A Summary of Climate Averages 1981-2010 for Ireland, Climatological Note No.14, Met Éireann, Walsh S., 2012*". Using this methodology for calculating water balance calculations is considered to be more accurate than sourcing rainfall data from the closest weather station to the Site which may not be as closely representative of the site-specific conditions, particularly with respect to higher altitude sites such as that of the proposed Development.

Four Met Éireann 1-kilometre square grid rainfall estimates are available for areas within or in close proximity to the Redline Boundary with the average of these four values being adopted for the purpose of site specific rainfall calculations. A total average of 2,237 mm rainfall per year is estimated to occur on average at the site which is taken to be the best available site-specific rainfall estimate for the Site and full details of this rainfall estimate are outlined in **Table 9.10**.

Table 9.10: Site Specific Average Rainfall Estimate Based on Met Éireann 1km Square Grid Modelling

Point ID	1km Grid Rainfall Position (ING)		Altitude Estimate (m OD)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
	East	North														
11,868	114,000	60,000	350m	266	195	182	137	133	127	118	156	168	247	230	243	2,203
12,169	115,000	60,000	520m	290	216	199	144	141	132	126	169	186	275	249	265	2,392
12,469	116,000	60,000	360m	263	192	178	133	131	124	116	149	164	243	226	241	2,161
12,168	115,000	59,000	370m	266	193	179	135	133	127	119	156	169	247	229	242	2,196
			Site Averages	**271**	**199**	**185**	**137**	**135**	**128**	**120**	**158**	**172**	**253**	**234**	**248**	**2,237**

The closest synoptic weather station where the average potential evapotranspiration (PE) is recorded is at Cork Airport, approximately 52km east of the Site. The long-term-average (LTA) PE data covers a continuous 30-year period from 1981 to 2010 (inclusive). The long-term average annual PE for Cork Airport station is 516.3 mm/yr and is outlined in **Table 9.11**. This value is taken to be the best available long-term-average estimate of the Site PE.

Table 9.11 Potential Evapotranspiration Data (mm) for Cork Airport Weather Station

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2023	12.5	19.6	29.7	47.6	87.8	91.4	79.0	67.4	45.5	21.7	15.4	12.1	529.7
2022	13.9	20.6	43.4	58.0	76.3	79.3	93.6	96.6	49.9	25.7	12.7	10.7	580.7
2021	11.4	17.0	32.5	59.9	70.2	88.3	94.3	72.1	42.9	24.9	15.4	12.4	541.3
2020	10.7	19.6	36.1	57.4	83.9	78.4	85.3	70.0	47.5	28.2	11.9	11.0	540.0
2019	13.0	16.0	35.3	51.6	81.0	79.4	87.6	67.7	47.0	27.1	13.9	11.5	531.1
LTA	12.8	20.1	32.1	52.5	71.2	81.7	81.3	69.1	46.1	24.7	13.8	10.9	**516.3**

https://www.met.ie/climate/available-data/monthly-data

Whilst the long-term average PE for Cork Airport station is 516.3 mm/yr, Actual Evapotranspiration (AE) at the Site will be dependent upon a number of factors, including the drainage of the soil. AE is limited by the amount of moisture available in the soil. Estimates of AE are derived from calculated values of PE and soil moisture deficits (SMD). Annual AE is estimated as 95% of P.E. to allow for seasonal moisture deficits (Hunter-Williams et al, 2013). Therefore, actual evapotranspiration at the Site is calculated to be 490.4 mm/yr which is 95% PE. The Effective Rainfall (ER) represents the water available for runoff and groundwater recharge and the annual ER for the Site is calculated via the following equation:

Annualised Average Rainfall – Actual Evapotranspiration = Effective Rainfall

2237 mm/yr – 490.4 mm/yr = 1746.5 mm/yr

It is noted that the GSI National Groundwater Recharge Map provides an alternative computer modelled method for estimating effective rainfall at any point in Ireland. The GSI Map Viewer modelling estimates effective rainfall across Ireland with a result of 1751.6 mm/yr being the estimated total across the majority of the area at the Site. This GSI map viewer modelled estimate for effective rainfall is only 5.1 mm/yr greater than the result from the methodology applied above, which is a difference of only 0.29% between the two methodologies.

According to the GSI National Groundwater Recharge Map, the recharge coefficient (RC) estimated ranges for the Site include 22.5% and 85% across the majority of the site. Peat and poorly drained soils form the dominant hydrogeological setting. The aquifer vulnerability across the Site is predominantly categorised as "*rock at or near the surface*" and "*extreme*" by GSI. Areas of aquifer vulnerability classified as "*rock at or near the surface*" may have slightly higher recharge rates than areas categorised as "*extreme*". However, at the Site, these areas are predominantly located on slopes or in areas with very poor natural drainage. The lowest value in the available range (22.5%) has therefore been chosen to reflect the poorly draining soil types and the presence of peaty soils at the Site. The relatively high stream density and the presence of wetlands at the Site also suggests that recharge rates are comparatively low. Annual recharge and runoff rates for the Site are estimated to be 393 mm/year (22.5% of ER) and 1354 mm/year respectively. The Baseline hydrology of the Site can therefore be characterised as having a flashy network of streams/rivers and by high surface water runoff rates.

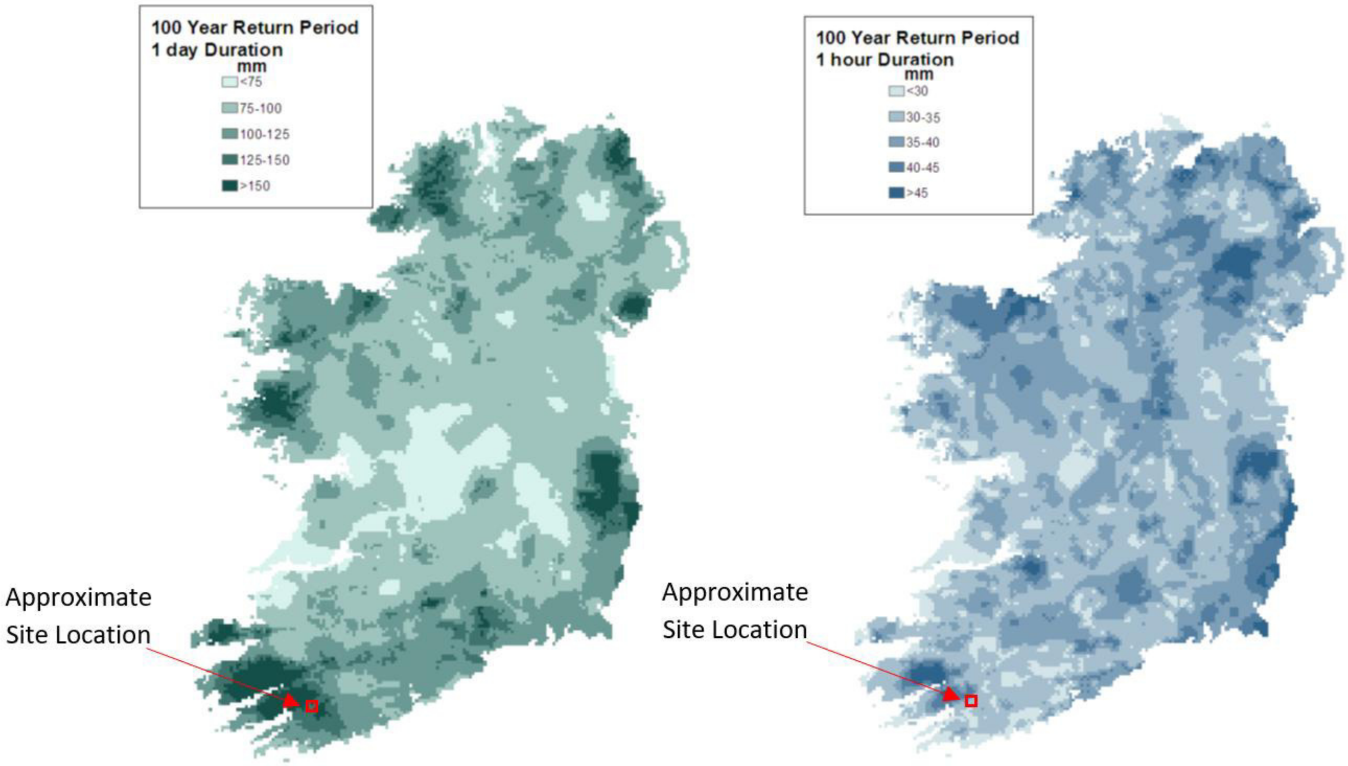
Met Éireann have undertaken a study for the Office of Public Works (OPW) through the Flood Studies Update (FSU) which provides a depth duration frequency (DFF) model. The model allows for the estimation of point rainfall frequencies across a range of durations for any location in Ireland to be predicted. The model consists of an index (median) rainfall and a log-logistic growth curve which provides a multiplier of the index rainfall. The modelling allows for the drainage system at the Site to be designed with the capacity of accommodating a rainfall event likely to be exceeded only once in a specified number of years (i.e. a return period). Requirements for attenuation may vary but in general best practice is to attenuate the 1 in 100-year storm with a 6-hour duration. The proposed drainage system at the Site will therefore be designed with the capacity to accommodate the 1 in 100-year storm with a 6-hour duration. Settlement ponds at the Site will be designed with the capacity to accommodate the 1 in 200-year storm with a 30 minute duration. The modelling provides an estimation of rainfall depths at the Site for multiple storm frequency durations which are outlined in **Table 9.12**.

Table 9.12: Storm Duration and Return Period Rainfall Depths (mm) at the Site

Duration (Mins/ Hours/ Days)	Return Period at the Site (Irish Grid) Easting: 115132, Northing: 059538								
	5 Years	10 Years	20 Years	30 Years	50 Years	75 Years	100 Years	150 Years	200 Years
5 mins	6.0	6.8	7.7	8.2	9.0	9.6	10.0	10.7	11.2
10 mins	8.3	9.5	10.7	11.5	12.5	13.4	14.0	15.0	15.7
15 mins	9.8	11.2	12.6	13.5	14.7	15.7	16.5	17.6	18.4
30 mins	13.7	15.6	17.6	18.8	20.5	21.9	23.0	24.5	25.7
1 hours	19.1	21.8	24.5	26.3	28.6	30.6	32.0	34.2	35.9
2 hours	26.6	30.3	34.2	36.6	39.9	42.6	44.7	47.7	50.0
3 hours	32.3	36.9	41.6	44.5	48.5	51.8	54.3	58.0	60.8
4 hours	37.1	42.3	47.7	51.1	55.6	59.5	62.3	66.6	69.8
6 hours	45.1	51.4	58.0	62.1	67.6	72.2	75.7	80.9	84.8
9 hours	54.8	62.5	70.5	75.4	82.1	87.8	92.0	98.3	103.0
12 hours	62.9	71.7	80.9	86.6	94.3	100.8	105.6	112.8	118.2
18 hours	76.4	87.1	98.3	105.2	114.5	122.4	128.3	137.1	143.6
24 hours	87.7	100.0	112.8	120.8	131.5	140.5	147.3	157.3	164.9
2 days	108.8	122.4	136.6	145.3	156.8	166.5	173.8	184.5	192.4
3 days	126.7	141.6	156.9	166.2	178.6	189.0	196.7	208.0	216.4
4 days	142.9	158.9	175.2	185.1	198.3	209.2	217.3	229.2	238.1

Site specific rainfall modelling data shown in **Table 9.10** indicates that the Site could potentially receive approximately 271 mm/month of rainfall during the average wettest month (January), or approximately an average of 8.7 mm of rainfall per day during the wettest month. For extreme weather events, or worst case scenarios, data from the FSU which is outlined in **Table 9.12**, indicates that the Site could potentially receive 147.3mm of rainfall per day, and potentially 32 mm of rainfall per hour during a 100-year return period (or a 1 in 100 year storm event). The FSU modelling outlined in **Table 9.9** is consistent with the generalised graphic modelling shown in **Figure 9.2** which indicates that between 125 – 150 mm of rainfall per day, and potentially between 30 – 35mm of rainfall per hour could be received by the Site during a 100-year return period.

Figure 9.2: One in a 100 Year Rainfall Events – Extreme Storm Events (Fitzgerald, D.L., 2007)



9.3.5 Regional and Local Hydrology

This section describes the available desktop information on the local and regional surface water hydrological environment. The European Communities Directive 2000/60/EC established a framework for community action in the field of water policy known as the Water Framework Directive (WFD). Ireland has published the River Basin Management Plan 2022-2027 (The Water Action Plan 2024: A River Basin Management Plan for Ireland) which defines the actions that will be taken to improve water quality and achieve "*Good*" ecological status in rivers, lakes, estuaries and coastal waters. The WFD is the overarching mechanism by which water quality management areas are divided and assessed. This section identifies the geographical distribution of WFD management areas and provides an assessment of the available water quality information relative to the proposed Site.

The Site, both Grid Connection route options, and the TDR are located within three separate catchment areas, including the Lee, Cork Harbour and Youghal Bay Catchment Area, the Bandon-Illen Catchment Area and the Dunmanus-Bantry-Kenmare Catchment Area in Hydrometric Areas 19, 20 and 21 respectively. The Proposed Development and Grid Connection route options are located within three WFD sub-catchments. These include the Lee[Cork]_SC_010 sub-catchment, the Bandon_SC_010 sub-catchment and the Coomhola_SC_010 sub catchment. These sub-catchments are geographically spread across three Margaritifera Sensitive Areas in accordance with Annex II and Annex V of the EU Habitats Directive. These include the Lee Upper, Bandon/Caha and the Owvane Margaritifera Sensitive Areas. All of the Proposed Development and Grid Connection options are located within the National River Basin District (RBD) as defined by the current cycle of the WFD. Maps illustrating the catchment and subcatchments areas relative to the Site and Grid Connection route options are illustrated on **Figure 9.9** and **Figure 9.10** respectively in **Volume III.**

There are no Special Areas of Conservation (SACs) or Special Protection Areas (SPAs), collectively referred to as Natura 2000 sites, within the Site nor in close proximity to the Site. The Bandon River SAC is located approximately 7.3km south-east of the Site. There is tenuous surface water connectivity between the Site and Bandon River SAC via the tributaries of the Bandon River which drain the Site. Derryclogher (Knockboy) Bog SAC is located approximately 8.5km west of the Site and is not hydrologically connected to the site. The Site is located approximately 5.5km southwest of the Conigar Bog Natural Heritage Area (NHA). The Conigar Bog NHA is located upstream of the Site via multiple different rivers, any potential hydrological connectivity between the Site and Conigar Bog NHA is therefore very tenuous.

The Site is intersected by four EPA mapped rivers or small streams, with sixteen rivers or small streams being located either within or in relative proximity to the Redline Boundary. Many of these streams merge to form larger channels. These small channels have been numbered 1 – 16 for the purpose of ease of identification and are shown on **Figure 9.3** and **Figure 9.4** in **Volume III**. The Site also contains multiple unmapped small natural and artificial drainage channels. Eight EPA mapped channels located north of the summit of Shehy More (Streams 1 - 8), are tributaries of the Gortloughra River which in turn is a tributary of the Owvane River, which is also referred to as the "*Ouvane River*". The Gortloughra River has the EPA name designation of "*Inchiroe*" and has a stream order of 3. The Gortloughra River flows for approximately 2km west of the Site until it merges with the Owvane River. The Owvane River has the EPA name designation of "*Owvane (Cork)*" and has a stream order of 4. The Owvane River flows in a south-westerly direction to the north of Kealkill before ultimately draining into Bantry Bay at Ballylickey.

Eight small channels are located south of the summit of Shey More (Channels 9 – 16, inclusive), all of which are tributaries of the River Bandon. Six of these small channels have a stream order of 1 and are unnamed streams. Two of these channels have a stream order of 2 and have the EPA names of "*Shehy_Beg*" and "*Shanacrane_East*". Six channels located in the south-eastern area of the Site all merge into the "*Shehy_Beg*" River to the south-east of the Site in the townland of Tooreen. The Shehy Beg River ultimately merges with the Bandon River, approximately 4km to the south-east of the Redline Boundary. Two channels drain the south-west portion of the Site, namely the "*Shanacrane_East*" and a small unnamed stream. Both of these streams ultimately merge and continue as the EPA named "*Shanacrane_East*" which merges with the Bandon River approximately 3.8km southwest of the Redline Boundary. The Bandon River then continues to flow in a south-easterly direction, through the Bandon River SAC and east of Dunmanway before turning eastward towards the villages of Ballineen and Enniskean. It then flows through the centre of Bandon town, and on to Innishannon and Kilmacsimon, before draining into Kinsale Harbour.

Approximately 300m east of the Redline Boundary, within the existing Shehy More Windfarm site, is the EPA named "*Cloghboola 19*" stream which flows in a north-easterly direction into Lough Nambrackderg, which is also located within the existing Shehy More Windfarm site. Lough Nambrackderg drains in a north-westerly direction via the EPA named "*Cloghboola 19*" stream which merges with the Sruhaunphadeen stream. The Sruhaunphadeen stream in turn merges with the Bealaphadeen Stream, which ultimately flows into Lough Allua, approximately 5km northeast of the Site. Approximately 200m north of the Site, within the existing Shehy More Windfarm site, an area of forestry plantation exists containing three channels which flow in a northerly direction to merge with another unnamed stream which ultimately merges with the Sruhaunphadeen Stream. Approximately 350m northwest of the of the Site boundary, three unnamed channels rise and merge to form Channel 6 which flows in a southerly direction before turning west and merging with the Gortloughra River.

Approximately 780m northwest of the Site, at the southern base of Douce Mountain, an unnamed stream (Channel 8) rises and flows in a southerly direction before turning west and merging with the Gortloughra River. Approximately 80m and 140m west of Channel 2, beyond the north-western Site, two additional unnamed streams (Channels 3 and 4 respectively) flow in a northerly direction, near parallel to Channel 2, into which they merge, before Channel 2 in turn merges with Channels 5, 7 and ultimately the Gortloughra River.

In addition to the named and unnamed rivers, streams and lake discussed above, there are also numerous natural and artificial drainage ditches located within the Site and its surrounds, examples of these are shown in **Plate 9.1**, **Plate 9.2** and **Appendix 9.1**. The pre-existing artificial drainage network is more prominent in the northern portion of the Site than in the southern portion of the Site. The natural and artificial drainage channels facilitate the flow of surface water runoff into the streams and rivers located downstream of the Site. Light Detection and Ranging (LiDAR) data has been utilised along with Geographic Information System (GIS) software to map the most prominent of the unmapped streams at the Site. Ground truthing surveys at the Site, and the use of satellite imagery were both used to confirm the accuracy of the LiDAR mapping with GIS software. The LiDAR modelling returned several thousand drainage flow paths, or very small channels within the Site. The most prominent of these are presented on **Figures 9.3 and 9.6** in **Volume III**. **Figure 9.6** in **Volume III** outlines a three-dimensional hydrological model of the Site with respect to the main design elements.

Within the northern portion of the Site, the drainage channels are heavily influenced by the topography and generally flow in a westerly or northerly direction to merge with unnamed channels that are tributaries of the Gortloughra River. Within the southern portion of the Site, the drainage channels generally flow in a southerly or easterly direction to generally mimic the land gradient and merge with the various rivers and unnamed streams that are tributaries of the Bandon River further south.

There are no lakes within the Site, the closest lake to the Site is Lough Nambrackderg, which is located approximately 850m northeast of the Site at the closet extent and is located within the pre-existing Shehy More windfarm site. Lough Nambrackderg is an unmonitored surface water body within the meaning of the Water Framework Directive (2000/60/EC). The lake lies within the Lee, Cork Harbour and Youghal Bay Catchment Area. A detailed review of Light Detection and Ranging (LiDAR) derived digital terrain modelling, site drainage mapping, and mapped surface water features confirms that some design elements of the Proposed Development are located near a topographic and hydrological divide between:

- The Lee, Cork Harbour and Youghal Bay Catchment Area, and
- The Dunmanus-Bantry-Kenmare Catchment Area.

At this specific topographic and hydrological divide, all mapped surface watercourses within the Site boundary drain south-westwards towards the Dunmanus-Bantry-Kenmare Catchment Area. The design elements of the Proposed Development are hydrogeologically upgradient of receiving waters within the Bandon-Ilen and the Dunmanus-Bantry-Kenmare Catchment Areas, and are not hydraulically connected to Lough Nambrackderg. On the basis of the absence of surface water connectivity, the absence of hydrogeological connectivity, the Site's location on a defined hydrological divide, and the absence of any mechanism by which the Proposed Development could alter that divide, there is no pathway for impact between the Proposed Development and Lough Nambrackderg. Further details on Lough Nambrackderg are outlined in the **Water Framework Directive Compliance Assessment (Appendix 9.3)**.

The Grid Connection route option to Carrigdangan substation follows the road network and would traverse across eighteen watercourses along the road network, two mapped watercourses within the Redline Boundary, and four field surveyed drainage channels within the Redline Boundary. The Grid Connection route option to Dunmanway substation follows the road network to Dunmanway and would traverse across thirty-three watercourses along the road network, two mapped watercourses within the EIAR boundary, and four field surveyed drainage channels within the Redline Boundary.

To facilitate the installation of either Grid Connection route option and upgrading of the Site access tracks, one new bridge would be constructed within the Redline Boundary, to the southwest of T06. Five existing culverts would be upgraded and three new culvers would be installed at the main Site. A maximum of 6 drainage channels would also require slight diversions to be implemented at the main site to allow for the access tracks, Turbine Hardstand areas and borrow pit to be constructed. These locations are shown on **Figure 9.7A** in **Volume III**.

The road network between the Site entrance and the townland of Gortnacarriga is proposed to be utilised for both grid connection route options, at this point the grid connection route options diverge towards either Dunmanway or Carrigdangan substations. There are eight watercourses located along this stretch of road network that is common to both grid connection route options (between the main Site and the townland of Gortnacarriga). Horizontal directional drilling (HDD) could potentially be required at all thirty-three crossing locations along the Dunmanway option as a conservative assumption. For the purpose of conservatism, it is also assumed that all eighteen crossings along the Carrigdangan option could potentially also require HDD to be carried out. The locations where HDD may potentially be required along both grid connection route options are shown on **Figure 9.7B** in **Volume III**.

In terms of the Turbine Delivery Route (TDR), which is from the Port of Cork to the northern entrance of the Site, the route crosses multiple mapped rivers and streams with minor works being carried out or laydown areas being utilised at a total of 49 individual locations. The type of minor works that would be required along the TDR include temporary road widening for overrun areas, areas to be cleared for oversail areas, vegetation clearance, checking the width of access roads and the use of fields as blade laydown areas. The locations of watercourse relative to the TDR are shown on **Figures 9.17** to **9.65** in **Volume III**.

9.3.6 Wind Farm Site Drainage

Plate 9.1: Example of Natural Drainage Channel

Plate 9.2: Examples of Excavated Artificial Drainage Channels

9.3.7 Water Balance Assessment

A water balance assessment has been carried out for the Site which is outlined in **Table 9.13**. The water balance assessment utilises site specific rainfall estimates for the highest average monthly rainfall (January) at the Site. Combined with long-term potential evapotranspiration (PE) data from Met Éireann, GSI recharge coefficient estimates, associated runoff estimates, and Site area (m^2) input variables; the assessment provides an estimate of the average volume of surface water expected to occur during the average January period. The water balance assessment is carried out for the estimated baseline runoff conditions and the estimated post Development conditions at the Site. A comparison is made between these two results to predict the estimated changes that the Proposed Development will have on surface water runoff rates at the Site during the average wettest month of the year.

The Met Éireann 1981-2010 one km^2 grid estimates provide modelled average rainfall totals near at the Site as is outlined in **Table 9.9** with a result of 271mm estimated for the average month of January. The closest synoptic weather station where the average potential evapotranspiration (PE) is recorded is at Cork Airport, approximately 52km east of the Site. The long term minimum monthly PE data from Cork Airport synoptic weather station has therefore been adopted as being the most representative available PE data for the Site. The minimum January potential evapotranspiration during the same period of 1981-2010 at Cork Airport Weather Station occurred in January 2010 at 7.8 mm PE, this has been adopted as a conservative estimate for PE. As these datasets represent the worst-case scenario, they have been conservatively used to estimate runoff volumes from the Site.

The surface water runoff coefficient for the Site will be variable and dependent on a range of factors such as the antecedent conditions, rainfall intensity, rainfall duration, slope, vegetation type and subsoil type etc. In winter, when wetter conditions prevail, a greater proportion of runoff is likely to occur, than that which occurs in summer for a similar rainfall event. Peat catchments are susceptible to high rates of runoff. May et al. (2005) found that over 90% of the total flow in a peat catchment in the west of Ireland originated from precipitation and was mainly in the form of surface runoff. Given that peat does contribute to the hydrogeological setting across the Site, and peat is usually saturated, in addition to the generally sloping topography, a surface water runoff co-efficient of 77.5% has been conservatively estimated for the Site.

A range of GSI recharge coefficient and runoff estimates exist for the Site with 22.5% being adopted as a site wide average. The water balance assessment conservatively estimates that the volume of surface water runoff at the Site during the average wettest month would be 228,226 m^3/month or 7,362 m^3/day. For the post development runoff scenario, the water balance assessment conservatively assumes that all hardstand areas and access tracks would be fully impermeable. This is most unlikely to be the case in reality and can be considered as a worst-case scenario. Assuming fully impermeable road and hardstand surfaces are constructed as a worst-case scenario, the surface water runoff at the site is estimated to increase by 3.26% when compared to the pre-Development baseline runoff rates which is considered to be a slight increase in terms of potential downstream impacts.

Table 9.13: Preliminary Water Balance Analysis

Variable	Data Description	Site Assessment	Units
Average Wettest Month (January) Estimated Water Balance			
Site Specific Average Wettest Monthly Rainfall Total (R)	Met Éireann 1981-2010 1 km^2 Grid Estimates of Wettest Monthly Average Rainfall Totals (January)(R)	271	mm
January Minimum Potential Evapotranspiration (PE)	Cork Airport 30 Year January Minimum PE (1981-2010) (January 2010)	7.8	mm
Minimum October Actual Evapotranspiration (AE = PE x 0.95)	AE = PE*0.95 (Hunter-Williams et al, 2013)	7.41	mm
Max Effective Rainfall (October) (ER = R - AE)	R - AE	263.59	mm
Range of GSI Recharge Coefficient Estimates (RC) for the Site (22.5% and 85%)	The lowest value in the GSI range (22.5%) has been adopted as a site wide average to reflect the presence of peat at the site and the National Soils Hydrology Map classification for the majority of the site as being poorly drained.	22.5	%
Estimated Recharge Coefficient	22.5% of ER	59.1	mm
Estimated Runoff	77.5% of ER	203.5	mm
Average Wettest Month (January) Runoff Estimates			
Site Area	EIAR Boundary File GIS Geometry Calculation	1,117,210	m^2
Baseline Wettest Month Monthly Runoff	Estimated Average Monthly Baseline Runoff During Wettest Month	228,226	m^3/month
Baseline Wettest Month Daily Runoff	Estimated Average Daily Baseline Runoff During Wettest Month	7,362	m^3/day
Estimated Changes to Baseline Runoff Post Development During the Average Wettest Month (October)			
Hardstand Development Area (DA)	EIAR Chapter 2 Description of Development (Sum of all Hardstand Areas)	125,298	m^2

Variable	Data Description	Site Assessment	Units
100% Runoff Scenario from Hardstand Area	DA*ER/1000	33,027	m^3
77.5% Runoff Scenario from Hardstand Area	DA*(ER*0.75)/1000	25,596	m^3
Net Monthly Runoff Increase	Estimated Monthly Runoff Increase Versus Baseline Conditions	7,431	m^3/month
Net Daily Runoff Increase	Estimated Daily Runoff Increase Versus Baseline Conditions	240	m^3/day
Percentage Runoff Increase	Percentage Runoff Increase Compared to Baseline Conditions	3.26	%

9.3.8 Flood Risk Identification

Flood risk identification is the first stage is a flood risk assessment (FRA) process that is required to be carried out for proposed developments in accordance with The Planning System and Flood Risk Management Guidelines. The scope of this flood risk identification includes both the Site and the proposed Grid Connection route options. Flood risk identification was conducted in order to assess the potential flood risks posed to the Proposed Development and to downstream receptors. A review of historic flooding within the study area has been undertaken. Multiples sources were consulted to identify the areas being potentially at risk of flooding, including the following:

- Catchments.ie (www.catchments.ie)
- Office of Public Works (OPW) Catchment Flood Risk Assessment and Management (CFRAM)
- National Flood Hazard Mapping (www.floodmaps.ie)
- Department of Environment, Community and Local Government on-line planning mapping (www.myplan.ie)
- The Planning System and Flood Risk Management - Guidelines for Planning Authorities (DHPLG/OPW, 2009)
- Ordnance Survey Ireland, Map Viewer http://map.geohive.ie/mapviewer.html

The OPW's interactive flood maps and Catchment Flood Risk Assessment and Management (CFRAM) are currently the main source of reference for flood risk identification in Ireland. The interactive maps are indicative flood risk maps and the interactive National Indicative Fluvial Mapping (NIFM) supersede the Preliminary Flood Risk Assessment (PFRA) maps. The Past Flood Events dataset has been reviewed on the OPW's website at www.floodinfo.ie. This dataset includes records of all available flood events held by the OPW, local authorities and other national organisations such as the EPA, Teagasc and the Department of the Environment, Climate and Communications.

No historical single or recurring flood events have been recorded within the Redline Boundary. The closest recurring flood event to the Site is mapped as the "*Sruhaunphadeen Derrynagree*" recurring flood event which occurs in a rural area approximately 1.8km north of the Site. This recurring flood event is located approximately 50m below the lowest altitude of the Site and has been recorded through mapping produced by Coillte identifying a number of areas prone to flooding in Cork. An additional recurring flood event has also been mapped by Coillte at Derragh Bridge, south of Shanacrane East along the R585 Road, approximately 2.2km south-east of the Site. The recurring flood event at Derragh Bridge is located at an altitude approximately 200m lower than that of the southern Site boundary. Given the distance of these recurring flood events to the Site and their occurrence at much lower altitudes than the Site, potential impacts from these flood events on the Proposed Development are expected to be negligible. Furthermore, given the considerable distance from the Site to these recurring flood events, and the minimal surface water runoff increase that is expected to occur as a result of the Proposed Development, the Proposed Development is not anticipated to exacerbate the existing potential for flooding at these locations.

Both Grid Connection route options to Carrigdangan and Dunmanway Substations would progress from the northern extent of the main Site onto the L-8544 local road in a north-easterly direction until the two route options diverge near the townland of Gortnacarriga. For the Carrigdangan Grid Connection route option, no single or recurring past flood events have been recorded either on or in close proximity to the road network along which this Grid Connection route option would follow. The closet recorded flood events to this Grid Connection route option is the "*Sruhaunphadeen Derrynagree*" recurring flood event described above, which is also the closest recurring flood event to the mains Site. The "*Sruhaunphadeen Derrynagree"* recurring flood event is located approximately 890m northwest of the L-8544 local road along which both Grid Connection options would traverse, although it is located at an altitude of approximately 90m lower than the L-8544 local road at the closet extent. Any potential impacts from the *Sruhaunphadeen Derrynagree"* recurring flood event on either of the Grid Connection route options is expected to be negligible.

For the Carrigdangan Grid Connection route option, approximately 1.7km south of the route, both a recurring and single flood event are recorded in the townland of Knockariblihane. The single flood event in this area last occurred at Inchigeelagh Junction, on the R585 regional road, on September 11th, 2015. The flood source is not identified on the OPW database for this flood event with only limited details being available for this flood event. The recurring flood event in this area occurs approximately 340m northeast of a single flood event in this area which is described as the "*Caha Knockariblihane recurring*" flood event where the flood source is a "*River*", which is presumably the Caha River which flows past this location. The immediate area surrounding the Carrigdangan Substation is not recorded to have been impacted by any historical flood events.

For the Dunmanway Grid Connection route option, one single flood event has been recorded at Ardcahan Bridge when the Bandon River flooded in February 1991, approximately 220m southwest of the existing roadway which this Grid Connection route option would traverse. OPW photographic records also exist for a flood event on 19th February 2002, at Inchicuhan Crossroads along which this Grid Connection route option would traverse and also at Ardcahan Bridge. The cause of this flooding in February 2002 is noted to be the Caha River and not the Bandon River which caused the February 1991 flooding. Since two separate rivers were the cause of these two flood events, this is presumably the rationale as to why the Ardcahan Bridge flooding has not been mapped as a recurring flood event on the OPW Past Flood Event database although it is noted that it has been known to become flooded more than once.

Further north of Ardcahan Bridge, along the R587 road which the Dunmanway Grid Connection route option would traverse, a flood event occurred on 2nd February 2021. This event has been recorded on the OPW flood database as "*Flooding at Dunmanway/Enniskeane*" with the source of this flood event being attributed to a river. Although details of the river in question are not provided on the OPW database, it is notable that two rivers are located in close proximity to the R587 road at this location, namely the Caha River and a tributary of the Caha River with the EPA name of "*Ardachan*". It is possible that either or both of these rivers resulted in the flooding along this stretch of the R587 road in February 2021. Approximately 900m further northwest of this single flood event, a recurring flood event of the Caha River is recorded as "*Caha River Neaskin*". This location is approximately 240m west of this Grid Connection route option along the R587 road at the closest extent. Approximately 370m further north along the R587 road, another single flood event is recorded as "*Flooding at Ardachan*" where a flood event occurred on 11th September 2015. A river was the source of this flood event and although the details of the river in question are not provided on the OPW database, two rivers exist in close proximity to this location. These are the Caha River and a tributary of the Caha River with the EPA name of "*Aultagh*". Similar to the flood event described above at Ardachan in February 2021, it is possible that either or both of these rivers resulted in the flooding along this stretch of the R587 road in September 2015.

South of Keelaraheen, approximately 500m south of the L-8551-15 local road along which the Dunmanway grid connection route would traverse, a recuring flood event has also been recorded along the Bandon River. This recuring flood event has also been recorded by Coillte and is located on land approximately 10m lower in altitude than the L-8551-15 local road along which this Grid Connection route option would traverse. The Bandon River has also flooded in east Dunmanway in October 1996 along the R586 near "*The Long Bridge*". This location is approximately 500m west of the substation near Ballyhawlwick, Dunmanway, where this Grid Connection route option would terminate. The immediate area surrounding the substation at Dunmanway is not recorded as having been impacted by the 1996 flood event nor any other flood events.

Regardless of which Grid Connection route option is chosen, the Grid Connection route would consist of underground trenching along public roads which will be restored with like-for-like surfaces. Any trenching works which will be carried out will be temporary in nature with no additional hardstand being proposed. As a result, runoff characteristics will be effectively unchanged when compared to the existing surfaces along the chosen route. The proposed Grid Connection route will therefore not change flood risk potential upstream or downstream of the proposed Grid Connection.

In terms of the TDR, a review of past flood events along the road network from the Port of Cork to the Site has been carried out. A single flood event recorded as "*Inchigeelagh 15/01/11*" on the L-4608 local road occurred near the townland of Cappanclare in January 2011. The cause of this single flood event was reported to be overtopping of the River Lee, which is located to the north of this section of road. An additional single flood event recorded as "*Flooding at Inchigeelagh Junction on 11/09/2015*" occurred in September 2015, only limited information regarding this event is available on the OPW floodinfo website. The flood source for this event is not listed, it could have resulted from overtopping of the nearby Caha River, although this is not stated on the OPW database. Only short duration minor works consisting of checking of the road with for oversail and overrun widening areas, and/or vegetation clearing will be carried out in the vicinity of these locations. The use of the road network for the purpose of TDR is expected to have a negligible impact on potential flooding at these locations and on the vehicles/personnel that will temporarily be utilising the road network.

An additional single flood event recorded as "*Flooding at Crookstown June 28th 2012*" is also recorded on the OPW flood database. In this instance, the flood source is recorded as being the "*River Bridge / Brouen River*". No works will be carried out in the vicinity of this recorded flood event location, use of the road network for the purpose of TDR is expected to have a negligible impact on flooding at this location.

A blade laydown area, to the east of Cookstown, is the furthest east between the Site and the Port of Cork where any works will be required along the TDR. No single flood or recurring flood east of this location have been considered further since use of the wider road network for the purposes of the TDR is not expected to have any impacts on potential flooding or on the vehicles/personnel that would be temporarily utilising the public road network.

Rainfall runoff from the Site will be captured for attenuation in the Site's designed drainage system, which will include settlement ponds. The settlement ponds will be strategically located at turbine bases and/or hardstand areas which will facilitate the treatment of runoff water through the settling out of sediments before eventual discharge to the existing drainage environment. The proposed drainage system will result in increased attenuation of rainwater during heavy rainfall events prior to ultimately being discharged to the surrounding environment for natural recharge. Natural recharge will occur via seepage to groundwater, diverted to topographically low points such as drains via the undulating topography or absorbed by the natural vegetation. The Proposed Development will therefore not exacerbate the identified pre-existing single or recurring flood event due to an absence of direct pathways between the Site and the identified flood event locations. Details of these flood events is outlined in **Table 9.14** and their locations relative to the Site and Grid Connection route options are also mapped on **Figure 9.11** in **Volume III**.

Table 9.14: Regional Flood Events Recorded

Flood ID	Flood Location Description	Flood Type	Flood Source	Approximate Distance to Project Location
2839	Sruhaunphadeen Derrynagree	Recurring	River	1.8km north of the Redline Boundary and 890m northwest of both Grid Connection route options
2887	Derragh Bridge	Recurring	River	2km southeast of the Redline Boundary
13956	Inchigeelagh Junction	Single	Null	1.7km south of the Carrigdangan Grid Connection route option
2892	Caha Knockariblihane	Recurring	River	1.8km south of the Carrigdangan Grid Connection route option
2836	Bandon Keelaraheen	Recurring	River	500m south of the Dunmanway Grid Connection route option

Flood ID	Flood Location Description	Flood Type	Flood Source	Approximate Distance to Project Location
10281	Caha River, Ardcahan Bridge Feb 2002	Single Event	River	Inchicuhan Cross Roads (along Grid Connection route) and Ardcahan Bridge (220m southwest of the Dunmanway Grid Connection route option)
608	Bandon Dunmanway October 1996	Single Event	River	500m west of the substation near Ballyhawlwick, Dunmanway
14061	Flooding at Dunmanway/Enniskeane, Feb 2021	Single Event	River	Along the R587 road which the Dunmanway Grid Connection route option
2893	Caha River Neaskin	Recurring	River	240m west of the Dunmanway Grid Connection route option
13957	Flooding at Ardcahan, September 2015	Single Event	River	70m northwest of the the Dunmanway Grid Connection route option
11302	Inchigeelagh 15/01/11	Single Event	River	Along the TDR on the L-4608 local road near the townland of Cappanclare
13956	Flooding at Inchigeelagh Junction on 11/09/2015	Single Event	Not Stated	Along the TDR on the R585 near the townland of Inchincurka
11740	Flooding at Crookstown June 28th 2012	Single Event	River	Along the TDR on the R585 at Crookstown

The NIFM interactive maps have also been consulted with reference to fluvial sourced (rivers and streams) flooding for both current day and future case scenarios. The medium and low probability present day scenarios relate to an annual exceedance probability (AEP) of 1% and 0.1% respectively. The medium and low probability present day scenarios reflect the odds of a theoretical extreme flood event occurring in a given year being 1:100 and 1:1000 respectively. There are no 1% or 0.1% AEP fluvial flood events predicted within the Site for the present-day scenario.

A possible 0.1% and 1% AEP fluvial flood event is mapped downstream of the Site adjacent to the EPA named "*Shanacrane_East"* River for the medium and low probability present day scenario. The location of these modelled possible flood events are approximately 650m south of the Site at an elevation of approximately 230m below the lowest point on the southern Site boundary. An additional 0.1% and 1% AEP fluvial flood event is modelled downstream of the Site adjacent to the Shehy Beg River for the medium and low probability present day scenarios. The closet distance of this potential flood extent for the present-day scenario to the southern Site boundary is 1.8km. This modelled potential flood event is located approximately 230m below the lowest point of the southern Site boundary.

Approximately 1.6km west of the northern Site boundary, a possible 0.1% and 1% AEP fluvial flood event is modelled downstream of the Site adjacent to the Gortloughra River. In both of these potential flood modelled scenarios, the elevation of the flood extent is approximately 80m below that of the lowest elevation on the northern Site boundary. Approximately 1.9km north of the Site, along the Sruhaunphadeen Stream, which is not hydrologically connected to the Site via a mapped watercourse, a possible 0.1% and 1% AEP fluvial flood event for the present-day scenario has also been modelled. The elevation of these potential flood events are approximately 100m below the lowest point of the northern Site boundary.

Given that the proposed drainage system outlined in the **Surface Water Management Plan** attached to **Appendix 2.1** will result in increased attenuation of rainwater during heavy rainfall events, the potential risk of exacerbating a theoretical 1% or 0.1% AEP fluvial flood downstream of the Site for the present-day scenarios is expected to be negligible. The predicted extent of the current day scenario fluvial flood events surrounding the site and the Grid Connection route options have been mapped in **Figure 9.13** in **Volume III**.

In terms of the Carrigdangan Grid Connection route option, there are no potential 1% or 0.1% AEP fluvial flood events modelled to occur along this Grid Connection route option with the closest potential event modelled to occur approximately 130m north of the L-8540 Local Road at the townland of Gortaknockane. This event is located at 10m lower in altitude than the L-8540 Local Road, potential impacts on the Carrigdangan Grid Connection route option from this event are expected to be negligible.

In terms of the Grid Connection route option to Dunmanway, the Caha River is the primary source of potential 1% or 0.1% AEP fluvial flood events that could potentially occur along the road network during the present-day scenario. Potential 1% or 0.1% AEP fluvial flood events that could potentially occur at or near the townlands of Lackabaun, Tullagh, Farrannahineeny, Dromlough, Aultaghreagh, Aultagh, Gortanure, and Ardachan. To a much lesser extent, the Bandon River also represents a source of potential 1% or 0.1% AEP fluvial flood events that could potentially occur along the road network during the present-day scenario near the townlands of Knockduff and Gurteennasowna.

In an assessment of potential future flooding impacts on the Proposed Development, the NIFM's "*High-End Future Scenario*" which models a 30% increase in rainfall resulting from climate change has been adopted as a precautionary approach. The medium probability scenarios (AEP of 1%) has been reviewed at the Site for additional conservatism. There are no 1% AEP extreme fluvial flood events modelled within the Site for the high-end future scenario. Similar to the modelled present-day scenario, stretches of the Shanacrane East River, Shehy Beg River, Caha River, Gortloughra River and the Sruhaunphadeen Stream are all predicted to flood during the medium probability high end future scenario flood events. The extent of these potential future modelled scenarios are all similar in area to the present day scenario and are not expected to impact on the proposed development site.

Similar to the current day scenario, the proposed drainage system outlined in the **Surface Water Management Plan** attached to **Appendix 2.1** will result in increased attenuation of rainwater during heavy rainfall events. Surface water runoff from the developed areas of the Site will be directed to a stormwater drainage system designed in accordance with the principles of Sustainable Drainage Systems (SuDS). The management of surface water runoff will limit discharge from the Site to greenfield runoff rates. The potential risk of exacerbating theoretical downstream high end future scenario fluvial flood events is therefore expected to be negligible. The predicted extent of this High-End Future Scenario has been mapped in **Figure 9.12** in **Volume III.**

Regardless of which Grid Connection route option is chosen, works along the Grid Connection route will be of short duration and temporary in nature. Trenching works required to facilitate the installation of the Grid Connection route will be backfilled resulting in no notable changes of the road network. As a result, any potential changes to the fluvial flood risk along the road network for the present-day or "*High-End Future Scenarios"* are expected to be negligible.

In terms of the TDR, multiple sections of the existing public road network are modelled to flood during both the present day and high-end future scenarios. These locations include along the R585 near the areas of Inchincurka, Farranmareen, Bealnablath, Bellmount

Lower and Crookstown. Additional present day and high-end future scenarios are also modelled to occur along the N22 national road further east towards Cork City. Only very short duration minor works will occur along the TDR. Any potential impacts on the present day or high-end future flood scenarios at these locations, and on the vehicles/personnel that will temporarily utilise the TDR are expected to be negligible.

The Geological Survey of Ireland (GSI) groundwater flooding probability maps were also reviewed at https://www.floodinfo.ie/map/floodmaps/. There are no low, medium or high probability instances of groundwater flooding predicted to occur at the Site or along either of the Grid Connection route options or the TDR. The closet area to the Site which is mapped for potential groundwater flooding impacts is located approximately 52 km to the northeast of the Site near Cecilstown, County Cork. Ordnance Survey Ireland's (OSI's) National Townland and Historical 6 and 25 inch maps were also consulted for potential evidence of historical references to flooding at the Site. These historical maps do not provide any references to lands within or adjacent to the Site being prone to flooding.

The OPW's database on Arterial Drainage Schemes (ADS) benefiting areas associated with the schemes constructed under the *Arterial Drainage Acts 1945 & 1995* was also reviewed. The benefited lands database identifies land that was drained as part of the Arterial Drainage Schemes, which typically was performed to improve land for agricultural purposes. The benefitting lands database can be indicative of land that has historically been subject to flooding, or which had poor drainage. There are no mapped OPW benefited lands located within the Site or along either of the Grid Connection route options. In terms of the TDR, some OPW benefitted lands have been identified along the N22 National Road near the townlands of Currahaly, Greenfiled, Maglin, Currahee n, Garranedarragh and Inchisarsfiled, although no works on the TDR will occur in these areas, potential flood impacts are therefore expected to be negligible.

The closest mapped constructed flood embankment to the Site is located along the Bandon River near Dunmanway, approximately 10km south-east of the Site. Drainage from the Site is not predicated to have any influence on the benefitted lands at this downstream location due to the absence of proximity to the Site and the attenuation of water during periods of heavy rainfall which is incorporated into the drainage design as is outlined in the **Surface Water Management Plan** attached to **Appendix 2.1**.

In addition to the proposed drainage design, a fundamental component of the Site's flood mitigation strategy will be achieved via mitigation through avoidance wherever possible. All proposed design elements such as access tracks, turbine locations, Temporary Construction Compound, Onsite Substation and Control Buildings, Met Mast and borrow pit etc. will all be positioned a minimum distance of 50m away from the Site's rivers and streams wherever possible.

Similarly, at the Site, the pre-existing unpaved tracks traverse over several rivers and small drains which flow through culverts beneath the unpaved tracks at the Site. In addition to the pre-existing crossings at the Site, new access tracks will also be constructed to facilitate access to turbine and Turbine Hardstand positions. The newly constructed access tracks will not cross any additional EPA mapped rivers or streams which have been deliberately avoided through the design process. There are numerous small man-made and natural drainage channels at the Site which are identified on **Figure 9.7A** in **Volume III**. Due to the large quantity of small drains existing at the Site, the turbine access track layout could not avoid intersecting several drainage channels at the Site. Many of the drainage channels at the Site are man-made and were dug out in relatively straight lines to improve land drainage. Some of the small drains will be diverted whilst others will be culverted with appropriately sized culverts as set out in the **Surface Water Management Plan** attached to **Appendix 2.1**.

The site access tracks will only be used temporarily during construction and will be used very infrequently during the operational phase for occasional maintenance activities. The volume of water in the small drains at the Site is generally minimal, many of these drains are ephemeral and dry out completely during dry spells, they are not classified as rivers or streams by the EPA or Tailte Éireann. Careful planning of culvert sizing and the drainage diversion methodology detailed in the **Surface Water Management Plan** will ensure that the crossing of small drains at the Site will result in an anticipated negligible flood risk posed at site access tracks crossing over drainage channels. No significant risk of flooding has been identified within the project area due to the elevated nature of the Site relative to the surrounding area.

In terms of the Grid Connection route options, the chosen route will follow the existing road network to either Carrigdangan or Dunmanway. The Grid Connection route option to Carrigdangan substation would traverse across eighteen watercourses along the road network, two mapped watercourses within the Redline Boundary, and four field surveyed drainage channels within the Redline Boundary. The Grid Connection route option to Dunmanway substation would traverse across thirty-three watercourses along the road network, two mapped watercourses within the Redline Boundary, and four field surveyed drainage channels within the Redline Boundary. The use of existing infrastructure at bridges, horizontal directional drilling (HDD) under watercourses and/or the replacement of some exiting culverts with appropriately sized new culverts along the chosen Grid Connection route will be carried out to facilitate the construction of the Grid Connection route. Short duration temporary shallow trenching will be carried out along the reminder of the Grid Connection route. None of these activities are considered likely to increase the flood risk along the existing road network.

The flood risk identification has not identified any flood risk at the Site and the potential for exacerbating existing recurring flood events along the Grid Connection route options is considered to be negligible.

The drainage design will ensure that surface water runoff from the Site will not increase the risk of flooding to downstream receptors. Mitigation by avoidance through design will also alleviate the risk of any potential flood risks. Having assessed the potential risks in the context of the Proposed Development and in accordance with the guidelines, there is no requirement to proceed further in the staged process of the flood risk assessment.

9.3.9 Surface Water Hydrochemistry

The Environmental Protection Agency (EPA) conducts an ongoing monitoring programme as part of Ireland's requirements under the WFD. The monitoring programme involves assessment of river water quality and trends with respect to ecological criteria and to physico-chemical water quality standards. All of Ireland's major rivers and their more important tributaries are included within the programme. As part of the physico-chemical monitoring programme, approximately 1,500 rivers are assessed annually. The monitoring programme includes an assessment of biotic indices (biological quality ratings ranging from 1-5) known as Q-Values. Historical and ongoing monitoring data does exist downstream of the site along the Ouvane River to the south-west of the Site downstream of its confluence with the Gortloughra River.

The most recent assessment of the Ouvane River by Cork County Council was carried out in 2020 which indicated that this river had a Q-Value of 4-5 or "*High*" at the time of monitoring. Details of this closest Cork County Council monitoring point to the Site on the Ouvane River is outlined in **Table 9.15**.

Table 9.15: EPA Monitoring Points and Latest Available Q-Values

Station ID	RS21O070200
Station Name	Br SW of Cappaboy
WFD Waterbody Code	IE_SW_21O070200
Type	River
Latest Monitoring Year	2020
Latest Status	High
Latest Q-Value	4 - 5
Approximate Distance from the EIAR Boundary	3.7 Km
Easting	108849.38
Northing	59017.27
Local Authority	Cork County Council

Four rounds of water quality monitoring for laboratory analysis and field hydrochemistry measurements on unstable parameters including pH, dissolved oxygen (DO), electrical conductivity, total dissolved solids (TDS) and temperature were conducted across the following dates.

Table 9.16: Water Quality Monitoring Rounds and Dates

Monitoring Round	Monitoring Dates
Round 1	14th and 15th of June 2021
Round 2	4th and 5th of April 2022
Round 3	13th and 14th of June 2023
Round 4	2nd and 3rd of April 2024

In total, 12 different water quality monitoring locations were analysed throughout the monitoring programme for a wide variety of laboratory and field measured parameters. The water quality monitoring locations have been mapped and are shown on **Figure 9.4** in **Volume III**. A number of water quality parameters are physically or chemically unstable and must be analysed in-situ immediately after collection with a field monitoring (FM) multi-parameter meter. The pH values across the Site ranged from between pH 6.42 at FM3 during monitoring round 1 to pH 7.63 at FM6 during monitoring round 2. The majority of the pH concentrations recorded were relatively pH neutral or slightly acidic. Slightly acidic pH concentrations are not uncommon in waterbodies of a catchment containing forestry plantations such as those located near the northern extent of the Site. Small pockets of localised acidic peatland soils could also potentially be influencing the pH in the network of small rivers and streams at the Site.

Electrical conductivity is a measure of the ability of an aqueous solution to carry an electrical current. Conductivity is useful as a general measure of water quality; it is primarily used as an indicator of saline intrusion although it also increases if contamination by most ionic species is present in a waterbody. There are no nationally recognised environmental quality standards (EQS) for electrical conductivity in surface waters with an EQS of 2,500 μS/cm being the upper acceptable concentration for drinking water. Significantly elevated electrical conductivity can indicate that unknown pollutions have entered the waterbody. Conductivity values recorded across the four monitoring rounds ranged from between 44 μS/cm at FM6 during monitoring round 4 to 120 μS/cm at FM7 during monitoring round 2. The relatively low electrical conductivity values recorded during the four monitoring rounds did not indicate the presence of polluted surface waters.

Concentrations of total dissolved solids (TDS) ranged from 30 mg/L at FM1 during monitoring round 4 to 84 mg/L at FM7 during monitoring round 2. TDS are made up of inorganic salts, as well as a small amount of organic matter and are linked to electrical conductivity as a general indicating measure of the presence of pollutants in surface waters. TDS originate from a number of sources, both natural and as a result of human activities such as agricultural, urban runoff, wastewater discharges, industrial wastewater and salt that is used to de-ice roads. Total dissolved solids in rivers can range from between 20 – 20,000 mg/L and higher TDS results can often indicate that the water is saline. If the concentration of TDS in water is elevated, it can reduce the clarity of the water, contributing to a decrease in photosynthesis, compounds react with heavy metals, and cause an increase in water temperature. TDS concentrations are also used as an indicator of the aesthetic characteristics of the water and as an indicator of the number of very small particles. As a result of the very low concentrations of TDS recorded at each sample location across the four monitoring rounds, the presence of dissolved pollutants were not indicative at any of the monitoring locations.

Dissolved oxygen (DO) concentrations ranged from 6.93 mg/L at FM5 during monitoring round 3 to 11.97 mg/L at FM7 during monitoring round 4. Water temperature influences DO concentrations in a river or stream, DO generally increases as the water temperature decreases. The flow rate or movement of water in a river or stream can also impact upon the DO concentration. Rapidly moving water, such as in rivers or streams, tends to contain higher DO concentrations since the movement of the water allows for a greater mixing of air whereas stagnant water typically contains lower DO concentrations. Lower concentrations of DO in stagnant water is also due to the enhanced consumption of dissolved oxygen by plants and microbial life. Water at lower altitudes can hold more dissolved oxygen than water at higher altitudes. The DO concentrations were notably lower during monitoring round 3 after a prolonged dry spell resulted in lower flow rates in the stream network and when the highest average temperature of the four monitoring rounds were recorded at 17.68°C. With the exception of monitoring round 3, the recorded DO concentrations at all monitoring locations were within the ≥ 9 mg/L mandatory value as set out in the *Salmonid Water Regulations 1988*. In terms of % saturation, with the exception of FM5 during monitoring round 3, all of the recorded DO results across the four monitoring rounds were within the 80 – 120% range as set out in the *European Communities Environmental Objectives (Surface Water) Regulations 2009*.

Surface water temperatures ranged from between 8.09°C at FM7 during monitoring round 4 to 21.32°C at FM11 during monitoring round 3. This equates to a difference of 13.23°C between the maximum and minimum recorded results. Increases in surface water temperature resulting from human activities may exceed the thermal tolerances of aquatic biota that are adapted to colder environments. The *European Communities Environmental Objectives (Surface Water) Regulations 2009* and the *European Communities (Quality of Salmonid Waters) Regulations, 1988* screening criterion for temperature both relate to thermal discharges to waters with the capacity to increase the surface water temperate by a maximum of 1.5°C. The proposed Development is not expected to require any thermal discharge activities and this screening criteria is therefore of limited value. The significant temperature differential of 13.23°C between the maximum and the minimum results across the four monitoring rounds is representative of natural seasonal surface water temperature fluctuations with air temperature being the dominant factor in influencing seasonal surface water temperatures.

Table 9.17: Field Hydrochemistry Results from Monitoring Round 1

Field Monitoring Location	Monitoring Date	pH	Specific Electrical Conductivity @20°C (µS/cm)	Total Dissolved Solids (ppm)	Dissolved Oxygen (mg/L)	Temperature (°C)
FM1	14/06/2021	6.81	49	34	11.50	14.21

Field Monitoring Location	Monitoring Date	pH	Specific Electrical Conductivity @20°C (µS/cm)	Total Dissolved Solids (ppm)	Dissolved Oxygen (mg/L)	Temperature (°C)
FM2	14/06/2021	6.76	49	34	11.03	14.92
FM3	14/06/2021	6.42	50	35	9.74	16.74
FM4	14/06/2021	7.01	52	36	11.55	15.81
FM5	14/06/2021	7.16	66	46	9.96	18.91
FM6	14/06/2021	6.75	63	44	10.73	17.80
FM7	14/06/2021	6.79	68	48	11.35	14.24
FM8	14/06/2021	7.19	47	33	11.52	16.86
FM9	14/06/2021	7.05	47	33	10.71	16.02
FM10	14/06/2021	7.52	60	42	10.54	17.77
FM11	14/06/2021	7.16	50	35	10.11	18.44
FM12	14/06/2021	7.20	52	36	10.92	16.73

Table 9.18: Field Hydrochemistry Results from Monitoring Round 2

Field Monitoring Location	Monitoring Date	pH	Specific Electrical Conductivity @20°C (µS/cm)	Total Dissolved Solids (ppm)	Dissolved Oxygen (mg/L)	Temperature (°C)
FM1	4/04/2022	7.08	60	42	11.09	8.17
FM2	4/04/2022	7.06	51	36	10.59	9.17
FM3	4/04/2022	7.37	65	45	10.74	10.21
FM4	4/04/2022	7.44	72	50	11.34	9.65
FM5	4/04/2022	7.23	85	60	10.54	10.24
FM6	4/04/2022	7.63	69	49	10.93	9.98
FM7	4/04/2022	7.03	120	84	10.95	8.31
FM8	4/04/2022	7.10	66	46	11.16	9.22
FM9	4/04/2022	7.35	66	46	10.68	9.37
FM10	4/04/2022	7.33	88	62	10.73	10.59
FM11	4/04/2022	7.55	63	44	10.44	10.61
FM12	4/04/2022	7.54	81	57	11.02	10.09

Table 9.19: Field Hydrochemistry Results from Monitoring Round 3

Field Monitoring Location	Monitoring Date	pH	Specific Electrical Conductivity @20°C (µS/cm)	Total Dissolved Solids (ppm)	Dissolved Oxygen (mg/L)	Temperature (°C)
FM1	14/06/2023	7.25	52	37	8.71	15.64
FM2	14/06/2023	6.72	56	39	8.37	15.13
FM3	14/06/2023	7.22	57	40	8.10	19.34
FM4	14/06/2023	7.28	64	45	8.37	15.50
FM5	14/06/2023	7.28	75	52	6.93	19.46
FM6	14/06/2023	7.59	65	46	8.13	18.31
FM7	14/06/2023	6.78	108	75	9.09	15.82
FM8	14/06/2023	7.50	54	38	8.60	17.48
FM9	14/06/2023	7.37	62	43	8.10	17.86
FM10	14/06/2023	7.57	67	47	8.14	19.22
FM11	14/06/2023	7.28	53	37	7.49	21.32
FM12	14/06/2023	7.05	66	46	8.39	17.05

Table 9.20: Field Hydrochemistry Results from Monitoring Round 4

Field Monitoring Location	Monitoring Date	pH	Specific Electrical Conductivity @20°C (µS/cm)	Total Dissolved Solids (ppm)	Dissolved Oxygen (mg/L)	Temperature (°C)
FM1	3/04/2024	7.11	47	30	11.90	8.12
FM2	3/04/2024	7.08	47	37	10.11	8.78
FM3	3/04/2024	7.45	44	31	10.20	9.01
FM4	3/04/2024	7.11	45	32	9.59	8.21
FM5	3/04/2024	7.49	49	34	9.95	9.14
FM6	3/04/2024	7.32	72	50	10.27	8.21
FM7	3/04/2024	7.01	90	45	11.97	8.09
FM8	3/04/2024	7.33	55	33	10.78	9.95
FM9	3/04/2024	7.47	48	49	10.89	9.90
FM10	3/04/2024	7.25	70	54	10.70	10.01

Field Monitoring Location	Monitoring Date	pH	Specific Electrical Conductivity @20°C (μS/cm)	Total Dissolved Solids (ppm)	Dissolved Oxygen (mg/L)	Temperature (°C)
FM11	3/04/2024	7.61	65	42	10.77	10.59
FM12	3/04/2024	7.17	65	35	10.85	9.23

A total of 24 surface water samples were also collected at multiple locations for laboratory analysis on a broad range of parameters during the four monitoring rounds. Copies of the laboratory certificates from each round of monitoring are contained in **Volume IV**. The results from the laboratory analysis from the four monitoring rounds are compared to various screening criteria in **Table 9.21**, **Table 9.22**, **Table 9.23** and **Table 9.24** below. The sample locations have been mapped and are shown on **Figure 9.4** in **Volume III**. It should be noted that two separate laboratories were utilised for analyses across the four monitoring rounds. As a result, the laboratory limits of detection may vary slightly for particular analyses. It should also be noted that the Redline Boundary has been modified and reduced throughout the design phase, as a result, some of the monitoring locations are located outside of the finalised Redline Boundary.

Biochemical Oxygen Demand (BOD) concentrations were below the laboratory limit of detection in all 24 samples analysed during each monitoring round. It is noted that the limit of detection at the first lab was <2 mg/L for BOD which is greater than the "*High*" and "*Good*" status thresholds of 1.3 mg/L and 1.5 mg/L respectively as set out in the *European Communities Environmental Objectives (Surface Waters) Regulations 2009.* The limit of detection for BOD at the second lab was <1 mg/L which is below both the "*High*" and "*Good*" status thresholds as set out in the *European Communities Environmental Objectives (Surface Waters) Regulations 2009*. All of the BOD results from monitoring rounds 3 and 4 did meet the "*High*" status threshold as set out in the "*European Communities Environmental Objectives (Surface Waters) Regulations 2009"*. The results from monitoring rounds 1 and 2 were all below the laboratory limit of detection and were therefore not considered to be elevated.

Total suspended solids (TSS) were reported below the laboratory limit of detection in 13 out of 24 samples analysed across the four monitoring rounds. A maximum concentration of 15 mg/L TSS was recorded at monitoring location SW2 during monitoring round 3. None of the recorded results for TSS exceeded the mandatory threshold value of ≤ 25 mg/L TSS as set out in the *Salmonid Water Regulations 1988*.

Concentrations of total nitrogen were below the laboratory limit of detection at both laboratories (<2.5 mg/L and <1 mg/L) in all 24 samples analysed across the four monitoring rounds. There are no applicable EQS against which to compare the total nitrogen results. However, since all of the recorded results for total nitrogen were below the limits of detection for both laboratories, the natural background concentrations were not considered to be elevated at the time of monitoring.

Concentrations of nitrate were below the laboratory limit of detection at both laboratories of <8.9 mg/L and <4.4 mg/L in all 24 samples analysed across the four monitoring rounds. The nitrate concentrations at all monitoring locations were therefore all below the 50 mg/L threshold value set out in the *European Union Drinking Water Regulations 2023*. For nitrite, the results were below the laboratory limit of detection in 19 out of 24 samples analysed. Five other results, all recorded during monitoring round 2, did marginally exceed the ≤0.05 mg/L as set out in the *Salmonid Water Regulations 1988* with a maximum result of 0.074 being recorded at SW4 during monitoring round 2.

Concentrations of total phosphorus were below the laboratory limit of detection in 20 out of 24 samples analysed across the four monitoring rounds. The most elevated total phosphorous concentration recorded was 0.03 mg/L which was recorded at each of the three monitoring locations SW1, SW2 and SW6 during monitoring round 3. There are no applicable screening criteria for rivers against which to compare total phosphorous, however, since all concentrations were either below or fractionally above the laboratory limit of detection, it can be concluded that the total phosphorous concentrations were not elevated. Orthophosphate concentrations were below the laboratory limit of detection in 19 out of 24 samples analysed with a maximum concentration of 0.054 mg/L being recorded at SW3 during monitoring round 4. Each of the five detectable orthophosphate concentrations exceeded the "*High*" status criteria whilst four of the samples exceeded the "*Good*" status criteria as set out in the *European Communities Environmental Objectives (Surface Waters) Regulations 2009*.

Chloride concentrations ranged from between below the laboratory limit of detection to 17.8 mg/L at SW5 during monitoring round 2. The maximum detected concentration for chloride did not exceed the 250 mg/L threshold value set out in the *European Union Drinking Water Regulations 2023*.

The ammonia as N concentrations were recorded below the laboratory limit of reporting in 8 out of 24 samples analysed. Of the 16 laboratory detections of ammonia, 6 exceeded the "*High*" status criteria and 6 also exceeded the "*Good*" status criteria as set out *in the European Communities Environmental Objectives (Surface Waters) Regulations 2009.*

A likely potential cause for the elevated ammonia as N concentrations may be due to the peatland soils and organic-rich catchment area. Decomposition of organic matter in peat and soils can release ammonia, especially under anaerobic or reducing conditions. The localised acidic peatland conditions are likely influencing the water quality as limited nitrification in acidic conditions results in ammonia persistence rather than conversion to nitrate. Other local activities such as forestry and sheep grazing (manure or fertiliser) could also influence ammonia concentrations. Ammonia exceedances were episodic and localised; they were not persistent across all monitoring rounds. Other nitrogen forms (nitrate, nitrite, total N) were generally below detection limits, suggesting ammonia is from organic matter rather than widespread pollution. There is no evidence of significant urban or industrial pollution sources.

Table 9.21: Surface Water Results from Round 1 Monitoring on 15 June 2021

Parameter	Sample ID						EC Directive 2006/44/EC		EC Directives 75/440/EEC 79/869/EEC	EC Directive 98/83/EC	EC Directives 2000/60/EC 2008/105/EC	EC Directive 78/659/EEC
	SW1	SW2	SW3	SW4	SW5	SW6	Cyprinid Guide Limits	Salmonid Guide Limits	EC (Quality of Surface Water Intended For The Abstraction of Drinking Water) Regulations, 1989	EU (Drinking Water) Regulations 2023	EC Environmental Objectives (Surface Waters) Regulations 2009	EC (Quality of Salmonid Waters) Regulations, 1988
Biochemical Oxygen Demand (mg/L)	<2	<2	<2	<2	<2	<2	≤6	≤3	A1 and A2 Waters = 5 A3 Waters= 7	-	High ≤ 1.3 mean Good ≤ 1.5 mean	≤5
Total Suspended Solids (mg/L)	<2	2	2	4	2	2	≤25	≤25	50	-	-	≤25
Total Nitrogen as N (mg/L)	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	-	-	-	-	-	-
Total Phosphorus as P (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-	-

Chloride (mg/L)	10.2	<10	10.3	<10	10.2	11.4	-	-	250	250	-	-
Nitrate as NO_3 (mg/L)	<8.9	<8.9	<8.9	<8.9	<8.9	<8.9	-	-	50	50	-	-
Nitrite as NO_2 (mg/L)	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	≤0.03	≤0.01	-	0.5	-	≤ 0.05
Orthophosp-hate as PO_4-P (mg/L)	0.04	<0.025	<0.025	<0.025	<0.025	0.033	≤0.4	≤0.2	-	-	High ≤ 0.025 Good ≤ 0.035	-
Ammonia as N(mg/L)	0.011	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	High ≤ 0.04 Good ≤ 0.065	- -

Table 9.22: Surface Water Results from Round 2 Monitoring on 5 April 2022

Parameter	Sample ID						EC Directive 2006/44/EC		EC Directives 74/440/EEC 79/869/EEC	EC Directive 98/83/EC	EC Directives 2000/60/EC 2008/105/EC	EC Directive 78/659/EEC

	SW1	SW2	SW3	SW4	SW5	SW6	Cyprinid Guide Limits	Salmonid Guide Limits	EC (Quality of Surface Water Intended For The Abstraction of Drinking Water) Regulations, 1989	EU (Drinking Water) Regulations 2023	EC Environmental Objectives (Surface Waters) Regulations 2009	EC (Quality of Salmonid Waters) Regulations, 1988
Biochemical Oxygen Demand (mg/L)	<2	<2	<2	<2	<2	<2	≤6	≤3	A1 and A2 Waters = 5 A3 Waters= 7	-	High ≤ 1.3 mean Good ≤ 1.5 mean	≤5
Total Suspended Solids (mg/L)	2	5	<2	<2	4	8	≤25	≤25	50	-	-	≤25
Total Nitrogen as N (mg/L)	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	-	-	-	-	-	-
Total Phosphorus as P (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-	-
Chloride (mg/L)	13.3	15.1	14.7	14.6	17.8	13.9	-	-	250	250	-	-

Nitrate as NO_3 (mg/L)	<8.9	<8.9	<8.9	<8.9	<8.9	<8.9	-	-	50	50	-	-
Nitrite as NO_2 (mg/L)	0.068	0.067	0.072	0.074	0.069	<0.066	≤0.03	≤0.01	-	0.5	-	≤ 0.05
Orthophosphate as PO_4-P (mg/L)	<0.025	0.043	<0.025	<0.025	0.051	<0.025	≤0.4	≤0.2	-	-	High ≤ 0.025 Good ≤ 0.035	-
Ammonia as N(mg/L)	0.012	0.035	0.019	<0.010	0.023	<0.010	-	-	-	-	High ≤ 0.04 Good ≤ 0.065	- -

Table 9.23: Surface Water Results from Round 3 Monitoring on 3 June 2023

Parameter	Sample ID						EC Directive 2006/44/EC		EC Directives 74/440/EEC 79/869/EEC	EC Directive 98/83/EC	EC Directives 2000/60/EC 2008/105/EC	EC Directive 78/659/EEC
	SW1	SW2	SW3	SW4	SW5	SW6	Cyprinid Guide Limits	Salmonid Guide Limits	EC (Quality of Surface Water Intended For The Abstraction of Drinking Water) Regulations, 1989	EU (Drinking Water) Regulations 2023	EC Environmental Objectives (Surface Waters) Regulations 2009	EC (Quality of Salmonid Waters) Regulations, 1988
Biochemical Oxygen Demand (mg/L)	<1	<1	<1	<1	<1	<1	≤6	≤3	A1 and A2 Waters = 5 A3 Waters= 7	-	High ≤ 1.3 mean Good ≤ 1.5 mean	≤5
Total Suspended Solids (mg/L)	13	15	<5	<5	<5	<5	≤25	≤25	50	-	-	≤25
Total Nitrogen as N (mg/L)	<1	<1	<1	<1	<1	<1	-	-	-	-	-	-
Total Phosphorus as P (mg/L)	0.03	0.03	<0.02	<0.02	<0.02	0.03	-	-	-	-	-	-

Chloride (mg/L)	12.1	11.1	8.87	9.16	14.2	14.8	-	-	250	250	-	-
Nitrate as NO_3 (mg/L)	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4	-	-	50	50	-	-
Nitrite as NO_2 (mg/L)	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	≤0.03	≤0.01	-	0.5	-	≤ 0.05
Orthophosphate as PO_4-P (mg/L)	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	≤0.4	≤0.2	-	-	High ≤ 0.025 Good ≤ 0.035	-
Ammonia as N(mg/L)	0.10	0.10	0.09	0.09	0.11	0.13	-	-	-	-	High ≤ 0.04 Good ≤ 0.065	- -

Table 9.24: Surface Water Results from Round 4 Monitoring on 2 April 2024

Parameter	Sample ID						EC Directive 2006/44/EC		EC Directives 75/440/EEC 79/869/EEC	EC Directive 98/83/EC	EC Directives 2000/60/EC 2008/105/EC	EC Directive 78/659/EEC
	SW1	SW2	SW3	SW4	SW5	SW6	Cyprinid Guide Limits	Salmonid Guide Limits	EC (Quality of Surface Water Intended For The Abstraction of Drinking Water) Regulations, 1989	EU (Drinking Water) Regulations 2023	EC Environmental Objectives (Surface Waters) Regulations 2009	EC (Quality of Salmonid Waters) Regulations, 1988
Biochemical Oxygen Demand (mg/L)	<1	<1	<1	<1	<1	<1	≤6	≤3	A1 and A2 Waters = 5 A3 Waters= 7	-	High ≤ 1.3 mean Good ≤ 1.5 mean	≤5
Total Suspended Solids (mg/L)	<5	<5	<5	<5	<5	<5	≤25	≤25	50	-	-	≤25
Total Nitrogen as N (mg/L)	<1	<1	<1	<1	<1	<1	-	-	-	-	-	-
Total Phosphorus as P (mg/L)	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	-	-	-	-	-	-

Chloride (mg/L)	9.83	9.81	8.18	7.53	7.79	10.2	-	-	250	250	-	-
Nitrate as NO_3 (mg/L)	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4	-	-	50	50	-	-
Nitrite as NO_2 (mg/L)	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	≤0.03	≤0.01	-	0.5	-	≤ 0.05
Orthophosp-hate as PO_4-P (mg/L)	<0.03	<0.03	0.054	<0.03	<0.03	<0.03	≤0.4	≤0.2	-	-	High ≤ 0.025 Good ≤ 0.035	-
Ammonia as N(mg/L)	0.013	0.012	0.011	<0.01	0.018	0.013	-	-	-	-	High ≤ 0.04 Good ≤ 0.065	- -

9.3.10 Hydrogeology

The underlying bedrock within the Site and along the Grid Connection route options is variable, it consists of a combination of the following at a scale of 1:500,000 according to the Geological Survey Ireland (GSI):

- Shallow marine, (Cork Group, Old Head Sandstone Fm); Sandstone & mudstone;
- Marine (Cork Group) (extends into the Visean); Mudstone, sandstone & thin limestone; and,
- Continental redbed facies; Sandstone, conglomerate & siltstone (in places extends into the Carboniferous)

The bedrock formations underlying the Site are classified by the GSI as Locally Important (LI), bedrock which is moderately productive only in local zones. The Site and both Grid Connection route options are spread across three underlying groundwater bodies (GWBs) which are the Bandon GWB, the Beara Sneem GWB and the Ballinhassig West GWB.

The three GWBs which underly the Site and Grid Connection route options share many common characteristics due to their geographical locations and topography being quite similar, especially at the Site where the boundaries of these three GWBs meet. The rocks in these GWBs have no intergranular permeability, the aquifers are generally characterised as having low to moderate permeability. Diffuse recharge will occur via rainfall percolating through the subsoil or areas of outcropping rock. The proportion of the effective rainfall that will recharge the aquifer is determined by the permeability of the soil and subsoil, and by the slope. Due to the generally low/moderate permeability of the aquifers within these GWBs, and the multiple steep slopes at the Site, a high proportion of the recharge will discharge rapidly to surface watercourses via the upper layers of the aquifer, effectively reducing further the available groundwater resource in the underlying aquifer.

Permeability is highest in the upper few metres but generally decreases rapidly with depth. In general, groundwater flow is concentrated in the upper 15m of the aquifer, although deeper inflows form along fault zones or connected fractures can be encountered. The water table can vary from a few metres up to more than 10m below ground surface, depending upon topography. Groundwater is generally unconfined. Flow path lengths are generally short, ranging from 30-300m. Local groundwater flow directions are controlled by local topography. Groundwater discharges to the numerous streams and rivers crossing the aquifer and to small springs and seeps (GSI,2004). There are no known karst features recorded in close proximity to the Site nor along the Grid Connection route options. The closest evidence of karstification to the Site is recorded within an enclosed depression approximately 25km northwest of the Site near the townland of Tubbrid, Co. Kerry.

In terms of the TDR, only minor works that are short in duration will be carried out along the TDR. The groundwater is not expected to be intercepted by any of the proposed works along the TDR. No impacts to any GWB are expected to occur as a result of the works along the TDR.

The Ballinhassig West GWB is a Registered Protected Area (RPA) as it is a WFD GWB intersecting with WFD Designated Salmonid Waters under *S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988*. Groundwater flow paths are expected to be generally short, ranging from 30-300m. Groundwater discharges to the numerous streams and rivers crossing the aquifer and to small springs and seeps. The nearest turbine position to a designated salmonid river in the Ballinhassig West GWB is located approximately 620m north of T02. Any potentially impacted groundwater is most likely to discharge to small springs or seeps across this distance given that groundwater flow paths are generally not anticipated to exceed a maximum of 300m. The Beara Sneem and the Bandon are RPAs for Shellfish as these GWBs intersect with coastal Designated Shellfish Zones under *S.I. No. 55/2009 European Communities (Quality of Shellfish Waters) (Amendment) Regulations 2009*. Due to the absence of proximity to coastal shellfish zones, shallow depths of trenching along the proposed grid connection route options and minor short duration works along the TDR, potential impacts on groundwater are expected to be negligible. Potential impacts on groundwater from the proposed wind farm Site are discussed in detail in subsequent sections of this Chapter.

9.3.11 Wells

Mapping and searches of the GSI well databases confirms that there are no known groundwater abstraction wells located within the Redline Boundary. The closet known groundwater well is located approximately 2.4km to the northeast of the Site boundary, and approximately 580m west of the Dunmanway Grid Connection route option, in the townland of Coolcaum. This borehole is classified as being utilised for agricultural and domestic use and has been drilled to a depth of 40m.

For the remainder of the Dunmanway Grid Connection route option, there is one GSI mapped well located approximately 1km east of this option at the closet extent in the townland of Acres, or approximately 1.2km north-east of the existing substation in Dunmanway. Given that the nature of the Proposed Development is expected to result in limited impact with groundwater, combined with the generally short groundwater flow paths in the region that are generally between 30-300m long, potential impacts on all of these wells are expected to be negligible.

There are no mapped wells located in close proximity to where any works will be caried out along the TDR with the closest being located approximately 150m east of a blade laydown area near the townland of Castlemore. Temporary use of this area as a blade laydown area is expected to have a negligible impact on the identified wells that are located approximately 150m east of this location.

There are no mapped holy wells located within the Site nor in close proximity to the Grid Connection route options, nor along the TDR where any works will be carried out. The closest mapped holy well to the Proposed Development is located approximately 4.4km south-east of the Site in the townland of Togher. This holy well is located approximately 520m southwest of the existing road along which the Dunmanway Grid Connection route option would traverse. Given that the nature of the Proposed Development is expected to result in limited impact with groundwater, combined with the generally short groundwater flow paths in the region that are generally between 30-300m long, potential impacts on all of these wells are expected to be negligible. The location of these wells relative to the Site and other wells in the wider region, including holy wells, are outlined on **Figure 9.16** in **Volume III**.

The main Site and the Grid Connection route options are divided across three underlying groundwater bodies (GWBs) which are the Bandon GWB, the Beara Sneem GWB and the Ballinhassig West GWB as is discussed in detail above. The three GWBs which underly the main site contain aquifers that are generally characterised as having low to moderate permeability. Groundwater flow paths are expected to be short (approximately 30-300m) on account of the steep topography and low to moderate soil permeability. Groundwater discharges to the numerous streams and rivers crossing the aquifer and to small springs and seeps.

Given that the existing GSI groundwater well database is an incomplete dataset, it should be assumed for the purpose of conservatism that all dwellings located within or in close proximity to the Site have the potential to maintain a groundwater well for abstraction. In addition, all Water Framework Directive (WFD) Groundwater bodies have been identified as Drinking Water Protected Areas (DWPA) due to the potential for qualifying abstractions of water for human consumption as defined under Article 7 of the WFD. The DWPA designation applies to all groundwater bodies nationally regardless of the productivity status of the underlying aquifer. The upper estimate for a flow path of 300m has been conservatively assumed to exist at the site. No dwellings are located within or on the Redline Boundary as can be seen on **Figure 9.16** in **Volume III**. Due to the absence of private dwellings within the Redline Boundary, or within 300m of the main development features, any potential impacts on local private wells is expected to be negligible. Any potential impacts to groundwater would most likely discharge to a surface water prior to impacting upon private wells in the region. Along both of the grid connection route options, only shallow trenching will be carried out to facilitate the cable installation, groundwater is most unlikely to be intercepted along either of the Grid Connection route options. Only minor short duration works that are not expected to intercept groundwater will be required along the TDR. Potential impacts associated with groundwater along either of the Grid Connection route options and the TDR are therefore expected to be negligible. Potential risks to groundwater quality and drinking waters sources are discussed in **Section 9.4.4.9.**

9.3.12 Groundwater Vulnerability

Groundwater vulnerability is a measure of the inherent geological and hydrogeological characteristics which determine the ease at which groundwater may potentially become contaminated via human activities at the surface. The vulnerability of groundwater is dependent upon multiple factors. These include the intrinsic toxicity of the contaminants in question, the quantity of contaminants that can reach the groundwater, the rate at which contaminants can flow to the groundwater and the attenuating capacity of the subsoils and bedrock through which the water travels.

The GSI groundwater vulnerability rating for the aquifers within the Site range from predominantly "*Rock at or Near the Surface*" and to a lesser extent "*Extreme*". The majority of the wider west Cork Region, including along the grid connection route options and TDR, is also classified for groundwater vulnerability by the GSI as "*Rock at or Near the Surface*", "*Extreme*" and "*High*". The high and extreme vulnerability classifications are reflective of the considerably variable and often shallow depths of subsoil and blanket peat in the area. The GSI aquifer vulnerability classifications broadly aligns with changes in elevation across the Site with higher altitude areas generally being characterised as more vulnerable than less elevated areas. The high and extreme vulnerability classifications across the Site indicate that the combined thickness of blanket peat and mineral subsoils in these areas ranges from 0 – 5m as is outlined in **Table 9.25** below. The GSI mapped "*Extreme*" classification locations align with the mapped blanket peat areas at the Site and the "*Bedrock at or Near the Surface"* classification locations are consistent with bedrock outcrops at the surface and areas where shallow subsoil has been identified. Extensive peat/soil probing at the Site confirmed that the depth to the top rock ranged from depths of between in 0 – 3.8m. This is consistent with the GSI groundwater vulnerability classifications for the Site of "*Extreme*" and "*Rock at or Near the Surface*".

The sandstone and mudstone bedrock formations that underlie the Site are characterised by a low fissure permeability. Blanket peat and poorly draining soils are also low permeability materials which are dominant within the Redline Boundary. These low permeability materials protect underlying groundwater and restrict recharge. Where sufficiently thick, such low permeability materials may confine groundwater. Flow paths are expected to be short with groundwater discharging rapidly to nearby streams and small springs, thus restricting the potential for signification groundwater flux to the uppermost part of the aquifer. In the event that contaminants were to be accidentally released on the Site, it is expected that their mobility within the groundwater would be limited and would remain relatively localised to the source of contamination. It is more likely that contaminants would be discharged to a nearby watercourses more rapidly than to groundwater. As a result, surface waters such as rivers, streams and small drains are likely to have a higher vulnerability to potential contamination at the Site than groundwater. The GSI mapped groundwater vulnerability for the Site is shown in **Figure 9.14 in Volume III.**

Table 9.25: Groundwater Vulnerability Classes

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil permeability (type) and thickness			Unsaturated zone	Karst features
	High permeability (sand/gravel)	Moderate permeability (e.g. sandy till)	Low permeability (e.g. clayey till, clay, peat)	Sand/gravel aquifers only	(<30m radius)
Extreme (E)	0 – 3.0m	0 – 3.0m	0 – 3.0m	0 – 3.0m	-
High (H)	>3.0m	3.0m – 10.0m	3.0m – 5.0m	>3.0m	N/A
Moderate (M)	N/A	>10.0m	5.0m – 10.0m	N/A	N/A
Low (L)	N/A	N/A	>10.0m	N/A	N/A

Source: Strive Report Series No. 6, Water Framework Directive – Recharge and Groundwater Vulnerability, Environmental Protection Agency, 2008

The majority of the proposed Grid Connection route options and TDR are underlain by aquifer vulnerabilities classified as "*Extreme*" and "*Moderate*" with "*Rock at or Near the*

Surface" also mapped along the route options. These groundwater vulnerability classifications are consistent with those mapped in the wider west Cork region. Shallow trenching which will be backfilled is expected to be required for the chosen Grid Connection route option, the shallow trenching is not expected to breach the groundwater table and will be excavated upon the overburden. Minor short duration works along the TDR are also not expected to breach the groundwater table. As a result, potential impacts on groundwater along both of the Grid Connection route options and the TDR is expected to be negligible. Mitigation measures to minimise potential risks to groundwater quality are outlined in **Section 9.5**.

9.3.13 Groundwater Levels

The blanket peat, sandstone shales and till, which constitute the dominant surface layers at the Site normally form in areas where the underlying bedrock is characterised by low to moderate permeability as is the case at the Site. In areas where blanket peat exists at the Site, the overlying bog typically forms part of a fully saturated perched aquifer system. In these areas of the Site, the water table is generally either at or just below the surface particularly during the wetter winter months but also throughout most of the year due to the high rainfall levels which occur at the Site. The presence of this perched water table at or very near the surface was observed in some areas when gouge cores were advanced at turbine locations, gouge coring at turbine locations is discussed in **Chapter 8: Soils and Geology.** Much of the site is characterised by steep slopes, these areas are likely to have a very low groundwater level since less time is allowed for stormwater to infiltrate, thus rainfall is easily converted to runoff and rapidly flows down the slope. Since areas of steep slopes, shallow subsoils, generally shallow blanket peat and bedrock outcrops make up the majority of the Site area, the depth to groundwater is not anticipated to exceed more than approximately five metres at any area of the Site.

9.3.14 Groundwater Hydrochemistry

There is no groundwater hydrochemistry data available for the Site and only limited GSI groundwater hydrochemistry data is available for the wider region. Groundwater quality monitoring is generally not conducted for proposed wind farm developments due to the limited excavation nature of such developments. Impacts on groundwater quality are also generally not expected to occur from such developments.

According to the GSI (2004), the Bandon GWB, the Beara Sneem GWB, and the Ballinhassig West GWB have alkalinity concentrations raging from 4-310 mg/L ($CaCO_3$) and are underlain by non-carbonate rock units such as sandstones, mudstones and siltstones.

The hardness in the Bandon and Ballinhassig West GWBs generally ranges from 40-224 mg/l which is categorised as moderately soft to moderately hard. The hardness in the Beara Sneem GWB ranges from almost zero to 360 mg/l $CaCO_3$, concentrations above 250 mg/L $CaCO_3$ are classified as hard water.

The Old Red Sandstone formations of the Bandon and Ballinhassig West GWBs largely contain calcium bicarbonate type water. Conductivities in these units are relatively low, ranging 125-600 μS/cm, with an average of approximately 300-312 μS/cm. Conductivities in the Cork Group rocks are quite similar with an average of approximately 380 μS/cm and a range from 160 to 433 μS/cm. In general, high iron (Fe) and manganese (Mn) concentrations can occur in groundwater derived from old red sandstone due to the dissolution of Fe and Mn from the sandstone/shale where reducing conditions occur. Background chloride concentrations in all aquifers will be higher than in the Midlands, due to the proximity to the sea. In terms of the Beara Sneam GWB, conductivity in the groundwater ranges from 100-700 μS/cm, with an average of approximately 370 μS/cm.

Groundwater flow paths at the main site are expected to be short, any potential impacts on groundwater at the Site are anticipated to be highly localised as groundwater readily discharges to the surrounding surface water network. Only shallow trenching which will be backfilled is expected to be required for whichever of the two Grid Connection route options is chosen. The shallow trenching is not expected to breach the groundwater table and will be excavated upon the overburden. Minor short duration works along the TDR are also not expected to breach the groundwater table. As a result, potential impacts on groundwater at the Site, along the Grid Connection route and TDR is expected to be negligible. Mitigation measures to minimise potential risks to groundwater quality are outlined in **Section 9.5**.

9.3.15 Water Framework Directive Water Body Status & Objectives

The Site area is divided across three separate catchments, namely, the Bandon-Ilen Catchment Area (~59%), the Dunmanus-Bantry-Kenmare Catchment Area (~21.8%) and the Lee Cork Harbour and Youghal Bay Catchment Area (~19.2%). The latest available water quality status for waterbodies in each of these catchment areas has been reviewed. This review included an analysis of the Water Framework Directive (WFD) surface water body status and the associated objectives assigned for the surface water network both within and surrounding the Site. All three of these catchment areas are similar in size with the Bandon-Ilen Catchment Area covering an area of 1,799 km^2, the Dunmanus-Bantry-Kenmare Catchment Area covering of 1,900 km^2 and the Lee Cork Harbour and Youghal Bay Catchment covering an area of 2,181 km^2. Surface water bodies with "*Good*" or "*High*" status have an overall objective to retain this status, that is that no deterioration in water quality is the objective for these water bodies. Surface water bodies assigned "*Moderate*" status are "*At Risk*" of not meeting objectives whereby the object is to restore the status to at least "*Good*" status by 2027 under the third cycle of the WFD.

Approximately 59% of the Site area, including all areas south of the most elevated ridgeline and summit of Shehy More (546m) drains to the Bandon-Ilen Catchment Area, or more immediately to the Bandon_SC_10 Subcatchment Area. All river waterbodies at the Site which form part to the Bandon_SC_10 Subcatchment Area are assigned "*Moderate*" status under the 2019 – 2024 monitoring period of the WFD. This represents no status decrease from "*Moderate*" which was assigned to the same river waterbodies for the 2016 – 2021 monitoring period of the WFD.

The north-western extent of the Site accounts for approximately 21.8% of the total Site area. This area of the Site drains to the Dunmanus-Bantry-Kenmare Catchment Area, and more immediately to the Coomhola_SC_10 Subcatchment Area. All river waterbodies at the Site which form part to the Coomhola_SC_10 Subcatchment Area are assigned "*High*" status under the 2019 – 2024 cycle of the WFD. This "*High*" status remains unchanged from the earlier 2016 – 2021 monitoring period of the WFD.

The north-eastern extent of the Site accounts for approximately 19.2% of the total Site area and drains to the Lee Cork Harbour and Youghal Bay Catchment Area, and more immediately to the Lee [Cork]_SC_010 Subcatchment Area. All river waterbodies downstream of the Site which form part to the Lee [Cork]_SC_010 Subcatchment Area are assigned "*Good*" status under the 2019 – 2024 monitoring period of the WFD. This "*Good*" status remains unchanged from the earlier 2016 – 2021 monitoring period of the WFD . One lake waterbody in the Lee [Cork]_SC_010 Subcatchment Area, namely Lough Allua is at "*moderate*" status under the 2019 – 2024 monitoring period of the WFD. The closest lake to the Site, Lough Nambrackderg, does not have a designated status under the WFD and it is not hydrologically connected to the Site, further details on Lough Nambrackderg are contained in **9.3.5**. There are no mapped surface waters contained within the Site which drain to the Lee [Cork]_SC_010 Subcatchment Area with only runoff from the northern extent of Shehy More draining to this subcatchment Area. The closest mapped rivers to the Site beyond the north-eastern Site boundary in the Lee [Cork]_SC_010 Subcatchment Area are currently designated as "*Good*" status under the 2019 – 2024 WFD monitoring period.

In terms of the assigned risk of waterbodies not meeting their objectives by 2027, all surface waterbodies at the north-western extent of the Site which drain to the Dunmanus-Bantry-

Kenmare Catchment Area are classified as "*Not At Risk*" of meeting their WFD objectives. All surface waterbodies which drain the southern extent of the Site to the Bandon-Ilen Catchment Area are classified as "*At Risk*" of not meeting their WFD objectives. No mapped surface waterbodies exist at the north-eastern extent of the Site which forms part of the Lee Cork Harbour and Youghal Bay Catchment Area. The closest surface waterbodies to the Site in this catchment area are currently classified as "*Not at Risk*" of meeting their objectives under the WFD. A **Water Framework Directive Assessment** for the Proposed Development is contained in **Appendix 9.3**.

9.3.16 Groundwater Body Status

The three groundwater bodies which underly the Site and the Grid Connection route options, have been assigned "*Good Status*" under the Water Framework Directive (WFD) which is based on an assessment of the chemical and quantitative status of the GWB. The status is derived from representative monitoring points selected specifically for the WFD groundwater monitoring programme. The Beara Sneem GWB (IE_SW_G_019), the Ballinhassig West GWB (IE_SW_G_005) and the Bandon GWB (IE_SW_G_086) which underly the Site have been categorised as "*Not at Risk*" of failing to meet their WFD objectives by 2027.

The risk of not meeting WFD objectives is determined by assessment of monitoring data, data on the pressures and data on the measures that have been implemented. Waterbodies may be categorised as "*Review*" either because additional information is needed to determine their status before resources and more targeted measures are initiated or measures have already been undertaken although the outcome has not yet been measured/monitored. The GWBs which underly the site and/or the grid connection route options are not categorised as "*Review*" under the 3rd cycle of the WFD. Groundwater bodies that are "*At Risk*" are prioritised for implementation of additional measures and resources to mitigate potential impacts, the implementation of such additional measures does not apply to the GWBs underlying the Site or the Grid Connection route options.

In terms of the TDR, the existing road network does intersect the Banson GWB which is a designated nutrient sensitive area. Only short duration minor works that are not expected to intercept any groundwater body will be carried out. Potential impacts on groundwater from works carried out along the TDR are expected to be negligible.

9.3.17 Designated Sites & Habitats

Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), often referred to as "*European Sites*" or "*Natura 2000 Sites*", are the means by which European legislation protects threatened or rare habitats and species. Candidate Sites (i.e. cSAC or cSPA) have the same level of protection as fully designated sites under Irish Law. Candidate sites are those that are currently under consideration by the Commission of the European Union for SAC or SPA status in accordance with the Habitats Directive.

Natural heritage areas (NHAs) are designated areas that are protected under the *Wildlife Act 2000* for areas considered important for the habitats present or which hold species of plants and animals whose habitat needs protection. Proposed natural heritage areas (pNHAs) are sites not yet offered the same statutory protection as NHAs but which may become NHAs in due course and are sites of significance for wildlife and habitats. The proposed Site is not located within any of the aforementioned categories of designated areas of conservation. Other non-Natura 2000 Sites in the wider region which are considered to be sensitive, or which require certain actions to taken are also addressed in this section. These sites include WFD Designated Salmonid Waters, Margaritifera Sensitive Areas, Priority Areas for Action (PAAs and Registered Protected Areas (RPA) for Shellfish. All of the surface waters at the Site located south of the Shehy More mountain uppermost ridgeline and summit ultimately flow into the Bandon River, which in turn flows into the Bandon River SAC (Site Code 002171). The downstream distance from the nearest design elements to the Bandon River SAC is approximately 10.5km via the EPA named "*Shehy_Beg*" river which merges with the Bandon River near the townland of Togher, Co. Cork. Multiple other rivers and streams merge with the "*Shehy_Beg"* river prior to its confluence with the Bandon River. Given the considerable ~10.5km downstream distance from the Site to the Bandon River SAC, in addition to the dilution effect of multiple other merging rivers and streams, hydrological connectivity from the Site to the Bandon River SAC is considered to be highly tenuous.

The Grid Connection route option to Dunmanway follows the existing road network which already traverses through the Bandon River SAC. Approximately 455m west of the existing substation at Dunmanway is the Bandon Valley South of Dunmanway pNHA through which the Bandon River SAC also flows. With the exception of horizontal directional drilling locations along the Dunmanway Grid Connection route, only shallow trenching along the existing roadway is proposed to facilitate the construction of the Grid Connection route, the shallow trenching will not breach the groundwater table. In the unlikely event that a brecciated or fractured formation were to occur, it could potentially result in the loss of

drilling fluid through cracks, voids and fractures. If test pits and boreholes were located directly on, or extended through the proposed alignment, these areas could act as weak points that may serve as conduits where inadvertent fluid returns or frac out occurs.
However, if a frac-out occurs, there will be a loss in drilling pressure, this is a signal to the operator that an issue has arisen with the drilling process and the drilling would be immediately ceased. The method for reducing the drilling fluid losses, and thereby control the consumption of water and drilling fluid products, is to identify the point of losses and seal the area off. Clearbore drilling fluid will be used during the drilling process which is not toxic to aquatic organisms, and it is biodegradable which further reduces the potential for adverse impacts in the event of frac-out occurring. Due to the vast majority of the Grid Connection route option to Dunmanway requiring shallow trenching which will be backfilled, the temporary nature of the construction works, the established HDD technique with controls and use of non-toxic fluids, the potential impacts on Bandon River SAC are expected to be negligible.

Approximately 4.5km west of the Site is the Conigar Bog NHA. However, the closest hydrological distance from the Site to the Conigar Bog NHA is approximately 25km in an overall upstream direction. Given that pollutants do not migrate or flow upstream, and the considerable hydrological distance of 25km, any hydrological connectivity between the Site and the Conigar Bog NHA is considered to range from highly tenuous to almost non-existent. Approximately 11.5km north-west of the Site is the Slaheny River Bog NHA. There is no hydrological connectivity between the Site and the Slaheny Bog NHA. Other NHAs in the wider region north of the Site include the Doughill Bog NHA and the Sillahertnage Bog NHA which are not hydrologically connected to the Site.

Approximately 9km west of the north-western Site is the Derryclogher (Knockboy) Bog SAC. None of the surface waters which drain the Site are hydrologically connected to the Derryclogher (Knockboy) Bog SAC. Approximately 4.8km north-east of the Site is the Lough Allua pNHA. None of the surface waters which drain the Site are hydrologically connected to the Lough Allua pNHA. Approximately 6.3 km north-west of the Site is the Gouganebarra Lake pNHA and the Ballagh Bog pNHA. None of the surface waters which drain the Site are hydrologically connected to the Gouganebarra Lake pNHA or the Ballagh Bog pNHA. No works will near a designated site along the TDR, potential impacts associated with works along the TDR on any designated sites are therefore expected to be negligible. The catchment locations surrounding the Site area are mapped on **Figure 9.9 in Volume III** and the designated sites in the wider region are mapped in **Figure 9.5 in Volume III**.

None of the surface waters which drain the Site are classified as WFD Designated Salmonid Waters under *S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988* nor do they intersect any waters under this designation. The rivers and streams located beyond the north-eastern Site boundary, in the Lee, Cork Harbour and Youghal Bay Catchment Area are designated as waters which do intersect designated Salmonid Waters. Detailed basin delineation using LiDAR has been carried out as part of the **WFD Assessment** attached as **Appendix 9.3**. None of the proposed turbine positions, Turbine Hardstand areas or access tracks etc. are modelled to fall within the drainage basin of the Salmonid Waters within the Lee, Cork Harbour and Youghal Bay Catchment Area. Any potential runoff or groundwater flow directions from the Proposed Development are modelled to flow towards the Dunmanus-Bantry-Kenmare Catchment Area. As a result, potential impacts from the Site, on waters classified as waters which intersect designated Salmonid Waters are expected to be negligible.

In terms of potential impacts from the grid connection route options, the existing road along which both route options would follow does intersect WFD Designated Salmonid Waters under S.*I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988.* HDD could potentially be required at an upper maximum of eight WFD Designated Salmonid Waters along the Dunmanway Grid Connection route option and at potentially an upper maximum of thirteen WFD Designated Salmonid Waters along the Carrigdangan Grid Connection route option. The number of locations where HDD would be required along both Grid Connection route option was unknown at the time of preparing this report. As a conservative approach, it has been assumed that all watercourses along both grid connection route options would require HDD which is unlikely to be the case. The use of well-established HDD techniques, with control measures, including the use of non-toxic fluids will be in place regardless of the grid connection route option that is chosen.

In terms of the TDR, minor short duration works such as vegetation clearing, checking road widths, use of oversail areas and temporary road widening along the existing road network will be carried out at seven locations that are in close proximity to WFD Designated Salmonid Waters under S.*I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988.* With appropriate mitigation measures in place, the potential impacts on WFD Designated Salmonid Waters under *S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988* are expected to be negligible. The Ballinhassig West GWB which underlies approximately 19.2% of the total site area at the north-eastern extent, and both Grid Connection route options, is a RPA as a WFD GWB intersecting with WFD Designated Salmonid Waters. As discussed in **Section 9.3.10**, groundwater flow paths are expected to be generally short, ranging from 30-300m. Groundwater discharges to the numerous streams and rivers crossing the aquifer and to small springs and seeps. The nearest turbine position to a designated salmonid river in the Ballinhassig West GWB is located approximately 620m north of T02. Any potentially impacted groundwater is most likely to discharge to small springs or seeps across this distance given that groundwater flow paths are generally not anticipated to exceed a maximum of 300m.

The Site is located within three separate Margaritifera Sensitive Areas in accordance with the EU Habitats Directive. These include the Bandon/Caha, Owvane, and Lee Upper Margaritifera Sensitive Areas. These Margaritifera Sensitive Areas and their associated sensitivities are discussed in detail in **Chapter 6: Biodiversity**.

The Site is located within the Caha and Allua Priority Areas for Action (PAAs). All areas of the Site located south of the summit of Shehy More mountain are located within the Caha PAA, this area of the Site accounts for approximately 59% of the total Site Area. The Caha PAA comprises of two waterbodies, the Caha_020 and Coolkellure Lake. The Caha_020 waterbody is a section of the Caha River that rises in the Shehy Mountains and merges with the Bandon River 4km north of Dunmanway. The Caha river flows from Drumlough, Crushterra and Gurteen in the west and northwest of the waterbody to Inchicuhan crossroads at Ardcahan in the south. Sediment and nutrient loading are considered to be the most likely issues impacting water quality in the Caha_020 waterbody. The Caha_020 waterbody is located approximately 12.3km downstream of the Site via the Shehy_Beg River and the Bandon River, hydrological connectivity between the Site and the Caha_020 waterbody is therefore highly tenuous. The Dunmanway Grid Connection route option would follow the existing road network which currently crosses over the Caha_020 waterbody.

Coolkellure Lake is 3.5 hectares in area and is located in an upland area within the waterbody Bandon_020 which is currently at "*Moderate*" status and is not part of the PAA. The lake is the abstraction source for the drinking water supply for Dunmanway. The primary water quality issue with Coolkellure Lake is elevated phosphorus, most likely due to clear felling of forestry is the primary water quality issue impacting Coolkellure Lake. No forestry felling is proposed at the Site, localised small area felling and replanting may be required along TDR at pinch point although these works will have a negligible impact on Coolkellure Lake. The Coolkellure Lake is located approximately 10.4km in an overall upstream direction from the nearest surfaces waters at the Site. Given this considerable distance, and

since contaminants such as phosphorous do not generally flow upstream, hydrological connectivity between the Site and Coolkellure Lake is considered to be highly tenuous.
At the north-east section of the Site, approximately 19.20% of the total site area falls within the Allua PAA. The Allua PAA is divided into two sections or waterbodies which are the Lee (Cork)_020 and Lough Allua. Lough Allua is protected for salmonids and is also used locally as a recreational water for both bathing and kayaking. The Lee (Cork)_020 is assigned "*High*" status for the 2016 – 2021 WFD cycle. Lough Allua is currently at "*Poor*" status for the 2016 – 2021 WFD cycle. This is due to a combination of an unsatisfactory fish community dominated by coarse fish (roach and perch) as well as high nutrient levels and physical modification. None of the surface waters which drain the Site are hydrologically connected to the Lee (Cork)_020 waterbody nor Lough Allua.

Both the Bandon GWB (IE_SW_G_086) and the Beara Sneem GWB (IE_SW_G_019) which underly the Site and both Grid Connection route options are designated as a Registered Protected Areas (RPA) for Shellfish due to these GWBs extending from the Site as far as the south-east and west coasts of County Cork respectively. Due to the site being located approximately 15km inland from the nearest coastline, potential impacts on shellfish are expected to be negligible.

9.3.18 Water Resources

All of the rivers and streams at the Site located to the south of the summit of Shehy More Mountain are designated as river Drinking Water Protected Areas (DWPA) from which there is a known qualifying abstraction of water for human consumption as defined under Article 7 of the WFD. The rivers and streams located beyond the north-eastern Site are also designated as Drinking Water Rivers.

In terms of the TDR and both Grid Connection route options, these design elements all follow the existing road network to the northeast of the Site would cross multiple watercourses that are designated as a Drinking Water Rivers. The Bandon River, which the Grid Connection route option to Dunmanway traverses across is also designated as a Drinking Water River in accordance with the *European Communities (Drinking Water) Regulations 2023 (S.I. No, 99/2023)* in addition to multiple other rivers and streams along this Grid Connection route option that are tributaries of the Bandon River. With the exception of horizontal directional drilling locations along the Grid Connection route options, only shallow trenching along the existing roadway is proposed to facilitate the construction of the chosen Grid Connection route. Only short duration minor works such as vegetation clearing, use of oversail areas and temporary road widening will be required in the vicinity of these watercourses along the TDR.

All of the rivers identified above are designated as Drinking Water Rivers in accordance with *the European Communities (Drinking Water) Regulations 2023 (S.I. No, 99/2023)*. All Water Framework Directive GWBs nationally have been identified as DWPAs due to the potential for qualifying abstractions of water for human consumption as defined under Article 7 of the WFD. As a result, the rivers, streams, and GWB's at the Site and along the Grid Connection route options and TDR, should be considered to be highly sensitive in terms of potential chemical pollution and/or sediment laden runoff.

The EPA maintains a register of water abstractions in accordance with the *Water Environment (Abstractions and Associated Impoundments) Act 2022 (S.I. No. 48 of 2022)*. All persons that abstract a volume of 25 cubic metres (25,000 litres) per day or more from rivers, lakes and groundwater are required to register. The EPA does not publish a detailed public abstraction register as it may contain personal or commercially sensitive information or other information that could jeopardise the security of water supplies. A limited publicly available version of the abstraction register is available from the EPA upon request. This request was made on July 7th 2023. The data received does not include information on water abstractions where the abstraction purpose has been identified as being for drinking water. Additionally, grid references are rounded to the nearest kilometre to protect the identity of individual households and businesses, who may also use the abstracted water for private domestic use.

The publicly available abstraction register was received from the EPA on 13th July 2023. The publicly available register indicates that there are no registered abstraction points located within 5km of the Site. The closest registered abstraction point to the Site is located approximately 6km west of the Site near the townland of Lackareagh. The primary abstraction purpose at this Site is for hydropower. This hydropower site is located in an overall upstream direction relative to the Site, potential impacts on hydropower at this site would therefore be negligible.

Consultation with local residents in the wider area has indicated that residents in the townland of Coolmountain do extract water from an unnamed stream that is a tributary of the Shehy_Beg River as their drinking water supply. This small unnamed channel has been labelled as "*Channel 16*" for the purposes of ease of identification and is shown on **Figure 9.16** in **Volume III.** Channel 16 is located beyond the eastern Site boundary; the closest design element would be the proposed Onsite Substation and Control Buildings location which is approximately 500m to the west of Channel 16. Any potential run-off from the Substation location is modelled to flow toward the Shehy_Beg River and not towards Channel 16. Any potential impacts on the drinking water supply at Channel 16 are therefore expected to be negligible.

There are no registered abstraction points located along or within the vicinity of the proposed Grid Connection route option to Carrigdangan. The closest registered abstraction point to this Grid Connection route option is located approximately 9km east of the existing substation at Carrigdangan where the primary abstraction purpose is for quarrying. There are no registered abstraction points located along or within the vicinity of the proposed Grid Connection route option to Dunmanway. The closest registered abstraction point to this Grid Connection route option is located approximately 2.2km south of the existing substation at Dunmanway where the primary abstraction purpose is for mining or quarrying. The proposed Grid Connection route options are both expected to have a negligible impact on these regional abstraction points since only shallow trenching that is not expected to breach the water table will be carried out along the chosen Grid Connection route option.

In terms of the TDR, there are no abstraction points located in close proximity to any proposed works locations along the TDR. Therefore, potential impacts on abstractions points resulting from works associated with the TDR are expected to be negligible.

As discussed in **Section 9.3.11**, the GSI well databases indicate that there are no known groundwater abstraction wells located within the Site with the closest being located approximately 2.4km to the northeast of the Site, or approximately 580m west of the Dunmanway Grid Connection route option, in the townland of Coolcaum. This borehole is classified as being utilised for agricultural and domestic use and has been drilled to a depth of 40m. For the remainder of the Dunmanway Grid Connection route option, there is one GSI mapped well located approximately 1km east of this option at the closet extent in the townland of Acres, or approximately 1.2 km north-east of the existing substation in Dunmanway.

In terms of the Carrigdangan Grid Connection route option, a registered borehole is located approximately 900m northeast of the route in the townland of Scrahan where the primary use is registered as agricultural and domestic. Given that the nature of the Proposed Development is expected to result in limited impact with groundwater, combined with the generally short groundwater flow paths in the region that are generally between 30-300m long, potential impacts on all of these wells are expected to be negligible.

There are no mapped wells located in close proximity to where any works will be caried out along the TDR with the closest being located approximately 150m east of a blade laydown area near the townland of Castlemore. Given this considerable distance and the limited use of this area as a laydown area, potential impacts on the nearest wells are expected to be negligible.

There are no mapped holy wells located within the Site nor in close proximity to the Grid Connection route options or TDR. The closest mapped holy well to the Proposed Development is located approximately 3.8km south-east of the Site in the townland of Togher. This holy well is located approximately 520m southwest of the existing road along which the Dunmanway Grid Connection route option would traverse. Given that the nature of the Proposed Development is expected to result in limited impact with groundwater, combined with the generally short groundwater flow paths in the region that are generally between 30-300m long, potential impacts on all of these wells are expected to be negligible. Consultation with Uisce Éireann has confirmed that there are no known public water supplies (PWS) in existence in the area surrounding the Site or along the Grid Connection route options. Uisce Éireann maintains records of Water Supply Zones (WSZ's) through which water is delivered to each tap from a particular WSZ. A WSZ is a defined supply area served by a single source or group of connected sources. There are no WSZs located within the Site nor along the Carrigdangan Grid Connection route option according to Uisce Éireann's publicly available WSZ data for west Cork which was last updated in August 2024. Approximately 600m east of the L-4607 local road along which the Carrigdangan Grid Connection route would traverse is the Johnstown WSZ. Since only shallow backfilling that is not expected to breach the water table will be carried out, coupled with the approximate 600m distance at the closest extent, potential impacts on the Johnstown WSZ are expected to be negligible.

A small portion of the Dunmanway Grid Connection route option traverses through the Dunmanway WSZ as it follows the road network to Dunmanway. Due to the shallow trenching nature of the Grid Connection works that will be backfilled, no impacts on the Dunmanway WSZ are anticipated.

The Turbine Delivery Route (TDR) also slightly intersects the Coppeen WSZ along the L-8684 local road near the townland of Moneygaff West, the Crookstown WSZ along the R-585 regional road near the townland of Farranduff and the Cork Harbour and City WSZ to the east of Crookstown along the N22 national road. No works will be carried out at any of these locations that is considered to have potential to impact on the these WSZs. Potential impacts on any WSZ as a consequence of works being undertaken along the TDR are therefore expected to be negligible.

There are no National Federation of Group Water Schemes (NFGWS) located within 5km of the Site or the Grid Connection route options or along the TDR, with the closest being located approximately 5.2km north of the Site which is not hydrologically connected to the Site. The nearest public supply source protection area is located approximately 9.3km north of the Site at the townland of Carrignadoura. This area comprises both an inner and an outer source protection area, neither of which is hydrologically connected to the Site. As a result, no adverse impacts on NFGWS are expected to occur as a result of the Proposed Development.

The Site is divided across three separate locate Electoral Divisions (ED) of Garrown, Douce and Bealanageary. The published census data from the Central Statistics Office (CSO) relating to water supply data in private households from the year 2016 has been reviewed. A breakdown of the reported water supply type in the three Electoral Divisions that intersect the Site is outlined in **Table 9.26**. There may be some uncertainty or errors in the census data which the general republic responded to. Nevertheless, the data strongly indicates that the majority of households in the localised region are utilising a "*Other Private Source*" for their drinking water supply. There are no dwellings located within or on the EIAR boundary. Given the rural location, it is considered that private groundwater wells, which are discussed in **Section 9.3.11**, are likely to makeup a large portion of these private sources.

Table 9.26: 2016 Census Data Water Supply by Type in Electoral Divisions at the Site

Electoral Division	No. of Permeant Private Households	Public Main	Group Scheme With Public Source	Group Scheme With Private Source	Other Private Source	None	Not Stated
Garrown	**91**	0 (0%)	0 (0%)	3 (3.3%)	87 (95.6%)	0 (0%)	1
Douce	**95**	8 (8.4%)	0 (0%)	1 (1.1%)	84 (88.4%)	1 (1.1%)	1
Bealanageary	**64**	11 (17.2%)	8 (12.5%)	9 (14.1%)	34 (53.1%)	2 (3%)	0

The locations of water supply zones, dwellings near the Site, GSI/EPA mapped boreholes, wells, springs and holy wells, relative to the Site and the Grid Connection route options are mapped on **Figure 9.16** in **Volume III.**

9.3.19 Receptor Sensitivity

All water-based receptors associated with the Proposed Development, such as streams, rivers, lakes and groundwater, are considered to be highly sensitive in accordance with the criteria set out in **Table 9.3**. A key basis for this consideration is due to the hydrological connectivity of the water bodies at the Site to Drinking Water Protected Areas and the Bandon River SAC. The characterisation of the local water courses as highly sensitive is further warranted by the "*High*" and "*Good*" WFD status of many local rivers located within and downstream of the Site, and the associated sensitive habitats or species associated with same. Ultimately, all surface water and groundwater associated with the Site, Grid Connection route options and TDR are considered highly sensitive and must be protected as per numerous legislative instruments relating to same. However, risk to receptors must consider both the hazard and likelihood of adversely impacting on any given sensitive receptor, and therefore parameters such as distance from the potential source of hazard to receptor, pathway directness and/or connectivity, and assimilative capacity of the receiving water body should also be considered.

In terms of surface water sensitivity, as is noted in **Section 9.3.12**, the vast majority of potential contaminants or adverse impacts would likely infiltrate to surface water bodies rather than to groundwater bodies. However, sensitive receptors are of variable distance to proposed turbine locations and the pathways are of variable condition for each proposed turbine location and/or any part of the Proposed Development. Extensive surface water mitigation measures are outlined in **Section 9.5** to ensure protection of all downstream receiving water bodies. Mitigation measures will ensure that surface water runoff from the Site will be of a high quality and will therefore not impact on the quality of downstream receiving waters. The proposed drainage design for the Site will mimic the existing hydrological regime and will therefore significantly reduce potential changes to flow volumes leaving the Site.

A self-imposed 50m buffer zone from all waterbodies will be maintained during the construction phase wherever possible. The only exceptions to this rule will be as follows:

- Where the Grid Connection route traverses existing bridges that are already located within the 50m buffer zone, horizontal directional drilling will be carried out at potential upper maximum of eighteen watercourses for the Carrigdangan Grid Connection option, and eighteen watercourses for the Dunmanway Grid Connection option;

- Along the TDR, the route crosses multiple mapped rivers and streams with minor works being carried out or laydown areas being utilised at eleven locations in close proximity to a watercourse. The type of minor works that would be required along the TDR include temporary road widening for overrun areas, areas to be cleared for oversail areas, vegetation clearance, checking the width of access roads and the use of fields as blade laydown areas. The locations of watercourse relative to the TDR are shown on **Figures 9.17** to **9.65** in **Volume III**.
- Where small drains at Site will be culverted or diverted, such as for the borrow pit location, site access tracks and at the T09 Turbine Hardstand area; and,
- Where pre-existing unpaved access tracks at the Site will be utilised in locations that are already within the 50m buffer zone of rivers. This includes multiple areas immediately adjacent to the existing access tracks as can be seen on **Figures 9.7A** in **Volume III**.

The vast majority of the Proposed Development areas are located greater than 50m distance away from watercourses. The significant buffer zone distance of 50m from sensitive watercourses will ensure that sensitive watercourses will not be impacted as a result of excavations or other construction works such the construction of access tracks. The buffer zone will also ensure adequate space is available for the proposed drainage mitigation measures to be suitably constructed up gradient of natural drainage features at the Site. This approach will allow for attenuation of surface water runoff to be diffuse and effective. In instances where implementation of a 50m buffer zone is unavoidable, the use of sediment fences and/or straw bales will be implemented to reduce the potential for surface water runoff to sensitive watercourses. The proposed 50m buffer zone relative to the surface waters at the Site is mapped on **Figure 9.8** in **Volume III**. It is noted through experience and consultation with Inland Fisheries Ireland (IFI) on other windfarm developments that their recommendation has typically been for a minimum 15m buffer zone from all watercourses to be implemented. Implementation of a 50m buffer zone can therefore be considered to be a conservative approach.

The nature of the Proposed Development as a wind farm will necessitate near surface construction activities which would generally result in negligible groundwater impacts. Although all groundwater associated with the Site is protected as a source of drinking water, the bedrock aquifer underlying the Site and surrounding area is likely to be a poorly permeable aquifer and can support only local scale flow systems. As the proposed construction works at the Site will not be located within close proximity to any dwellings, the risk of potential adverse impacts to groundwater will be highly limited to localised zones.

Furthermore, it is considered that the majority of any potential contaminants such as fuel/chemical spills or seepage from cementitious materials would likely partially or fully infiltrate to surface water systems rather than recharging via percolation into groundwater. Potential impacts during the construction phase are common to all construction sites. All potential contamination sources will be carefully managed during the construction and operational phases. Mitigation measures are proposed in **Section 9.5** to ensure that such potential impacts are appropriately managed. Based on the above factors and on the sensitivity criteria outlined in **Figure 9.1** and **Table 9.3**, groundwater at the proposed Site can be classed as medium sensitivity from potential adverse effects.

9.3.20 Other Infrastructure - Boreholes

The Proposed Development will not require the installation of boreholes for groundwater extraction purposes during the construction or operation phase. Drilling of boreholes in general is not considered to have potentially significant impacts on groundwater. There is no potential for the Proposed Development to impact on groundwater due to drilling of boreholes for extraction purposes.

EIA Reports should be compliant with current best practice guidelines but also proportional to the nature, scale and significance of effects. With reference to **Chapter 8: Soils and Geology**, drilling of boreholes and mechanical geotechnical testing have not been carried out as part of this assessment, as these types of analyses are not considered proportional to the nature, location and size of the project and the limited significance of its effects on the surrounding hydrogeological environment. However, a detailed Site investigation (DSI) will be carried out at the pre-construction phase which will include drilling of boreholes and geotechnical testing of the underlying bedrock.

9.4 POTENTIAL EFFECTS AND MITIGATION MEASURES

9.4.1 Assessing the Magnitude of Potential Effects – Surface Water

The receiving environment in terms of **SURFACE WATER** associated with the Proposed Development is considered as being of **Very High Importance** and **Highly Sensitive**, and therefore classification of any potential impacts associated with the Proposed Development will be limited to Magnitudes associated with **Very High Importance**, as presented in the **Table 9.27** below.

Table 9.27: Weighted Rating of Significant Environmental Impacts – Surface Water Systems – Limited to Very High

Sensitivity (Importance of Attribute/s)	Magnitude of Impact			
	Negligible (Imperceptible)	**Small Adverse (Slight)**	**Moderate Adverse (Moderate)**	**Large Adverse (Significant to Profound)**
Very High	Imperceptible	Significant / Moderate	Profound / Significant	Profound

In terms of determining and assessing the magnitude of impacts on surface water features, categories of magnitude relate to the potential effect on the status of the attribute, that is; the attribute driving the classification of sensitivity such as the WFD status, and condition of the surface water feature/s, the risk of not reaching WFD objectives and the potential for the surface water system to support, or function as part of designated and protected areas (SAC, SPA, NHA etc).

9.4.2 Assessing the Magnitude of Potential Effects – Groundwater

The receiving environment in terms of **GROUNDWATER** associated with the Proposed Development is considered as being of **Medium Importance** and **Medium Sensitivity**, and therefore classification of any potential impacts associated with the Development will be limited to Magnitudes associated with **Medium Importance** as a conservative approach which is presented in the following table.

Table 9.28: Weighted Rating of Significant Environmental Impacts – Groundwater Systems – Limited to Medium

Sensitivity (Importance of Attribute/s)	Magnitude of Impact			
	Negligible (Imperceptible)	**Small Adverse (Slight)**	**Moderate Adverse (Moderate)**	**Large Adverse (Significant to Profound)**
Medium	Imperceptible	Slight	Moderate	Significant

In terms of determining and assessing the magnitude of impacts on groundwater features, categories of magnitude relate to the potential effect on the status of the attribute, i.e. the attribute driving the classification of sensitivity is the aquifer potential classification and use as a drinking water source, the proximity of the Site to groundwater wells, condition of the groundwater feature/s, the risk of not reaching WFD objectives, the GSI groundwater vulnerability classification and the potential for the groundwater system to support, or function as part of designated and protected areas (SAC, SPA, NHA etc).

9.4.3 Do Nothing Impact

If the Proposed Development does not proceed, current land use practices such as agricultural grazing will continue. There are no significant impacts to the hydrological and hydrogeological environment in the do-nothing scenario.

9.4.4 Construction Phase Potential Effects

9.4.4.1 Assessment of Effects - Increased Hydraulic Loading

The Proposed Development has the potential to result in increased rates of runoff during the construction phase relative to Baseline conditions. Such an increase in surface water runoff from the Proposed Development has the potential to result in increased hydraulic loading to the receiving drainage network and ultimately to the surface water network at the Site. Preliminary water balance calculations indicate that the Proposed Development will lead to a net increase of surface water runoff of approximately 7,431 m^3/month (or 3.26% relative to the area of the Site) during the wettest month of the year. This is considered to be a likely, negative, slight or moderated, slight weighted significance, permanent impact of the Proposed Development. The increase in hardstand area associated with the Proposed Development will likely impact on groundwater and hydrogeological flow regimes at a localised scale but not at a regional scale. This is considered a likely, negative, imperceptible or not significant, Imperceptible weighted significance, permanent impact of the Proposed Development.

9.4.4.2 Assessment of Effects - Earthworks

The construction phase of the Proposed Development will involve the following primary excavations activities which may have the potential adversely impact on surface water and groundwater:

- Construction of access tracks and amenity routes;
- Widening of the local road network to facilitate the delivery of turbines and other infrastructure;
- Temporary Construction Compound;

- Turbine Foundations and Turbine Hardstand areas;
- Borrow pit excavations;
- Foundations for the proposed Onsite Substation and Control Buidlings;
- Foundations for the proposed Met Mast;
- Trenching for underground electrical cabling, including along the Grid Connection route; and,
- Temporary stockpiling of peat, subsoils and bedrock.

All of the abovementioned excavations which will be required will necessitate the removal of vegetation, the excavation of peat and mineral subsoils. Such excavations and associated ground disturbance may increase the risk of either point source or diffuse sediment laden runoff to sensitive receptors via drainage channels and discharge routes. The proposed earthworks therefore have the potential to result in the release of elevated suspended solids to surface waters, particularly during prolonged heavy rainfall events. The release of elevated suspended solids to watercourses would adversely affect water quality and potentially negatively affect aquatic habitats or fish stocks downstream of the discharge source point if not mitigated against. The most vulnerable areas of the Site to surface water quality deterioration through the release of elevated suspended solids are considered to be:

- Proposed crossings of EPA mapped rivers or small drainage channels that ultimately drain to the Site's network of rivers and streams;
- Turbine Hardstand and infrastructure development, particularly at moderate to high gradient slopes to existing waterways; and,
- Upgrading of the pre-existing unpaved tracks at the Site that area already located within the 50m buffer zone of rivers and streams at the Site.

The potential release of elevated suspended solids to surface waters is considered to be a direct, negative, potentially moderate to significant, potentially significant / profound weighted significance, impact of the Development. This potential impact is considered to be in contrast to Baseline conditions, with the exception of existing sheep at the Site accessing rivers or streams which has the potential to disturb riverbanks resulting in increased sediment laden runoff, although it is also temporary. Although this impact is likely to be temporary, considering the mobility characteristics of surface waters to downstream receptors, it is not considered reversible. However, with appropriate mitigation measures in place and via the implementation of environmental engineering controls, this impact will be reduced to within water quality regulatory limits. Potential effects impacting on water quality are discussed in greater detail in the following sections of this chapter.

Potential localised peat stability issues, and erosion or degradation of peat such as by vehicular movements have the potential to increase the potential for entrainment of suspended solids in surface water runoff, impact or obstruct established drainage networks, and increase the amount of excavation works required generally which in turn increases the potential for standard effects associated with earthworks. This is considered an unlikely, direct, negative, potentially moderate to significant, potentially significant / profound weighted significance impact on receiving surface waters. This potential impact is considered to be in contrast to Baseline conditions but is also temporary.

A potential worst-case scenario associated with earthworks activities is the potential for significant stability issues leading to mass peat movement or landslides. As discussed in **Chapter 8: Soils and Geology** and the associated **Peat Stability Risk Assessment**, the risk of significant stability issues leading to mass movement or landslides is negligible to low. However, in the unlikely event of such an occurrence, there is the potential to greatly increase entrainment of suspended solids in surface water runoff, impact or obstruct established drainage or surface water networks. Such an occurrence could potentially obliterate sensitive aspects of the environment, and increase the amount of excavation works required, including for emergency remediation, which in turn would increase the potential for standard effects associated with earthworks. This is considered an unlikely, indirect, negative, potentially profound, potentially profound weighted significance impact. This potential impact is considered to be in contrast to Baseline conditions and also potentially permanent.

Table 9.29: Impact Summary – Earthworks

Impact Description	Type	Quality	Significance	Weighted Significance	Context	Probability	Duration / Frequency	Reversible
Entrainment of suspended solids during earthworks	Direct	Negative	Moderate to Significant	Significant / Profound	Contrast to Baseline	Likely	Temporary	No but can be minimised
Increased entrainment of contaminants and other impacts arising due to localised stability issues	Direct	Negative	Moderate to Significant	Significant / Profound	Contrast to Baseline	Unlikely[1]	Temporary	No but can be minimised
Catastrophic impacts arising from significant stability issues (Landslide – worst case)	Indirect	Negative	Potentially Profound	Potentially Profound	Contrast to Baseline	Unlikely[2]	Permanent	No

[1] Assuming mitigation measures described in **Chapter 8 – Soils and Geology** and in this chapter are implemented and adhered to, localised stability issues are unlikely to give rise to impacts on surface water networks associated with the proposed development.

[2] With reference to **Appendix 8.3 Peat Stability Risk Assessment** of **Chapter 8 – Soils and Geology**, the risk of mass movement or landslide is negligible to low.

9.4.4.2.1 Monitoring

Monitoring of peat, subsoils, bedrock and material management during the construction phase of the Proposed Development will be fundamentally important in ensuring that potential suspended solid entrainment in surface waters is minimised. With comprehensive planning and preparation, and implementation of relevant mitigation measures contained in the CEMP, the potential for elevated suspended solids to be released to surface waters via runoff is likely to be minimal. Monitoring of surface water quality is discussed in greater detail in **Section 9.5.2.10** of this chapter.

9.4.4.3 Assessment of Effects – Excavation Dewatering

The dewatering of excavations during construction is likely to have significant adverse effects on surface water runoff quality in the absence of mitigation measures. Should dewatering of open excavations, Turbine Foundations or the borrow pit etc. be required, the receiving engineered drainage and attenuation features will likely receive water discharges elevated in suspended solids. The potential overflow of such sediment laden water into the receiving downstream surface waters is considered to be a likely, direct, negative, potentially moderate to significant, potentially significant / profound weighted significance of the Proposed Development. This impact is considered to be in contrast to Baseline conditions although it is also temporary. Although temporary, considering the mobility characteristics associated with flowing surface waters, it is not considered reversible. However, with the implementation of appropriate mitigation measures and environmental engineering controls, this potential impact can be reduced to within water quality regulatory limits. Potential effects impacting on water quality are discussed in greater detail in the following sections of this report.

Potential dewatering through drainage in advance of excavation activities, or dewatering via pumping during excavation activities, will likely impact on groundwater and hydrogeological flow regimes at a localised scale but not at a regional scale. This is considered to be a likely, negative, slight, slight weighted significance, localised impact of the Proposed Development which is in contrast to the Baseline conditions. The potential effects on groundwater during the operational phase of the Proposed Development is considered to be negligible to low. Contaminated land has not been identified at the Site and therefore the potential for sources of contamination other than elevated suspended solids or chemical spills to be released to surface waters through dewatering activities is not anticipated.

9.4.4.4 Diversion and Enhancement of Drainage

The Development will likely result in the diversion, alteration and/or enhancement of the existing drainage networks at the Site during the construction of the project relative to Baseline conditions. The existing drainage network at the Site is mapped and presented in **Figure 9.3** in **Volume III**. Considering that pre-existing natural and artificially established drainage networks are present at the Site, the diversion, enhancement or introduction of additional drainage features is considered a likely, negative, moderate, localised impact of the Proposed Development which conforms to Baseline conditions. However, there are potential risks associated with the earthworks required to carry out such drainage works. The potential impacts of excavations are addressed in **Section 9.4.4.2** and in **Chapter 8: Soils and Geology**.

9.4.4.5 Watercourse Crossings & Drainage Channel Diversions

At the Site, one new bridge would be constructed within the Redline Boundary, to the southwest of T06. Five existing culverts would be upgraded, and three new culverts would be installed in the Site to facilitate the construction of the Grid Connection route and the site access tracks. A maximum of 6 drainage channels would also require slight diversions to be implemented in the Site to allow for the access tracks, turbine hardstand areas and borrow pit to be constructed. These locations are shown on **Figure 9.7A** in **Volume III**. These EPA mapped rivers and small drainage channels ultimately drain to the river and stream network downstream of the Site and they are therefore considered sensitive to the potential release of pollutants.

Construction of any new watercourse crossing will have an inherent risk of resulting in adverse impacts to surface waters due to the required ground disturbance through excavations and the movement of heavy plant machinery and the proximity to the primary sensitive receptor which is the watercourse itself. Multiple existing crossings in the form of small culverts are in place along the exiting unpaved access tracks located within the Site. Therefore, the introduction of the proposed new watercourse crossings is considered to conform with Baseline conditions at the Site. In relation to the proposed Grid Connection route options and TDR, no new watercourse crossings / culverts will be constructed.

Release of elevated suspended solids to surface waters due to excavations or other earthworks etc, or the accidental release of any form of anthropogenic contaminant such as fuels or chemicals during construction of new watercourse crossings are both potential significant adverse effects. This is considered a likely, negative, significant, but temporary impact of the Proposed Development which contrasts to Baseline conditions. The impacts relating to the release of contaminants during earthworks is addressed in **Section 9.4.4.2** of this chapter.

Poor planning, design and construction methodology of new watercourse crossings can potentially result in significant changes in flow, erosion and deposition patterns and rates associated with the surface water feature. This in turn can potentially lead to flow being restricted, leading to increased risk of flooding locally. In the absence of mitigation measures, these impacts are considered a likely, negative, significant, profound weighted significance, localised impact of the Proposed Development which contrasts to Baseline conditions.

9.4.4.6 Potential Effects on Surface Water and Groundwater Quality

9.4.4.6.1 Assessment of effects - release of suspended solids

The Proposed Development has the potential to result in the release of suspended solids during the construction phase of the Project relative to Baseline conditions. Runoff of suspended solids will increase turbidity concentrations in surface waters which can smother spawning grounds, reduce light penetration for flora growth, block fish gills, and promote algal growth in surface waters.

Nutrients associated with the solids entrained in runoff such as phosphorus, nitrogen and other potential contaminants such as hydrocarbons can lead to eutrophication of the water environment and eventually to fish-kills due to lowering of the dissolved oxygen concentration. Freshwater Pearl Mussel (*Margaritifera margaritifera*) are particularly sensitive to changes in water quality, and in particular elevated suspended solids. The Site is located within three separate Margaritifera Sensitive Areas in accordance with the EU Habitats Directive. These include the Bandon/Caha, Owvane, and Lee Upper Margaritifera Sensitive Areas. **Chapter 6: Biodiversity** of this EIAR outlines further information on the Freshwater Pearl Mussels and other ecological sensitivities.

In addition to potentially direct adverse impacts on ecological sensitivities down-gradient of the Site, runoff of suspended solids will potentially impact on the WFD status and objectives associated with the surface water networks both within and downstream of the Proposed Development. Considering the WFD assigned "*Good*" and "*High*" quality of the Baseline surface waters draining many parts of the Site, and the sensitivity and '*Very High*' importance of the associated surface water networks, any introduction of contaminants is considered an adverse impact of high significance. The release of suspended solids is considered a direct, negative, potentially moderate to significant, potentially significant / profound weighted significance impact of the Proposed Development. This impact is considered to be in contrast to Baseline conditions but also temporary in nature. Considering the long ranging mobility of surface waters, this potential impact is not considered reversible. However, with the implementation of mitigation measures and appropriate environmental engineering controls, this impact can be reduced to within water quality regulatory limits.

It is considered that the release of suspended solids does not have significant potential to adversely impact on groundwater due to the natural process of filtration associated with percolation of water through soils. This principle is particularly pertinent at a Site of this nature where a combination of steep topography and low to moderate permeability subsoils and low recharge rates at the Site are anticipated.

9.4.4.6.2 Assessment of effects – release of hydrocarbons and storage

Hydrocarbons are a pollutant risk due to their inherent toxicity to all flora and fauna organisms. Hydrocarbons chemically repel water and do not readily dissolve in polar solvents such as water. Most hydrocarbons are light non-aqueous phase liquids (L-NAPL's) that are less dense than water. If hydrocarbons are accidentally released to water, they will therefore float on the water's surface. Hydrocarbons adsorb onto the majority of natural solid objects they come in contact with, such as peat, soil, vegetation and animals. Hydrocarbons will burn most living organic tissue they come in contact with due to their volatile chemistry. Hydrocarbons also represent a nutrient supply for adapted micro-organisms, this process in turn can rapidly deplete dissolved oxygen and thus result in fish kills or mortality of water based vertebrate and invertebrate life.

During the construction phase, vehicles and plant associated with excavation, material transport, and construction activities introduce the risk of hydrocarbon spillages and leaks from fuels and oils. The risk is increased when regular refuelling is required which in turn implies the requirement of a designated refuelling area which will likely require fuel storage on Site. Alternatively, the fuel could be supplied by fuel tanker scheduled to refuel the plant and equipment directly.

Hydrocarbons or any other forms of toxic chemicals such as paints or adhesives etc. accidentally released to the environment will likely be intercepted by drainage and surface water networks at the Site. The low to moderate permeability subsoils and the generally steep topography at the Site will inhibit the spatial distribution and temporal variation of hydrocarbon mass and concentration should an accidental spill occur. This results in limited potential for contaminant movement through the subsoils. Therefore, the risk to subsoils / peat is limited, and in turn the risk to groundwater at a significant scale is also limited.
With regards to surface waters at the Site, an accidental hydrocarbon spillage is considered a likely, negative, significant to potentially profound, profound weighted significance, medium to long term impact of the Development, which is in contrast to Baseline conditions.

In terms of groundwater associated with the Site, an accidental hydrocarbon spillage is considered to be a likely, negative, significant, significant weighted significance, localised medium to long term impact of the Proposed Development, which is in contrast to Baseline conditions. With the implementation of appropriate mitigation measures and environmental engineering, these potential risks can be significantly reduced.

9.4.4.6.3 Assessment of effects – release of wastewater sanitation contaminants

The Proposed Development has the potential to result in the accidental leakage of wastewater or chemicals associated with wastewater sanitation onto peat/soils and ultimately into surface waters during the construction phase of the project. The installation of permanent sanitation facilities at the Site will not be required for the operational phase of the Proposed Development. There will be a toilet installed at the control building in the substation which will be connected to a holding tank, fitted with an alarm and taken off site for disposal at a licensed facility prior to reaching its holding capacity.

Sanitation facilities such as portaloos used during the construction phase will be self-contained and supplied with water by tank trucks. Portaloos will contain water storage tanks and separate wastewater storage tanks which will be routinely emptied by vacuum removal for off Site disposal via a tank truck. Accidental release of wastewater to surface waters would likely result in an increase in biochemical oxygen demand (BOD) which in turn would lower the dissolved oxygen concentration and adversely impact on aquatic life. Wastewater sanitation chemicals are also pollutant risks due to their inherent toxicity to aquatic flora and fauna and their potential to adversely impact on the productivity or status of surface water systems. The level of risk posed by such temporary facilities is dependent upon the following key factors:

- The location of the proposed temporary sanitation facilities relative to sensitive receptors;
- The condition, emptying schedule and maintenance of the facilities;
- The level of toxicity of the chemical agents used to aquatic flora and fauna.

A potential worst-case scenario/s associated with wastewater sanitation is the potential for wastewater or sanitation chemicals to accidentally spill or leak and to be intercepted by surface water drainage features, ultimately discharging to surface waters at the Site. This is considered to be an unlikely, negative, significant, profound weighted significance, medium to long term impact of the Proposed Development, which is in contrast to Baseline. With the implementation of appropriate mitigation measures, these potential risks can be significantly reduced.

9.4.4.6.4 Assessment of effects – construction or cementitious materials

The construction phase of the Proposed Development has the potential to result in the accidental spillage or deposition of construction waste into soils and peatlands. This in turn has the potential for waste materials to leach out toward preferential drainage flow paths that are ultimately be connected to the Sites surface water network.

The accidental leaching of cementitious wastes such as concrete, lean mix or cement etc., can result in an adverse change to hydrochemistry which can adversely impact on sensitive aquatic flora and fauna. Cementitious materials are highly alkaline and if accidentally released to surface waters can significantly elevate the pH concentration above the tolerance range of fish such as cyprinid and salmonid species. Freshly poured or wet concrete has greater potential to leach out towards preferential flow paths when compared to set concrete which is considered inert in comparison, the risk from wet concrete is further increased during periods of heavy rainfall. Surface water runoff that comes into contact with concrete will be impacted to a lesser extent than water percolating through lean mix concrete which will be impacted significantly. Regardless of the nature of the construction waste in question, the deposition of any construction materials or waste deposited at the Site that does not form part of the constructed development, even if inert, is considered contamination.

The accidental spillage or deposition of construction materials such as wet or lean mix concrete which is intercepted by drainage or surface water networks is considered a direct, negative, moderate to significant, significant / profound weighted significance, temporary to medium term impact of the Proposed Development, which is in contrast to Baseline.

With the implementation of appropriate mitigation measures and environmental engineering controls, these potential risks can be significantly reduced and considered unlikely.

9.4.4.7 Potential Effects on Hydrologically Connected Designated Sites

The Site is situated upstream of the Bandon River SAC (Site Code 002171) which is also crossed over by the existing road network which the Dunmanway Grid Connection route option would traverse. The Site is located within three separate Margaritifera Sensitive Areas which are the Bandon/Caha, Owvane, and Lee Upper Margaritifera Sensitive Areas. The Site is located within the Caha and Allua Priority Areas for Action (PAAs). Both the Bandon GWB (IE_SW_G_086) and the Beara Sneem GWB (IE_SW_G_019) which underly the Site and Grid Connection route options are designated as a Registered Protected Areas (RPA) for Shellfish. The Ballinhassig West GWB which underlies approximately 19.2% of the total site area at the north-eastern extent, both Grid Connection route options, and the

TDR, is a RPA as a WFD GWB intersecting with WFD Designated Salmonid Waters. All Water Framework Directive GWBs nationally have been identified as Drinking Water Protected Areas (DWPA) as is discussed in **Section 9.3.17**.

In the event that the Dunmanway Grid Connection route option is the preferred option, horizontal directional drilling (HDD) will be carried out at a maximum of three locations along the road network which intersect the Bandon River SAC. The locations would be at the Caha River and at two unnamed tributaries of the Caha River near the townland of Aultagh. With the implementation of appropriate mitigation measures, potential impacts on all watercourses, including those located within the Bandan River SAC are expected to be negligible.

Any accidental release of potential contaminants to the environment as a result of the Proposed Development will likely be intercepted by the drainage and surface water network at the Site. Therefore, any contaminants released will subsequently impact on a designated Site. Contaminants which are intercepted by the surface water network may also be carried further downstream towards other designated Sites. The potential of the Proposed Development to introduce contaminants to surface waters and in turn impact on the designated areas downstream is considered to be a negative, significant to profound, Significant / Profound weighted significance, potentially temporary to long-term impact of the Proposed Development which is in contrast to the Baseline.

However, with the implementation of appropriate mitigation measures and environmental engineering controls, these potential risks can be significantly reduced and considered unlikely. Furthermore, considering the geographical scale of the Site and the Bandon River, the assimilative capacity of the surface water systems will buffer against any potential contaminants introduced. In the event of accidental release of contaminants to surface waters at the Site, they will become more diluted in receiving waterbodies as the distance from the Site increases. This principle does not lessen potential adverse impacts in the immediate vicinity, and it does not reduce the need for robust mitigation measures to be implemented.

9.4.4.8 Drilling of Boreholes and Extraction of Groundwater

The bedrock formations underlying the Site are classified by the GSI as Locally Important (LI), bedrock which is moderately productive only in local zones. Drilling of boreholes in general is not considered to have potentially significant impacts on groundwater. Extraction of groundwater is considered to have potentially significant impacts on groundwater and on associated sensitive receptors. The Proposed Development will not require the installation of boreholes for groundwater extraction purposes during the construction or operation phase. All fresh water required during the construction phase of the project will be delivered to the Site via tank trucks. During the operational phase, there will be a toilet installed at the control building in the substation which will be connected to a holding tank, fitted with an alarm and taken off site for disposal at a licensed facility prior to reaching its holding capacity. Therefore, there is no potential for the Proposed Development to impact on groundwater due to drilling of boreholes for extraction purposes.

9.4.4.9 Potential Effects on Local Groundwater Supplies (Wells)

Mapping and searches of the GSI well databases confirms that there are no known groundwater abstraction wells located within the Site. The closet known groundwater well is located approximately 2.4km to the northeast of the Site, or approximately 580m west of the Dunmanway Grid Connection route option, in the townland of Coolcaum. There are also no known groundwater wells located in close proximity to works will occur along the TDR.

Given the incomplete nature of the GSI well database and the rural location, it has been assumed for the purpose of conservatism that all dwellings in the vicinity of the Site are utilising a private groundwater well and that groundwater flow direction in the underlying aquifer mimics the local topography. In other words, the groundwater flow paths are expected to be from topographic high points to lower elevated discharge points at streams, flushes, bog pools and rivers. Utilising this conceptual model of groundwater flow, dwellings that are located down gradient of the Site can be identified as potential receptors. The groundwater flow direction in the area of the Site is expected to predominantly follow the down gradient slope direction of Shehy More Mountain which is also the case for the rivers and streams which rise at and flow from Shehy More Mountain. There are no dwellings located within the Site or within 300m of the main development features. However, the closest dwelling to a proposed design feature is situated approximately 300m to the south of the Met Mast access track, it is anticipated that any potential groundwater impacts will have significantly attenuated across this distance in the underlying poorly productive aquifer. It is noted that a small number of dwellings are located approximately 300m south of the proposed Onsite Substation and Control Buildings, in the townland of Tooreen. However, the construction of the Onsite Substation and Control Buildings will not require deep excavations and any potential interactions with groundwater is expected to be negligible. Furthermore, given that there is a very steep slope separating the substation from these dwellings, groundwater would most likely discharge to mountain streams or springs across the approximately 300m distance to the nearest dwellings.

Piling works will not be carried out at turbine positions due to the presence of shallow rock across much of the Site. Excavations will be advance to approximately 3m and mass reinforced concrete gravity bases will be constructed. Minimal excavation dewatering is expected to be required at turbine positions or Turbine Hardstand locations. Excavations will occur in a moderate to low permeability environment which will have a containment effect on the localised groundwater. The potential for any possible contaminants to leach or migrate across long distances or to alter the localised groundwater chemistry will therefore be limited. A combination of low to moderate permeability subsoils, the temporary nature of the construction works, moderate recharge rates at the Site and the absence of proximity to the nearest dwellings is expected to result in a likely, neutral to negative, slight to moderate significance, localised impact of the Proposed Development which is in contrast to the Baseline. With appropriate mitigation measures in place, the potential impacts on groundwater wells can be managed and reduced to imperceptible to slight.

9.4.5 Potential Groundwater and Surface Water Effects due to the Grid Connection Cable Works and the TDR

The Dunmanway Grid Connection route option is located primarily within the Bandon GWB, the Carrigdangan Grid Connection route options is located primarily within Ballinhassig West GWB with a small section of both options being located within the Beara Sneem GWB. A small portion of the TDR is located with the Beara Sneem GWB, with the majority of the TDR where any works will be carried out being located within the Ballinhassig West GWB, Bandon GWB and the Ballinhassig East GWB. One blade laydown area along the TDR is also located near the boundary of the Lee Valley Gravels GWB and the Ballincollig GWB. No works along the TDR are expected to intercept groundwater, potential impacts from these works are therefore expected to be negligible.

According to the GSI, the GWBs which underly the main Site are all categorised as poorly productive bedrock. The GSI well database has indicated that there is one GSI mapped well located approximately 580m west of the Dunmanway Grid Connection route option, in the townland of Coolcaum. For the remainder of the Dunmanway Grid Connection route option, there is one GSI mapped well located approximately 1km east of this option at the closet extent in the townland of Acres, or approximately 1.2 km north-east of the existing substation in Dunmanway.There is also a mapped holy well located approximately 520m southwest of the Dunmanway Grid Connection route option in the townland of Togher. For the Carrigdangan Grid Connection route option, there is one GSI mapped well located approximately 900m north-east of the route in the townland of Scrahan.

Shallow trenching, which will be backfilled is expected to be required for whichever Grid Connection route option is chosen. For the purpose of conservatism, it is assumed that all crossings along the both the Dunmanway and Carrigdangan grid connection route options would require HDD. This would result in a potential total maximum of thirty-three crossings requiring HDD along the Dunmanway option and eighteen along the Carrigdangan option as a conservative assumption. The HDD locations shown on **Figure 9.7B** in **Volume III**. In the unlikely event that a brecciated or fractured formation were to occur, it could potentially result in the loss of drilling fluid through cracks, voids and fractures. If test pits and boreholes were located directly on, or extended through the proposed alignment, these areas could act as weak points that may serve as conduits where inadvertent fluid returns or frac out occurs. However, if a frac-out occurs, there will be a loss in drilling pressure, this is a signal to the operator that an issue has arisen with the drilling process and the drilling would be immediately ceased. The method for reducing the drilling fluid losses and thereby control the consumption of water and drilling fluid products is to identify the point of losses and seal the area off. Clearbore drilling fluid will be used during the drilling process which is not toxic to aquatic organisms and is biodegradable which further reduces the potential for adverse impacts in the event of frac-out occurring.

Due to the vast majority of the Grid Connection requiring shallow trenching which will be backfilled, the temporary nature of the construction works, the established HDD technique with controls and use of non-toxic fluids is expected to result in a neutral to negative, slight to moderate significance, localised impact of the Proposed Development which is in contrast to the Baseline. With appropriate mitigation measures in place, the potential impacts on groundwater wells can be managed and reduced to imperceptible to slight.

9.4.6 Potential Groundwater and Surface Water Effects due to Wind Farm Internal Cabling Works at the Site

The Wind Farm Internal Cabling works at the Site will follow the hardstand and road alignment and will be predominantly buried within shallow cable trenches. There are no known groundwater wells located within the Site, the known wells located beyond the Site are discussed in **Section 9.3.11**. The closest internal cable works at the Site to a mapped well is expected to occur at the T06 turbine location, approximately 2.8 Km south-east of the closest GSI mapped well. It has been assumed for the purpose of conservatism that all dwellings in the vicinity of the Site are utilising a private groundwater well and that groundwater flow direction in the underlying aquifer mimics the local topography. Excavations required for Wind Farm Internal Cabling works will be relatively shallow and are generally not anticipated to intercept the groundwater table. No significant potential to impact on groundwater supplies from such excavations are anticipated to occur at any area of the Site.

The pre-existing unpaved road alignment at the Site which will be upgraded is located within 50m of surface waters in some areas as is shown on **Figure 9.8** in **Volume III**. Since the Wind Farm Internal Cabling works will follow the track alignment, these works will also occur within the 50m buffer of watercourses in some areas. The installation of the Wind Farm Internal Cabling works will require shallow trenching along the track alignment. Given that the majority of the trackalignment is pre-existing and will be upgraded, coupled with the absence of proximal groundwater wells and the sealed nature of the Wind Farm Internal Cabling works at the proposed crossings, internal cable works are expected to result in a neutral to, slight significance, localised impact of the Proposed Development which is in contrast to the Baseline. With appropriate mitigation measures in place, the potential impacts on groundwater and surface waters can be managed and reduced to imperceptible to slight.

9.4.7 Reinstatement of Redundant Access Track, Hardstand Areas and Borrow Pit

Access tracks, borrow pits and Turbine Hardstand areas, such as Temporary Construction Compound areas that would be utilised for the construction phase of the Proposed Development will become redundant following the completion of construction activities at the Site. Redundant access tracks and Turbine Hardstand areas will require the removal of the top layer of hardstand and temporary access tracks. The underlying soil or peat will not be significantly exposed during such top layer surface removals. Any excess soil or peat from the top layer removals will be used to reinstate the single borrow pit at the Site.

Depositing of acrotelm (or vegetated peat) and soil over the areas in question will be carried out following the removal of the surface layers. Catotelm peat will not be used to reinstate redundant hardstand aeras or access tracks as it is prone to rapid erosion. There is potential for elevated suspended solids to become entrained by surface water runoff during the reinstatement of such areas. Any impacts to the receiving hydrological and hydrogeological environment during reinstatement are likely to be slight and infrequent assuming that the mitigation measures and precautions described in this report are implemented. Reinstatement of redundant infrastructure or borrow pit area following the Proposed Development construction phase is considered a positive, or beneficial impact of the Proposed Development. Although Reinstatement will not revert the areas in question to pre-existing Baseline conditions, it will serve as a foundation for the promotion and establishment of new blanket bog and associated ecological and biodiversity benefits.

9.4.8 Operational Phase Effects

The replacement of the vegetated surfaces at the Site with impermeable surfaces could potentially result in an increase in the proportion of surface water runoff reaching the surface water drainage network. The completed Site footprint will comprise of turbine hardstand areas, site access tracks, Onsite Substation and Control Buildings and Met Mast.

During prolonged heavy rainfall events, additional surface water runoff at increased flow velocity could increase sediment loading. This in turn has the potential to result in enhanced erosion of watercourses and adverse impact on aquatic ecosystems. However, with the implementation of the proposed drainage design discussed in the **Surface Water Management Plan** attached as **Appendix 2.1**, it is anticipated that such potential impacts are expected to be an imperceptible to slight, neutral, permanent impact during the operational phase. Nevertheless, the mitigation measures described in this report will be implemented in full as applicable.

Water supply for the Onsite Substation and Control Buildings sanitation facilities will be brought to Site and removed after use as wastewater from the Site by a licensed waste haulage contractor to be discharged at a suitable off-site treatment location. No water will be sourced on the Site or discharged to the Site during the operational phase. No operational phase effects are anticipated from water and wastewater sourcing and disposal.

9.4.9 Decommissioning Phase

Decommissioning of the Proposed Development would result in the cessation of renewable energy generation at the end of the operational life of the wind farm with the removal of various infrastructural elements. The Decommissioning phase will involve the removal of the above ground elements of the wind farm which will require the following key elements:

- De-energising of the Site via a high voltage (HV) disconnection followed by low voltage (LV); disconnection of turbines;
- Removal of the Onsite Substation and Control Buildings;
- Controlled dismantling of turbine components such as blades, tower and nacelle;
- Controlled removal of the Met Mast; and,
- Removal of de-energised underground cables, electrical control systems and ducts.

It is anticipated that the following elements of the wind farm will be left in place after Decommissioning:

- The reinforced concrete Turbine Foundations;
- The crane Turbine Hardstand areas adjacent to the turbines;

- The Site access roads;
- The hardstanding area for the Onsite Substation and Control Buidlings;
- The borrow pit; and,
- The Site drainage network.

There will not be a requirement for additional drainage measures to be implemented during the Decommissioning phase of the Proposed Development. With the passage of time, the constructed drainage network will likely become full of deposited sediment and revegetation will naturally occur which will render the drainage system less effective over time. The Site will therefore revert over time to a more natural drainage regime that is similar to its current Baseline environment. Given the relatively long operational lifespan of wind farms, the groundwater levels on the Site will have stabilised at a new equilibrium steady state condition when the Decommissioning phase is required. As the efficiency of the drainage network is reduced over time, a gradual restoration of groundwater levels on the Site will occur. The works to be completed during the Decommissioning phase are expected to be an imperceptible to slight, neutral, permanent impact on the hydrological and hydrogeological setting surrounding the Site.

9.5 MITIGATION MEASURES AND RESIDUAL EFFECTS

The Proposed Development has associated potential impacts as described in the previous sections of this report. The following sections outline mitigation measures to be implemented during the design, construction, operational and Decommissioning phases of the Proposed Development. Potential residual effects after mitigation measures are implemented are also described in the following sections.

9.5.1 Design Phase

9.5.1.1 Mitigation by Avoidance

The fundamental mitigation measure to be implemented during each stage of the Proposed Development will be avoidance of sensitive hydrological or hydrogeological receptors wherever possible, this key principle is referred to as "*mitigation by avoidance*". This principle has been adopted during the design of the turbine layout and associated infrastructure layout across multiple design iterations. Hydrological constraints maps have been developed which identify areas of the Site where surface water and drainage constraints resulted in areas of the Site being deemed less suitable for development. The multiple constraints maps are presented in **Volume III**. The identified constraints have been extensively discussed in consultation with the design team. The final proposed Site layout plan has been identified as the optimal layout design available for protecting the existing hydrological regime of the Site, while at the same time incorporating and overlaying engineering and other environmental constraints.

9.5.1.2 Constraints

As part of mitigation by avoidance principles applied during the design phase of the Proposed Development, a self-imposed 50m buffer zone around surface waters and significant drainage features was implemented. The 50m buffer zone is intended to inform the design process by minimising or avoiding the risk to surface water receptors and by restricting construction disturbance to outside these zones. The buffer zone will in turn provide enhanced potential for filtering capacity of runoff from the Site and will protect riparian zone vegetation. The implementation of 50m surface water buffer zones is not a legislative requirement, particularly for unmapped surface water features. However, it is a recommended approach for identifying areas of the Proposed Development which pose an elevated risk in terms of sensitive surface water receptors. A self-imposed 50m buffer zone can therefore be considered a conservative approach.

The layout of the Proposed Development itself is inherently restricted due to the proposed infrastructure requirements, such as the proposed turbines require a minimum distance from each other to ensure the potential for wind turbulence impacting on downwind locations is minimised. The vast majority of the Proposed Development features will be situated outside of the 50m buffer zone, with the exception of the following unique and unavoidable circumstances:

- Where the Grid Connection route traverses existing bridges that are already located within the 50m buffer zone, horizontal directional drilling will be carried out at a potential maximum of eighteen watercourses for the Carrigdangan Grid Connection option, or thirty-three watercourses for the Dunmanway Grid Connection option;
- Where small drains at site will be culverted or diverted, such as for the borrow pit, site access track and the T09 Turbine Hardstand area; and,
- Where pre-existing unpaved access tracks at the Site will be utilised in locations that are already within the 50m buffer zone of rivers. This includes areas immediately adjacent to the existing access tracks such as the borrow pit and the temporary spoil storage area.

The principle of mitigation by avoidance during the design phase has been implemented to the fullest practical extent. However, additional consideration and planning measures as described in **Section 9.5.2.7** will be required for the abovementioned areas which could not be designed for positioning outside of the 50m surface water buffer zone.

During the Site surveys discussed in **Section 9.2.4**, multiple natural and artificial drainage features were observed, surveyed and have been mapped on **Figure 9.3** in **Volume III.** These drainage features are relatively well connected to the mapped surface water network, especially at lower altitude areas of the Site. Given the pre-existing access track, the established drainage network at the Site, and the limits of the Proposed Development in terms of utilising the existing infrastructure (i.e. as a predominantly rural greenfield site), some construction activities will invariably be required in close proximity to surface waters, including within the 50m buffer zone.

Careful consideration and special attention to planning is required for the identified locations within the surface water 50m buffer zone as described in **Section 9.5.2.7**. The **Surface Water Management Plan** attached as **Appendix 2.1** details multiple mitigation measures for works proposed within the 50m buffer zone. Each proposed construction location will possess unique characteristics and will require assessment on a case-by-case basis to ensure adequate measures are implemented.

9.5.2 Construction Phase

9.5.2.1 Earthworks Proposed Mitigation Measures

Mitigation measures to reduce the potential for adverse impacts arising from earthworks and management of spoil include the following:

- Management of excavated material will adhere to the measures related to the management of temporary stockpiles outlined in **Chapter 8: Soils and Geology**;
- A materials management plan will be established and will form part of the **Construction Environmental Management Plan** with the objective of establishing material balance during the construction phase. This will minimise the potential for excavated materials to be exposed for long durations and becoming vulnerable to entrainment by surface water runoff;
- No permanent or semi-permanent stockpiles will remain on the Site during the construction or operational phase of the Proposed Development;
- Suitable locations for temporary stockpiles will be identified on an individual basis. The suitability of any particular location will consider Site specific characteristics, including;
    - The location of drainage networks in the vicinity;
    - The slope incline and topography of the downgradient area; and,
    - Any other relevant characteristics which are likely to facilitate or increase the potential for entrainment by surface water runoff.
- Construction activities will not be carried out during periods of sustained significant rainfall events, or directly after such events until such time that the risk of excess

surface water loading occurring is deemed to be negligible. This will allow sufficient time for work areas to drain excessive surface water loading and discharge rates to be reduced;

- Following heavy rainfall events, and before construction works recommence, the Site will be inspected and any required corrective measures implemented;
- An emergency response plan will be developed for the construction phase of the Project. The plan, at a minimum, will involve 24-hour advanced meteorological forecasting linked to a trigger-response system. When a pre-determined rainfall trigger level is exceeded such as a very heavy rainfall at >25mm/hr, planned responses will be undertaken. These responses will include cessation of construction until the storm event, including storm runoff has ceased;
- Sediment fencing will be erected along proximal and paralleling areas of watercourses, channels and drains spanned by the works to reduce the potential for sediment laden runoff to reach sensitive receptors;
- No direct flow paths between stockpiles and watercourses will be permitted at the Site;
- Excavated material will be backfilled to the borrow pit as soon as reasonably practicable to prevent long duration storage at the Site which increases the risk of adverse effects on aquatic environments; and,
- All mitigation measures related to surface water quality as described throughout this Chapter will be implemented before excavation works commence.

9.5.2.2 Excavation Dewatering Proposed Mitigation Measures

Mitigation measures to reduce the potential for adverse impacts arising from dewatering activities include the following:

- Management of excavations will adhere to the measures outlined in **Chapter 8: Soils and Geology**. Areas of peat and subsoils to be excavated will be drained if required ahead of excavation works. This will reduce the volumes of water encountered during excavation works and will therefore reduce the volume of water that is required to be dewatered whilst excavations are being carried out;
- Engineered drainage and attenuation features outlined in the **Surface Water Management Plan** attached as **Appendix 2.1** will be established ahead of excavation works;
- Dewatering pumping rates will be controlled by an inline gate valve or similar infrastructure which will facilitate a reduction of loading on the receiving environment, thus enhancing the attenuation and settlement of suspended solids;

- The direct discharge of dewatered loads to surface waters will not be permitted under any circumstances;
- All dewatering will follow a strict procedure of pumping to a settlement tank and then to a dewatering bag, or settlement ponds prior to discharging to the receiving environment for overland flow;
- Geofabric lined settlement ponds will buffer the runoff discharging from the drainage system which will reduce the hydraulic loading to watercourses. Settlement ponds will be designed to reduce flow velocity to 0.3 m/s at which velocity silt settlement generally occurs. In areas of the Site where the placement of settlement ponds is not feasible, other mitigation measures described below will be implemented;
- Check dams will be constructed across drains and will reduce the velocity of runoff which will in turn promote settlement of solids upstream of potential surface water receivers. An additional benefit of check dams is that they will reduce the potential for erosion of drains. Rock filter bunds may be used for check dams, wood or hay bales can also be used if properly anchored. It is recommended that multiple check dams are installed, particularly in areas immediately down gradient of construction areas;
- Overland flow paths of the final dewatered discharge will be maximised to the greatest practical extent to avoid prematurely draining to drainage channels or surface waters. This approach will allow for enhanced settling out of suspended solids entrained in the runoff;
- All pumps, tanks, settlement ponds, dewatering bags and check dams used in the dewatering process will be regularly inspected and maintained as necessary to ensure surface water runoff is appropriately treated;
- Sediment fencing will be installed up gradient of water courses which may receive the final overland flow;
- The final treated dewatered discharge will be directed towards heavily vegetated areas to allow for further natural filtration of suspended solids;
- A programme of water quality monitoring will be implemented during the construction phase which is outlined in detail in **Section 9.5.2.10**;
- No extracted or pumped water will be discharge directly to the surface water network associated with the Site (this in accordance with the *Local Government (Water Pollution) Act 1977* as amended); and,
- Any discharges of sediment treated water should meet the requirements of the *Surface Water Regulations 2009*, as amended.

9.5.2.3 Release and Transport of Suspended Solids Proposed Mitigation Measures

The following mitigation measures to reduce potential impacts from the release of suspended solids to the surface waters will be implemented:

- Collector drains and soil berms will be implemented to direct and divert surface water runoff from construction areas such as temporary stockpiles into established settling ponds, buffered discharge points and other surface water runoff control infrastructure. The planning and placement of these control measures will be of fundamental importance, especially for the areas where works within the 50m buffer zone will be unavoidable which is discussed in **Section 9.5.1.2**;
- Sediment control fences will be implemented significantly upgradient of potential receiving waters and as part of the drainage network. Sediment control fences will also be established upgradient of the Sites pre-existing natural and artificial drains in addition to degraded areas of peat that are likely to receive surface water runoff. This practice will reduce the potential for elevated suspended solids entrained in surface water runoff to discharge to surface waters;
- Multiple silt fences will be used in drains discharging to the surface water network. This will be especially important for the areas where works within the 50m buffer zone will be unavoidable which is discussed in **Section 9.5.1.2**;
- The drainage, attenuation and other surface water runoff management systems will be installed prior to the commencement of construction activities. Whenever possible, drainage and attenuation control measures will be installed during seasonally dry conditions to limit the potential for sediment laden runoff to discharge to surface waters during the installation of these measures;
- Surface water runoff will be discharged to land via buffered drainage outfalls that will contain hard core material of similar composition to the geology of the bedrock at the Site. This mitigation measure will promote the capture and retention of suspended sediment;
- Buffered drainage outfalls also promote sediment percolation through vegetation in the buffer zone, reducing sediment loading to adjacent watercourses and avoiding direct discharge to the watercourse;
- Buffered drainage outfalls will be placed outside of the 50m buffer zone and will not be positioned in areas with extensive erosion and degradation;
- A relatively high number of discharge points will be established to decrease the loading on any one particular outfall;
- Discharging at regular intervals mimics the natural hydrology by encouraging percolation and by decreasing individual hydraulic loadings from discharge points;

- A site-specific CEMP appended to the EIAR in **Appendix 2.1** has been developed which mandates regular inspections and maintenance of pollution control measures. Contingency measures outlining urgent protocols to repair or backup any breaches of designed mitigation measures are incorporated into the site-specific CEMP;
- In the event that mitigation measures are failing to reduce suspended solids to acceptable levels, construction works will cease until remediation works are completed;
- If fine solids or colloidal particles are very slow to settle out of waters, coagulant or flocculant will be used to promote the settlement of finer solids prior to discharging to surface water networks. Flocculant gel blocks can be placed in drainage channels, these are passive systems that are self-dosing, self-limiting and are environmentally friendly. Flocculant gel blocks bind elevated levels of silt and associated contaminants into masses that are easily separated, captured and then removed from the water; and,
- Surface water runoff controls will be checked and maintained on a regular basis and as soon as any signs of deterioration become visible. Surface water runoff controls, check dams and settlement ponds will be maintained and emptied on a regular basis and as soon as any signs of deterioration become visible.

The adoption of precautionary principles and the implementation of mitigation measures listed above will ensure that the risk of elevated suspended solids to surface waters remains low. This in turn will ensure that potential risks to sensitive receptors is also low. Nevertheless, should a significant discharge of suspended solids to surface waters occur, the absence of immediate proximity to designated Sites and the assimilative capacity of the localised surface waters will act as a natural hydrological buffer in terms of suspended solids loading. Should such a discharge occur, the dilution and retention time of suspended solids in the localised surface water network will reduce potential impacts on highly sensitive downstream designated sites. It should be noted that this natural mitigation measures is not to be adopted as a first principle, and is not to be relied upon to prevent adverse impacts on designated sites, it should be considered as a last line of defence.

A detailed design of required drainage, collector drainage, stilling ponds and other listed mitigation infrastructure is contained in the **Surface Water Management Plan** in **Appendix 2.1**. Unsuitable and particularly sensitive areas are identified and presented in various figures contained in **Volume III**.

9.5.2.4 Horizontal Directional Drilling Proposed Mitigation Measures

The following mitigation measures to reduce potential impacts associated with horizontal directional drilling will be implemented:

- Clearbore, which is not toxic to aquatic organisms and is biodegradable will be the drilling fluid used;
- Mud mixing will be monitored to suit the ground conditions encountered and will initially be based on a mud programme developed by the specialised HDD Contractor, the drilling fluid supplier and an Environmental Clerk of Works;
- The drilling fluids will be constantly monitored, any changes required to the mix will be performed on site by a specialised HDD Contractor upon consultation with the drilling fluid supplier and Environmental Clerk of Works;
- Mud testing equipment will be available at all times during drilling operations to monitor key mud parameters;
- All equipment will be carefully checked on a daily basis by the Site Supervisor prior to use to ensure plant and machinery is in good working order with no leaks or potential for spillages;
- Spill kits, including an appropriate hydrocarbon boom, will be available on the site in the event of any unforeseen hydrocarbon spillages and all staff shall be trained in their use;
- All plant, materials and wastes will be removed from site following the HDD works;
- The launch pit will be reinstated to the original land surface condition and the normal duct trench will continue from this point;
- Should any dewatering be required, it will be carried out in accordance with the site-specific CEMP; and,
- Test pits and boreholes will not be located directly on, or extend through, the proposed alignment, as these weak points may serve as conduits where inadvertent fluid returns or frac outs occur. At least a 3m offset will be provided between the boreholes and pipe alignment.

9.5.2.5 Release of Hydrocarbons Proposed Mitigation Measures

The following mitigation measures to reduce potential impacts from the environmental release of hydrocarbons and other harmful chemicals to the surface waters will be implemented:

- Refuelling of vehicles will be carried out off-site to the greatest practical extent. This refuelling policy will mitigate the potential for impacts by avoidance. Due to the remote location nature of the Site, it is unlikely that implementation of this refuelling policy will be practical in all circumstance. In instances where refuelling of vehicles on Site is unavoidable, a designated and controlled refuelling area will be established at the Site.

The designated refuelling area will enable low risk refuelling and storage practices to be carried out during the works. The designated refuelling area will contain the following attributes and mitigation measures as a minimum requirement:

- The designated refuelling area will be located a minimum distance of 50m from any surface waters or Site drainage features;
- The designated refuelling area will be bunded to 110% volume capacity of fuels stored at the Site;
- The bunded area will be drained by an oil interceptor that will be controlled by a pent stock valve that will be opened to discharge storm water from the bund;
- Management and maintenance of the oil interceptor and associated drainage will be carried out by a suitably licensed contractor on a regular basis;
- Any oil contaminated water will be disposed of at an appropriate oil recovery plant or licensed tip site;
- Any minor spillage during this process will be cleaned up immediately;
- Vehicles will not be left unattended whilst refuelling;
- All machinery will be checked regularly for any leaks or signs of wear and tear; and,
- Containers will be properly secured to prevent unauthorised access and misuse. An effective spillage procedure will be put in place with all staff properly briefed. Any waste oils or hydraulic fluids will be collected, stored in appropriate containers and disposed of offsite in an appropriate manner.

Notwithstanding the management of refuelling and fuel storage at the designated refuelling area, the potential risk of hydrocarbon spills from plant and equipment or other general chemical spills at other areas of the Site remains. To mitigated against potential spills at other areas of the Site, the following mitigation measures will be implemented:

- Oil absorbent booms and spill kits will be available adjacent to all surface water features associated with the Development. The controls will be positioned downstream of each construction area and at principal surface water drainage features. Oil booms deployed will have sufficient absorbency relative to the potential hazard;
- Spill kits will also be available at construction areas such as at turbine erection locations, the Temporary Construction Compound, Onsite Substation and Control Buildings and Met Mast location etc.;
- Spill kits will contain a minimum of oil absorbent pads, oil absorbent booms, oil absorbent granules, and heavy-duty refuse bags for collection and appropriate disposal of contaminated matter;

- Should an accidental spill occur during the construction or operational phase of the Proposed Development, such incidents will be addressed immediately, this will include the cessation of works in the area of the spillage until the issue has been resolved;
- Spill kits will be kept in each vehicle at the Site and will be readily available to all operators;
- No materials, contaminated or otherwise will be left on the Site;
- Suitable receptacles for hydrocarbon contaminated materials will also be available at the Site; and,
- A detailed spill response plan will be prepared as part of the site-specific CEMP.

Implementation of the above mitigation measures will significantly reduce the risk of hydrocarbon contamination being released to the surface water network. Nevertheless, the potential risk cannot be entirely eradicated. Therefore, precautionary measures and emergency response protocols will be established and outlined in the site-specific CEMP appended to the EIAR in **Appendix 2.1**.

9.5.2.6 Construction and Cementitious Materials Proposed Mitigation Measures

The following mitigation measures to reduce potential impacts posed by the use of concrete and the associated effects on surface water in the receiving environment are recommended:

- The procurement, transport and use of any cement or concrete will be planned fully in advance and supervised by appropriately qualified personnel at all times;
- Vehicles transporting cement or concrete to the Site will be visually inspected for signs of excess cementitious material prior to being granted access to the Site. This will prevent the likelihood of cementitious material being accidentally deposited on the Site access tracks or elsewhere at the Site.
- Drivers of such vehicles will be instructed to ensure that all vehicles are washed down in a controlled environment prior to the departure of the source Site, such as at concrete batching plants;
- Precast concrete will be used wherever possible, although the use of pre-cast concrete is not a viable option for large structures such as turbine foundations and so concrete will be delivered to the Site;
- Concrete will not be poured during periods of rainfall or if any kind of precipitation is forecast. This policy will limit the potential for freshly poured concrete to adversely impact on surface water runoff;
- Raw or uncured waste concrete will be disposed of by removal from the Site;

- Washout of concrete trucks shall be strictly confined to the batching facility and shall not be located within the vicinity of watercourses or drainage channels. Only the chutes will be cleaned prior to departure from Site, and this will take place at a designated area at the Temporary Construction Compound;
- Spill kits will be readily available to Site personnel, and any spillages or deposits will be cleaned up immediately and disposed of appropriately;
- Pouring of concrete into standing water within excavations will be avoided;
- Excavations will be prepared before pouring of concrete by pumping standing water out of excavations to the buffered surface water discharge systems in place;
- Any surplus concrete will not be stored or deposited anywhere on Site and will be returned to the source location or disposed of appropriately at a suitably licensed facility; and,
- Any required shuttering installed to contain the concrete during pouring will be fully secured around its perimeter to minimise any potential for leaks.

9.5.2.7 Watercourse Crossings and Drain Diversions Proposed Mitigation Measures

At the Site, the pre-existing unpaved tracks traverse over several rivers and small drains which flow through culverts beneath the unpaved tracks at the Site. In addition to the pre-existing crossings at the Site, new access tracks will also be constructed to facilitate access to turbine and hardstand positions. One new bridge would be constructed within the Site, to the southwest of T06. Five existing culverts would be upgraded, and three new culverts would be installed at the Site to facilitate the construction of the Grid Connection route and the access tracks. A maximum of 6 drainage channels would also require slight diversions to be implemented at the Site to allow for the access tracks, Turbine Hardstand areas and borrow pit to be constructed. Detailed planning and consideration to ensure that potential impacts are assessed adequately, and in turn mitigated against, will be implemented for these locations. These locations are shown on **Figure 9.7A** in **Volume III**.

Due to the large quantity of small drains existing at the Site, the access tracks layout could not avoid intersecting all of the existing drainage channels at the Site. In terms of the Grid Connection route option to Dunmanway, thirty-three EPA mapped watercourses along the road network would be traversed to facilitate the installation of this Grid Connection. For the Carrigdangan Grid Connection route option, eighteen mapped watercourses along the road network would be traversed to facilitate the installation of the Grid Connection. The use of existing infrastructure at bridges, horizontal directional drilling (HDD) under watercourses and/or the replacement of some exiting culverts with appropriately sized new culverts along the chosen Grid Connection route will be carried out to facilitate the construction of the route.

In terms of the Turbine Delivery Route (TDR), which is from the Port of Cork to the northern entrance of the Site, the route crosses multiple mapped rivers and streams with minor works being carried out or laydown areas being utilised at a total of 49 individual locations. The type of minor works that would be required along the TDR include temporary road widening for overrun areas, areas to be cleared for oversail areas, vegetation clearance, checking the width of access roads and the use of fields as blade laydown areas. The locations of watercourse relative to the TDR are shown on **Figures 9.17** to **9.65** in **Volume III**. No actual crossings will be constructed, nor will any culverts be installed as part of the TDR works. With the implementation of sediment control fences, straw bales, check dams and all measures contained in the CEMP, potential impacts associated with TDR works at crossings are expected to be negligible.

A detailed design stage assessment in terms of culvert design will be carried out that will have cognisance to crossing locations including the characteristics of water flow at these locations. The following mitigation measures are recommended as minimum requirements to ensure that any potential impacts of the proposed watercourse crossings are minimised:

- The design of the proposed crossings and a method statement for the proposed construction will be agreed in advance with Inland Fisheries Ireland (IFI);
- The design of all crossings will adhere to relevant available guidance and will be reviewed through consultation with the OPW which will mitigate against any significant impact on surface water flow and in turn the risk of localised or downstream flooding;
- Crossings will be designed to minimise in so far as practical and to the extent deemed acceptable by the competent authority, the disturbance or alteration of water flow, erosion and sedimentation patterns and rates;
- A **Construction Environmental Management Plan** has been prepared and is appended to the EIAR in **Appendix 2.1**. Adherence to this plan, which will be mandatory throughout the construction of the watercourse crossings, details of the culvert design and construction methodology, including the environmental risk/s involved which have been identified and assessed in this EIAR will be included in the CEMP at the detailed design phase. Detailed site-specific mitigation measures and best practice techniques will be contained in the construction management plan and Risk Assessment Method Statement (RAMS) for any proposed crossings of small unmapped drainage channels;

- Vehicles used in the construction of small drain crossings will only be refuelled at the Site's bunded and designated refuelling area. No refuelling will be permitted within 50m of any watercourse at the Site; and,
- To mitigate against the potential risk of accidental leaks or spillages from plant and equipment, an emergency response plan for such incidents is contained in the CEMP appended to the EIAR in **Appendix 2.1**. Multiple spill kits will be maintained on the Site at all times within the cabs of vehicles and placed strategically at environmentally sensitive locations across the Site. Spill kits will be routinely inspected to ensure that they are fully stocked with oil absorbent booms and pads at all times. Oil absorbent booms will be installed downstream of channel crossing work areas within 25m of the works location, prior to the commencement of works.

Section 50 of the *European Communities (Assessment and Management of Flood risks) Regulation SI 122 of 2010* states; *"No Person, including a body corporate, shall construct any new bridge or alter, reconstruct, or restore any existing bridge over any watercourse without the Consent of the Commissioners or otherwise than in accordance with plans previously approved of by the Commissioners*". The same regulations also state that the word "*bridge*" includes a culvert or other like structure. The OPW is the agency in Ireland responsible for the implementation of the regulations and consent to construct all crossings will firstly be sought from the OPW via their application process. This OPW application and consent process will mitigate against the potential for the design of the crossings to result in significant adverse impacts on the surface water network at the Site. Relevant guidance documents will also be consulted, and applicable mitigation measures incorporated at the detailed design stage of the proposed crossings with a view to mitigating and reducing any potential impact on the receiving watercourse. The following is a non-exhaustive list of relevant guidance documents:

- OPW (2013) Construction, Replacement, or Alteration of Bridges and Culverts, A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945;
- OPW (2019), Environmental Guidance: Drainage Maintenance and Construction;
- Inland Fisheries Ireland (IFI) (2016) Guidelines on the Protection of Fisheries During Construction Works in and Adjacent to Waters;
- National Roads Authority (NRA) (2008) Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes; and,
- Scottish Environment Protection Agency (SEPA) (2010) Engineering in the water environment: good practice guide – River Crossings.

9.5.2.8 Groundwater Contamination Proposed Mitigation Measures

A combination of the underlying bedrock geology, the associated poor aquifer potential, low to moderate permeability subsoils beneath the topsoil/peat and moderate recharge rates at the Site has resulted in the risk posed to groundwater quality by the Proposed Development being considered as generally low to moderate risk which is discussed in previous sections of this report. Nevertheless, mitigation measures to reduce potential risks to groundwater will be implemented as a precautionary approach. A primary risk to the underlying groundwater quality would be through the accidental release of hydrocarbons from fuels or oils during the construction phase of the Proposed Development. In order to mitigate against potential groundwater contamination by hydrocarbons, implementation of the following mitigation measures is recommended:

- In the first instance, no fuel storage should occur at the Site whenever feasible and refuelling of plant and equipment will occur off-site at a controlled fuelling station;
- In instances where on-site refuelling is unavoidable, then the bunded on-site designated refuelling area must be used. The designated refuelling area must be bunded to 110% volume capacity of fuels stored at the Site;
- The bunded area will be drained by an oil interceptor that will be controlled by a pent stock valve that will be opened to discharge storm water from the bund;
- Management and maintenance of the oil interceptor and associated drainage will be carried out by a suitably licensed contractor on a regular basis;
- Any oil contaminated water will be disposed of at an appropriate oil recovery plant or licensed tip Site;
- Any minor spillage during this process will be cleaned up immediately;
- Vehicles will not be left unattended whilst refuelling;
- A site-specific CEMP appended to the EIAR in **Appendix 2.1** will be enforced to ensure that equipment, materials, and chemical storage areas are inspected and maintained as required on a regular basis; and,
- The mitigation measures outlined for the protection of surface waters as set out in **Section 9.5.2.5** will be also implemented which will inadvertently serve to protect groundwater from potential hydrocarbon contamination.

The following mitigation measures are recommended in relation to non-hydrocarbon potential contamination of groundwater:

- All other liquid-based chemicals such as paints, thinners, primers and cleaning products etc. will be stored in locked and labelled bunded chemical storage units;
- Temporary sanitation facilities such as portaloos used during the construction phase will be self-contained and supplied with water by tank trucks. Portaloos will contain water storage tanks and separate wastewater storage tanks which will be routinely emptied by vacuum removal for offsite disposal via a tank truck. All temporary sanitation facilities will be removed from the Site following the completion of the construction phase;
- The controlled attenuation of suspended solids in settlement ponds and check dams etc. will result in inorganic nutrients (if present in elevated concentrations) such as phosphorus and nitrogen being absorbed and retained by the solids in the water column. This will allow for a reduction of peak inorganic discharges in a controlled and stable runoff rate. It is noted that the presence of elevated contaminants were not detected during any of the surface water quality monitoring rounds which are discussed in **Section 9.3.9**;
- It is considered that there is a low risk of mobilising trace metals that may naturally be present in low concentrations in the Baseline environment. The potential for mobilising trace metals is most likely to result from enhanced water percolation associated with excavated bedrock substrate. To mitigate against this potential impact, water quality should be monitored for trace metal concentrations prior to, during and after the construction phase;
- The potential for livestock such as sheep which have been observed grazing at the Site to cause bacteriological contamination of groundwater will be controlled through the implementation of strict grazing control zones, site perimeter fencing and exclusion zones around all open excavations; and,
- The mitigation measures outlined for the protection of surface waters as set out in **Section 9.5.2.5** will be also implemented which will inadvertently serve to protect groundwater from potential non-hydrocarbon contamination.

9.5.2.9 Groundwater Extraction Proposed Mitigation Measures

The extraction of groundwater from boreholes for the purpose of potable water supply will not be required for either the construction or operational phase of the project. As a result, no potential effects are anticipated from the extraction of groundwater as a potable water supply.

9.5.2.10 Water Quality Monitoring

The following Site monitoring recommendations should be implemented to mitigate against potential impacts on the surface water and groundwater receiving environment:

- A programme of water quality monitoring outlining the selected parameters and monitoring frequency should be agreed with Inland Fisheries Ireland and Cork County Council prior to the commencement of construction;
- In order to assist in the detection of any deviations from the Baseline hydrochemistry conditions at the Site, regular periodic monitoring of the surface waters on Site should be carried out prior to and during construction;
- It is proposed that a programme of operational phase water quality monitoring is also implemented at a monitoring frequency agreed with the competent authority in order to aid the detection of any potential operational phase impacts on surface water quality;
- As a minimum requirement, field-measured parameters such as pH, conductivity, total dissolved solids (TDS), temperature, dissolved oxygen (DO) and turbidity will be included in the water quality monitoring programme. The results should be compared to the applicable EQS to determine if adverse impacts on water quality are occurring;
- It is also recommended that laboratory analyses for parameters such as total suspended solids, nitrogen, phosphorous, biochemical oxygen demand and trace metals etc. is implemented during and after the construction phase;
- Water quality monitoring locations will include both upstream and downstream points relative to the works locations. The locations of the water quality monitoring points will be flexible and will be moved as the construction phase progresses so that monitoring points remain representative of the most likely construction impact receptor points;
- The downstream monitoring locations will be positioned as close as possible downstream of the works location and another positioned further downstream. This approach will allow for an assessment of the dilution of potential contaminations (if present) as the distance from the point of diffuse source location increases;
- Watercourses which do not have year-round flows such as artificial drains, ditches or ephemeral streams will be avoided as water quality monitoring locations;
- During the construction phase, daily visual inspections of excavations, dewatering procedure, settlement ponds, silt traps, buffered outfalls and drainage channels etc. will be carried out by a suitably qualified person. Any excess build-up of sediment at settlement ponds, drains or at any other drainage features that may decrease the effectiveness of the drainage feature will be promptly removed;

- During the construction phase of the Proposed Development, all development areas will be monitored on a daily basis for evidence of groundwater seepage, water ponding and wetting of previously dry spots;
- Following the completion of the construction phase, silt traps, buffered outfalls and drainage channels will be periodically inspected during maintenance visits to the Site when the operational phase water quality monitoring will also be carried out;
- Any proposed crossings of small unmapped drains discussed in **Section 9.5.2.7** will be monitored daily during construction and during each Site visit during the operational phase. These small culvert crossings will be monitored in terms of their impacts (if any) on the receiving watercourses and in terms of their structural integrity to identify any signs of erosion or potential for sediment release;
- It is proposed that a handheld turbidity meter is available at the Site to accurately measure the quality of water discharging from the Site. The meter will be maintained and calibrated before each use by a qualified Environmental Clerk of Works; and,
- Any discharges of sediment treated water should meet the requirements of the *Surface Water Regulations 2009*, as amended.

9.5.2.11 Emergency Response

Mitigation measures outlined in the previous sections of this chapter will significantly reduce the potential for contamination of surface water or groundwater associated with the Site. Nevertheless, as is the case with all construction projects, a risk of accidental chemical spillages, sediment overloading of control measures or leaks of contaminants from plant or equipment remains a possibility. Emergency response procedures to potential contamination incidents are contained in the site-specific CEMP appended to the EIAR in **Appendix 2.1** and will be implemented at the Site prior to the commencement of the construction phase. The following is a non-exhaustive list of potential emergencies and respective emergency responses:

- Spill or leak of hazardous substances (less than 20 litres);
  - All spill incidents will be dealt with immediately as they arise;
  - Spill kits will be prepared and available in vehicles associated with the construction phase of the Development;
  - Spill kits will also be prepared and made available at primary work areas such as at proposed Turbine, Hardstand, Onsite Substation and Control Buildings, Met Mast, borrow pit and Temporary Construction Compound locations;

    - Disposal receptacles for hydrocarbon contaminated materials will also be available at the Site;
- Major spill of hazardous or toxic substance off-site or to environmentally sensitive areas;
    - Immediate escalation measures will be implemented for all major spill events;
    - Escalation measures may include installation of temporary sumps or drains to control the flow or migration of hydrocarbons or other chemicals;
    - Attempts to be made to limit or contain the spill using sandbags to construct a bund wall, use of absorbent material, temporary sealing of cracks or leaks in containers, use of geotextile or silt fencing to contain the spill;
    - Excavation and disposal of contaminated material should be immediately carried out following any such incidents;
    - Evacuation procedures will be implemented to remove non-essential personnel from the area;
    - Data gathering and an investigation should commence immediately after the emergency is contained;
    - If a significant hydrocarbon spillage does occur, the contractor on behalf of the developer must have an approved and certified clean-up consultancy available on 24-hour notice to contain and clean-up the spill; and,
    - All major spills of this nature will be reported to the competent authority immediately following such instances.
- Flooding of low-lying areas of the Site;
    - Immediately remove all chemicals, fuels and other hazardous substances from low-lying areas of the Site;
    - Immediately remove plant and equipment from low-lying areas;
    - Recover materials washed from Site including sediment and other waste;
    - Review and address the potential for excess water entering the Site; and,
    - Review and maintain erosion and sedimentation controls.
- Spills of cementitious material;
    - Cement / concrete contamination incidents will be cleaned up immediately as they arise;
    - Spill kits will also be established at key construction areas, and they will also be readily available in the cabs of plant and equipment; and,
    - Suitable receptacles for cementitious materials will also be available at the Site.

Emergency responses, including methodologies and all relevant contact details are specified in the site-specific CEMP appended to the EIAR in **Appendix 2.1**.

9.5.2.12 Construction Phase Residual Impacts

The residual impact on the surface water receiving environment resulting from the construction phase of the Proposed Development is anticipated to be a limited temporary decrease in water quality. A limited temporary decrease in water quality may arise due to a release of suspended solids and sediments to surface waters during excavations. The potential for release of elevated suspended solids is likely to be exacerbated following heavy rainfall events which occur after sustained dry periods. Any localised reduction in water quality is likely to be mitigated against by the extensive control measures outlined in this chapter and by natural dilution as distance from the point or diffuse source of contamination increases with distance from the Site.

Mitigation by avoidance and the implemented of physical control measures will ensure that contaminant concentrations, particularly elevated suspended solids entrained in runoff are reduced to below the relevant legislative screening criteria and adopted EQS. The overall impact is anticipated to be a direct, negative, imperceptible, imperceptible weighted significance and temporary.

9.5.3 Operational Phase

9.5.3.1 Increase in Hydraulic Loading Proposed Mitigation Measures

The Proposed Development will lead to an increase in impermeable surface area through the construction of hardstand areas within the Site. This in turn will lead to an increase in hydraulic loading by surface water runoff. However, preliminary water balance calculations indicate that the worst-case net increase in surface water runoff volumes will be approximately 7,431m^3/month, or +3.26% in a worst-case scenario wettest month relative to the area of the Site, therefore this is considered a slight, or not significant impact.

As a consequence of the estimated low significance of the impact of hydraulic loading during the operational phase, mitigation measures to facilitate a reduction in surface water runoff are limited to ensuring that pre-existing and newly established drainage infrastructure is sufficiently maintained for the discharge rates associated with all areas of the Site. Any and all blockages which may adversely impact upon the drainage regime at the Site should be immediately removed during the operational phase of the Proposed Development. No other additional impacts are anticipated during the operational phase of the Proposed Development.

9.5.3.2 Operational Phase Residual Impacts

The residual impact on the receiving surface water environment during the operational phase of the Proposed Development is anticipated to be an increase in runoff of rainwater and an increase in drainage discharge. This is anticipated to occur as a result of the construction of mostly impermeable hardstand areas in a worst-case scenario at the Site. Depending on the exact area of the Site in question, the finalised drainage design may result in some areas becoming more saturated, particularly at lower elevations, whilst other predominantly upland areas may result in a net drying effect being observed. This is considered a direct, neutral, localised impact of the Development, which contrasts to the Baseline conditions.

9.5.4 Development Decommissioning and Restoration Phase/s

9.5.4.1 Decommissioning of Infrastructure

As discussed in **Section 9.4.9**, no new impacts on the surface water and groundwater receiving environment are anticipated during the Decommissioning phase of the project. The Decommissioning phase of the Project would result in the removal of Site infrastructure such as wind turbines and the Met Mast etc. No new additional mitigation measures are required for the Decommissioning phase of the Proposed Development. The Decommissioning phase and associated removal of major infrastructure components is anticipated to result in similar potential risks to surface water and groundwater as those that will be encountered during the construction phase of the Proposed Development.

The excavation of soil or peat is not expected to be required during the Decommissioning phase. In addition, the movement of plant, vehicles and equipment is expected to be limited during the Decommissioning phase since all of the Project's hardstand areas will be pre-existing by the time the Decommissioning phase is being carried out. As a result, the risk of elevated suspended solids being discharged in surface water runoff to the downstream receiving environment is expected to be low. However, the potential risk remains for spills of fuels or hazardous chemicals which is a common risk to all developments. The mitigation measures outlined in this chapter will be implemented during the Decommissioning phase to reduce the potential for such impacts.

9.5.4.2 Reinstatement of Redundant Access Track and Hardstand Areas

Reinstatement of redundant access tracks and hardstand areas during the Decommissioning phase has the potential to result in soil creep, associated erosion and potential entrainment of elevated suspended solids in surface water runoff. This in turn has the potential to impact on the receiving surface water environment. The potential for such impacts are likely to be increased at areas of the Site where steep slopes are present. As a result, additional care and attention to detail is required for the following:

- Mitigation measures described in this chapter to reduce the potential for runoff of elevated suspended solids will be implemented;
- Sediment fences will be implemented along the perimeter of all access tracks and hardstand areas during the reinstatement works;
- Additional precautions such as the implementation of check dams, secured straw bales, sandbags, or settlement ponds will be implemented at areas where surface water runoff is likely to be intercepted by both natural and artificial drainage features;
- Any drains or outfalls which have the potential to draw water from reinstatement areas, or promote preferential surface water runoff flow paths through reinstatement areas will be removed, blocked or decommissioned as required;
- The mitigation measures for the preparation of the hardstand area surfaces prior to material being deposited is discussed in **Chapter 8: Soils and Geology** will be implemented; and,
- Monitoring and maintenance of the reinstated areas will be conducted regularly following the initial stages of establishment to ensure that the potential for excessive surface water runoff eroding deposited material along preferential pathways is minimised.

9.5.4.3 Reinstatement Residual Impacts

It is anticipated that the appropriate reinstatement of redundant access track and hardstand areas will result in a net beneficial impact. This will be achieved through passive continuous improvements at the areas in question. Over time, the reinstated areas will become revegetated and will recover to become similar in appearance to the surroundings of the wider Site. The reinstatement of the Site areas will likely result in

enhanced water storage at the Site. This will occur through the reintroduction of permeable layers at former hardstand areas which will in turn promote the filtration of potentially contaminated surface water runoff which may originate from reinstated areas. Therefore, the residual impact of reinstatement at access tracks and former hardstand areas is considered to be a positive, localised and permanent impact of the Proposed Development.

9.5.5 Decommissioning and Restoration Phase – Physical Infrastructure

Restoration of physical infrastructure at the Site following the Decommissioning phase has the potential to cause adverse impacts on the receiving hydrological and hydrogeological receiving environment. It is recommended that a benefit analysis should be carried out to determine the overall positive outcomes against any potential adverse effects prior to such activities being permitted. The assessment of all restoration activities will require an analysis across multiple other environmental disciplines (i.e. ecology, noise and human beings etc.) with the overall synergistic effects requiring evaluation. It is noted that the ecological environment surrounding the Site will also become altered over time across the operational lifetime of the Proposed Development. It is therefore recommended that the potential for restoration activities following the Decommissioning phase of the Proposed Development is evaluated in detail following the completion of the Decommissioning phase.

9.5.6 Cumulative Effects

There are 29 operational, consented and proposed wind farms within 20km of the Site, details of these are provided in **Table 2.1** in **Chapter 2**. For non-wind farm developments, including all small, medium and large-scale developments within 10km of the Site that are currently active in the planning system have been identified in **Appendix 2.4** of the EIAR.

The only other major development in the locality of the Site is the existing Shehy More Wind Farm, consisting of 11 turbines. The Shehy More Wind Farm abuts the existing Site to the north-east. The Shehy More Wind Farm is also divided across the same three catchment areas as the Proposed Development, although the proportion of the divide across these three catchment areas differs significantly. The Shehy More Wind Farm Site is predominantly located within the Bandon-Ilen and Lee,Cork Harbour and Youghal Bay Catchment areas with only a very small portion of this site located within the Dunmanus-Bantry-Kenmare Catchment Area.

With respect to hydrology, the effects of the Proposed Development are considered to contribute to and add to the cumulative nature of adverse impacts imposed on the surface water network in the catchments associated with the Proposed Development. However, considering the pre-existing "*Good*" and "*High*" WFD status of many of the surface waters surrounding the Proposed Development, and the high quality baseline water quality results outlined in **Section 9.3.9**, the potential for the Proposed Development to have adverse cumulative impacts on hydrology is limited to the construction phase. In further consideration of the wider locality, given that the Shehy More Wind Farm is already constructed, the potential for in-combination effects is greatly reduced due to greatest impacts on surface waters being most likely to occur during construction. In considering the absence of immediate proximity to designated sites, the Proposed Development is not considered likely to significantly contribute to cumulative effects in terms of water quality nor flood risk.

In terms of the Grid Connection route options and TDR, where short duration temporary works will be carried out, no existing or proposed developments have been identified which have the potential to result in cumulative impacts associated with the Proposed Development.

With respect to hydrogeology, and the potential effects of the Proposed Development having been assessed as likely being localised due to the moderate subsoil permeability, expected short groundwater flow paths, moderate recharge rates, comparatively high runoff rates and moderate yielding underlying groundwater aquifer only in local zones, the Proposed Development is not considered to significantly contribute to cumulative effects.

9.6 SUMMARY OF SIGNIFICANT EFFECTS

During both the construction and operational phases of the Project, activities will take place at the Site that will have the potential to significantly affect the hydrological regime or water quality at the Site or its vicinity. These significant potential impacts generally arise from sediment input from runoff and other pollutants such as hydrocarbons and cementitious substances, with hydrocarbons or chemicals spills to surface waters having the most potential for impact.

The implementation of mitigation through avoidance principles, pollution control measures, surface water drainage measures and other preventative measures have been incorporated into the project design in order to minimise potential significant adverse impacts on water quality at the Site. A self-imposed 50m stream buffer zone will be implemented at the Site wherever possible which will largely result in the avoidance of sensitive hydrological features. Direct discharges to surface waters of dewatered loads will not be permitted under any circumstances. This in turn will reduce the potential for adverse impacts on downstream designated sites.

The drainage plan for the Site will be a key method through which sediment runoff arising from construction activities will be reduced and through which runoff rates will be controlled. Implementation of the control measures outlined in this EIAR are considered to result in a likely, neutral to negative, imperceptible to slight significance, imperceptible weighted significance impact of the Project which is in contrast to the Baseline conditions. There will be minor localised changes to how water flows at the Site, this is considered a likely, neutral to negative, slight to moderate significance, localised impact of the Proposed Development which conforms to the Baseline due to the pre-existing network of artificial field drains in existence at the Site. The Project, once the mitigation measures outlined are implemented, is not likely to have significant effects.

9.7 REFERENCES

- Department of Housing, Planning and Local Government (2019) Draft Revised Wind Energy Guidelines;
- Office of Public Works (OPW) (2019), Environmental Guidance: Drainage Maintenance and Construction;
- The Cork County Development Plan (2022-2028);
- EPA (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- EPA (2025) Water Quality in Ireland, 2019–2024;
- Institute of Geologists of Ireland (IGI) (2002) Geology in Environmental Impact Statements – A Guide;
- IGI (2013) Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements;
- Irish Wind Energy Association (IWEA) (2012) Best Practice Guidelines for the Irish Wind Energy Industry;
- National Roads Authority (NRA) (2008) Guidelines on Procedures for the Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- NRA (2008) Environmental Impact Assessment of National Road Schemes – A Practical Guide – Rev 1;
- National Roads Authority (NRA) (2008) Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes;
- CIRIA (2006) Control of Water Pollution from Linear Construction Projects – Technical Guidance;
- GSI (2004) Bandon GWB: Summary of Initial Characterisation;

- GSI (2004) Ballinhassig GWB: Summary of Initial Characterisation;
- GSI (2004) GSI (2004) Beara Sneem GWB: Summary of Initial Characterisation;
- Environmental Protection Agency, Cycle 3, HA 19 Lee, Cork Harbour and Youghal Bay Catchment Report, May 2024;
- Environmental Protection Agency, Cycle 3, HA 20 Bandon-Illen Catchment Report, May 2024;
- Environmental Protection Agency, Cycle 3, HA 21 Dunmanus-Bantry-Kenmare Catchment, May 2024;
- Department of Housing, Planning and Local Government (2018) River Basin Management Plan for Ireland, 2018 – 2021;
- Department of Housing, Local Government and Heritage (2024) River Basin Management Plan 2022 – 2027, The Water Action Plan 2024: A River Basin Management Plan;
- Local Authority Waters Programme (Undated) Allua Priority Area for Action – Desk Study Summary;
- Local Authority Waters Programme (Undated) Caha Priority Area for Action – Desk Study Summary;
- Met Éireann (2007), Technical Note 61, Estimation of Point Rainfall Frequencies, D.L. Fitzgerald, 2007;
- Met Éireann (2012) A Summary of Climate Averages 1981-2010 for Ireland, Climatological Note No.14;
- Hunter Williams, N.H., Misstear, B.D., Daly, D. and Lee, M. (2013) Development of a national groundwater recharge map for the Republic of Ireland. Quarterly Journal of Engineering Geology and Hydrogeology;

- Fitzgerald, D.L. (2007) Estimation of Point Rainfall Frequencies. Met Éireann;

- Office of Public Works (OPW) (2009) The Planning Systems and Flood Risk Management: Guidelines for Planning Authorities;

- Scottish National Heritage (SNH) (2013) A Handbook on Environmental Impact Assessment;

- Scottish Environment Protection Agency (SEPA) (2010) Engineering in the Water Environment: Good Practice Guide – River Crossings;

- EPA (2008) Strive Report Series No. 6, Water Framework Directive – Recharge and Groundwater Vulnerability;

- Department of Housing, Local Government and Heritage, River Basin Management Plan 2022-2027 (The Water Action Plan 2024: A River Basin Management Plan for Ireland); https://www.gov.ie/en/policy-information/8da54-river-basin-management-plan-2022-2027/

- Department of Housing, Planning and Local Government, National River Basin Management Plan 2018-2021; (https://www.housing.gov.ie/water/water-quality/river-basin-management-plans/river-basin-management-plan-2018-2021)

- EPA Map Viewer, Water Framework Directive (WFD), surface water and hydrogeological features; (https://gis.epa.ie/EPAMaps/Water)

- EPA HydroNet, Surface water levels, flows and groundwater levels; (http://www.epa.ie/hydronet/#Water%20Levels)

- Office of Public Works (OPW), Preliminary Flood Risk Assessment (PFRA); (https://www.gov.ie/en/publication/1c7d0a-preliminary-flood-risk-assessment-pfra)

- OPW, National Flood Information Portal; (https://www.floodinfo.ie)

- Ordnance Survey Ireland, Map Viewer; (http://map.geohive.ie/mapviewer.html)
- National Parks and Wildlife Service (NPWS), Protected Sites Map-Viewer; (https://www.npws.ie/protected-Sites)
- The Geological Survey of Ireland (GSI), groundwater data and maps; (https://www.gsi.ie/en-ie/data-and-maps/Pages/Groundwater.aspx)
- The Geological Survey of Ireland (GSI), karst features database; (https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/understanding-irish-karst/Pages/Karst-databases.aspx)
- Myplan.ie; National Planning Application Map Viewer; (https://myplan.ie/national-planning-application-map-viewer)
- Sustainable Energy Authority of Ireland (SEAI), Wind Atlas; (https://www.seai.ie/technologies/seai-maps/wind-atlas-map/)
- Met Éireann Meteorological Data; (https://www.met.ie/climate/available-data/historical-data)
- Department of Housing, Planning and Local Government, EIA Portal; (https://www.housing.gov.ie/planning/environmental-assessment/environmental-impact-assessment-eia/eia-portal)
- Catchments.ie; and, (https://www.catchments.ie/)

10 NOISE

10.1 INTRODUCTION

This chapter of the EIAR assesses the effects of the Proposed Development from noise impacts. The Proposed Development refers to all elements of the application for the proposed Wind Farm, which includes:

- 8 no. wind turbines, site access tracks, Turbine Hardstands, 100 m permanent Met Mast, underground cabling, borrow pit, Temporary Construction Compound, and all site infrastructure on the wind farm site. It also includes the provision of signage at 4 no. locations for existing cultural heritage on the Site and the provision of biodiversity improvements.

This is described in further detail in **Chapter 2: Project Description**. The assessment considers the potential effects at noise sensitive receptors as identified in Section 10.4.2, during the following phases of the Proposed Development:

- Construction of the Development
- Operation of the Development
- Decommissioning of the Development

The Proposed Development refers to all elements of the application for the construction and operation of the wind farm (**Chapter 2: Development Description**).

This chapter of the EIAR is supported by the Figures in **Volume III** and following Appendices documents provided in **Volume IV** of this EIAR:

- **Appendix 10.1:** Photos of noise monitors in-situ
- **Appendix 10.2**: Methodology for calculating wind shear, different hub heights and standardising hub height wind speed
- **Appendix 10.3**: Derived background noise levels, background plus 5 trendline with the predicted noise levels against a noise limit of 43dB(A) at each receptor
- **Appendix 10.4**: SoundPLAN noise outputs
- **Appendix 10.5**: Calibration certificates of noise instruments
- **Appendix 10.6**: Candidate turbine manufacturer's noise emission data

10.1.1 Statement of Authority

Irwin Carr Consulting is based in County Down. The company has a proven track record in noise impact assessments throughout the UK and Ireland, with extensive knowledge of the issues in relation to noise from wind energy developments. Mark Burke carried out the noise modelling in this assessment. Mark is a Consultant in Irwin Carr Consulting, primarily responsible for environmental noise and noise monitoring. He has experience working in both the public and private sectors having previously obtained a BSc (Hons) Degree in Environmental Health. Mark has been responsible for undertaking and reviewing noise impact assessments on numerous large scale wind farms throughout Ireland.

Brendan O'Reilly has a Master's degree in noise and vibration from Liverpool University and has over 40 years' experience in noise and vibration control (and many years' experience in preparation of noise impact statements) and has been a member of a number of professional organisations. Brendan was a co-author and project partner (as a senior noise consultant) in 'Environmental Quality Objectives Noise in Quiet Areas' administered by the EPA. Brendan has considerable experience in the assessment of noise impact and has compiled studies for over 100 wind farm developments throughout Ireland, north and south. Brendan carried out the baseline study.

10.1.2 Acoustic Terminology

Table 10.1 Table of Definitions

Term	Definition
A-weighting	A frequency weighting designed to correlate measured sound levels with subjective human response. The human ear is frequency selective and our ears are most sensitive between 500 Hz to 6 kHz, particularly when compared with lower and higher frequencies. The A-weighting applies a frequency correction which reduces the effect of these low and high frequencies on the overall measured level in order to account for the subjective human response at these frequencies.
LAeq	LAeq is defined as being the A-weighted equivalent continuous steady sound level that has the same sound energy as the real fluctuating sound during the sample period and effectively represents a type of average value.
LA90	LA90, or L90dBA is defined as the noise level equalled or exceeded for 90% of the measurement interval and with wind farm noise the interval used is 10 minutes.
Site	The land required for the Proposed Development
Lden	The average sound level over a 24 hour period, including a penalty for noise at night and in the evening.
dBm-1	The atmospheric absorption coefficient, measured in decibels per milliwatt.
Sound Power Level	The logarithmic measure of sound power in comparison to a referenced sound intensity level of one picowatt (1pW) per m2
Sound Pressure Level	Sound pressure refers to the fluctuations in air pressure caused by the passage of a sound wave. It may be expressed in terms of sound pressure level at a point

Table 10.2 List of Abbreviations

Abbreviation	Description
dB	Decibel
Hz	Hertz
IOA	Institute of Acoustics
2006 Guidelines	Wind Energy Development Guidelines 2006
WHO	World Health Organisation
DRWEDG 2019	Draft Revised Wind Energy Development Guidelines December 2019
ISO 1996	ISO 1996 Acoustics-Description and Measurement of Environmental Noise - Part 1: Basic Quantities and Procedures (ISO 1996)
ISO 9613-2	ISO 9613-2 Acoustics - Attenuation of sound during propagation outdoors, Part 2: General Method of Calculation
IEC 61400	IEC Technical Specification 61400-11-2 Wind energy generation systems – Part 11-2: Acoustic noise measurement techniques – Measurement of wind turbine sound characteristics in receptor position, 2024
ETSU-R-97	ETSU-R-97: The Assessment & Rating of Noise from Wind Farms (ETSU-R-97)
NRA	National Roads Authority
TII	Transport Infrastructure Ireland
ABP	An Bord Pleanála
IOA RM	Institute of Acoustics Reference Method
m/s	Meters per second
STE	Serrated trailing edge
Leq,d 8 hour dBA	The time weighted average of the daily noise exposure level for a normal week of five eight hour working days

Sound is simply the pressure oscillations that reach our ears. These are characterised by their amplitude, measured in decibels (dB), and their frequency, measured in Hertz (Hz). Noise is unwanted or undesirable sound, it does not accumulate in the environment, is transitory, fluctuates, and is normally localised. Environmental noise is normally assessed in terms of A-weighted decibels, dB (A), when the 'A weighted' filter in the measuring device elicits a response which provides a good correlation with the human ear. The criteria for environmental noise control are of annoyance or nuisance rather than damage. In general, a noise level is liable to provoke a complaint whenever its level exceeds by a certain margin, the pre-existing noise level or when it attains an absolute level. A change in noise level of 3 dB (A) is 'barely perceptible', while an increase in noise level of 10 dB (A) is perceived as a twofold increase in loudness[1]. A noise level in excess of 85 dB (A) gives a significant risk of hearing damage. Construction and industrial noise sources are normally assessed and expressed using equivalent continuous levels, LAeq. Wind turbine source noise is generally expressed in Leq dBA and in sound power levels (LWA dB), however it can also be measured using the LA90 descriptor. Sound power level the descriptor of the noise emitted

[1] Department of Environment, Heritage and Local Government: Wind Energy Development Guidelines, Guidelines for Planning Authorities 2006 Energy

by as source while sound pressure level is a measurement taken at a distance from the noise source carried out with a noise meter.

Operational wind turbine noise is assessed using the LA90 descriptor, which allows reliable measurements to be made without corruption from relatively loud transitory noise events from other sources such as barking dogs, background noise levels generated by wind in the vicinity or local road traffic. The LA90 should be used for assessing both the wind energy development noise and background noise as stated in the Wind Energy Development Guidelines (WEDG)[2] 2006 (the 2006 Guidelines) and the Draft Revised Wind Energy Development Guidelines December 2019 (DRWEDG 2019). As discussed in ETSU-R-97[3] the LA90 is 1.5-2.5dBA less than the LAeq measured over the same period. In this assessment, the difference between LAeq and LA90 is given as 2dBA, in line with the Institute of Acoustics Good Practice Guide which is best practice and the value most commonly applied in wind farm assessments in Ireland. Wind turbine noise levels are given as sound power levels (LWA) dB at integer wind speeds up to maximum LWA levels. The wind turbine noise levels for the Proposed Developed have been detailed in Section 10.2.11. **Table 10.3** gives a comparison of noise levels in our everyday environment, a 10-turbine wind farm at 350m produces approximately 35-45 dB(A)[4]. A similar figure is presented in Section 3 of "Guidance Note for Noise: License Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)".

Table 10.3: Comparison of sound pressure level in our Environment[5]

Source/Activity	Indicative noise level dBA
Threshold of hearing	0
Rural night-time background	20-50
Quiet bedroom	35
Wind farm at 350m	35-45
Busy road at 5 km	35-45
Car at 65km/hr at 100m	55
Busy general office	60
Conversation	60
Truck at 50km/hr at 100m	65
Inside a typical shopping centre	70-75
Inside a modern car at around 90km/hr	75-80
Passenger cabin of jet aircraft	85
City Traffic	90
Pneumatic drill at 7m	95

[2] Department of Environment, Heritage and Local Government: Wind Energy Development Guidelines, Guidelines for Planning Authorities 2006 Energy

[3] ETSU-R-97, The Assessment & Rating of Noise from Wind Farms, June 1996

[4] Select Committee on Wind Turbines (2014) Wind Energy, Climate and Health: Evidence For The Impacts Of Wind Generated Energy in Australia

[5] Fact sheet published by the Australian Government (Greenhouse Office) and the Australian Wind Energy Association

Jet aircraft at 250m	105
Threshold of pain	140

10.1.3 Assessment Structure

This Chapter contains the following sections:

- **Assessment Methodology and Significance Criteria** – a description of the methods used in baseline surveys and in the assessment of the significance of effects.
- **Baseline Description** – a description of the current baseline noise environment of the area surrounding the Proposed Development based on the results of surveys, desk information and consultations, and a summary of any information required for the assessment that could not be obtained.
- **Assessment of Potential Effects** – identifying the ways in which noise receptors within 2.0km of the Proposed Development could be affected by the construction, operational and decommissioning phases of the Proposed Development, including a summary of the measures taken during design of each phase of the Proposed Development to minimise noise effects.
- **Mitigation Measures and Residual Effects** – a description of measures recommended to off-set potential negative effects and a summary of the significance of the effects of the EIA Proposed Development after mitigation measures have been implemented.
- **Cumulative Effects** – identifying and assessing the potential for effects of the EIA Proposed Development to combine with those from other wind farm developments.
- **Summary of Effects** – a summary of the effects of construction, operational and decommissioning noise associated with the Proposed Development.
- **Statement of Significance –** the significance of the potential effects of the Proposed Development during operation, construction and Decommissioning.

10.2 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

10.2.1 Assessment Methodology

This assessment has involved the following elements, further details of which are provided in the following sections:

- Legislation and guidance review
- Desk study, including review of available maps and published information
- Site walkover
- Evaluation of potential effects
- Evaluation of the significance of these effects
- Identification of measures to avoid and mitigate potential effects

10.2.2 Description of Effects

The significance of effects of the Proposed Development is described in accordance with the EPA guidance document '*Guidelines on the information to be contained in the Environmental Impact Assessment Reports (EIAR), EPA May 2022'*. The details of the methodology for describing the significance of effects are provided in Table 3.4: Section 3.7.3 of the aforementioned EPA 2022 document.

10.2.3 Relevant Legislation and Guidance

The noise assessment is carried out in accordance with the guidance contained in the following documents:

- Wind Energy Development Guidelines (WEDG)[6] 2006(the 2006 Guidelines)
- Recent 2023 An Bord Pleanála Decision on Noise Limits
- WHO 2018 Environmental Noise Guidelines for European Region (WHO 2018)
- Draft Revised Wind Energy Development Guidelines December 2019 (DRWEDG 2019).
- A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise including Supplementary Guidance Note 4: Wind Shear'[7] (the IOA Good Practice Guide) 2013
- ISO 1996[8] Acoustics-Description and Measurement of Environmental Noise - Part 1: Basic Quantities and Assessment Procedures Third Edition (ISO 1996)
- ISO 9613-2 Acoustics - Attenuation of sound during propagation outdoors, Part 2: General Method of Calculation
- ETSU-R-97[9]: The Assessment & Rating of Noise from Wind Farms (ETSU-R-97)
- Institute of Acoustics Amplitude Modulation Working Group[10], WSP Turbine AM Review[11] and IEC Technical Specification 61400-11-2 Wind energy generation systems – Part 11-2: Acoustic noise measurement techniques – Measurement of wind turbine sound characteristics in receptor position, 2024[12]
- National Roads Authority (NRA) Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 2004
- Transport Infrastructure Ireland (TII) document Good Practice Guidance for the Treatment of Noise during the planning of National Road Schemes, 2014

[6] Department of Environment, Heritage and Local Government: Wind Energy Development Guidelines, Guidelines for Planning Authorities 2006 Energy
[7] Institute of Acoustics (2013) A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise
[8] ISO 1996/1- Acoustics-Description and Measurement of Environmental Noise - Part 1: Basic Quantities and Procedures
[9] ETSU-R-97: Acoustics-The Assessment & Rating of Noise from Wind Farms: ETSU for the DTI, UK, 1996
[10] IOA Noise Working Group (Wind Turbine Noise) Amplitude Modulation Working Group, Final Report, A Method for Rating Amplitude Modulation in Wind Turbine Noise, August 2016
[11] Wind Turbine AM Review, Phase 2 Report, Department of Energy & Climate Change, WSP/Parsons Brinckerhoff, August 2016
[12] IEC Technical Specification 61400-11-2 Wind energy generation systems – Part 11-2: Acoustic noise measurement techniques – Measurement of wind turbine sound characteristics in receptor position, 2024

- BS 5228:2009-1+A1:2014, *Code of Practice for Noise and Vibration Control on Construction and Open Sites* (two parts)
- Cork County Development Plan 2022-2028

10.2.3.1 Wind Energy Development Guidelines 2006 ("2006 Guidelines")

The following are a number of key extracts from Section 5.6 of the 2006 Guidelines in relation to noise impact:

General Noise Impact

"*Noise impact should be assessed by reference to the nature and character of noise sensitive locations.*"

"*Separate noise limits should apply for day-time and for night-time*"

"Noise limits should be applied to external locations and should reflect the variation in both turbine source noise and background noise with wind speed."

Measurement Units

"The descriptor [LA90 10min] which allows reliable measurements to be made without corruption from relatively loud transitory noise events from other sources, should be used for assessing both wind energy development noise and background noise."

Specific Noise Limits

"Noise limits should be applied to external locations and should reflect the variation in both turbine source noise and background noise with wind speed."

"In general, a lower fixed limit of 45 dB(A) or a maximum increase of 5 dB(A) above background noise at nearby noise sensitive locations is considered appropriate to provide protection to wind energy development neighbours.

However, in very quiet areas, the use of the margin of 5 dB(A) above the background noise at nearby noise sensitive properties is not necessary to offer a reasonable degree of protection and may unduly restrict wind energy developments. Instead in low noise environments where background noise is less than 30 dB(A), it is recommended that the daytime level of LA90,10min of the wind energy development noise should be limited to an absolute level within the range 35-40 dB(A)".

"During the night the protection of external amenity becomes less important and the emphasis should be on preventing sleep disturbance. A fixed limit of 43 dB(A) will protect sleep inside properties during the night"

The 2006 Guidelines do not specify daytime or night-time hours. However, it is considered good practice to follow the framework given in ETSU-R-97 and IOA Good Practice Guide where daytime and night-time hours are specified. The limits are based on the prevailing background noise level for 'quiet daytime' periods, defined in ETSU-R-97 as:

- Quiet waking hours or quiet day-time periods are defined as:
  - All evenings from 18:00 to 23:00 hrs
  - Saturday afternoon from 13:00 to 18.00 hrs and all-day Sunday 07:00 to 18:00 hrs
- Night-time is defined as 23:00 to 07:00 hrs

The consideration of only the Quiet Daytime hours ensures that a conservative noise limit is applied to all daytime hours.

10.2.3.2 An Bord Pleanála

2023 An Bord Pleanála Decisions

A recent decision by ABP gave limits (ABP-313750-22, dated 23rd November 2023) in accordance with the 2006 Guidelines and were as follows:

(a) between 7am and 11pm:

(i) the greater of 5 dB(A) L90,10min above background noise levels, or 45 dB(A) L90, 10min, at wind speeds of 7m/s or greater,

(ii) 40 dB(A) L90, 10min, at all other wind speeds.

(b) 43 dB(A) L90,10min at all other times

where wind speeds are measured at 10 metres above ground level.

10.2.3.3 World Health Guidelines (WHO) 2018

The most recent WHO 2018 Guidelines: 'Environmental Noise Guidelines for the European Region' gives a recommendation limit of 45 dB Lden . This is an annual average noise level, based on wind speed and direction in the vicinity of the site with no specific limits for night.

10.2.3.4 Draft Revised Wind Energy Development Guidelines 2019 (DRWEDG 2019)

There have been a number of draft guidelines over the years with the latest one being in December 2019. The DRWEDG 2019 guidelines, currently in draft format are subject to significant public and stakeholder consultation and liable to change, in line with best practice.

A tender has been issued by the Department of Environment, Climate and Communications to review and re-draft the Wind Energy Development Guidelines. This process has yet to be completed.

This assessment is based on the current guidance outlined in Section 10.2.3.1.

10.2.3.5 Cork County Development Plan 2022

The Cork County Development Plan 2022 has a new of key extracts, in particular Section BE 15-13 : Noise and Light Emissions, in relation to noise impact:

(a) Seek the minimisation and control of noise pollution associated with activities or development, having regard to relevant standards, published guidance and the receiving environment

The relevant standards and guidelines identified above are considered applicable in line with this requirement of the County Development Plan.

10.2.4 Desk Study

The locations for noise monitoring were selected by inspection of Site layout maps produced at design freeze and by identifying the nearest noise sensitive receptors surrounding the wind turbines. The Noise Study Area has been defined such that the predicted results have been included for all residential receptors within 2.0km of the wind farm.

The six noise monitoring locations are considered representative of the local noise environment.

10.2.5 Acquisition and Analysis of Background Noise Data

The 2006 Guidelines, ETSU-R-97 and the IOA Good Practice Guide recommend the measurement and use of wind speed data, against which background noise measurements are correlated. The IOA Good Practice Guide Supplementary Guidance Note 4[13] (**Appendix 10.2)** gives the methodology to account for wind shear, calculation to hub height and to standardise 10m height wind speed.

A LiDAR positioned within the Site during the noise survey was used for wind data measurements over 10-minute intervals.

[13] IOA, A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise- Supplementary Guidance Note 4: Wind Shear

The 105 m hub height wind speed was then standardised to 10 m height wind speed with the wind speed plotted against the 10-minute background noise data to derive a best fit polynomial curve.

10.2.6 Prediction of Wind Turbine Noise Levels

The predicted noise levels are based on the methodology given in the IOA Good Practice Guide. Noise level calculations are based on ISO 9613-2[14] which provides a prediction of noise levels likely to occur under worst-case down-wind conditions.

There are numerous models for predicting noise from a point source and some of these models are specifically used for the prediction of noise from wind farms. SoundPLAN software package was used to calculate the noise level at the receptors. The propagation model calculates the predicted sound pressure levels by taking the source sound power level for each turbine in their respective octave bands and subtracting a number of attenuation factors according to the following formula:

Predicted Octave Band Noise level = $LW + D - (A_{geo} + A_{atm} + A_{gr} + A_{br} + A_{mis})$

Each attenuation factor is considered in more detail below.

The predicted octaves from each of the turbines are summed to give the predicted noise level expressed as dBA.

No allowance has been made for the character of noise emitted by the turbines, however in general the emissions from wind turbines are broadband (non-tonal) in nature. In the unlikely event of a turbine exhibiting clearly tonal components at any receptor, the turbine would be turned down or stopped until such tonality is ameliorated. A guarantee will be required in the procurements of the turbine to be used onsite, stating that there should be no clearly tonal or impulsive components audible at any noise sensitive receptor location.

A_{geo} –Geometric Spreading

Geometric (spherical) spreading from a simple free-field point source results in attenuation over distance according to:

$$Lp = Lw - (20 \log R + 11)$$

Where:

Lp = sound pressure level

[14] ISO 9613-2 Acoustics -Attenuation of sound during propagation outdoors, Part 2: General Method of Calculation

Lw = sound power level

R = distance from the turbine to receiver

D – Directivity Factor

The directivity factor allows for adjustment where the sound radiated in the direction of the receptor is higher than that for which the sound power level is specified. In this case, the sound power levels are predicted as worst-case propagation conditions, i.e. all receptors are assumed to be in downwind conditions.

A_{gr} - Ground Effects

Ground effect is the result of sound reflected by the ground interfering with the sound propagating directly from the turbine to receiver. The prediction of ground effects is complex and depends on the source height, receiver height, propagation height between the source and receiver and the intervening ground conditions.

Ground conditions are described according to a variable defined as G, which varies between 0 for hard ground and 1 for soft ground. Although in reality the ground is predominately porous, it has been modelled as mixed 50% hard and 50% porous corresponding to a ground absorption coefficient of 0.5. Our predictions have been carried out using a source height corresponding to the proposed height of the turbine nacelle, a receiver height of 4m and an assumed ground factor of G=0.5 as recommended in the IOA Good Practice Guide.

A_{bar}- Barrier Attenuation

The effect of a barrier (including a natural barrier) between a noise source and receptor is that noise will be reduced according to the path difference (difference between the direct distance between source to receptor and distance between source and receptor over the barrier). The reduction is relative to the frequency spectrum of the sound and may be predicted according to the method given in ISO 9613. In practice, barriers can become less effective in downwind conditions. A barrier can be very effective when it lies within a few metres of the receptor. In the prediction model, zero attenuation is given for barrier effects, which is a worst-case scenario setting.

A_{atm} - Atmospheric Absorption

Sound emergence through the atmosphere is attenuated by conversion of sound energy to heat. This energy is dependent on the temperature and relative humidity of the air, but only weakly on ambient pressure through which the sound is travelling and is frequency dependent, with increasing attenuation towards higher frequencies. The attenuation by atmospheric absorption A_{atm} in decibels during propagation through distance in metres is given by:

$A_{atm} = d \times \alpha$,

α = atmospheric absorption coefficient in dBm^{-1}

d = distance from turbine (m)

Values of α from ISO 9613 Part 1, corresponding to a temperature of 10^0C and a relative humidity of 70% has been used for these predictions and are given in **Table 10.4** below. These values are recommended in the IOA Good Practice Guide.

Table 10.4: Frequency dependent atmospheric attenuation coefficients (dB/m)

Octave Band Centre Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
Atmospheric Absorption Coefficient (dB/m^{-1})	0.0001	0.0004	0.001	0.0019	0.0037	0.0097	0.0328	0.117

A_{misc} – Miscellaneous Other Effects

ISO 9613 includes effects of propagation through foliage, industrial plants and housing as additional attenuation effects. These have not been included here and any such effects are unlikely to significantly reduce noise levels below those predicted.

The ISO 9613-2 standard calculates under downwind propagation conditions and therefore predicts the average downwind sound pressure level at each dwelling. The model assumes that the wind is directly downwind from each turbine to each dwelling. The prediction model is calculated as a worst-case scenario.

The predicted noise levels $L_{Aeq\ 10min}$ are converted to the required $L_{A90,10min}$ by subtracting 2 dBA.

10.2.7 Aerodynamic Modulation or Aerodynamic Noise

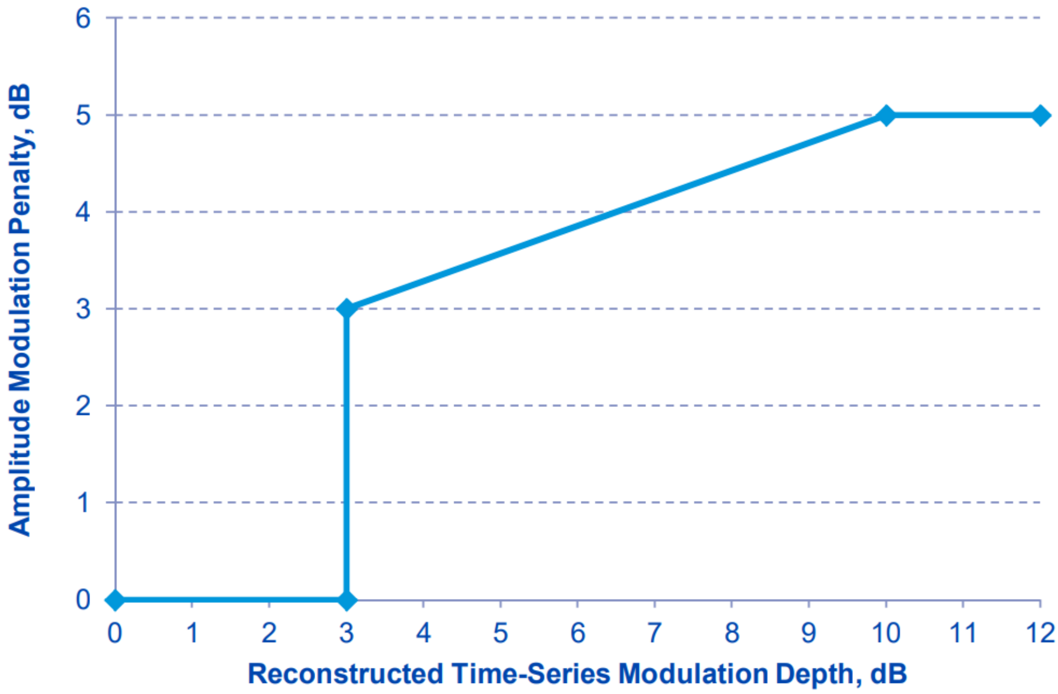
Aerodynamic noise originates from the flow of air over, under and around the blades and is generally broadband in character. It is directly linked to the movement of the rotors through the air and will occur to varying degrees whenever the turbine blades move. Aerodynamic noise is generally both broadband i.e. it does not contain a distinguishable note or tone, and of random character, although the level is not constant and fluctuates in time with the movement of the blades. The dominant character of such aerodynamic noise is therefore normally a 'swish' type of sound, which is familiar to most people who have stood near to a large wind turbine.

The sound level of aerodynamic noise from wind turbine blades is not completely steady but is modulated (fluctuates) in a cycle of increased and then reduced level, sometimes called "*blade swish*", typically occurring in step with the angle of rotation of the blades and so being periodic at the rotor's rotational speed – for typical commercial turbines, this is at a rate of around once or twice per second. This phenomenon is known as Amplitude Modulation of Aerodynamic Noise or more succinctly by the acronym AM. In some situations, however, the modulation characteristics can change in character to the point where it can potentially give rise to increased annoyance.

In early wind turbine designs, where the rotor was positioned downwind of the tower, a pronounced 'beat' was audible as each blade passed through the turbulent wake shed from the tower. However, this effect does not exist for the upwind rotor designs found on the majority of modern wind farms where the air flow to the blades is not interrupted by the tower structure. Instead, it seems that aerodynamic modulation is due to fluctuation of the primary mechanisms of aerodynamic noise generation.

The most recent information in relation assessing AM comes in the IEC TS 61400-11. The scope of this document includes an assessment of the sound characteristics of the noise and relies on the Institute of Acoustics Reference Method (IOA RM) to quantify the AM level along with the WSP Phase 2 Report which identified a penalty scheme as shown Figure 1 below.

Figure 1: Proposed Penalty Scheme



Current scientific knowledge is such that AM cannot be predicted at the planning stage but can only be measured once the wind farm becomes operational.

The methodology contained within the IOA RM and IEC 61400 allows quantification of all aspects of AM and the penalty scheme identified above allows quantification of the mitigation required, if any. An appropriate penalty based on the Reconstructed Time-Series Modulation Depth as defined by the IOA RM and the IEC 61400 documentation and shown in Figure 1 above can be added onto the measured LA90 noise level, to ensure overall noise levels comply with the applicable noise limit.

10.2.8 Infrasound and Low Frequency Noise and Vibration

There is always low frequency (or infrasound) noise present in the ambient quiet background. It is generated by natural sources such as road traffic, wind effects through air and vegetation, wave motion, water flow in streams and rivers. Low frequency emissions are also present from many sources found in modern life, such as household appliances (e.g., washing machines, air conditioners, fridges, heating systems, boilers, burners, heat pumps, extraction systems, electric or battery clocks, sky box, etc.), Other sources include water flowing through pipes within your home and in water flow from municipal water supply. Vibration of elements of structures (low frequency, less than 20Hz)) can be generated by local activity in one's home by way of normal routine activity, like climbing stairs, walking on the floor, closing doors etc.

When sitting in a moving vehicle very high levels of low frequency vibration/sound is experienced.

The frequency range of audible noise is in the range of 20 to 20,000Hz and low frequency noise is generally from about 2 to 200Hz with infrasound typically of frequencies below 20Hz. There appears to be little or no agreement about the biological effects of low frequency noise on human health and there is evidence to suggest that there are no serious consequences to people's health from infrasound exposure.

A study of low frequency noise (infrasound) and vibration around a modern wind farm was carried out for ETSU and reported in ETSU W/13/00392/REP – '*Low Frequency Noise and Vibration Measurements at a Modern Wind Farm*'[15]. The results showed levels of infrasound to be below accepted thresholds of perception even on the Site. Furthermore, a document prepared for the World Health Organisation[16]. , states that *"there is no reliable evidence that infrasound below the hearing threshold produce physiological or psychological effects".*

Significant research carried out on low frequency noise has been in the area of blasting (air overpressure) which falls into a very low frequency range (2-20 Hz), although with a considerably higher magnitude. Most microphones recording air-overpressure (low frequency sound) is linear down to 2 Hz with a range that does not go below a level of 88dB, as below that value trigger can occur from relatively low wind speeds (a gust of wind at 9m/s equates to an air overpressure of 133dB).

The level of ground vibration from the operation of the wind farms is below human threshold of 0.2mm/s[17] at the base of a turbine.

South Australian Environment Protection Authority (EPA) Infrasound Study

A report released in January 2013 by the South Australian EPA[18] entitled "Infrasound levels near windfarms and in other environments", found that the level of infrasound from wind turbines is insignificant and no different to any other sources of noise, and that the worst contributors to household infrasound are air-conditioners, traffic and noise generated by people. The study included several houses in rural and urban areas, houses both adjacent to a wind farm and away from turbines and measured the levels of infrasound with the wind farms

[15] ETSU W/13/00392/REP – '*Low Frequency Noise and Vibration Measurements at a Modern Wind Farm'.*

[16] Community Noise – Document Prepared for the World Health Organisation, Eds. Bergland B. & Lindvall T., Archives of the Centre for Sensory Research Vol. 2(1) 1995

[17] Wiss, J. F., and Parmelee, R. A. (1974) Human Perception of Transient Vibrations, "*Journal of Structural Division"*, ASCE, Vol 100, No. S74, PP. 773-787

[18] Infrasound levels near windfarms and in other environments, Environment Protection Authority, 2013, http://www.epa.sa.gov.au/environmental_info/noise/wind_farms

operating and also switched off. There were no noticeable differences in the level of infrasound under all these different conditions. In fact, the lowest levels of infrasound were recorded at one of the houses closest to a wind farm, whereas the highest levels were found in an urban office building. The South Australian study found: '*the contribution of wind turbines to the measured infrasound levels is insignificant in comparison with the background level of infrasound in the environment'*.

Massachusetts Institute of Technology (MIT)

A report by an Independent Expert Panel prepared for Massachusetts Department of Health (2012)[19] entitled "Wind Turbine Health Impact Study: Report of Independent Expert Panel" consisted of a panel that included seven individuals with backgrounds in public health, epidemiology, toxicology, neurology and sleep medicine, neuroscience, and mechanical engineering, all of which were considered independent experts from academic institutions. The report found that *"there is insufficient evidence that the noise from wind turbines is directly (i.e., independent from an effect on annoyance or sleep) causing health problems or disease'* and '*available evidence shows that infrasound levels near wind turbines cannot impact the vestibular system"*.

Technical Research Centre of Finland

A long-term study into so-called "wind turbine syndrome"[20] health problems supposedly caused by low-frequency sound from spinning blades has concluded that this "infrasound" has absolutely no physical impact on the human body.

The study entitled "Infrasound Does Not Explain Symptoms Related to Wind Turbines", conducted by the Technical Research Centre of Finland (VTT)[21] and others, commissioned by the Finnish government, found that infrasound sound waves with frequencies below the range of human hearing cause no measurable changes in the human body, and cannot in any way be detected by the human ear.

Infrasound measurements were taken inside and outside local dwellings near two Finnish wind farms, as well as inside the facilities and beyond them, for 308 days.

Measurements showed that the infrasound levels in rural areas with wind farms were about the same as levels in a regular urban environment.

[19] Ellenbogen, J.M., Grace, S., Heiger-Bernays, W.J., Manwell, J.F., Mills, D.A., Sullivan, K.A., Weisskopf, M.G., and Santos, S.L, Wind Turbine Health Impact Study: Report of Independent Expert Panel, January 2012

[20] Report by Leigh Collins, 21st April 2020 on a study commissioned by the Finnish Government into infrasound and wind turbine syndrome

[21] Infrasound Does Not Explain Symptoms Related to Wind Turbines, Finnish Government, June 2020, https://www.vttresearch.com/en/news-and-ideas/vtt-studied-health-effects-infrasound-wind-turbine-noise-multidisciplinary

"Infrasound samples representing the worst-case scenarios were picked out from the measurement data and used in the listening tests," said VTT.

"The participants in the listening tests were divided into two groups based on how they reported wind turbine infrasound related symptoms: people who suffered from those and people who never had symptoms."

"The participants were unable to make out infrasonic frequencies in wind turbine noise, and the presence of infrasound made no difference to how annoying the participants perceived the noise, and their autonomous nervous system did not respond to it. There were no differences between the results of the two groups."

10.2.9 Field Work

Baseline noise monitoring was undertaken between 21st February and 21st March 2022 at the locations shown in **Appendix 10.1**. The continuous monitoring period coincided with the wind speed monitoring over the same period at the same 10-minute intervals using a LiDAR located on site. Noise data was recorded for a representative range of wind speeds during the monitoring period.

10.2.10 Consultation

Consultation was carried out with landowners who were familiar with the Site. Access to the nearest dwellings was carried out with permission from the householders / landowners.

10.2.11 Noise Assessment Methodology

In summary, the assessment process comprised:

- Identification of potential receptors, i.e., houses and other potentially noise-sensitive locations;
- Measurement of existing background noise levels at representative locations close to the Site;
- Prediction of the noise levels from wind turbines received at each receptor; and
- Comparison of the predicted noise levels with noise limits.

Potential receptors in the area around the Proposed Development were initially identified from Ordnance Survey maps, google maps, EPA maps and Site visits. Background measurements were carried out at the locations shown in **Appendix 10.1**.

The method of measuring background noise is described in ISO 1996 and ETSU-R-97. In practice, it means carrying out continuous monitoring of background noise levels at receptors for a period that includes a range of wind speeds which correspond to the maximum sound power of the candidate turbines being proposed which is usually 3 to 4 weeks duration. The candidate turbine assessed reaches maximum sound power level at a mean wind speed of 8 m/s at 10 m height and generates the highest noise level for that turbine specification.

The method of predicting noise levels of wind turbines at receptors is discussed in Section 10.2.6. This method was applied to the calculations for both contour plots and individual receptor predictions.

It is standard practice to predict noise levels for a reference wind speed and to adjust these for other wind speeds, according to the variation in sound power level with wind speed.
For EIA purposes one candidate turbine, the Vestas V150-6.0 megawatts (MW) operating in unrestricted mode PO6000, with serrated trailing edge (STE) has been selected with a hub height of 105 m for the EIA technical assessment. The turbine used in this assessment is the Vestas V150-6.0 MW operating in unrestricted mode PO6000, with STE and a hub height of 105 m. This is a conservative assessment as the 105 m hub height shall have a higher sound power level than the 100m hub height turbine to be installed as part of the Proposed Development. The tip of the blades with STE lowers noise emissions without reducing energy output, and the selected turbine will have STE as standard. The worst-case sound power level at each wind speed from 4 m/s to 12 m/s was input into the noise model. A copy of the manufacturers performance specification for the turbines used in the assessment when operating in unrestricted mode PO6000 with STE is given in the **Appendix 10.6**.

The prediction modelling is based on the turbines operating at full power and all turbines fitted with STE which reduces noise emissions of each turbine. The IOA Good Practice Guide recommends that an uncertainty value is required to be added to the turbine emission data prior to modelling. Depending on the type of manufacturer's data, the uncertainty value will range from 0 to 2dBA. However, as no uncertainty is given in the manufacturer's data sheet, an uncertainty value of 2dBA is applied in line with the IOA GPG. **Table 10.5** presents the noise emission data for the turbine up to maximum sound power output at varying wind speed at 105m hub height. **Table 10.6** presents the maximum sound power output at varying wind speed (presented at standardised 10m height) for the turbine with a hub height of 105 m. A value of 2dBA is subtracted to account for conversion from LAeq to LA90 which is best practice.

Table 10.5: Noise Emission Data, Vestas V150-6.0MW, STE at Maximum Sound Power (LWA dB) at Hub Height (105m) at varying wind speeds

Hub Height Wind Speed, ms^{-1}	4	5	6	7	8	9	10	11	12
Sound Power Level, dB LWA at Varying Wind Speeds	92.2	94	96.9	99.9	102.7	104.6	104.8	104.9	104.9
Uncertainty added and conversion of LAeq to LA90	92.2	94	96.9	99.9	102.7	104.6	104.8	104.9	104.9

Table 10.6: Noise Emission Data, Vestas V150-6.0MW, STE at Maximum Sound Power (LWA dB) at Standardised 10m Height wind Speed

Standardised 10m Height Wind Speed ms^{-1}	4	5	6	7	8	9	10	11	12
Sound Power Level dB LWA derived from 105m hub height	95.4	99.5	103.2	104.7	104.9	104.9	104.9	104.9	104.9
Uncertainty added and Conversion of LAeq to LA90	95.4	99.5	103.2	104.7	104.9	104.9	104.9	104.9	104.9

The octave band values are given in **Table 10.7** for the V150–6.0MW with uncertainty values and conversion for LAeq to LA90 added as input to the prediction model.

Table 10.7: Octave Band Spectrum of Vestas V150-6.0MW, STE at Maximum Sound Power (LWA dB) at 8m/s wind speed

Octave Band Frequency (Hz)	63	125	250	500	1k	2k	4k	8k	L_{WA}
Sound Power Level, dB LWA at max sound power level	85.5	93.3	98.2	100.1	99.0	94.8	87.7	77.6	**104.9**
Uncertainty added to octaves and conversion of LAeq to LA90	85.5	93.3	98.2	100.1	99.0	94.8	87.7	77.6	

10.2.11.1 Noise Limits

The method of deriving operational noise limits, described in Section 10.2.3.1, is based on the 2006 Guidelines Wind Energy Development Guidelines 2006 and lower limits specified in a recent An Bord Pleanála decision (ABP-313750-22). The noise limits for the Gortloughra Wind Farm are designed to meet:

'Wind turbine noise arising from the proposed development, by itself or in combination with other existing or permitted wind energy development in the vicinity, shall not exceed the greater of:
43dB(A) L90,10min for day and night at wind speeds of 7m/s or greater, and
40 dB(A) L90, 10min at all other wind speeds
where wind speeds are measured at 10 metres above ground level. Where properties are financially involved, a 45dB(A) L90,10min limit can be applied.'

10.2.12 Construction Assessment Methodology

10.2.12.1 Relevant Guidance

There is no published national guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. However National Roads Authority (NRA) give limit values which are acceptable (the NRA Guidelines 2004)[22]. Guidance to predict and control noise is also given in BS 5228:2009-1+A1:2014, *Code of Practice for Noise and Vibration Control on Construction and Open Sites* (two parts) where Part 1 deals with Noise[23].

10.2.12.1.1 NRA Guidelines for the Treatment of Noise and Vibration in National Road Schemes

The NRA Guidelines provide noise limits which are acceptable and states, where it is deemed necessary to predict noise levels associated with construction noise, that this should be done in accordance with BS 5228.

10.2.12.1.2 BS 5228: 2009-1A; 2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites

Part 1 of BS 5228 deals with noise prediction and control. It recommends procedures for noise control in respect of construction operations. The standard stresses the importance of community relations, and states that early establishment and maintenance of the relations throughout the carrying out of Site operations will go some way towards allaying

[22] National Roads Authority, *Guidelines for Noise and Vibration in National Road Schemes.*
[23] BS 5228-1: 2009-1+A1:2014, Code of Practice for Noise and Vibration Control on Construction and Open Sites: *Code of Practice for Basic Information and Procedures for Noise Control*.

people's concerns. Some of the more relevant factors that are likely to affect the acceptability of construction noise are:

- The attitude of local residents to the Development
- Site location relevant to noise sensitive receptors
- Duration of Site operations
- Hours of work
- The characteristics of the noise produced.

Recommendations are made regarding the supervision, planning, preparation and execution of works, emphasising the need to consider noise at every stage of the activity. Measures to control noise are described including:
Control of noise at source by, for example:

- Substitution of plant or activities for less noisy ones
- Modification of plant or equipment by less noisy ones
- Using noise control enclosures
- Siting of equipment and its method of use
- Maintenance of equipment
- Controlling the spread of noise by increasing distance between plant and receptors, or by the provision of acoustic screening

Example criteria for the assessment of the significance of noise effects are also given, although these are not mandatory.

Methods of calculating the levels of noise resulting from construction activities are provided, as are updated source levels for various plant, equipment and construction activities.

10.2.12.2 Construction and Decommissioning Noise Assessment Methodology

The NRA guidelines for construction noise which are considered acceptable are given in **Table 10.8**.

Table 10.8: Noise levels that are considered acceptable based on the NRA guidelines

Day / Times	Guideline Limits
Monday to Friday 07:00 – 19:00hrs 19:00 – 22:00hrs	 70dB LAeq, (1h) and LAmax 80dB *60dB LAeq, (1h) and LAmax 65dB*
Saturday 08:00 – 16:30hrs	 65dB LAeq,1h and LAmax75dB
Sunday and Bank Holidays 08:00 – 16:00hrs	 *60dB LAeq,1h and LAmax 65dB*

*Construction at these times, other than required by an emergency works, will normally require explicit permission from the relevant local authority, in this case Cork County Council.

<u>Construction Times for The Development</u>

The construction times for this Development are:

Monday to Friday: 07.00 to 19.00hrs, Saturday 08.00 to 13.00hrs with no work on Sunday, or Bank Holidays.

Part 1 of BS 5228 provides several example criteria for the assessment of the significance of noise effects from construction activities. Noise levels generated by construction activities are considered significant if:

- The LAeq, period level of construction noise exceeds lower threshold values of 65dB during daytime, 55dB during evenings and weekends or 45dB at night.
- The total noise level (pre-construction ambient noise plus construction noise) exceeds the pre-construction noise level by 5dB or more for a period of one month or more.

Construction noise from wind farm development, or decommissioning is not considered an intensive activity. The main noise sources will be associated with the construction of the Turbine Foundations and Turbine Hardstands. Lesser noise source activity will be construction of site access tracks, temporary construction compound, turbine erection and the construction of an Onsite Control Building and Substation.

Decommissioning will involve the remediation of Turbine Hardstand Areas and Turbine Foundations, where they will be covered in topsoil and allowed to revegetate. site access tracks will be left in-situ for use by the landowners. Underground Internal Wind Farm Cables will be removed, and the ducting left in-situ. Therefore, the decommissioning phase is to be shorter and less intrusive than the construction phase with the resultant effects being less.

All workers associated with the Proposed Development will be subject to the Health and Safety Authority Guidance[24] which states that for noise exposure noise levels likely to exceed 80 dBA (expressed as Leq,d 8 hour dBA) there is the potential of risk of damage to hearing. All workers on site will be given guidance on how to comply with the 'First Action Level'.

10.2.13 Evaluation of Potential Effects

The potential impacts of construction are evaluated by comparing the predicted noise levels against the guideline limits given in **Table 10.8:** Noise levels that are considered acceptable based on the NRA guidelines**,** and sample criteria in Part 1 of BS 5228 in Section 10.2.12.1.2.

The potential operational impacts are evaluated by comparing the predicted noise levels against the day and night-time noise limits given in Section 10.3.6. The predicted noise levels are calculated according to the IOA Good Practice Guide as detailed in Section 10.2.6 and potential impacts are assessed against the noise limits at the nearest receptors.

10.2.13.1 Sensitivity

The sensitivity of the Proposed Development during construction is based on the guideline values in **Table 10.8:** Noise levels that are considered acceptable based on the NRA guidelines**,** and sample criteria in Part 1 of BS 5228. The sensitivity of the Proposed Development during operation is based on the values in Section 10.3.4 and Section 10.4.2.

10.2.13.2 Magnitude

The magnitude of potential impacts of construction is based on the values in **Table 10.13**. The magnitude of the Development during operation is based on the values in **Table 10.16**.

10.2.13.3 Significance Criteria

The significance of construction is based on the potential impacts based on the predicted values and compliance with the guideline limits in **Table 10.8** and sample criteria in Part 1 of BS 5228.

[24] Noise - Frequently Asked Questions - Health and Safety Authority (hsa.ie)

The significance of the potential impacts of the Proposed Development have been assessed by taking into account the noise limits at receptors and the degree to which compliance has been met.

10.3 BASELINE DESCRIPTION

10.3.1 Identification of Potential Receptors

A number of predictions were prepared for the layout of the Proposed Development. Based on the initial layout, potential noise-sensitive receptors within 2.0 km of the Proposed Development, including occupied and un-occupied dwellings, were identified from maps. Receptor locations were verified through visits to the area surrounding the Development.

10.3.2 Selection of Baseline Noise Survey Locations

Six baseline noise survey locations were selected on the basis of their locations relative to the turbine layout. The six locations selected also ensure that the distance was sufficient to ensure no noise contribution from any other operating wind turbines (see **Appendix 10.1**).

10.3.3 Baseline Noise Survey

Baseline noise measurements were carried out continuously between 21st February and 21st March 2022 at the receptor locations given in **Table 10.9** (Photos of monitors in-situ in **Appendix 10.1**).

Table 10.9: Baseline Noise Survey

Location	ITM Reference	Description of Location
NML 1 – H5	513258E, 560218N	Monitor located in front of the house. Main noise source was sounds from a river in the valley.
NML 2 – H39	513035E, 558529N	Monitor located approximately 40 m from the house. Main noise sources were from streams and wind interaction on conifers.
NML 3 – H67	514062E, 558379N	Monitor located approximately 20 m from the house. Main noise sources were a waterfall close to back garden and a second waterfall in the distance.
NML 4 – H20	516995E, 559974N	Monitor located approximately 30 m from the house. Noise levels controlled by nearby streams and sheep farming activity.
NML 5 – H15	516742E, 559597N	Monitor located approximately 20 m from the west of the house. Rural setting on mountainous setting with streams in the distance.
NML 6 – H36	516258E, 557871N	Monitor located approximately 12 m directly in front of the house. Some road traffic and low level background noise from distant streams.

The survey was carried out in accordance with ISO 1996, ETSU-R-97 and the IOA Good Practice Guide with the following implemented:

- Measurement of background noise levels at 10-minute intervals was undertaken using Type 1 instruments.
- Concurrent measurements of noise and mean wind were made at 10-minute intervals with the mean wind speed recorded from a LiDAR on the Development Site. The methodology is given in Section 10.2.5.
- The background noise measurement recorded continuously included 10-minute intervals, as LA90, 10min along with a series of other parameters including LAeq,10min.
- Noise measurements were recorded at a height of 1.2-1.5m above ground level and more than 5 m from any reflective surface, other than the porous ground.
- An electronic rain gauge was installed onsite at NML 8 - H104 to monitor rainfall at 10-minute intervals over the duration of the noise survey.
- The standardised 10 m wind speed was plotted against the time synchronised background noise levels using a best-fit polynomial line.

10.3.3.1 Instrumentation Used

The following instrumentation was used in the baseline survey measurements:

- Larson Davis Precision Integrating Sound Level Analyser/Data logger with 1/2" Condenser Microphones. Microphone was fitted with double skin windscreens based on that specified in W/31/00386/REP 'Noise Measurements in Windy Conditions[25]'.
- Calibration Type: Larson Davis Precision Acoustic Calibrator.
- Rain Gauge Type: TR-525met tipping bucket rain gauge, 0.2 mm pulse with LOGBOX datalogger.

All acoustic instrumentation was calibrated before and after the survey and the drift of calibration was less than 0.3 dB, which is within accepted guidelines. Calibration certificates of the acoustic instruments are included in **Appendix 10.5**.

10.3.4 Prevailing Background Noise Levels

Table 10.10 gives the background noise levels obtained from quiet daytime and night-time measurement periods at the baseline measurement locations completed during the monitoring period in Section 10.3.3. Within the vicinity of the noise monitoring locations, there were many small streams flowing down the mountain side. This area has a high rainfall level. Stream flow

[25] W/31/00386/REP 'Noise Measurements in Windy Conditions', ISVR, Davis and Lower 1996.

or distant river flow generate very steady noise levels which can be difficult to clarify with audibility as it is a very low frequency sound source. The distance of the six monitoring locations selected to ensure all sides of the wind farm were measured and the lowest background noise level was relied upon as being the prevailing background noise level to ensure conservatism.

The 2006 Guidelines define a low noise environment as an environment where the background noise is less than 30 dB(A). The area surrounding the Proposed Development is not defined as a low noise environment as the background is above 30 dB LA90 for most locations at all wind speeds, with the exception of some levels below 30 dB at low wind speeds.

Table 10.10: Prevailing Background Noise Levels

Monitoring Location		Prevailing Background (B/G) noise levels LA90dB, 10min Standardised Mean 10 m Height Wind Speed, (m/s)								
		4	5	6	7	8	9	10	11	12
NML 1 – H5	Day	35.7	35.9	36.2	36.7	37.3	38.1	39.0	40.0	41.1
	B/G+5	40.7	40.9	41.2	41.7	42.3	43.1	44.0	45.0	46.1
NML 1 – H5	Night	36.4	36.3	36.3	36.5	36.8	37.3	38.0	39.0	40.3
	B/G+5	41.4	41.3	41.3	41.5	41.8	42.3	43.0	44.0	45.3
NML 2 – H39	Day	31.8	33.0	34.6	36.6	38.7	40.9	42.9	44.5	45.7
	B/G+5	36.8	38.0	39.6	41.6	43.7	45.9	47.9	49.5	50.7
NML 2 – H39	Night	32.6	33.2	34.1	35.2	36.7	38.4	40.3	42.5	44.8
	B/G+5	37.6	38.2	39.1	40.2	41.7	43.4	45.3	47.5	49.8
NML 3 – H67	Day	42.1	42.1	42.3	42.6	43.2	43.9	44.9	46.0	47.4
	B/G+5	47.1	47.1	47.3	47.6	48.2	48.9	49.9	51.0	52.4
NML 3 – H67	Night	44.3	44.0	43.7	43.6	43.6	43.7	44.0	44.4	44.9
	B/G+5	49.3	49.0	48.7	48.6	48.6	48.7	49.0	49.4	49.9
NML 4 – H20	Day	39.6	39.6	39.8	40.2	40.7	41.5	42.5	43.9	45.7
	B/G+5	44.6	44.6	44.8	45.2	45.7	46.5	47.5	48.9	50.7
NML 4 – H20	Night	40.1	40.0	40.0	40.0	40.2	40.6	41.3	42.4	43.9
	B/G+5	45.1	45.0	45.0	45.0	45.2	45.6	46.3	47.4	48.9
NML 5 – H15	Day	34.6	34.9	35.6	36.6	37.8	39.0	40.2	41.2	41.8
	B/G+5	39.6	39.9	40.6	41.6	42.8	44.0	45.2	46.2	46.8
	Night	34.5	34.2	34.4	35.0	36.1	37.4	39.1	40.9	42.8

NML 5 – H15	B/G+5	39.5	39.2	39.4	40.0	41.1	42.4	44.1	45.9	47.8
NML 6 – H36	Day	32.1	33.6	35.5	37.7	40.1	42.4	44.5	46.2	47.2
	B/G+5	37.1	38.6	40.5	42.7	45.1	47.4	49.5	51.2	52.2
NML 6 – H36	Night	32.2	32.8	34.0	35.8	37.8	40.2	42.6	45.0	47.2
	B/G+5	37.2	37.8	39.0	40.8	42.8	45.2	47.6	50.0	52.2

Appendix 10.3 of this chapter plots the derived background noise levels, background plus 5 trendline with the predicted noise levels against a noise limit of 43dB(A) at each receptor.

10.3.5 Noise Assessment Locations

The monitoring locations were chosen so that the distance was sufficient to ensure no noise contribution from any other operating wind turbines.

10.3.6 Noise Limits

The noise limits for the Proposed Development are based on the limits contained within the Wind Energy Development Guidelines 2006 and on the background levels obtained in **Table 10.11**. A lower fixed limit of 45 dBA for daytime could be applied, however a more stringent limit is applied with the lowest background noise levels obtained at the location of NML 1 – H5 used as the basis for the assessment at all receptors with a limit of 43dBA being applied for day and night. Where receptors are financially involved, a 45 dBA limit can be applied as per the WEDG 2006 Guidelines.

Table 10.11: Derived Background Day and Night Noise Levels used in Assessment

Monitoring Location		Prevailing Background (B/G) noise levels LA90dB, 10min Standardised Mean 10 m Height Wind Speed, (m/s)								
		4	5	6	7	8	9	10	11	12
NML 1 – H5	Day	35.7	35.9	36.2	36.7	37.3	38.1	39.0	40.0	41.1
	B/G+5	40.7	40.9	41.2	41.7	42.3	43.1	44.0	45.0	46.1
Noise Limit		43	43	43	43	43	43.1	44.0	45.0	46.1
NML 1 – H5	Night	36.4	36.3	36.3	36.5	36.8	37.3	38.0	39.0	40.3
	B/G+5	41.4	41.3	41.3	41.5	41.8	42.3	43.0	44.0	45.3
Noise Limit		43	43	43	43	43	43	43	44.0	45.3

10.3.7 Development Design Mitigation

The preferred turbine model, the V150 will be fitted with STE as standard which is best practice. A serrated extension of the trailing edge to the rotor blades mitigates noise emissions by effectively breaking up the turbulence on the tooth flanks into smaller eddies. The intensity of the pressure fluctuations is reduced which mitigates the noise emissions. Since the intensity of the noise emissions is largely dependent on the flow speed, STE are only installed on the outer rotor blade area where the rotary speed is the highest. Typically, STE reduces the noise levels by 2 to 3 dBA depending on specific turbine used.

10.4 ASSESSMENT OF POTENTIAL EFFECTS

10.4.1 Construction Noise

10.4.1.1 Construction and Decommissioning Noise Levels

As has been previously stated, the construction process associated with wind farms is not considered intensive and is temporary works most of which is carried out a considerable distance from receptors. The main noise sources will be associated with the construction of the Turbine Foundations, Turbine Hardstands, Grid Connection Route Options and Temporary Construction Compound, with lesser sources being the construction of the Onsite Substation and Control Building. The main construction traffic to the Site will be during a very short period where ready-mix trucks deliver concrete for the turbine bases. While delivery of material from local quarries for upgrade of site access tracks, Turbine Hardstands, Temporary Construction Compound and Onsite Substation and Control Building will be for longer periods but will be of less intensity, generating lower levels of noise along the routes. During delivery of materials, trucks will access the Site from a different route than leaving the Site, thereby reducing traffic noise at receptors along the local road network. The delivery of turbines by large trucks travelling at very low speed will generate very low levels of noise at receptors along the Turbine Delivery Route.

It is not possible to specify the precise noise levels of emissions from the construction equipment until such time as a contractor is chosen and construction plant has been selected. However, **Table 10.12** indicates typical construction range of noise levels for this type of activity (levels from author's database and BS 5228[26]). Predictions are made for receptors nearest to the turbine bases / hardstands activity, compound development and for receptors at varying distance from the Grid Connection route.

[26] BS 5288-1: 2009-1+A1:2014, Code of Practice for Noise and Vibration Control on Construction and Open Sites: *Code of Practice for Basic Information and Procedures for Noise Control*

Table10.12: Typical Noise Levels from Construction Works

Activity	L_{Aeq} at 10m
General Construction (ready-mix trucks pouring concrete)	70-84 dBA
Tracked excavator removing topsoil, subsoil for foundation	80- 87 dBA
Rock breaker and excavator loading	82-89 dBA
Vibrating rollers including tipping material	76-86 dBA
Grid Connection: Trenching Tracked excavator 14t, pneumatic breaker, vibratory roller 71t, tractor	71-74 dBA
Excavator loading / tipping, excavator and Vibratory roller	80- 87 dBA

The difference in noise levels between two locations can be calculated as:

$$\mathbf{L}_{p2} - \mathbf{L}_{p1} = 10 \log (R_2 / R_1)^2 - (A_{atm} + A_{gr} + A_{br} + A_{mis})$$

$$= 20 \log (R_2 / R_1) - (A_{atm} + A_{gr} + A_{br} + A_{mis})$$

where:

L_{p1} = sound pressure level at location 1

L_{p2} = sound pressure level at location 2

R_1 = distance from source to location 1

R_2 = distance from source to location 2

and where:

A_{atm} = Attenuation due to air absorption

A_{gr} = Attenuation due to ground absorption

A_{br} = Attenuation provided by a barrier

A_{mis} = Attenuation provided by miscellaneous other effects

In the calculations attenuation by A_{atm}, A_{gr} and A_{mis} is taken as 3 dBA where distances are more than 200 m from a source and as zero within 200 m - amelioration by barriers is not accounted for.

Table 10.13 gives the noise levels predicted from construction activity at varying distances. The main noise sources are assumed to be the construction of the Turbine Foundations, Turbine Hardstands and Grid connection. The development of the site access tracks, construction of the Onsite Substation and Control Building will also take place, however the noise levels associated with this activity will be lower and of shorter duration than other works. The main road traffic noise will be associated with the delivery of ready-mix concrete for Turbine Foundations.

Road traffic is dealt with under a sub-heading **'Traffic and Transport'** in **Chapter 14**.
The maximum construction noise levels associated with the Development and Grid Connection are listed in **Table 10.13.** At receptor locations further away, noise levels will be less than that predicted. Works associated with Decommissioning will be no more than the levels predicted in **Table 10.13**.

Table 10.13: Predicted Construction Noise Levels

Activity taken as 100% per hour	Distance of Activity (m)	LAeq dB 1hr range
General Construction (ready-mix trucks pouring concrete)	486m to H67	33.4-47.4dBA
Tracked excavator removing topsoil, subsoil for foundation	486m to H67	43.4-50.4dBA
Rock breaker and excavator loading at nearest turbine T2	486m to H67	45.4-52.4dBA
Vibrating rollers including tipping material set down area close to T2	486m to H67	39.4-49.4dBA
Grid Connection: Trenching Tracked excavator 14t, pneumatic breaker, vibratory roller 71t, tractor	At varying distances along route: 15m 20m 40m 80m	67.5-70.5dBA 65-68dBA 59-62dBA 53-56dBA
Construction of compound (loading / tipping, excavator and Vibratory roller)	486m to H67	43.4-50.4dBA

Construction Traffic

The delivery of turbines to the Site will generate low level traffic noise as the vehicles carrying the turbines will move slowly along the local roads where impact is expected to be greatest. The main construction noise generated by traffic to and from the Site will be due to ready-mix trucks delivering concrete with trucking of spoil being carried out at the same time. The concrete pour for each individual turbine will be required to be completed in a short a period as possible (usually within 10 hours).

Each turbine will require approximately 950 m^3 of concrete while each ready-mix truck has a capacity of 8 m^3. This results in 118.75 loads of concrete and 238 truck movements for each turbine. For delivery of concrete the timeframe envisaged for each turbine concrete pour is taken as 10 hrs. This equates to an average of 23.8 movements per hour, or 24 movements per hour.

The general expression for predicting the 1 hr LAeq alongside a haul road used by single engine items of mobile plant is:

$L_{Aeq} = L_{WA} - 33 + 10\log_{10}Q - 10\log_{10}V - 10\log_{10}d$

where:

L_{WA} = the sound power level of the truck, in decibels (dB);

Q = 24, the number of vehicles per hour;

V = 60, the average vehicle speed, in kilometres per hour (km/h);

d = the distance of receiving position from the centre of haul road, in metres (m).

LAeq = 105-33 +10log24 – 10log60 – 10log20 = 54 LAeq 1hr.

At 10 m from the roadside the noise levels equate to 57 LAeq 1hr. The trucking for the concrete pour will extend for a total of 8 days (1 day for each turbine). In practice the levels generated by truck movement should be lower than predicted due to the smooth surface on the local roads.

<u>Grid Connection-Cable laying along road by trenching</u>

Cable laying and trenching will occur along the Grid Connection route from the On-site Substation and Control Building to either Dunmanway 110kV Substation (Option A) or Carrigdangan 110kV Substation (Option B) which means maximum levels will pertain no more than 0.5 days equivalent (4 hours) at any single receptor.

Construction noise levels are based on continuous operation. In practice, most plant will operate at a maximum level for short intervals.

10.4.1.2 Assessment of Construction Noise

The higher levels predicted are from the Grid Connection Routes and delivery of concrete for Turbine Foundations. These maximum noise levels will persist for no more than 4 hours at any receptor. All predicted noise levels are well within NRA/TII guidelines[27] given as acceptable and are considered slight. Construction noise is a temporary activity.

27 Transport Infrastructure Ireland (TII) document Good Practice Guidance for the Treatment of Noise during the planning of National Road Schemes, 2014

All activity is predicted without additional mufflers, or without topographic screening. The maximum road traffic noise which is generated by ready-mix trucks delivering concrete for Turbine Foundations will be short term and of 8 days' duration. The predicted noise levels are well 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 of 0.2mm/s peak particle velocity at all receptors[28]. The effects of noise and vibration from onsite construction activities are therefore considered not significant.

10.4.1.3 Description of Effects - Construction

The criteria for description of effects for all construction noise activity and the potential worst-case effects, at the nearest receptors is given below.

Table 10.14: Description of Effects – Construction

Quality	Significance	Duration
Negative	Not Significant	Temporary

10.4.1.4 Decommissioning

Noise effects during the Decommissioning phase of the Proposed Development are likely to be of a similar nature to that during construction but of shorter duration. It is likely that site access tracks and Turbine Foundations (excluding plinths) will be left in place and covered over with topsoil unless there are environmental reasons to remove. It is likely that the duration of the Decommissioning phase will be of shorter duration than that during construction. Any legislation, guidance, or best practice relevant at the time of decommissioning will be complied with.

10.4.1.5 Description of Effects - Decommissioning

The criteria for description of effects for all decommissioning noise activity and the potential worst-case effects, at the nearest receptors is given below.

Table 10.15: Description of Effects – Decommissioning

Quality	Significance	Duration
Negative	Not Significant	Temporary

[28] Wiss, J. F., and Parmelee, R. A. (1974) Human Perception of Transient Vibrations, "*Journal of Structural Division*", ASCE, Vol 100, No. S74, PP. 773-787

10.4.1.6 Predicted Operational Noise Levels

Table 10.16 gives the predicted noise levels at the nearest receptors to the Proposed Development at varying wind speeds for each receptor location. A noise contour map of the 8 no. turbine Development at maximum sound power output at a wind speed of 8m/s at 10m height is presented in **Appendix 10.4**. The contour map in **Appendix 10.4** assumes that all turbines are simultaneously downwind to each location all of the time (continuously) which results in an overprediction of the noise levels.

Table 10.16: Predicted Noise Levels as LA90 at Varying Wind Speeds from the Development

	ING	ING	4m/s	5m/s	6m/s	7m/s	8m/s	9+m/s
House ID	Easting	Northing	dBA	dBA	dBA	dBA	dBA	dBA
H1	512574	560249	24.8	28.9	32.6	34.1	34.3	34.3
H2	512548	560240	24.6	28.7	32.4	33.9	34.1	34.1
H3	512576	560296	24.7	28.8	32.5	34	34.2	34.2
H4	512607	560021	23.2	27.3	31	32.5	32.7	32.7
H5	513258	560218	27.8	31.9	35.6	37.1	37.3	37.3
H6	513280	560045	28.5	32.6	36.3	37.8	38	38
H7	514664	561741	22.2	26.3	30	31.5	31.7	31.7
H8	517491	561675	17.5	21.6	25.3	26.8	27	27
H9	517560	561620	17.1	21.2	24.9	26.4	26.6	26.6
H10	516223	559500	30.2	34.3	38	39.5	39.7	39.7
H11	516345	559495	29.1	33.2	36.9	38.4	38.6	38.6
H12	516426	559436	28.2	32.3	36	37.5	37.7	37.7
H13	516455	559391	27.8	31.9	35.6	37.1	37.3	37.3
H14	516453	559491	28.2	32.3	36	37.5	37.7	37.7
H15	516742	559597	26.2	30.3	34	35.5	35.7	35.7
H16	516913	559519	24.8	28.9	32.6	34.1	34.3	34.3
H17	517205	559763	23.1	27.2	30.9	32.4	32.6	32.6
H18	517186	559907	23	27.1	30.8	32.3	32.5	32.5
H19	516995	559974	24.3	28.4	32.1	33.6	33.8	33.8
H20	517058	560064	23.8	27.9	31.6	33.1	33.3	33.3
H21	517237	560043	22.7	26.8	30.5	32	32.2	32.2

	ING	ING	4m/s	5m/s	6m/s	7m/s	8m/s	9+m/s
House ID	Easting	Northing	dBA	dBA	dBA	dBA	dBA	dBA
H22	517355	560026	22	26.1	29.8	31.3	31.5	31.5
H23	517505	560096	21.2	25.3	29	30.5	30.7	30.7
H24	517525	560068	21.1	25.2	28.9	30.4	30.6	30.6
H25	517602	560034	20.8	24.9	28.6	30.1	30.3	30.3
H26	517766	560044	19.9	24	27.7	29.2	29.4	29.4
H27	517833	560174	19.5	23.6	27.3	28.8	29	29
H28	517746	560332	19.7	23.8	27.5	29	29.2	29.2
H29	515967	558698	28.9	33	36.7	38.2	38.4	38.4
H30	516071	558608	27.8	31.9	35.6	37.1	37.3	37.3
H31	516831	558505	25.3	29.4	33.1	34.6	34.8	34.8
H32	516331	558002	25.8	29.9	33.6	35.1	35.3	35.3
H33	516489	557893	25.3	29.4	33.1	34.6	34.8	34.8
H34	516258	557871	25.5	29.6	33.3	34.8	35	35
H35	515815	557831	26.7	30.8	34.5	36	36.2	36.2
H36	512706	558535	22.3	26.4	30.1	31.6	31.8	31.8
H37	513035	558529	24.3	28.4	32.1	33.6	33.8	33.8
H38	512590	558155	21.5	25.6	29.3	30.8	31	31
H39	514019	558165	29.3	33.4	37.1	38.6	38.8	38.8
H40	514606	558023	28.7	32.8	36.5	38	38.2	38.2
H41	514826	557698	27.3	31.4	35.1	36.6	36.8	36.8
H42	514556	557258	24.9	29	32.7	34.2	34.4	34.4
H43	514715	557154	25.6	29.7	33.4	34.9	35.1	35.1
H44	514833	557430	25.9	30	33.7	35.2	35.4	35.4
H45	514870	557636	26.8	30.9	34.6	36.1	36.3	36.3
H46	515012	557597	27	31.1	34.8	36.3	36.5	36.5
H47	516168	557781	26.1	30.2	33.9	35.4	35.6	35.6
H48	512339	560424	23.1	27.2	30.9	32.4	32.6	32.6
H49	512089	560001	22.1	26.2	29.9	31.4	31.6	31.6
H50	511856	559964	21.2	25.3	29	30.5	30.7	30.7
H51	515138	562209	19.8	23.9	27.6	29.1	29.3	29.3

	ING	ING	4m/s	5m/s	6m/s	7m/s	8m/s	9+m/s
House ID	Easting	Northing	dBA	dBA	dBA	dBA	dBA	dBA
H52	511651	559779	20.4	24.5	28.2	29.7	29.9	29.9
H53	514062	558379	31.8	35.9	39.6	41.1	41.3	41.3
H54	517177	559907	23.1	27.2	30.9	32.4	32.6	32.6
H55	517375	560081	21.9	26	29.7	31.2	31.4	31.4
H56	517485	560120	21.3	25.4	29.1	30.6	30.8	30.8
H57	517582	560131	20.8	24.9	28.6	30.1	30.3	30.3
H58	517565	560150	20.9	25	28.7	30.2	30.4	30.4
H59	517665	560186	20.3	24.4	28.1	29.6	29.8	29.8
H60	517712	560152	20.1	24.2	27.9	29.4	29.6	29.6
H61	517770	560146	19.8	23.9	27.6	29.1	29.3	29.3
H62	517793	560211	19.8	23.9	27.6	29.1	29.3	29.3
H63	517724	560209	20.2	24.3	28	29.5	29.7	29.7
H64	516185	558817	28	32.1	35.8	37.3	37.5	37.5
H65	516326	559301	28.7	32.8	36.5	38	38.2	38.2
H66	517061	559769	23.8	27.9	31.6	33.1	33.3	33.3
H67	516482	559447	27.8	31.9	35.6	37.1	37.3	37.3
H68	517190	559916	23	27.1	30.8	32.3	32.5	32.5
H69	517202	560097	22.9	27	30.7	32.2	32.4	32.4
H70	517121	559978	23.4	27.5	31.2	32.7	32.9	32.9
H71	517638	560049	20.6	24.7	28.4	29.9	30.1	30.1
H72	517727	560072	20.1	24.2	27.9	29.4	29.6	29.6
H73	517677	560204	20.3	24.4	28.1	29.6	29.8	29.8

10.4.2 Operational Noise Assessment

The assessment was made of the predicted operational noise levels from the Proposed Development based on the limits described in Section 10.2.3.1 in the 2006 Guidelines and taking into consideration the recent 2023 An Bord Pleanála decision described in Section 10.2.3.2.

As can be seen from **Table 10.16** that the predicted noise levels are lower than the noise limit of 43 dB at all receptors at all wind speeds used as part of the predicted modelling and are therefore compliant with the noise limits and are not significant in terms of EIA.

Table 10.17 gives the difference between the predicted noise levels in **Table 10.16** and noise limits for each receptor. A negative margin indicates that the predicted noise levels are within the lower fixed 43dBA limit (45dBA for financially involved properties), which means the levels are within the day and night limits.

The predicted noise levels assume that all turbines are directly down-wind to nearest receptors.

Table 10.17: Margin between Predicted Noise Levels and 43dBA Noise Limit

	ITM	ITM	4m/s	5m/s	6m/s	7m/s	8m/s	9+m/s
House ID	Easting	Northing	dBA	dBA	dBA	dBA	dBA	dBA
H1	512574	560249	-18.2	-14.1	-10.4	-8.9	-8.7	-8.7
H2	512548	560240	-18.4	-14.3	-10.6	-9.1	-8.9	-8.9
H3	512576	560296	-18.3	-14.2	-10.5	-9	-8.8	-8.8
H4	512607	560021	-19.8	-15.7	-12	-10.5	-10.3	-10.3
H5	513258	560218	-15.2	-11.1	-7.4	-5.9	-5.7	-5.7
H6	513280	560045	-14.5	-10.4	-6.7	-5.2	-5	-5
H7	514664	561741	-20.8	-16.7	-13	-11.5	-11.3	-11.3
H8	517491	561675	-25.5	-21.4	-17.7	-16.2	-16	-16
H9	517560	561620	-25.9	-21.8	-18.1	-16.6	-16.4	-16.4
H10	516223	559500	-12.8	-8.7	-5	-3.5	-3.3	-3.3
H11	516345	559495	-13.9	-9.8	-6.1	-4.6	-4.4	-4.4
H12	516426	559436	-14.8	-10.7	-7	-5.5	-5.3	-5.3
H13	516455	559391	-15.2	-11.1	-7.4	-5.9	-5.7	-5.7
H14	516453	559491	-14.8	-10.7	-7	-5.5	-5.3	-5.3
H15	516742	559597	-16.8	-12.7	-9	-7.5	-7.3	-7.3
H16	516913	559519	-18.2	-14.1	-10.4	-8.9	-8.7	-8.7
H17	517205	559763	-19.9	-15.8	-12.1	-10.6	-10.4	-10.4
H18	517186	559907	-20	-15.9	-12.2	-10.7	-10.5	-10.5

	ITM	ITM	4m/s	5m/s	6m/s	7m/s	8m/s	9+m/s
House ID	Easting	Northing	dBA	dBA	dBA	dBA	dBA	dBA
H19	516995	559974	-18.7	-14.6	-10.9	-9.4	-9.2	-9.2
H20	517058	560064	-19.2	-15.1	-11.4	-9.9	-9.7	-9.7
H21	517237	560043	-20.3	-16.2	-12.5	-11	-10.8	-10.8
H22	517355	560026	-21	-16.9	-13.2	-11.7	-11.5	-11.5
H23	517505	560096	-21.8	-17.7	-14	-12.5	-12.3	-12.3
H24	517525	560068	-21.9	-17.8	-14.1	-12.6	-12.4	-12.4
H25	517602	560034	-22.2	-18.1	-14.4	-12.9	-12.7	-12.7
H26	517766	560044	-23.1	-19	-15.3	-13.8	-13.6	-13.6
H27	517833	560174	-23.5	-19.4	-15.7	-14.2	-14	-14
H28	517746	560332	-23.3	-19.2	-15.5	-14	-13.8	-13.8
H29	515967	558698	-14.1	-10	-6.3	-4.8	-4.6	-4.6
H30	516071	558608	-15.2	-11.1	-7.4	-5.9	-5.7	-5.7
H31	516831	558505	-17.7	-13.6	-9.9	-8.4	-8.2	-8.2
H32	516331	558002	-17.2	-13.1	-9.4	-7.9	-7.7	-7.7
H33	516489	557893	-17.7	-13.6	-9.9	-8.4	-8.2	-8.2
H34	516258	557871	-17.5	-13.4	-9.7	-8.2	-8	-8
H35	515815	557831	-16.3	-12.2	-8.5	-7	-6.8	-6.8
H36	512706	558535	-20.7	-16.6	-12.9	-11.4	-11.2	-11.2
H37	513035	558529	-18.7	-14.6	-10.9	-9.4	-9.2	-9.2
H38	512590	558155	-21.5	-17.4	-13.7	-12.2	-12	-12
H39	514019	558165	-13.7	-9.6	-5.9	-4.4	-4.2	-4.2
H40	514606	558023	-14.3	-10.2	-6.5	-5	-4.8	-4.8
H41	514826	557698	-15.7	-11.6	-7.9	-6.4	-6.2	-6.2
H42	514556	557258	-18.1	-14	-10.3	-8.8	-8.6	-8.6
H43	514715	557154	-17.4	-13.3	-9.6	-8.1	-7.9	-7.9
H44	514833	557430	-17.1	-13	-9.3	-7.8	-7.6	-7.6
H45	514870	557636	-16.2	-12.1	-8.4	-6.9	-6.7	-6.7
H46	515012	557597	-16	-11.9	-8.2	-6.7	-6.5	-6.5
H47	516168	557781	-16.9	-12.8	-9.1	-7.6	-7.4	-7.4
H48	512339	560424	-19.9	-15.8	-12.1	-10.6	-10.4	-10.4

	ITM	ITM	4m/s	5m/s	6m/s	7m/s	8m/s	9+m/s
House ID	Easting	Northing	dBA	dBA	dBA	dBA	dBA	dBA
H49	512089	560001	-20.9	-16.8	-13.1	-11.6	-11.4	-11.4
H50	511856	559964	-21.8	-17.7	-14	-12.5	-12.3	-12.3
H51	515138	562209	-23.2	-19.1	-15.4	-13.9	-13.7	-13.7
H52	511651	559779	-22.6	-18.5	-14.8	-13.3	-13.1	-13.1
H53	514062	558379	-11.2	-7.1	-3.4	-1.9	-1.7	-1.7
H54	517177	559907	-19.9	-15.8	-12.1	-10.6	-10.4	-10.4
H55	517375	560081	-21.1	-17	-13.3	-11.8	-11.6	-11.6
H56	517485	560120	-21.7	-17.6	-13.9	-12.4	-12.2	-12.2
H57	517582	560131	-22.2	-18.1	-14.4	-12.9	-12.7	-12.7
H58	517565	560150	-22.1	-18	-14.3	-12.8	-12.6	-12.6
H59	517665	560186	-22.7	-18.6	-14.9	-13.4	-13.2	-13.2
H60	517712	560152	-22.9	-18.8	-15.1	-13.6	-13.4	-13.4
H61	517770	560146	-23.2	-19.1	-15.4	-13.9	-13.7	-13.7
H62	517793	560211	-23.2	-19.1	-15.4	-13.9	-13.7	-13.7
H63	517724	560209	-22.8	-18.7	-15	-13.5	-13.3	-13.3
H64	516185	558817	-15	-10.9	-7.2	-5.7	-5.5	-5.5
H65	516326	559301	-14.3	-10.2	-6.5	-5	-4.8	-4.8
H66	517061	559769	-19.2	-15.1	-11.4	-9.9	-9.7	-9.7
H67	516482	559447	-15.2	-11.1	-7.4	-5.9	-5.7	-5.7
H68	517190	559916	-20	-15.9	-12.2	-10.7	-10.5	-10.5
H69	517202	560097	-20.1	-16	-12.3	-10.8	-10.6	-10.6
H70	517121	559978	-19.6	-15.5	-11.8	-10.3	-10.1	-10.1
H71	517638	560049	-22.4	-18.3	-14.6	-13.1	-12.9	-12.9
H72	517727	560072	-22.9	-18.8	-15.1	-13.6	-13.4	-13.4
H73	517677	560204	-22.7	-18.6	-14.9	-13.4	-13.2	-13.2

A noise contour map of the cumulative effects of all 8 no. turbines is presented with a maximum sound power output at a wind speed of 12 ms^{-1} at 10 m height in **Appendix 10.4**. The contour map in **Appendix 10.4** assumes that all turbines are propagating noise simultaneously in a downwind direction to each location which results in an overprediction of the noise levels.

There are seven properties within 5 dB of the 43 dB lower fixed limit, when all of the turbines are operating at their maximum noise levels. There is an inherent conservatism in the prediction noise modelling when it is carried out in line with ETSU-R-97 and the IOA Good Practice Guide.

The turbines to be installed on this site are able to operate in various modes. If specific conditions arise that AM is generated, the maximum AM penalty will be up to 5dB. The operator can amend the operating mode of one or more turbines in certain wind speeds and wind directions to sufficiently mitigate the generation of AM or reduce the overall noise level in compensation to achieved set noise limits.

10.4.3 Cumulative Effects Assessment

An assessment of the cumulative effects of noise from the Proposed Development together with nearby operational wind farms in a proximity of the Proposed Development has been undertaken. There are eight operational wind farms in a proximity, detailed in **Table 10.18** below. The impacts from the Onsite Substation and Control Building are negligible so have not been included in this assessment.

Table 10.18: Cumulative Wind Farms

Wind Farm	Wind Turbine
Millane Hill WF	9 x Vestas V47 0.6MW, 49m hub height
Grousemount WF	38 x SWT-3.4-101, 71m hub height
Derreenacrinnig WF	7 x Vestas V52/850, 55m hub height
Derragh WF	6 x Nordex N100 3.3MW, 100m hub height
Cleanrath WF	11 x Nordex N117 3.6MW, 91m hub height
Shehy More WF	11 x Nordex N100 3.3MW, 81m hub height
Carrigarierk WF	5 x Nordex N117 3.6MW, 76m hub height
Carrigarierk 2 WF	3 x Nordex N133 4.8MW, 110m hub height

The sound power levels associated with the turbines installed have been detailed in **Table 10.19** below.

Table 10.19: Noise Emission Data for Cumulative Wind Farms at Standardised 10m Height wind Speed

Wind Farm	Sound Power Level, dB LWA at Varying Wind Speeds								
	4	5	6	7	8	9	10	11	12
Millane Hill WF	98.9	98.9	99.2	99.6	100	100.4	100.8	101.1	101.1
Grousemount WF	95.1	99.6	104.3	106.5	107	107	107	107	107
Derreenacrinnig WF	99.7	100.8	101.9	103	104.1	105.2	106.3	106.3	106.3
Derragh WF	96.7	99.2	103.6	104.6	105.2	105.5	105.5	105.5	105.5
Cleanrath WF	94.5	100	103	103.5	103.5	103.5	103.5	103.5	103.5
Shehy More WF	96.5	98.5	102.8	104.4	105	105.5	105.5	105.5	105.5
Carrigarierk WF	94.4	99.3	102.8	103.5	103.5	103.5	103.5	103.5	103.5
Carrigarierk 2 WF	95	100.6	104.3	104.5	104.5	104.5	104.5	104.5	104.5

10.4.3.1 Cumulative Assessment Locations

The same receptor locations used for the Proposed Development are also used in the cumulative assessment. The assessment is a worst-case scenario with the assumption made that the predicted noise levels to receptors are downwind from all wind farms at the same time, a scenario that cannot occur in practise.

10.4.3.2 Noise Limits

The noise limits are the same as that used in **Table 10.11**.

10.4.3.3 Cumulative Noise Levels

Table 10.20 gives details of the predicted cumulative noise levels for the nearest receptors to the development.

Table 10.20: Predicted Cumulative Noise Levels

	ING	ING	4m/s	5m/s	6m/s	7m/s	8m/s	9+m/s
House ID	Easting	Northing	dBA	dBA	dBA	dBA	dBA	dBA
H1	512574	560249	25.6	29.4	33.2	34.7	35.0	35.0
H2	512548	560240	25.4	29.2	33.0	34.5	34.8	34.8
H3	512576	560296	25.6	29.4	33.1	34.6	34.9	35.0
H4	512607	560021	24.3	28.0	31.8	33.3	33.6	33.7
H5	513258	560218	28.9	32.6	36.4	37.9	38.2	38.3
H6	513280	560045	29.4	33.2	37.0	38.5	38.8	38.8

	ING	ING	4m/s	5m/s	6m/s	7m/s	8m/s	9+m/s
House ID	Easting	Northing	dBA	dBA	dBA	dBA	dBA	dBA
H7	514664	561741	30.5	32.9	37.1	38.6	39.2	39.6
H8	517491	561675	33.3	35.5	39.8	41.3	41.9	42.4
H9	517560	561620	32.9	35.1	39.3	40.9	41.4	41.9
H10	516223	559500	30.6	34.5	38.3	39.8	40.0	40.0
H11	516345	559495	29.6	33.5	37.3	38.8	39.0	39.0
H12	516426	559436	28.8	32.7	36.4	37.9	38.2	38.2
H13	516455	559391	28.4	32.3	36.0	37.5	37.8	37.8
H14	516453	559491	28.8	32.7	36.4	37.9	38.2	38.2
H15	516742	559597	27.3	31.0	34.8	36.3	36.6	36.7
H16	516913	559519	26.2	30.0	33.8	35.2	35.5	35.6
H17	517205	559763	25.5	29.1	32.9	34.4	34.7	34.8
H18	517186	559907	25.8	29.3	33.1	34.6	34.9	35.1
H19	516995	559974	26.8	30.2	34.1	35.6	35.9	36.1
H20	517058	560064	26.8	30.2	34.1	35.5	35.9	36.1
H21	517237	560043	26.2	29.5	33.4	34.9	35.2	35.4
H22	517355	560026	25.7	29.0	32.9	34.4	34.7	34.9
H23	517505	560096	25.0	28.4	32.3	33.7	34.0	34.3
H24	517525	560068	24.9	28.3	32.2	33.6	33.9	34.1
H25	517602	560034	24.6	28.0	31.9	33.3	33.6	33.8
H26	517766	560044	24.1	27.7	31.5	32.8	33.2	33.4
H27	517833	560174	24.3	27.8	31.6	33.0	33.3	33.5
H28	517746	560332	25.1	28.4	32.3	33.7	34.0	34.3
H29	515967	558698	29.1	33.2	36.9	38.4	38.6	38.6
H30	516071	558608	28.1	32.1	35.8	37.3	37.5	37.6
H31	516831	558505	25.7	29.7	33.4	34.9	35.2	35.2
H32	516331	558002	26.1	30.1	33.8	35.3	35.5	35.5
H33	516489	557893	25.6	29.6	33.3	34.8	35.0	35.0
H34	516258	557871	25.8	29.8	33.5	35.0	35.2	35.2
H35	515815	557831	26.9	30.9	34.6	36.1	36.3	36.4
H36	512706	558535	22.7	26.6	30.4	31.9	32.1	32.1

	ING	ING	4m/s	5m/s	6m/s	7m/s	8m/s	9+m/s
House ID	Easting	Northing	dBA	dBA	dBA	dBA	dBA	dBA
H37	513035	558529	24.6	28.6	32.3	33.8	34.0	34.1
H38	512590	558155	21.8	25.8	29.5	31.0	31.2	31.2
H39	514019	558165	29.4	33.5	37.2	38.7	38.9	38.9
H40	514606	558023	28.8	32.9	36.6	38.1	38.3	38.3
H41	514826	557698	27.4	31.5	35.2	36.7	36.9	36.9
H42	514556	557258	25.0	29.1	32.8	34.3	34.5	34.5
H43	514715	557154	25.7	29.8	33.5	35.0	35.2	35.2
H44	514833	557430	26.0	30.1	33.8	35.3	35.5	35.5
H45	514870	557636	26.9	31.0	34.7	36.2	36.4	36.4
H46	515012	557597	27.1	31.2	34.9	36.4	36.6	36.6
H47	516168	557781	26.3	30.3	34.1	35.6	35.8	35.8
H48	512339	560424	24.0	27.8	31.6	33.1	33.4	33.4
H49	512089	560001	22.9	26.7	30.5	32.0	32.2	32.3
H50	511856	559964	21.9	25.8	29.5	31.0	31.3	31.4
H51	515138	562209	28.5	30.9	35.1	36.6	37.2	37.6
H52	511651	559779	21.4	25.2	29.0	30.5	30.7	30.8
H53	514062	558379	31.9	35.9	39.7	41.2	41.4	41.4
H54	517177	559907	25.9	29.3	33.2	34.7	35.0	35.2
H55	517375	560081	25.5	28.9	32.8	34.2	34.5	34.7
H56	517485	560120	25.2	28.5	32.4	33.8	34.2	34.4
H57	517582	560131	24.9	28.3	32.2	33.6	33.9	34.1
H58	517565	560150	25.1	28.4	32.3	33.7	34.0	34.3
H59	517665	560186	24.9	28.2	32.1	33.5	33.8	34.1
H60	517712	560152	24.6	28.0	31.9	33.3	33.6	33.8
H61	517770	560146	24.4	27.8	31.7	33.1	33.4	33.6
H62	517793	560211	24.6	28.0	31.9	33.3	33.6	33.8
H63	517724	560209	24.8	28.2	32.1	33.5	33.8	34.0
H64	516185	558817	28.3	32.3	36.0	37.5	37.8	37.8
H65	516326	559301	29.1	33.1	36.8	38.3	38.5	38.6
H66	517061	559769	26.0	29.5	33.4	34.8	35.1	35.3

	ING	ING	4m/s	5m/s	6m/s	7m/s	8m/s	9+m/s
House ID	Easting	Northing	dBA	dBA	dBA	dBA	dBA	dBA
H67	516482	559447	28.4	32.3	36.1	37.6	37.8	37.8
H68	517190	559916	25.9	29.3	33.2	34.6	34.9	35.1
H69	517202	560097	26.5	29.8	33.7	35.1	35.5	35.7
H70	517121	559978	26.3	29.7	33.6	35.0	35.3	35.5
H71	517638	560049	24.5	28.0	31.9	33.2	33.6	33.8
H72	517727	560072	24.3	27.8	31.7	33.0	33.3	33.5
H73	517677	560204	24.9	28.3	32.2	33.6	33.9	34.1

A noise contour map of the cumulative effects of all turbines is presented with a maximum sound power output at a wind speed of 8 m/s at 10 m height in **Appendix 10.4**. This contour map assumes that all turbines are simultaneously downwind at the same time to each location which results in an overprediction of the noise levels.

10.4.3.4 Cumulative Noise Assessment

The assessment was made with predicted operational noise levels from the Proposed Development and wind farms located in the vicinity and stated in **Table 10.18** against noise limits in the Wind Energy Development Guidelines 2006. All predicted noise levels are within the noise limits. **Table 10.21** gives the difference between the predicted cumulative noise levels in **Table 10.20** and noise limits for each receptor. A negative margin indicates that the predicted noise levels are within the lower fixed 43dBA limit (45dBA for financially involved properties), which means the levels are within the day and night limits.

Table 10.21: Margin between Predicted Cumulative Noise Levels and Lower Fixed Limit of 43dBA

	ITM	ITM	4m/s	5m/s	6m/s	7m/s	8m/s	9+m/s
House ID	Easting	Northing	dBA	dBA	dBA	dBA	dBA	dBA
H1	512574	560249	-17.4	-13.6	-9.8	-8.3	-8.0	-8.0
H2	512548	560240	-17.6	-13.8	-10.0	-8.5	-8.2	-8.2
H3	512576	560296	-17.4	-13.6	-9.9	-8.4	-8.1	-8.0
H4	512607	560021	-18.7	-15.0	-11.2	-9.7	-9.4	-9.3
H5	513258	560218	-14.1	-10.4	-6.6	-5.1	-4.8	-4.7
H6	513280	560045	-13.6	-9.8	-6.0	-4.5	-4.2	-4.2

	ITM	ITM	4m/s	5m/s	6m/s	7m/s	8m/s	9+m/s
House ID	Easting	Northing	dBA	dBA	dBA	dBA	dBA	dBA
H7	514664	561741	-12.5	-10.1	-5.9	-4.4	-3.8	-3.4
H8	517491	561675	-9.7	-7.5	-3.2	-1.7	-1.1	-0.6
H9	517560	561620	-10.1	-7.9	-3.7	-2.1	-1.6	-1.1
H10	516223	559500	-12.4	-8.5	-4.7	-3.2	-3.0	-3.0
H11	516345	559495	-13.4	-9.5	-5.7	-4.2	-4.0	-4.0
H12	516426	559436	-14.2	-10.3	-6.6	-5.1	-4.8	-4.8
H13	516455	559391	-14.6	-10.7	-7.0	-5.5	-5.2	-5.2
H14	516453	559491	-14.2	-10.3	-6.6	-5.1	-4.8	-4.8
H15	516742	559597	-15.7	-12.0	-8.2	-6.7	-6.4	-6.3
H16	516913	559519	-16.8	-13.0	-9.2	-7.8	-7.5	-7.4
H17	517205	559763	-17.5	-13.9	-10.1	-8.6	-8.3	-8.2
H18	517186	559907	-17.2	-13.7	-9.9	-8.4	-8.1	-7.9
H19	516995	559974	-16.2	-12.8	-8.9	-7.4	-7.1	-6.9
H20	517058	560064	-16.2	-12.8	-8.9	-7.5	-7.1	-6.9
H21	517237	560043	-16.8	-13.5	-9.6	-8.1	-7.8	-7.6
H22	517355	560026	-17.3	-14.0	-10.1	-8.6	-8.3	-8.1
H23	517505	560096	-18.0	-14.6	-10.7	-9.3	-9.0	-8.7
H24	517525	560068	-18.1	-14.7	-10.8	-9.4	-9.1	-8.9
H25	517602	560034	-18.4	-15.0	-11.1	-9.7	-9.4	-9.2
H26	517766	560044	-18.9	-15.3	-11.5	-10.2	-9.8	-9.6
H27	517833	560174	-18.7	-15.2	-11.4	-10.0	-9.7	-9.5
H28	517746	560332	-17.9	-14.6	-10.7	-9.3	-9.0	-8.7
H29	515967	558698	-13.9	-9.8	-6.1	-4.6	-4.4	-4.4
H30	516071	558608	-14.9	-10.9	-7.2	-5.7	-5.5	-5.4
H31	516831	558505	-17.3	-13.3	-9.6	-8.1	-7.8	-7.8
H32	516331	558002	-16.9	-12.9	-9.2	-7.7	-7.5	-7.5
H33	516489	557893	-17.4	-13.4	-9.7	-8.2	-8.0	-8.0
H34	516258	557871	-17.2	-13.2	-9.5	-8.0	-7.8	-7.8
H35	515815	557831	-16.1	-12.1	-8.4	-6.9	-6.7	-6.6
H36	512706	558535	-20.3	-16.4	-12.6	-11.1	-10.9	-10.9

	ITM	ITM	4m/s	5m/s	6m/s	7m/s	8m/s	9+m/s
House ID	Easting	Northing	dBA	dBA	dBA	dBA	dBA	dBA
H37	513035	558529	-18.4	-14.4	-10.7	-9.2	-9.0	-8.9
H38	512590	558155	-21.2	-17.2	-13.5	-12.0	-11.8	-11.8
H39	514019	558165	-13.6	-9.5	-5.8	-4.3	-4.1	-4.1
H40	514606	558023	-14.2	-10.1	-6.4	-4.9	-4.7	-4.7
H41	514826	557698	-15.6	-11.5	-7.8	-6.3	-6.1	-6.1
H42	514556	557258	-18.0	-13.9	-10.2	-8.7	-8.5	-8.5
H43	514715	557154	-17.3	-13.2	-9.5	-8.0	-7.8	-7.8
H44	514833	557430	-17.0	-12.9	-9.2	-7.7	-7.5	-7.5
H45	514870	557636	-16.1	-12.0	-8.3	-6.8	-6.6	-6.6
H46	515012	557597	-15.9	-11.8	-8.1	-6.6	-6.4	-6.4
H47	516168	557781	-16.7	-12.7	-8.9	-7.4	-7.2	-7.2
H48	512339	560424	-19.0	-15.2	-11.4	-9.9	-9.6	-9.6
H49	512089	560001	-20.1	-16.3	-12.5	-11.0	-10.8	-10.7
H50	511856	559964	-21.1	-17.2	-13.5	-12.0	-11.7	-11.6
H51	515138	562209	-14.5	-12.1	-7.9	-6.4	-5.8	-5.4
H52	511651	559779	-21.6	-17.8	-14.0	-12.5	-12.3	-12.2
H53	514062	558379	-11.1	-7.1	-3.3	-1.8	-1.6	-1.6
H54	517177	559907	-17.1	-13.7	-9.8	-8.3	-8.0	-7.8
H55	517375	560081	-17.5	-14.1	-10.2	-8.8	-8.5	-8.3
H56	517485	560120	-17.8	-14.5	-10.6	-9.2	-8.8	-8.6
H57	517582	560131	-18.1	-14.7	-10.8	-9.4	-9.1	-8.9
H58	517565	560150	-17.9	-14.6	-10.7	-9.3	-9.0	-8.7
H59	517665	560186	-18.1	-14.8	-10.9	-9.5	-9.2	-8.9
H60	517712	560152	-18.4	-15.0	-11.1	-9.7	-9.4	-9.2
H61	517770	560146	-18.6	-15.2	-11.3	-9.9	-9.6	-9.4
H62	517793	560211	-18.4	-15.0	-11.1	-9.7	-9.4	-9.2
H63	517724	560209	-18.2	-14.8	-10.9	-9.5	-9.2	-9.0
H64	516185	558817	-14.7	-10.7	-7.0	-5.5	-5.2	-5.2
H65	516326	559301	-13.9	-9.9	-6.2	-4.7	-4.5	-4.4
H66	517061	559769	-17.0	-13.5	-9.6	-8.2	-7.9	-7.7

	ITM	ITM	4m/s	5m/s	6m/s	7m/s	8m/s	9+m/s
House ID	Easting	Northing	dBA	dBA	dBA	dBA	dBA	dBA
H67	516482	559447	-14.6	-10.7	-6.9	-5.4	-5.2	-5.2
H68	517190	559916	-17.1	-13.7	-9.8	-8.4	-8.1	-7.9
H69	517202	560097	-16.5	-13.2	-9.3	-7.9	-7.5	-7.3
H70	517121	559978	-16.7	-13.3	-9.4	-8.0	-7.7	-7.5
H71	517638	560049	-18.5	-15.0	-11.1	-9.8	-9.4	-9.2
H72	517727	560072	-18.7	-15.2	-11.3	-10.0	-9.7	-9.5
H73	517677	560204	-18.1	-14.7	-10.8	-9.4	-9.1	-8.9

It can be seen that the predicted noise level at each of the receptors are within the 43 dB limit applicable within the 2006 Guidelines. This considers the predicted noise levels from all of the cumulative turbines to be equivalent of the noise level in a downwind direction from the turbine to the receptor simultaneously. In practice this is not possible due to the location of the turbines.

10.3.1 Description of Effects – Operational Noise

The criteria for description of effects for all operational noise activity and the potential worst-case effects, at the nearest receptors is given below.

Table 10.22: Description of Effects – Operational Noise

Quality	Significance	Duration
Negative	Not Significant	Long Term

10.5 MITIGATION MEASURES AND RESIDUAL EFFECTS

10.5.1 Construction and Decommissioning Noise Mitigation

No significant construction noise effects have been identified. Therefore, no specific mitigation measures are required. However, general guidance for controlling construction noise through the use of good practice given in BS 5228 will be followed. Construction and Decommissioning of the Proposed Development shall be limited to working times given and any controls incorporated in any planning permission.

During the Decommissioning phase of the Proposed Development, noise levels are likely be no more than predicted in **Table 10.13,** however, it is envisaged that decommissioning will be of shorter duration. Any legislation, guidance or best practice relevant at the time of decommissioning will be complied with. Construction and decommissioning is a temporary day time activity.

10.5.1.1 Residual Construction and Decommissioning Effects

The residual effects are the same as the construction and Decommissioning effects identified in this assessment.

10.5.2 Operational Noise Mitigation

The Proposed Development has been designed to comply with the 2006 Guidelines and noise limits attached as conditions to the recent 2023 An Bord Pleanála decision outlined in 10.2.3.2. The operational noise emissions are predicted to be compliant and well within these guidelines with no special mitigation required apart from fitting rotors with STE which is now considered best practice.

In addition, all turbines will have STE fitted as standard to reduce noise emission levels. Mitigation is not considered necessary.

10.5.2.1 Residual Operational Effects

The residual effects are the same as the operational effects identified in this assessment.

10.5.3 Cumulative Effects

The cumulative effects of all nearby wind turbines located within 10 km have been assessed and found to be in compliance with the noise limits set in the Wind Energy Development Guidelines 2006.

10.6 SUMMARY OF EFFECTS

Table 10.23 below summarises the Effects.

Table 10.23: Summary of Effects

	Quality	Significance	Duration
Construction noise	Negative	Not Significant	Temporary
Operational Noise	Negative	Not Significant	Long Term
Decommissioning Noise	Negative	Not Significant	Temporary

10.7 STATEMENT OF SIGNIFICANCE

This Section has assessed the significance of the potential effects of the Proposed Development during operation, construction and decommissioning.

The effects of noise from the operation of the Proposed Development 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 Proposed Development have been predicted using the best practice of calculation technique. They have been compared with the noise limits in the 2006 Guidelines and recent 2023 An Bord Pleanála limits and found to be compliant.

There has been a consultation process in relation to the revision of the Draft Revised Wind Energy Development Guidelines December 2019. 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 direction and energy output.

The noise levels predicted at the nearest receptors are orders of magnitude below the level at which risk of hearing damage, or indeed negative health effects are possible.

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

10.8 REFERENCES

1) Department of Environment, Heritage and Local Government: Wind Energy Development Guidelines, Guidelines for Planning Authorities 2006 Energy

2) ETSU-R-97, The Assessment & Rating of Noise from Wind Farms, June 1996

3) Select Committee on Wind Turbines (2014) Wind Energy, Climate and Health: Evidence For The Impacts Of Wind Generated Energy in Australia

4) Fact sheet published by the Australian Government (Greenhouse Office) and the Australian Wind Energy Association

5) Department of Environment, Heritage and Local Government: Wind Energy Development Guidelines, Guidelines for Planning Authorities 2006 Energy

6) Institute of Acoustics (2013) A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise

7) ISO 1996/1- Acoustics-Description and Measurement of Environmental Noise - Part 1: Basic Quantities and Procedures

8) ETSU-R-97: Acoustics-The Assessment & Rating of Noise from Wind Farms: ETSU for the DTI, UK, 1996

9) IOA Noise Working Group (Wind Turbine Noise) Amplitude Modulation Working Group, Final Report, A Method for Rating Amplitude Modulation in Wind Turbine Noise, August 2016

10) Wind Turbine AM Review, Phase 2 Report, Department of Energy & Climate Change, WSP/Parsons Brinckerhoff, August 2016

11) IEC Technical Specification 61400-11-2 Wind energy generation systems – Part 11-2: Acoustic noise measurement techniques – Measurement of wind turbine sound characteristics in receptor position, 2024

12) IOA, A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise- Supplementary Guidance Note 4: Wind Shear

13) ISO 9613-2 Acoustics -Attenuation of sound during propagation outdoors, Part 2: General Method of Calculation

14) ETSU W/13/00392/REP – 'Low Frequency Noise and Vibration Measurements at a Modern Wind Farm'.

15) Wiss, J. F., and Parmelee, R. A.. (1974) Human Perception of Transient Vibrations, "Journal of Structural Division", ASCE, Vol 100, No. S74, PP. 773-787

16) Infrasound levels near windfarms and in other environments, Environment Protection Authority, 2013, http://www.epa.sa.gov.au/environmental_info/noise/wind_farms

17) Ellenbogen, J.M., Grace, S., Heiger-Bernays, W.J., Manwell, J.F., Mills, D.A., Sullivan, K.A., Weisskopf, M.G., and Santos, S.L, Wind Turbine Health Impact Study: Report of Independent Expert Panel, January 2012

18) Report by Leigh Collins, 21st April 2020 on a study commissioned by the Finnish Government into infrasound and wind turbine syndrome

19) Infrasound Does Not Explain Symptoms Related to Wind Turbines, Finnish Government, June 2020, https://www.vttresearch.com/en/news-and-ideas/vtt-studied-health-effects-infrasound-wind-turbine-noise-multidisciplinary

20) National Roads Authority, Guidelines for Noise and Vibration in National Road Schemes.

21) BS 5228-1: 2009-1+A1:2014, Code of Practice for Noise and Vibration Control on Construction and Open Sites: Code of Practice for Basic Information and Procedures for Noise Control.

22) Noise - Frequently Asked Questions - Health and Safety Authority (hsa.ie)

23) W/31/00386/REP 'Noise Measurements in Windy Conditions'.

24) Wiss, J. F., and Parmelee, R. A. (1974) Human Perception of Transient Vibrations, "Journal of Structural Division", ASCE, Vol 100, No. S74, PP. 773-787.

11 LANDSCAPE AND VISUAL AMENITY

11.1 INTRODUCTION

11.1.1 Background and Objectives

This chapter of the EIAR assesses the effects of the Proposed Development on the landscape and visual amenity of the receiving environment. Where significant effects are predicted, the chapter identifies appropriate mitigation strategies therein. The assessment will consider the potential effects during the construction, operational, and decommissioning phases.

The Proposed Development refers to all elements of the application for the construction and operation of the proposed Gortloughra Wind Farm (refer to **Chapter 2: Project Description**). Common acronyms used throughout this EIAR can be found in the **Appendix 1.4**. Figures are included in Volume III of the EIAR. This chapter of the EIAR is supported by a portfolio of photomontages provided as a separate booklet, and the following Appendix provided in **Volume IV** of this EIAR:

- **Appendix 11.1**: Visual Impact Assessments at VPs

This Landscape and Visual Impact Assessment (LVIA) describes the landscape context of the Proposed Development and assesses the likely landscape and visual impacts of the scheme on the receiving environment. Although closely linked, landscape and visual impacts are assessed separately, in accordance with relevant guidance outlined in section 11.2.2 of this chapter:

Landscape Impact Assessment (LIA) relates to changes in the physical landscape brought about by the Proposed Development, which may alter its character, and how this is experienced by people. This requires a detailed analysis of the individual elements and characteristics of a landscape that go together to make up the overall landscape character of that area. By understanding the aspects that contribute to landscape character, it is possible to make judgements in relation to its quality (integrity) and to identify key sensitivities. This, in turn, provides a measure of the ability of the landscape in question to accommodate the type and scale of change associated with the Proposed Development without causing unacceptable adverse changes to its character.

Visual Impact Assessment (VIA) relates to assessing effects on specific views and the general visual amenity experienced by people. This deals with how the surroundings of individuals or groups of people may be specifically affected by changes in the content and character of views as a result of the change or loss of existing elements of the landscape and/or introduction of new elements. Visual impacts may occur from visual obstruction (blocking of a view, be it full, partial or intermittent) or Visual Intrusion (interruption of a view without blocking).

Cumulative landscape and visual impact assessment is concerned with additional changes to the landscape or visual amenity caused by the Proposed Development in conjunction with other developments (associated or separate from it).

11.1.2 Assessment Structure

In accordance with the Landscape Institute and the Institute of Environmental Management and Assessment publication entitled Guidelines for Landscape and Visual Impact Assessment – Third Edition (2013) (GLVIA3), the structure of this chapter will consist of separate considerations of landscape effects and visual effects in the following order:

- Assessment of landscape value and sensitivity
- Assessment of the magnitude of landscape effects within the Study Area
- Assessment of the significance of landscape impacts
- Assessment of visual receptor sensitivity
- Assessment of visual impact magnitude at representative viewpoint locations (using photomontages)
- Assessment of visual impact significance
- Assessment of cumulative landscape and visual impacts

11.1.3 Statement of Authority

This Landscape and Visual Assessment (LVIA) report was prepared by Cian Doughan (BSLA, MILI) Associate Director at Macro Works Ltd and reviewed by Richard Barker (MLA MILI) Divisional Director of Macro Works Ltd. Macro Works Ltd is a specialist LVIA company with over 20 years of experience in the appraisal of effects from a variety of energy, infrastructure and commercial developments. Relevant experience includes LVIA work on over 140+ onshore wind farm proposals throughout Ireland, including 20+ Strategic Infrastructure Development (SID) wind farms. Macro Works and its senior staff members are affiliated with the Irish Landscape Institute.

11.1.4 Description of the Proposed Development

This LVIA considers the impacts of activities and features relating to the construction, operation, and decommissioning stages of this eight-turbine wind farm. The 10-year planning permission being sought relates to a 40-year operational life from the date of commissioning.

A full description of the Proposed Development is provided in **Chapter 2: Project Description**.

11.2 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

11.2.1 Assessment Methodology

Production of this Landscape and Visual Impact Assessment (LVIA) involved Baseline work in the form of desktop studies (review of relevant landscape and visual designations, policies and objectives) and fieldwork comprising professional evaluation by qualified and experienced Landscape Architects. This entailed the following:

11.2.2 Definition of Study Area

The Wind Energy Development Guidelines published by the Department of the Environment, Heritage and Local Government (DOEHLG) (2006 WEDG) and the 2019 Draft Revised Wind Energy Development Guidelines (2019 Draft) specify different radii for examining the zone of theoretical visibility of proposed wind farm projects (ZTV). As per the 2006 WEDG and 2019 Draft, the extent of this search area is influenced by turbine height, as follows:

- 15 km radius for blade tips up to 100 m
- 20 km radius for blade tips greater than 100 m
- 25 km radius where landscapes of national and international importance exist.

In the case of this project, the blade tips are 175m high and, thus, the minimum ZTV radius recommended is 20 km from the outermost turbines of the scheme. This is considered to be appropriate in this instance on the basis that significant impacts are not predicted to occur beyond 20 km. Furthermore, there are not considered to be any sites of national or international importance between 20 – 25 km and thus, the radius of the Study Area will remain at 20 km. Notwithstanding the full 20 km extent of the LVIA Study Area, there will be a particular focus on receptors and effects within the Central Study Area where there is higher potential for significant impacts to occur. When referenced within this assessment, the 'Central Study Area' is the landscape within 5 km of the Site.

The Study Area adopted is in accordance with both the 2006 WEDG and 2019 Draft, and is consistent with study areas employed for comparable wind energy applications throughout Ireland. It is considered a robust area on which to structure the LVIA, whilst being proportionate to the most notable effects.

11.2.2.1 Desktop Study

- Establishing an appropriate Study Area from which to study the landscape and visual impacts of the Development.
- Review of a Zone of Theoretical Visibility (ZTV) map, which indicates areas from which the Development is potentially visible in relation to terrain within the Study Area.
- Review of relevant County Development Plans, particularly with regard to sensitive landscape and scenic view/route designations.
- Selection of potential Viewshed Reference Points (VRPs) from key visual receptors to be investigated during fieldwork for actual visibility and sensitivity.

11.2.2.2 Fieldwork

- Recording of a description of the landscape elements and characteristics within the Study Area
- Selection of a refined set of VRP's for assessment. This includes the capture of reference images and grid reference coordinates for each VRP location for the visualisation specialist to prepare photomontages.
- Site visits were undertaken on multiple occasions during the Summer months of 2021 and then again during the Summer of 2024.

11.2.2.3 Appraisal

The process adopted in regard to the identification of landscape and visual effects (adopting the assessment criteria in 11.2.5 and 11.2.6 respectively) is summarised as follows:

- Consideration of the receiving landscape with regard to overall landscape character as well as the salient features of the Study Area including landform, drainage, vegetation, land use and landscape designations.
- Consideration of the visual environment including receptor locations such as centres of population and houses, transport routes, tourism, recreation and heritage features and designated and recognised views of scenic value.
- Consideration of design guidance and planning policies.

- Consideration of potentially significant construction stage and operational stage effects and the mitigation measures that could be employed to reduce such effects.
- Consideration of the significance of residual landscape impacts.
- Consideration of the significance of residual visual impacts aided by photomontages prepared at all of the selected VRP locations.
- Consideration of cumulative landscape and visual effects in combination with other surrounding developments that are either existing or permitted.

11.2.3 Relevant Legislation and Guidance

This LVIA uses a methodology that is in accordance with that prescribed within the following guidance documents:

- Environmental Protection Agency (EPA) publication 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports (2022) and the accompanying Advice Notes on Current Practice in the Preparation of Environmental Impact Assessment Reports;
- Landscape Institute and the Institute of Environmental Management and Assessment publication entitled Guidelines for Landscape and Visual Impact Assessment – Third Edition (2013) (GLVIA3);
- Department of the Environment, Heritage and Local Government Wind Energy Development Guidelines (2006) and Draft Revised Wind Energy Development Guidelines (2019);
- NatureScot: Assessing the cumulative landscape and visual impact of onshore wind energy developments (2021);
- Scottish Natural Heritage (SNH) Visual representation of wind farms: Best Practice Guidelines (version 2.2 - 2017); and
- Landscape Institute Technical Guidance Note (TGN) 06/19 Visual Representation of development proposals (2019).

The above guidance is widely recognised and used by landscape professionals in undertaking LVIA work in Ireland, and is considered to represent best practice in the absence of country-specific LVIA and visualisation guidance/standards.

11.2.4 Computer Generated Images, Photomontages and Wireframes

This LVIA is supported by a variety of computer-generated maps and graphics as well as verifiable photomontages that depict the Proposed Development within the views from a range of represented visual receptor locations. These maps, graphics and visualisations consist of the following:

- Zone of Theoretical Visibility (ZTV) maps; and
- Photomontages consisting of existing views, wireframe views and proposed views.

11.2.5 Assessment Criteria for Landscape Effect

The classification system used by Macro Works to determine the significance of landscape and visual impacts is in accordance with GLVIA3. When assessing the potential impacts on the landscape resulting from a wind farm development, the following criteria are considered:

- Landscape character, value and sensitivity;
- Magnitude of likely impacts; and
- Significance of landscape effects.

The sensitivity of the landscape to change is the degree to which a particular landscape receptor (Landscape Character Area (LCA) or feature) can accommodate changes or new features without unacceptable detrimental effects on its essential characteristics. Landscape Value and Sensitivity is classified using the following criteria:

Table 11.1 Landscape Value and Sensitivity

Sensitivity	Description
Very High	Areas where the landscape character exhibits a very low capacity for change in the form of development. Examples of which are high value landscapes, protected at an international or national level (World Heritage Site/National Park), where the principal management objectives are likely to be protection of the existing character.
High	Areas where the landscape character exhibits a low capacity for change in the form of development. Examples of which are high value landscapes, protected at a national or regional level (Area of Outstanding Natural Beauty), where the principal management objectives are likely to be considered conservation of the existing character.
Medium	Areas where the landscape character exhibits some capacity and scope for development. Examples of which are landscapes which have a designation of protection at a county level or at non-designated local level where there is evidence of local value and use.
Low	Areas where the landscape character exhibits a higher capacity for change from development. Typically, this would include lower value, non-designated landscapes that may also have some elements or features of recognisable quality, where landscape management objectives include, enhancement, repair and restoration.

Sensitivity	Description
Negligible	Areas of landscape character that include derelict, mining, industrial land or are part of the urban fringe where there would be a reasonable capacity to embrace change or the capacity to include the development proposals. Management objectives in such areas could be focused on change, creation of landscape improvements and/or restoration to realise a higher landscape value.

The magnitude of a predicted landscape impact is a product of the scale, extent or degree of change that is likely to be experienced as a result of the Proposed Development. The magnitude takes into account whether there is a direct physical impact resulting from the loss of landscape components and/or a change that extends beyond the Site boundary that may have an effect on the landscape character of the area.

Table 11.2 Magnitude of Landscape Impacts

Sensitivity	Description
Very High	Change that would be large in extent and scale with the loss of critically important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an extensive change of the landscape in terms of character, value and quality.
High	Change that would be more limited in extent and scale with the loss of important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to a considerable change of the landscape in terms of character, value and quality.
Medium	Changes that are modest in extent and scale involving the loss of landscape characteristics or elements that may also involve the introduction of new uncharacteristic elements or features that would lead to noticeable changes in landscape character, and quality.
Low	Changes affecting small areas of landscape character and quality, together with the loss of some less characteristic landscape elements or the addition of new features or elements that would lead to discernible changes in landscape character, and quality.
Negligible	Changes affecting small or very restricted areas of landscape character. This may include the limited loss of some elements or the addition of some new features or elements that are characteristic of the existing landscape or are hardly perceivable leading to no material change to landscape character, and quality.

The significance of a landscape impact is based on a balance between the sensitivity of the landscape receptor and the magnitude of the impact. The significance of landscape impacts is arrived at using the following matrix:

Table 11.3 Landscape Impact Significance Matrix

	Sensitivity of Receptor				
Scale/Magnitude	*Very High*	*High*	*Medium*	*Low*	*Negligible*
Very High	Profound	Profound-substantial	Substantial	Moderate	Slight
High	Profound-substantial	Substantial	Substantial-moderate	Moderate-slight	Slight-imperceptible
Medium	Substantial	Substantial-moderate	Moderate	Slight	Imperceptible
Low	Moderate	Moderate-slight	Slight	Slight-imperceptible	Imperceptible
Negligible	Slight	Slight-imperceptible	Imperceptible	Imperceptible	Imperceptible

Note: *Judgements deemed 'substantial' and above are considered to be 'significant effects' in EIA terms. Substantial-moderate judgements are considered near significant effects.*

11.2.6 Assessment Criteria for Visual Effect

As with the landscape impact, the visual impact of the Proposed Development will be assessed as a function of receptor sensitivity versus magnitude. In this instance, the sensitivity of visual receptors, weighed against the magnitude of visual effects.

11.2.6.1 Visual Sensitivity

As with landscape sensitivity, the sensitivity of a visual receptor is categorised as Very High, High, Medium, Low, and Negligible. Unlike landscape sensitivity, however, the sensitivity of visual receptors has an anthropocentric (human) basis. It considers factors such as the perceived quality and values associated with the view, the landscape context of the viewer, the likely activity the viewer is engaged in and whether this heightens their awareness of the surrounding environment.

Visual sensitivity is a two-sided analysis of receptor susceptibility (people or groups of people) versus the value of the view on offer at a particular location.

To assess the susceptibility of viewers and the amenity value of views, the assessors use a range of criteria and provide a four-point weighting scale to indicate how strongly the viewer/view is associated with each of the criteria. Susceptibility criteria are extracted directly from the GLVIA3, whilst the value criteria relate to various aspects of a view that might typically be related to high amenity including, but not limited to, scenic designations. These are set out below:

- **Susceptibility of receptor group to changes in view**. This is one of the most important criteria to consider in determining overall visual sensitivity because it is the single category dealing with viewer susceptibility. In accordance with the GLVIA 3 visual receptors most susceptible to changes in views and visual amenity are:
  - *"Residents at home*
  - *People, whether residents or visitors, who are engaged in outdoor recreation, including use of public rights of way, whose attention or interest is likely to be focussed on the landscape and on particular views*
  - *Visitors to heritage assets, or to other attractions, where views of the surroundings are an important contributor to the experience*
  - *Communities where views contribute to the landscape setting enjoyed by residents in the area*
  1. *Travellers on road rail or other transport routes where such travel involves recognised scenic routes and awareness of views is likely to be heightened".*

  "Visual receptors that are less susceptible to changes in views and visual amenity include:
  - *People engaged in outdoor sport or recreation, which does not involve or depend upon appreciation of views of the landscape*
  2. *People at their place of work whose attention may be focussed on their work or activity, not their surroundings and where the setting is not important to the quality of working life".*

Values typically associated the visual amenity

- **Recognised scenic value of the view (**County Development Plan designations, guidebooks, touring maps, postcards etc). These represent a consensus in terms of which scenic views and routes within an area are strongly valued by the population because in the case of County Development Plans, at least, a public consultation process is required.
- **Views from within highly sensitive landscape areas.** Again, highly sensitive landscape designations are usually part of a county's Landscape Character Assessment, which is then incorporated with the County Development Plan and is therefore subject to the public consultation process. Viewers within such areas are likely to be highly attuned to the landscape around them.

- **Intensity of use, popularity.** Whilst not reflective of the amenity value of a view, this criterion relates to the number of viewers likely to experience a view on a regular basis and whether this is significant at county or regional scale.
- **Connection with the landscape.** This considers whether or not receptors are likely to be highly attuned to views of the landscape i.e. commuters hurriedly driving on busy national route versus hill walkers directly engaged with the landscape enjoying changing sequential views over it.
- **Provision of elevated panoramic views.** This relates to the extent of the view on offer and the tendency for receptors to become more attuned to the surrounding landscape at locations that afford broad vistas.
- **Sense of remoteness and/or tranquillity.** Remote and tranquil viewing locations are more likely to heighten the amenity value of a view and have a lower intensity of development in comparison to dynamic viewing locations such as a busy street scene, for example:
- **Degree of perceived naturalness.** Where a view is valued for the sense of naturalness of the surrounding landscape it is likely to be highly sensitive to visual intrusion by obvious human interventions.
- **Presence of striking or noteworthy features**. A view might be strongly valued because it contains a distinctive and memorable landscape feature such as a promontory headland, lough or castle.
- **Historical, cultural or spiritual value.** Such attributes may be evident or sensed at certain viewing locations that attract visitors for the purposes of contemplation or reflection heightening the sense of their surroundings.
- **Rarity or uniqueness of the view.** This might include the noteworthy representativeness of a certain landscape type and considers whether other similar views might be afforded in the local or the national context.
- **Integrity of the landscape character in view.** This criterion considers the condition and intactness of the landscape in view and whether the landscape pattern is a regular one of few strongly related components or an irregular one containing a variety of disparate components.
- **Sense of place.** This criterion considers whether there is special sense of wholeness and harmony at the viewing location.
- **Sense of awe.** This criterion considers whether the view inspires an overwhelming sense of scale or the power of nature.

Those locations where highly susceptible receptors or receptor groups are present, and which are deemed to satisfy many of the view value criteria above are likely to be judged to have a high visual sensitivity and vice versa.

11.2.6.2 Visual Impact Magnitude

The magnitude of visual effects is determined on the basis of two factors: the visual presence of the proposal and its effect on visual amenity.

Visual presence is a somewhat quantitative measure relating to how noticeable or visually dominant the proposal is within a particular view. This is based on a number of aspects beyond simply scale in relation to distance. Some of these include the extent of the view as well as its complexity and the degree of existing contextual movement experienced such as might occur where turbines are viewed as part of/beyond a busy street scene. The backdrop against which the Proposed Development is presented and its relationship with other focal points or prominent features within the view is also considered. Visual presence is essentially a measure of the relative visual dominance of the proposal within the available vista and is expressed as such i.e. minimal, sub-dominant, co-dominant, dominant, highly dominant.

For wind energy developments, a strong visual presence is not necessarily synonymous with adverse impact, specifically being 'noticed' by viewers and contributing memorably to the experience of that view or location – positive or negatively. Instead, the 2018 Fáilte Ireland survey entitled 'Report on Visitor Awareness and Perceptions of the Irish Landscape' summarised results as below:

- *"The majority of visitors appear not to notice the majority of development – even very large and visually prominent structures such as wind turbines and powerlines*
- *It appears that there are significant divergences between the what can be seen and what is noticed*
- *The majority of visitors expressed very limited desire to change developments that they do notice*
- *The visibility of developments of all types give rise to significantly less adverse effects on the impression of landscape than may often be assumed in the decision-making process*

- *The majority of visible development does not appear to have any adverse effects on the impression of the quality of the landscape"*

With specific regard to wind farms, the following is mentioned within the main report:

- *"Visibility at Locations - Windfarms or Wind Turbines were visible from four locations, they were mentioned by visitors at one location – Cobh. At this site 11% of visitors mentioned noticing wind energy projects*

- *Visibility en-route to locations - Wind Energy projects were mapped as being visible en-route to six sites, they were mentioned by less than 5% of all visitors."*

The purpose here is not to suggest that turbines are unlikely to be noticed, regardless of the visual presence, but rather to highlight that the assessment of visual impact magnitude for wind turbines is more complex than just the degree to which turbines occupy a view. Furthermore, a clear and comprehensive view of a wind farm might be preferable in many instances to a partial, cluttered view of turbine components that are not so noticeable within a view. On the basis of these reasons, the visual amenity aspect of assessing impact magnitude is qualitative and considers such factors as the spatial arrangement of turbines both within the scheme and in relation to surrounding terrain and land cover. It also examines whether the project contributes positively to the existing qualities of the vista or results in distracting visual effects and disharmony.

It should be noted that as a result of this two-sided analysis, a high order visual presence can be moderated by a low level of effect on visual amenity and vice versa. Given that wind turbines do not represent significant bulk, visual impacts result almost entirely from visual 'intrusion' rather than visual 'obstruction' (the blocking of a view). The magnitude of visual impacts is classified in the following table derived from the GLVIA 3:

Table 11.4 Magnitude of Visual Impacts

Sensitivity	Description
Very High	The proposal obstructs or intrudes into a large proportion or critical part of the available vista and is without question the most noticeable element. An extensive degree of visual change will occur within the scene completely altering its character, composition and associated visual amenity
High	The proposal obstructs or intrudes into a significant proportion or important part of the available vista and is one of the most noticeable elements. A considerable degree of visual change will occur within the scene substantially altering its character, composition and associated visual amenity
Medium	The proposal represents a moderate intrusion into the available vista and is a readily noticeable element. A noticeable degree of visual change will occur within the scene perceptibly altering its character, composition and associated visual amenity
Low	The proposal intrudes to a minor extent into the available vista and may not be noticed by a casual observer and/or the proposal would not have a marked effect on the visual amenity of the scene
Negligible	The proposal would be barely discernible within the available vista and/or it would not influence the visual amenity of the scene

11.2.6.3 Visual Impact Significance

As stated above, the significance of visual impacts is a function of visual receptor sensitivity and visual impact magnitude. This relationship is expressed in the significance matrix in **Table 11.3** above.

11.2.6.4 Quality and Duration of Effects

In addition to assessing the significance of landscape/townscape effects and visual effects, EPA Guidance requires that the quality of the effects is also determined. This could be negative/adverse, neutral, or positive/beneficial.

- Positive Effects: A change which improves the quality of the environment;
- Neutral and/or balanced Effects: No effects, or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error; and
- Negative/adverse Effects: A change that reduces the quality of the environment.

The same EPA guidelines also set out categories of impact duration:

- Temporary – Lasting for one year or less;
- Short Term – Lasting one to seven years;
- Medium Term – Lasting seven to fifteen years;
- Long Term – Lasting fifteen years to sixty years; and

- Permanent – Lasting over sixty years.

In the case of commercial wind energy developments and the associated introduction of new moving structures within rural and upland areas, the quality of the landscape and visual effects will almost always be negative, rather than positive or even neutral. Unless otherwise stated, the quality of the landscape and visual effect judgements herein can be taken as negative.

In terms of duration, the proposed turbines will have a long-term impact, as permission is being sought for a 40 year period after which the turbines will be decommissioned. Some other elements of the Proposed Development relating to access tracks, enhanced amenity trails and elements of the grid connection will likely remain in perpetuity and will therefore have Permanent effects.

11.2.7 Assessment Criteria for Cumulative Effects

NatureScot's 'Guidance – Assessing the Cumulative Effects of Onshore Wind Farms' (2021) is considered a key reference with regard to cumulative landscape and visual impacts. GLVIA3 provides comparable guidance in relation to cumulative issues, whilst recognising that it is an emerging area of study.

The principal focus of wind energy cumulative impact assessment guidance relates to other wind farms - as opposed to other forms of development. This will also be the main focus herein, albeit with subsequent consideration of cumulative impacts with other forms of development (existing, permitted or proposed).

In relation to cumulative landscape impacts, the NatureScot guidance states:

"Cumulative landscape impacts can change either the physical fabric or character of the landscape, or any special values attached to it. For example:

- *Cumulative impacts on the physical fabric of the landscape arise when two or more developments affect landscape components such as woodland, dykes, rural roads or hedgerows. Although this may not significantly affect the landscape character, the cumulative effect on these components may be significant – for example, where the last remnants of former shelterbelts are completely removed by two or more developments.*

- *Cumulative impacts on landscape character arise when two or more developments introduce new features into the landscape. In this way, they can change the* *landscape character to such an extent that they create a different landscape character type, in a similar way to large scale afforestation. That change need not be adverse; some derelict or degraded landscapes may be enhanced as a result of such a change in landscape character, especially where opportunities for new woodland planting, or peatland restoration are maximised, for example."*

In relation to cumulative visual impacts, the NatureScot guidance states:

Cumulative impacts on visual amenity can be caused by 'combined visibility' and/or 'sequential impacts':

- *Combined visibility occurs where the observer is able to see two or more developments from one viewpoint. Assessments should consider the combined effect of all wind farms which are (or would be) visible from relevant viewpoints. Combined visibility may either be in combination (where several wind farms are within the observer's arc of vision at the same time) or in succession (where the observer has to turn to see the various wind farms).*

- *Sequential impacts occur when the observer has to move to another viewpoint to see different developments. Sequential impacts should be assessed for travel along regularly-used routes like major roads, railway lines, ferry routes, popular paths, etc. The magnitude of sequential effects will be affected by speed of travel and distance between viewpoints'*

The 2006 WEDG describes a cumulative effect as "t*he perceived effect on the landscape of two or more wind energy developments visible from any one place*", and provides guidance as to the aesthetic effects of multiple turbine developments in various landscape contexts. It also requires that cumulative effects are represented using Zone of Theoretical Visibility maps that show other wind energy developments.

Based on both sets of guidance (NatureScot and 2006 WEDG), cumulative impacts can be experienced in a variety of ways.

In terms of landscape character, additional wind energy developments might contribute to an increasing sense of proliferation. A new wind farm might also contribute to a sense of being surrounded by turbines with little relief from the view of them.

In terms of visual amenity, there is a range of ways in which an additional wind farm might generate visual conflict and disharmony with other wind energy developments. Some of the most common include visual tension caused by disparate extent, scale or layout of neighbouring developments. A sense of visual ambivalence might also be caused by adjacent developments traversing different landscape types. Turbines from a proposed wind farm that are seen stacked in perspective against the turbines of nearer or further developments tend to cause visual clutter and confusion. Such effects are exacerbated when, for example, the more distant turbines are larger than the nearer ones and the sense of distance is distorted.

Table 11.5 provides Macro Works' criteria for assessing the magnitude of cumulative impacts. The approach adopted is informed by the NatureScot Guidelines (2021) and GLVIA3, but adopts a study area (20 km) that is consistent with the main assessment to retain a proportionate focus on the most notable effects. As industry-specific guidance for the assessment of cumulative landscape and visual effects, this guidance is widely adopted for LVIA work and is considered best practice in Ireland, and the approach adopted in relation to many other schemes across Ireland.

Other wind energy developments are the most relevant type of development in a cumulative LVIA assessment given the comparable characteristics. In this regard, small and domestic-scale wind turbines are generally not considered relevant given their proportions and potential to generate notable cumulative effects. Given the potentially extensive scope of including all other types of development within a cumulative LVIA, a proportionate level of consideration is given to schemes that are considered to have the potential to significantly alter the cumulative landscape and visual Baseline environment. Factors such as scale and proximity of a proposed development are important factors, in addition to the characteristics of the development in question.

Table 11.5 – Magnitude of Cumulative Impacts

Criteria	Description
Very High	• The proposed wind farm will strongly contribute to wind energy development being the defining element of the surrounding landscape. • It will strongly contribute to a sense of wind farm proliferation and being surrounded by wind energy development. • Strongly adverse visual effects will be generated by the proposed turbines in relation to other turbines.
High	• The proposed wind farm will contribute significantly to wind energy development being a defining element of the surrounding landscape. • It will significantly contribute to a sense of wind farm proliferation and being surrounded by wind energy development. • Significant adverse visual effects will be generated by the proposed turbines in relation to other turbines.
Medium	• The proposed wind farm will contribute to wind energy development being a characteristic element of the surrounding landscape. • It will contribute to a sense of wind farm accumulation and dissemination within the surrounding landscape. • Adverse visual effects might be generated by the proposed turbines in relation to other turbines.
Low	• The proposed wind farm will be one of only a few wind farms in the surrounding area and will be viewed in isolation from most receptors. • It might contribute to wind farm development becoming a familiar feature within the surrounding landscape. • The design characteristics of the proposed wind farm accord with other schemes within the surrounding landscape and adverse visual effects are not likely to occur in relation to these.
Negligible	• The proposed wind farm will most often be viewed in isolation or occasionally in conjunction with other distant wind energy developments. • Wind energy development will remain an uncommon landscape feature in the surrounding landscape. • No adverse visual effects will be generated by the proposed turbines in relation to other turbines.

11.3 BASELINE DESCRIPTION

11.3.1 Landscape Baseline

The landscape Baseline represents the existing landscape context and is the scenario against which any changes to the landscape brought about by the Project will be assessed.

This also includes reference to any relevant landscape character appraisals and the current landscape policy context (both are generally contained within County Development Plans).

A description of the landscape context of the proposed wind farm Site and Wider Study Area is provided below under the headings of landform and drainage, vegetation and land use, centres of population, transport routes and public amenities and facilities as well as the immediate site context.

Additional descriptions of the landscape, as viewed from each of the selected viewpoints, are provided under the detailed assessments later using a similar structure. Although this description forms part of the landscape Baseline, many of the landscape elements identified also relate to visual receptors i.e. places and transport routes from which viewers can potentially see the proposed development. The visual resource will be described in greater detail below. **Figure 11.2** shows the site and its immediate surrounding landscape context.

11.3.2 Landform and Drainage

This is a varied and dynamic landscape that comprises a multitude of landforms and landscape features. Indeed, much of the study area comprises elevated rolling hills, ridges and rocky outcrops, with the Site situated along an elevated ridge that extends in a general east–west direction southwest of the summit of Shehy More. Shehy More rises to a maximum elevation of c. 545.6m AOD and is one of the most elevated parts of the Central Study Area, whilst the most elevated part of the Site rises to a height of c. 446m AOD. In terms of watercourses, several small streams descend from the elevated lands that contain the site in all directions. Several of these flow into the Ouvane River, which is the nearest notable watercourse to the site and flows in the southwesterly direction some c. 3.5 km northwest of the Site. Lough Nambrackderg is a small upland lough located less than c. 1km north of the Site, whilst Lough Allue is the largest inland waterbody within the Study Area and is situated just over c.5 km from the proposed turbines at its nearest point. Other notable watercourses and lakes within the study area include the River Lee, which flows out from Gouganebarra Lake in the northern half of the study area and is located c. 6km north of the site at its nearest point. The Gougane Barra complex is a highly distinctive glacial landform that comprises a broad lake enclosed by steep escarpments and surrounding elevated ridges and is located some c. 7km northwest of the site. Numerous other elevated hills, upland ridges and mountaintop summits occur throughout the Wider Study Area, most notably within its northwest quadrant along the Kerry – Cork County border. The westernmost extent of the study area also comprises an area of coastline encompassing broad bays, coastal inlets and small islands.

11.3.3 Vegetation and Land use

In terms of land use, the Central Study Area generally comprises extensive areas of mountain moorland and sizeable commercial conifer forests. Jagged rocky outcrops and areas of scrubby vegetation are also typical in the most elevated upland parts of the study area, whilst the lower winding valleys are characterised by pastoral farmland and areas of transitional scrub. Due to the site's relatively remote location, there are no notable settlements within the Central Study Area. Nonetheless, the Wider Study Area comprises several notable settlements, including Bantry, Drimoleage and Dunmanway. The central and wider study also encompasses numerous existing wind farm developments, the nearest of which is Shehy More Wind Farm (c. 180 m northwest), which is situated immediately north of the site and extends across the northern extents of Shehy More Mountain. Wind Energy development can be found throughout the Wider Study Area's northern and southern extent. Other notable land uses include the N22 and N71 national route corridors, which are situated in the wider northeast and southwest periphery of the study area, respectively.

11.3.4 Landscape Policy Context and Designations

11.3.4.1 The Department of Environment, Heritage and Local Government Wind Energy Development Guidelines (2006/2019 revision)

The Wind Energy Development Guidelines (2006/2019 draft revision) provide guidance on wind farm siting and design criteria for a number of different landscapes types. The site of the Proposed Development is considered to be located within a relatively complex and dynamic landscape setting that is most consistent with the 'Mountain Moorland' type from the Wind Energy Development Guidelines. However, the wider context does encompass characteristics from a mix of the landscape types including, 'Transitional Marginal Landscapes' and 'Hilly and Flat Farmland'.

The most relevant recommendations for the 'Mountain Moorland' Landscape type are set out below, but with consideration of the guidance relating to other relevant landscape types considered thereafter.

Mountain Moorland:

Location – "*Ridges and saddles are generally acceptable.*"

Spatial extent - *"Tend towards large, depending on scale of actual context"*

Spacing - *"Any spacing may be acceptable, but regular spacing may be best on a simple ridge or on broad sweeping areas."*

Layout - *"Any layout may be acceptable, but random or clustered may be best on ridges and hilltops, respectively, and grid on broad sweeping areas"*

Height - *"There would generally be no height restrictions on mountain moorlands as the scale of the landscape is so great…..Profile, whether even or uneven is dependent on topography: the more rugged and undulating the more uneven it will be"*

Cumulative - "*The open expanse of such landscapes can absorb a number of wind energy development, depending on their proximity. The cumulative impact will also depend on the actual visual complexity of landform, whether steeply rolling, undulating or gently sweeping."*

It is considered that the siting and design of the Proposed Development is generally consistent with the guidance noted above for the 'Mountain Moorland' landscape type. In combination with the recommendations for 'Mountain Moorland' landscape type, the siting and design recommendations for the 'Transitional Marginal Landscapes' and 'Hilly and Flat Farmland' landscape types have also been considered when designing the turbine layout for the proposed Gortloughra Wind Farm as a result of the varied nature of the landscape within the Central and Wider Study Area. Most design options appear to be appropriate for 'Mountain Moorland' and vary depending on the specific site. The design of the Proposed Development is in keeping with the Wind Energy Development guidance, which states "*Ridges and saddles are generally acceptable*", whilst the 175m tip height turbines are considered appropriate in this instance and are consistent with the guidance which states "*There would generally be no height restrictions on mountain moorlands as the scale of the landscape is so great"*.

<u>Siting in Relation to Individual Properties ('Setback')</u>

Section 6.18 of the Draft Revised Wind Energy Development Guidelines (December 2019) refers to appropriate setback distances for visual amenity purposes. It is important to note that there are no setback distance for visual amenity purposes outlined in the current 2006 WEGs. The guidelines (Draft 2019) outline a mandatory minimum setback distance of "500 meters" or the distance of "4 times the tip height" of the proposed turbines "between the nearest point of the curtilage of any residential property". This is set out in SPPR2 which is included below:

SPPR 2: With the exception of applications where reduced setback requirements have been agreed with relevant owner(s) as outlined at 6.18.2 below, planning authorities and An Bord Pleanála (where relevant), shall, in undertaking their development planning and development management functions, ensure that a setback distance for visual amenity purposes of 4 times the tip height of the relevant wind turbine shall apply between each wind turbine and the nearest point of the curtilage of any residential property in the vicinity of the proposed development, subject to a mandatory minimum setback of 500 metres from that residential property. Some discretion applies to planning authorities when agreeing separation distances for small scale wind energy developments generating energy primarily for onsite usage. The planning authority or An Bord Pleanála (where relevant), shall not apply a setback distance that exceeds these requirements for visual amenity purposes.

The nearest residential dwelling to any of the proposed turbines is approximately 486m from the nearest turbine (T8), although this property is involved in the Project. All other receptors exceed the setback distance outlined in the both the current 2006 Guidelines and the Draft Revised Guidelines (2019).

11.3.5 Cork County Development Plan 2022-2028

The Cork County Development Plan 2022-2028 (Volume 1) includes Chapter 14 'Green Infrastructure and Recreation', within which sub-section 14.7 relates to landscape. A number of general objectives relating to landscape are noted within this chapter and are included below:

GI 14-9: Landscape

a) *"Protect the visual and scenic amenities of County Cork's built and natural environment.*

b) *Landscape issues will be an important factor in all land-use proposals, ensuring that a pro-active view of development is undertaken while maintaining respect for the environment and heritage generally in line with the principle of sustainability.*

c) *Ensure that new developments meets high standards of siting and design.*

d) *Protect skylines and ridgelines from development.*

e) *Discourage proposals necessitating the removal of extensive amounts of trees, hedgerows and historic walls or other distinctive boundary treatments."*

GI 14-10: Draft Landscape Strategy

"Ensure that the management of development throughout the County will have regard for the value of the landscape, its character, distinctiveness and sensitivity as recognised in the Cork County Draft Landscape Strategy and its recommendations, in order to minimize the visual and environmental impact of development, particularly in areas designated as High Value Landscapes where higher development."

A Landscape Character Assessment was undertaken as part of the Draft Cork Landscape Strategy (2007). This has been incorporated within the Cork County Development Plan (2022-2028) and divides the county into 16 No. Landscape Character Types (LCTs) – refer to **Figure 11,4** The Proposed Development is situated entirely within the Landscape Character Type '15a Ridge and Peaked Upland', which is classified with a; 'High' landscape sensitivity; 'High' Landscape Value; and 'Local' level Landscape Importance **(Figure 11.5 refers)**. The Central Study Area also encompasses two other contrasting LCTs and includes 'LCT 12b - Rolling Marginal and Forested Middleground' located immediately to the east of the site and 'LCT 16b – Glaciated Cradle Valleys' located c. 2km south of the nearest proposed turbine. LCT12b is classified with a 'Medium' landscape sensitivity; 'Medium' Landscape Value; and 'Local' level Landscape Importance, whilst LCT16b is classified with a 'Low' Landscape Sensitivity; 'Medium' Landscape Value; and 'Local' level Landscape Importance.

Within the draft Cork Landscape Strategy (2007), LCT 15a *"flanks much of the mid-western boundary of County Cork, from the vicinity of Bantry in the south to Millstreet in the north. This landscape type has been glaciated and comprises a fairly rugged and rolling mountainous topography at a relatively high elevation. The area around the Cousane Gap provides a good example of this landscape type which is inclined towards the rugged whereas the southern slopes of the Boggeragh Mountains further to the north in type 15B are a somewhat smoother example, thus adding to the openness of the moorland. These are often delineated by tight gorse hedgerows, walls, banks or post and wire fencing and punctuated by coniferous or broadleaf shelterbelts around small farmsteads. The landscape, with its rapid and steep rising and falling, seems to tumble down along the valleys. The rugged and diverse landcover, involving moorland, heath and scrub, lends a strong sense of the naturalistic."*

LCTs within the Wider Study Area include, 'LCT4 - Rugged Ridge Peninsulas', 'LCT6a – Broad Fertile Lowland Valleys', 'LCT8 – Hilly River and Reservoir Valleys', 'LCT9 – Broad Marginal Middleground and Lowland Basin', 'LCT10a – Fissured Fertile Middleground', 'LCT12a – Rolling Marginal Middleground', 'LCT13a – Valleyed Marginal Middleground', 'LCT15b – Ridged and Peaked Upland', 'LCT16a and LCT16c Glaciated Cradle Valleys'.

The value of the landscape in county Cork "*is defined as the environmental or cultural benefits, including services and functions, which are derived from various landscape attributes. Value is evaluated using criteria ranging from Very High to Low*". The current CDP defines High Value Landscapes as "*Landscape Character Types which have a very high or high landscape value and high or very high landscape sensitivity and are of county or national importance are considered to be our most valuable landscapes and therefore are designated as High Value Landscapes (HVL)*" It should be noted that the Proposed Development is not situated in an area recognised as HVL, however and the nearest HVL designation is located some c. 6.1km northwest of the site and relates to 'LCT16a – Glaciated Cradle Valleys' (refer to Error! Reference source not found.).

A number of general recommendations are outlined in the Draft Cork County Landscape Strategy regarding LCT15a, some of which relate to the Proposed Development:

<u>*LCT 15a* – Ridged and Peaked Upland (Mullaghanish to Millstreet)</u>

- *"Protect the unique setting and character of villages like Ballingeary and Inchigeelagh.*
- *Recognise the scenic value of the Cousane Gap as a valuable tourist attraction in this LCT.*
- *Recognise the value of Lough Allua as a valuable amenity for tourism and recreational activities.*
- *Recognise the value of the upland areas (Shehy Mountains) in this LCT particularly as a tourism resource for hill walking.*

11.3.5.1 Cork County Development Plan 2022-2028 – Wind Energy Policy

Section 13.6 of the Cork County Development Plan 2022-2028 covers onshore wind energy within County Cork. A number of objectives relating to the Proposed Development are outlined therein:

County Development Plan Objective ET 13-4: Wind Energy *- In order to facilitate increased levels of renewable energy production consistent with national targets on renewable energy and climate change mitigation as set out in the National Energy and Climate Plan 2021-2030, the Climate Action Plan 2021, and any updates to these targets, and in accordance with Ministerial Guidelines on Wind Energy Development, the Council will support further development of on-shore wind energy projects including the upgrading, repowering or expansion of existing infrastructure, at appropriate locations within the county* *in line with the Wind Energy Strategy and objectives detailed in this chapter and other objectives of this plan in relation to climate change, biodiversity, landscape, heritage, water management and environment etc.*

***County Development Plan Objective ET 13-5**: **Wind Energy Projects (b) -** On-shore wind energy projects should focus on areas considered 'Acceptable in Principle' and 'Areas Open to Consideration' and generally avoid "Normally Discouraged" areas as well as sites and locations of ecological sensitivity.*

Figure 13.2 of the Cork County Development Plan 2022-2028 shows a map with policy considerations for wind energy projects (**Figure 11.8** refers) and identifies areas likely to be most suitable for wind energy developments. Whilst the site is not situated within one of the areas identified as '*likely to be most suitable'*, nor is it situated in areas designated as important landscape (Medium or High).

Section 13.6 of the Cork County Development Plan 2022-2028 covers onshore wind energy within County Cork. A number of objectives relating to the Proposed Development are outlined therein:

development in relation policy considerations for wind energy projects.

Figure 9.3 of the County Development Plan identifies areas of the county where wind energy developments are '*Accepted in Principle*', '*Open to consideration'* and '*Normally discouraged'* (Figure 11.9 refers).

The Proposed Development is entirely situated in an area designated as '*Open to Consideration*'. These areas are *"locations that may have potential for wind farm developments but there are also some environmental issues to be considered. This area has variable wind speeds and some access to the grid. Urban areas, metropolitan/town green belts, and Natural Heritage Areas (NHA's) within this area are not generally considered suitable for wind farm developments".* Objectives outlined within the Cork County Development Plan relating to areas identified as *'open to consideration'* are included below:

***"County Development Plan Objective ED 13-7:** Open to Consideration - Commercial wind energy development is open to consideration in these areas where proposals can avoid adverse impacts on:*

- *Residential amenity particularly in respect of noise, shadow flicker and visual impact;*
- *Urban areas and Metropolitan/Town Green Belts;*
- *Natura 2000 Sites (SPA and SAC), Natural Heritage Areas (NHA's) or adjoining areas affecting their integrity.*

- *Architectural and archaeological heritage;*
- *Visual quality of the landscape and the degree to which impacts are highly visible over wider areas."*

The nearest '*normally discouraged'* wind energy designation is situated outside of the Central Study Area some c. 6.1km to the northwest of the site and relates to the 'LCT16a – Glaciated Cradle Valleys'. The nearest 'Acceptable in Principle' designation is located a similar distance to the south of the site and is associated with 'LCT 9 – Broad Marginal Middleground and Lowland Basin'.

11.3.6 Kerry County Development Plan 2022 – 2028

Section 11.6 of this relates to the landscapes and refers to a landscape review for the County Kerry, where "the landscapes of the county are described in terms of their type, the impact of various types of development on these landscapes are assessed, landscape areas are defined, with the visual sensitivity of these then determined". The landscape review identifies 40 landscape character areas throughout County Kerry. The most relevant of these include LCA 38: Owbaun, Slaheny and Roughty River Valleys and LCA 40: Upper Sheen River Valley, both of which are classified with a 'Medium/High' landscape sensitivity. It is also important to note that almost the entirety of the landscape of Kerry in the northwest quadrant of the Wider Study Area is classified as 'Visually Sensitive Areas'. These areas are described as *"the outstanding landscapes throughout the County which are sensitive to alteration. Rugged mountain ranges, spectacular coastal vistas and unspoilt wilderness areas are some of the features within this designation."*

11.3.7 Visual Baseline

11.3.7.1 Zone of Theoretical Visibility (ZTV)

Only those parts of the Study Area that potentially afford views of the Proposed Development are of interest to this part of the assessment. Therefore, the first part of the visual Baseline is establishing a 'Zone of Theoretical Visibility' and subsequently, identifying important visual receptors from which to base the visual impact assessment.

A computer generated Zone of Theoretical Visibility (ZTV) map has been prepared to illustrate where the Proposed Development is potentially visible from. The ZTV map is based solely on terrain data (bare ground visibility), and ignores features such as trees, hedges or buildings, which may screen views. Given the complex vegetation patterns within this landscape, the main value of this form of ZTV mapping is to determine those parts of the landscape from which the Proposed Development will definitely not be visible, due to terrain screening within the 20 km Study Area.

The following key points are illustrated by the 'bare-ground' ZTV map (**Figure 11.10** refers):

- The key point to note from the ZTV is that due to the heavily rolling nature of the terrain within the surrounding landscape, over half of the study area will afford no visibility of the proposed turbines.
- With regard to the Central Study Area, the most notable potential for comprehensive theoretic visibility relates to its southern half, where theoretic visibility of all 8 turbines has the potential to be afforded along sections of the R585 regional road and along the rolling hills further to the south.
- Within the eastern extent of the Central Study Area a splay of theoretic potential visibility where views of up to 8 turbines have the potential to be afforded.
- In the northern and western extents of the Central Study Area, the theoretical potential for visibility ranges between views of one to eight turbines, with the most elevated locations affording theoretical visibility of a higher number of turbines than the lower winding valleys.
- The wider southeast quadrant of the Study Area accounts for the most notable area of comprehensive theoretic visibility throughout the full 20 km Study Area, although it is important to note that broad areas of no visibility are also located within this quadrant of the Study Area.
- In contrast to the southeast quadrant, the southwest quadrant accounts for the most notable area of no turbine visibility, with the only notable areas of theoretic visibility occurring in the surrounds of the coastal settlements of Bantry and Ballylicky.
- In the northern half of the Wider Study Area, there are some sporadic areas of theoretic visibility ranging from views of all eight turbines to views of up to two turbines. These areas are principally associated with elevated hills, ridges and mountaintop summits. The northern extent of the Wider Study Area, especially northwest of the Kerry County bounds has very limited potential for visibility of the proposed turbines due to the high degree of terrain screening in this aspect of the study area. Whilst there will be some potential for theoretical visibility of the proposed turbines on the local access roads to Gougane Barra, there will be no potential for turbine visibility from the immediate surrounds of the Lough, which is a highly sensitive receptor.
- Within the Wider Study Area, there will be no or limited visibility of the proposed turbines at the centre of the settlements of Drimoleague, Ballingeary, Ballyvourney and Ballineen.

11.3.7.2 Views of Recognised Scenic Value

Views of recognised scenic value are primarily indicated within County Development Plans in the context of scenic views/routes designations, but they might also be indicated on touring maps, guidebooks, road-side rest stops or on post cards that represent the area.

All of the scenic routes and views in both Cork and Kerry that fall inside the ZTV pattern (**Figure 11.10**) were investigated during fieldwork to determine whether actual views of the Proposed Development might be afforded. Where visibility may occur, a viewpoint has been selected for use in the visual impact appraisal later in this chapter (representative viewpoints are highlighted on Figure 11.11 below and in the accompany photomontage booklet).

Table 11.6 Rational for selection of scenic designations within the relevant County Development Plans

Scenic View or Route Reference (CDP):	Relevance to visual impact appraisal?	Represented herein by VRP No.
Cork County Development Plan 2022-2028 – Scenic Routes		
S23	**Not relevant** – Limited potential for any clear turbine visibility from this heavily contained section of the N22	-
S24	**Not relevant** – Located outside of ZTV	-
S25	**Yes relevant** – Potential for distant views of the proposed turbines	VP1
S26	**Yes relevant** – Potential for distant views of the proposed turbines	VP1
S27	**Yes relevant** – Potential for distant views of the proposed turbines	VP2 & VP5
S28	**Yes relevant** – Potential for views to be afforded of the proposed development	VP13
S29	**Yes relevant** – Potential for views to be afforded of the proposed development	VP20, VP22, VP23, VP24
S30	**Yes relevant** – Potential for views to be afforded of the proposed development	VP27
S31	**Yes relevant** – Potential for distant views of the proposed turbines	VP29

Scenic View or Route Reference (CDP):	Relevance to visual impact appraisal?	Represented herein by VRP No.
S32	**Yes relevant** – Potential for distant views of the proposed turbines	VP8, VP12
S33	**Yes relevant** – Potential for distant views of the proposed turbines	VP8
S34	**Yes relevant** – Potential for distant views of the proposed turbines	VP6, VP3
S35	**Yes relevant** – Potential for distant views of the proposed turbines	V4
S36	**Yes relevant** – Potential for distant views of the proposed turbines	VP9
S92	**Not relevant** – Located outside of ZTV	
S111	**Yes relevant** – Potential for distant views of the proposed turbines	VP30
Kerry County Development Plan 2022-2028 – Protected Views		
Note: the current Kerry County Development Plan includes a selection of scenic views and prospects in Volume 4. Nonetheless, none of these located within the wider northern aspects of the study area are located within ZTV. Thus, these protected views and prospects are not considered relevant to the proposed development.		

Policy relating to scenic designations in both the Cork and Kerry County Development Plans is included below;

Cork CDP

GI 14-12: General Views and Prospects - *Preserve the character of all important views and prospects, particularly sea views, river or lake views, views of unspoilt mountains, upland or coastal landscapes, views of historical or cultural significance (including buildings and townscapes) and views of natural beauty as recognized in the Draft Landscape Strategy.*

GI 14-13: Scenic Routes - *Protect the character of those views and prospects obtainable from scenic routes and in particular stretches of scenic routes that have very special views and prospects identified in this Plan. The scenic routes identified in this Plan are shown on* *the scenic amenity maps in the CDP Map Browser and are listed in Volume 2 Heritage and Amenity Chapter 5 Scenic Routes of this Plan.*

GI 14-14: Development on Scenic Routes -

Require those seeking to carry out development in the environs of a scenic route and/or an area with important views and prospects, to demonstrate that there will be no adverse obstruction or degradation of the views towards and from vulnerable landscape features. In such areas, the appropriateness of the design, site layout, and landscaping of the proposed development must be demonstrated along with mitigation measures to prevent significant alterations to the appearance or character of the area.

Encourage appropriate landscaping and screen planting of developments along scenic routes (See Chapter 16 Built and Cultural Heritage).

Kerry CDP

KCDP 11-79: *Preserve the views and prospects as defined on Maps contained in Volume 4.*

KCDP 11-80: *Facilitate the sustainable development of existing and the identification of new Viewing Points along the route of the Wild Atlantic Way in conjunction with Fáilte Ireland, while ensuring the protection of environmental attributes in the area through the implementation of environmental protection objectives, standards and guidelines of this Plan.*

KCDP 11-81: *Prohibit developments that have a material effect on views designated in this plan from the public road or greenways towards scenic features and/or public areas.*

11.3.7.3 Centres of Population and Houses

Due to the remote character of much of the Central Study Area, which comprises upland hills, ridges and mountaintop summits, there is a relatively modest rural population density. With regard to settlements, the only settlement within the Central Study Area is Togher Village, which is located c. 4.7km southeast of the nearest turbine. Aside from this, the only other notable centres of population are small linear clusters of dwellings and cross-road settlements.

Whilst the Wider Study Area shares similar characteristics to the Central Study Area, there is a more notable agglomeration of settlements. The most notable of these is the coastal town of Bantry, located some 16km southwest of the site at its nearest point. Other notable settlements in the Wider Study Area include the towns and villages of Ballingeary (c. 7km north), Inchigeelagh (c. 8.5 km northeast), Kealkill (c. 9km southwest), Dunmanway (c. 9.5 km southeast) and Drimoleague (c. 12.5 km south). Several other small settlements are also located along the wider periphery of the Study Area and include Ballylickey, Drinagh, Ballyvourney and Kilgarvan.

11.3.7.4 Transport Routes

The most notable major transport route in relation to the Proposed Development is the R585 regional road, which traverses the Study Area in an east-west direction through the Cousane Gap and is located some c. 1.3km south of the turbine array at its nearest point. The R584 is the only other major route within the Central Study Area, some 3.5 km northwest of the Site. Aside from these routes, the Central Study Area also encompasses several local roads, the nearest of which is the L8776 local road, which traverses east-west through the Study Area and is some c. 750 m north of the nearest turbine in the array at its nearest point. A network of crisscrossing local roads also traverses the Central Study Area, most of which are contained in its eastern half.

Within the Wider Study Area, the most notable major routes include the N22 national primary route and N71 national secondary route, which are located some c. 17km northeast and c. 14.4km southwest of the Site. The Wider Study Area also encompasses a web of interconnecting local and regional roads.

11.3.7.5 Tourism, Recreational and Heritage Features

Due to the complex and varied nature of the landscape within the Study Area, there are several notable tourism and recreational features that pass through the surrounding landscape context.

The Wild Atlantic way is a popular tourist driving route, which occurs along the western coastline of Ireland stretching from Derry at the very northern tip of the country all the way to Kinsale in County Cork. The route enters the Study Area along the coastline in the wider western periphery of the Study Area and skirts around the coastal promontories in the surrounds of Bantry. The Wild Atlantic Way route passes just over c. 14km west of the Site at its nearest point.

The Eurovelo is a network of up to 17 long-distance cycling routes that crisscross Europe. The most relevant of these is the Atlantic Coast route which traverses the northwest and southern coastline of Ireland. Whilst the section of this route along the southwest coast is still under development, it will pass along the coastal parts of the Study Area, and follows the same path as the Wild Atlantic Way within the Study Area.

Due to the elevated and rolling nature of the Study Area, numerous walking trails and cycling trails criss-cross the Study Area. The most notable of these include the Slí Gaeltacht Mhuscrai, the Beara Way and the Sheep's Head Way national waymarked walking trail, all of which occur throughout the northern, western and southwestern extents of the Study Area. A selection of other local walks and looped trails also occur within the wider surrounds of the Study Area. Some of the most notable of these are the Gougane Barra Loop trails, which are located throughout a dense conifer forest to the west of the Gougane Barra Lake. The Gougane Barra complex itself is also a notable tourism and recreation receptor within the Study Area and St Finabarr's Church and notable heritage feature located along a small island on the lake.

It should also be noted that the site encompass several new looped walking and hiking trails (Shehy Trails) that emanate from a newly constructed car park located to the southwest of the westernmost turbine in the array. Some of these trails will follow existing tracks that traverse the site, whilst others will follow new trails along elevated sections of the upland terrain that characterises much of the site. The looped walking trails also encompass several local heritage features, all of which are outlined in the AIA (refer to **Chapter 13**)

The study area also encompasses an array of heritage features, including Carriganass Castle, Kealkill Stone Circle, Clodagh Standing Stones, Castledonavan, Meighan's Crannóg and Carrignacurra Castle.

11.3.7.6 Identification of Viewshed Reference Points as a Basis for Assessment

The results of the ZTV analysis provide a basis for the selection of Viewshed Reference Points (VRP's), which are the locations used to study the landscape and visual impact of the Proposed Development in detail. It is not warranted to include each and every location that provides a view of the Proposed Development as this would result in an unwieldy report and make it extremely difficult to draw out the key impacts arising from the project. Instead, a variety of receptor locations was selected that are likely to provide views of the Proposed Development from different distances, different angles and different contexts. In all instances, every effort has been made to select the clearest views of the Proposed Development from the relevant receptor type.

The visual impact of a Proposed Development is assessed using up to 6 categories of receptor type as listed below. These categories are derived from both GLVIA3 and best practice:

- Key Views (from features of national or international importance) (KV);
- Designated Scenic Routes and Views (DSR);
- Local Community views (LCV);
- Centres of Population (CP);
- Major Routes (MR); and
- Amenity and heritage features (AH).

Where a VRP might have been initially selected for more than one reason it will be assessed according to the primary criterion for which it was chosen. The characteristics of each receptor type vary as does the way in which the view is experienced. These are described below.

Key Views (KV)

These VRPs are at features or locations that are significant at the national or even international level, typically in terms of heritage, recreation or tourism. They are locations that attract a significant number of viewers who are likely to be in a reflective or recreational frame of mind, possibly increasing their appreciation of the landscape around them. The location of this receptor type is usually quite specific.

Designated Scenic Routes and Views (DSR)

Due to their identification in the County Development Plan, this type of VRP location represents a general policy consensus on locations of high scenic value within the Study Area. These are commonly elevated, long distance, panoramic views and may or may not be mapped from precise locations. They are more likely to be experienced by static viewers who seek out or stop to take in such vistas.

Local Community Views (LCV)

This type of VRP represents those people who live and/or work in the locality of the Proposed Development, usually within a 5 km radius of the site. Although the VRPs are generally located on local level roads, they also represent similar views that may be available from adjacent houses. The precise location of this VRP type is not critical; however, clear elevated views are preferred, particularly when closely associated with a cluster of houses and representing their primary views. Coverage of a range of viewing angles using several VRPs is necessary in order to sample the spectrum of views that would be available from surrounding dwellings.

Centres of Population (CP)

VRPs are selected at centres of population primarily due to the number of viewers that are likely to experience that view. The relevance of the settlement is based on the significance of its size in terms of the Study Area or its proximity to the site. The VRP may be selected from any location within the public domain that provides a clear view either within the settlement or in close proximity to it.

Major Routes (MR)

These include national and regional level roads and rail lines and are relevant VRP locations due to the number of viewers potentially impacted by the Proposed Development. The precise location of this category of VRP is not critical and might be chosen anywhere along the route that provides clear views towards the Site, but with a preference towards close and/or elevated views. Major routes typically provide views experienced whilst in motion and these may be fleeting and intermittent depending on screening by intervening vegetation or buildings.

Tourism, Recreational and Heritage Features (AH)

These views are often one and the same given that heritage locations can be important tourist and visitor destinations and amenity areas or walking routes are commonly designed to incorporate heritage features. Such locations or routes tend to be sensitive to development within the landscape as viewers are likely to be in a receptive frame of mind with respect to the landscape around them. The sensitivity of this type of visual receptor is strongly related to the number of visitors they might attract and, in the case of heritage features, whether these are discerning experts or lay tourists. Sensitivity is also heavily influenced by the experience of the viewer at a heritage site as distinct from simply the view of it. This is a complex phenomenon that is likely to be different for every site. Experiential considerations might relate to the sequential approach to a castle from the car park or the view from a hilltop monument reached after a demanding climb. It might also relate to the influence of contemporary features within a key view and whether these detract from a sense of past times. It must also be noted that the sensitivity rating attributed to a heritage feature for the purposes of a landscape and visual assessment is not synonymous with its importance to the Archaeological or Architectural Heritage record.

The Viewshed Reference Points selected in this instance are set out in **Table 11.7** below and shown on the VP selection Map in the Photomontage Booklet.

Table 11.7 Outline description of selected Viewshed Reference Points (See Viewpoint Location Map Figure 11.11)

VRP No.	Location	Distance to Nearest Turbine(km)	Representative of	Direction of view
VP1	Local road at Cahernacaha	10.9km – T2	DSR, AH	S
VP2	Local road at Derreenlunnig	7.9km – T1	DSR, AH	SE
VP3	R548 at Ballingeary	7.4km – T2	DSH, CP, MR	S
VP4	Local road at Rossmore	12.5 km – T6	DSR	SW
VP5	Local road east of Gougane Barra Lake	7.8km – T1	DSR, AH	SE
VP6	R584 at Currahy north of Lough Allua	6.0 km – T6	DRS, MR	SW
VP7	Local cemetery at Inchigeelagh	9.3km – T6	AH, CP	SW
VP8	Local road at Kealvaugh More	4.8km – T2	DSR, LCV	S
VP9	Local road at Lisnacuddy	17km – T6	DSR	W
VP10	L8776 at Cornery east of Cloghboola Bridge	1.7km – T2	LCV	S
VP11	Local road laneway at Shehy More	2.5 km – T6	LCV	SW
VP12	Local road at Lakabaun	4.4km – T6	LCV, DSR	SW
VP13	R584 at Curraglass	4.1km T1	LCV, DSR, MR	SE
VP14	L8776 at Douce	1.1km – T1	LCV	SE
VP15	Local road at Coolmountain	2.3km – T6	LCV	W
VP16	Local road at Shanacrane East	1.9km – T6	LCV	W
VP17	Local road at Shanacrane West	1.1km – T9	LCV, AH	NW

VRP No.	Location	Distance to Nearest Turbine(km)	Representative of	Direction of view
VP18	Local road laneway at Cousane	714m – T7	LCV	N
VP19	Local road at Cousane, southwest of site	2.3km – T7	LCV	NE
VP20	R585 at Derragh	1.5 km – T9	MR, LCV, DSR	NW
VP21	Local road south of Shnacrane Cross at Keenrath	3.9km – T9	LCV	NW
VP22	R585 at Glancycarney	1.7km – T7	DSR, MR, LCV	N
VP23	R585 Cousane Gap at Glancycarney	2.0 km – T7	DSR, MR, LCV	NE
VP24	R585 at Maughanaclea	4.3km – T7	DSR, MR, LCV	NW
VP25	Local road at Carriganass	9.9km – T7	AH, CP	E
VP26	Kealkill Stone Circle	9.4km – T7	AH	NE
VP27	Local road at Carrigskullihy	5.9km – T9	DSR	NW
VP28	Ros Geal Residential Housing Estate, Dunmanway	10.6km – T9	CP	NW
VP29	Local road at Grillagh	16.7km – T6	DRS	NW
VP30	Bantry Abbey Cemetery	19.4km – T7	DRS, MR, AH	NE

11.4 MITIGATION MEASURES

Outside of those landscape and visual mitigation measures that formed part of the iterative design process of this Proposed Development over a number of years, and which are embedded in the assessed project, other specific landscape and visual mitigation measures are not considered necessary / likely to be effective. Thus, the impacts assessed in **Section 11.4** are the equivalent of residual impacts in this instance.

11.5 MONITORING MEASURES

Given that there are no specific mitigation measures proposed in regard to the moderation of landscape and visual effects, monitoring measures are not required. It is reiterated however, that an Environmental Manager / Ecological Clerk of Works (ECoW) with appropriate experience will be appointed for the duration of the construction phase so that the CEMP is effectively implemented. This will include replacement landscaping works.

11.6 ASSESSMENT OF POTENTIAL EFFECTS

11.6.1 Do Nothing Effects

In this instance the do-nothing effect would be that the receiving landscape stays in the same or similar condition as it currently is, managed for a combination pastoral farmland and/ or forestry or left as semi-naturalistic moorland.

11.6.2 Landscape Character, Value and Sensitivity

Central Study Area (<5 km)

Landscape value and sensitivity are considered in relation to a number of factors highlighted in the GLVIA3, which are set out below and discussed relative to the Central and Wider Study Area.

The Central Study Area is a dynamic landscape that comprises a multitude of varying landscape features and elements. Nonetheless, it is principally dominated by elevated upland hills, ridges and mountaintop summits and has a relatively remote character due to the rugged and elevated nature of the surrounding landscape context. In terms of land use, the majority of the more elevated lands within the Central Study Area are cloaked in extensive areas of mountain moorland, rocky outcrops and broad commercial conifer forest plantations. Within the lower winding valleys, there is a more notable agglomeration of more typical rural land uses such as agricultural farmland, networks of dense mixed hedgerows and isolated farmsteads.

Whilst there is some sense of the naturalistic within the Central Study Area, which principally relates to rugged rocky outcrops and broad areas of mountain moorland, the immediate surrounds of the Site are also characterised by extensive commercial conifer forest plantations, whilst existing access tracks traverse some of the most elevated parts of the site and dimmish any strong sense of remoteness or the naturalistic. Nonetheless, some of the most highly scenic and rugged parts of the Study Area are associated with the landscape in the immediate surrounds of the Cousane Gap. A scenic route designation (S29) in the Cork CDP traverses the central part of the Cousane Gap, where a notable sense of containment is afforded, whilst views across the surrounding rolling landscape are afforded as you exit its more contained sections of the Gap to the east and west. Despite the elevated nature of much of the Central Study Area, the surrounding landscape also presents with a notable working character, which is principally related to the notable accumulation of commercial conifer forest plantations, whilst an existing 12-turbine wind farm development is also located throughout the northern and eastern half of the Central Study Area.

With regard to settlements within the Central Study Area, the surrounding landscape has a relatively modest rural population, with the only notable settlement being the small village settlement of Togher Village located in its southeast extent. Otherwise, the Central Study Area comprises small linear clusters of dwellings and isolated rural dwellings that are principally located along low-lying winding valleys and sloping hillsides.

As noted above, there is some designated scenic amenity within the Study Area, which predominately relates to designated scenic routes in the current Cork CDP. The nearest of these is the aforementioned S29 Cousane Gap Scenic route, which affords a strong sense of containment by surrounding terrain and vegetation, whilst also encompassing some broad views across the rolling distant landscape. Other designated scenic views within the Central Study Area include the S28 scenic route located along a contained valley in its western extent, whilst sections of the S32 and S33 scenic routes occur in its northeast quadrant and afford both contained views along valleys and broad panoramic views from elevated hilltops and ridges. Whilst some of these scenic designations provide heavily contained views and present with a notable sense of scenic amenity, sections of many of these routes are also notably influenced by an array of existing anthropogenic features, including existing wind farm development and extensive commercial conifer forest plantations. It is important to note that whilst a notable sense of scenic amenity is present within the Central Study Area, there is only a local sense of amenity and heritage within the central study area, defined by the recent inclusion of the Sheey Trails, a collection of looped walking trails which traverse the site and provide access to several local heritage features. Whilst the Wider Study Area encompasses a vast array of walking trails, scenic driving routes and heritage features, there is a notable absence of these within the Central Study Area, which is reflective of its more working upland landscape values.

In terms of landscape designations, the proposed development is contained with the 'LCT – Ridged and Peaked Upland', which is classified with a; 'High' landscape sensitivity, 'High' Landscape Value, and 'Local' level Landscape Importance. The Central Study Area also encompasses two other contrasting LCTs, further reinforcing its dynamic and transitioning nature. 'LCT 12b - Rolling Marginal and Forested Middleground' located immediately to the east of the site, and 'LCT 16b – Glaciated Cradle Valleys' located c. 2km south of the nearest proposed turbine. LCT12b is classified with a 'Medium' landscape sensitivity; 'Medium' Landscape Value; and 'Local' level Landscape Importance, whilst LCT16b is classified with a 'Low' Landscape Sensitivity; 'Medium' Landscape Value; and 'Local' level

Landscape Importance. It is important to note that all three landscape character types within the study area have been classified with the lowest of the four landscape importance classifications. Furthermore, whilst the landscape character type that contains the site is classified with a 'high' value, it is not located within Cork CDPs 'High Value Landscape (HVL)' classification. Indeed, none of the landscape areas within the Central Study Area are classified as HVL.

Overall, it is considered that this is a dynamic landscape comprising some distinct landscape features and landscape areas. Nonetheless, despite some of the more scenic aspects of the Central Study Area, it is considered that much of the surrounding landscape presents with robust working upland characteristics, which is reinforced by the extensive commercial conifer forest plantations and existing wind farm development. Landscape values within the Central Study Area tend to be most associated with the subsistence of the rural economy as opposed to any highly susceptible recreational or naturalistic values. Despite this, there is a notable presence of designated scenic amenity within the Study Area, which relates to a combination of highly contained driving routes and sections of road corridors that pass across elevated terrain. On balance of the reasons outlined above, the Central Study Area is considered to have an overriding Medium landscape sensitivity due to its robust working upland character, although it is important to note that there are some localised parts of the study area that present with a High and Very High sensitivity, such as the Cousane Gap and other heavily contained winding low-lying valleys.

Wider Study Area (c.5-20 km).

The Wider Study Area is similarly varied, encompassing a broad mix of land uses and landscape features. Some of the most notable landscape features include the Shehy Mountains located in the surrounds of the Cork and Kerry County bounds, which encompass the highest mountains in Cork, Knockboy, which rises to a height of 706m AOD. Whilst the northern half of the study area encompasses some of the most elevated ridges and peaks within the surrounding landscape, the southern half of the Study Area also encompasses some notable elevated hills and ridges. Nonetheless, much of the Study Area's wider southern and eastern half accounts for the most notable areas of more typical rural land uses comprising pastoral farmland and smaller blocks of conifer forest. Lough Allua and the River Lee are also other notable landscape features in the wider northern half of the Study Area, whilst the western periphery includes the only sections of the coastline within the Study Area. This coastal part of the study area comprises small islands, broad bays, coastal promontories and a range of other coastal features.

In terms of recreational amenity, the Wider Study Area encompasses more notable tourism and recreational landscape values and contains a large network of waymarked walking trails, local walks, cycling routes and scenic driving routes. The most prominent include sections of the Wild Atlantic Way driving route and the Eurovelo Cycling route. Due to the elevated and scenic nature of the landscape of the Wider Study Area, many of the most prominent walking and hiking routes tend to cross over elevated mountaintop summits and broad linear ridges and include sections of the Sheep's Head Way, the Slí Gaeltacht Mhuscrai and the Beara Way. The Wider Study Area also encompasses an array of heritage features, which include castle remnants, stone circles, old churches and graveyards.

The highly scenic nature of the surrounding landscape context is reflected in the number of scenic designations located throughout the Wider Study Area, many of which are located along elevated routes that afford views across the surrounding landscape and/or high scenic landscape features. Some of the most visually susceptible parts of the wider landscape include the Gougane Barra complex, situated in the study area's northwest quadrant and enclosed by steep cliffs and rugged escarpments. Other highly sensitive landscape areas include the immediate surrounds of Lough Allua and the coastal parts of the study area.

In terms of landscape designations, the study area encompasses some highly sensitive landscape character types in its wider surrounds, all of which are associated with the aforementioned highly sensitive landscape areas and features. The most sensitive landscape character types include LCT4 – Rugged Ridge Peninsulas (Very High Landscape Sensitivity, Very High Landscape Value, National Landscape Importance), LCT8 – Hilly River and Reservoir Valleys (High Landscape Sensitivity, High Landscape Value, National Landscape Importance) and LCT16a – Glaciated Cradle Valleys (High Landscape Sensitivity, High Landscape Value, National Landscape Importance). It is important to note that all three of these landscape character types are also designated with Cork CDPs 'High Value Landscape' designations. The current Cork CDP describes these landscape areas as "our most valuable landscapes".

Overall, the Wider Study Area comprises an array of landscape areas which comprise contrasting values and sensitivities. Nonetheless, the Wider Study Area also encompasses large areas of more typical rural and upland landscapes, where the landscape values tend to relate to the subsistence of the rural economy as opposed to any other highly susceptible landscape values. On balance of the reasons outlined above, the landscape sensitivity of the Wider Study Area is deemed Medium, however, it is important to note that there are some areas of high and even very high sensitivity, which typically relate to areas such as Gougane Barra, the coastline and other highly sensitive landscape features and area.

11.6.3 Landscape Impacts

Landscape impacts are assessed on the basis of landscape sensitivity weighed against the magnitude of physical landscape effects within the Site and effects on landscape character within the wider landscape setting. This wider setting is considered with respect to the Central Study Area (<5 km) as well as the Wider Study Area (5-20 km).

11.6.3.1 Magnitude of Landscape Effect

The physical landscape as well as the character of the Site and the Central Study Area (<5 km) is affected by the Proposed Development as well as ancillary development such as access and circulation tracks, areas of hard standing for the turbines, borrow pits, Grid Connection Route Options and the Onsite Substation and Control Building. By contrast, for the wider landscape of the Study Area, landscape impacts relate exclusively to the influence of the proposed turbines on landscape character. The aspects of the Proposed Development that are likely to have an impact on the physical landscape and landscape character are described in Chapter 2 (Description of Proposed Development) with construction processes described in the Construction and Environmental Management Plan (CEMP) at **Appendix 2.1**.

11.6.3.2 Magnitude of Landscape Effect – Construction Stage

It is considered that the Proposed Development will have a modest physical impact on the landscape within the Site as none of the Proposed Development features have a large 'footprint' and land disturbance/vegetation clearing will be relatively limited. The topography and land cover of the Site will remain largely unaltered with construction being limited to Access Tracks, Turbine Hardstands, the On-site Substation and Control Building compound, Temporary Construction Compound and proposed Met Mast. Excavations will tie into existing ground levels and will be the minimum required for efficient working. Any temporary excavations or stockpiles of material will be re-graded to marry into existing site levels and reseeded appropriately in conjunction with advice from the project ecologist.

The finalised internal Access Track layout has been designed to avoid environmental constraints, and every effort has been made to minimise the length of necessary roadway by utilising and upgrading the existing site access track. Furthermore, the road layout has been designed to follow the natural contours of the land wherever possible reducing potential for areas of excessive 'cut and fill'. There will be an intensity of construction stage activity associated with the Access Tracks and Turbine Hardstands consisting of the movement of heavy machinery and materials, but this will be temporary/short term in duration and transient in location. The construction stage effects on landscape character from these activities will be minor.

There will be one 110kV Onsite Substation and Control Building constructed to collect the generated power from the Proposed Development before connecting to the national grid at either the Dunmanway 110kV Substation (Option A) or the Carrigdangan 110kV substation (Option B). The Onsite Substation and Control Building will be located on the east of the Site. The proposed Onsite Substation and Control Building will be contained in an existing small pastoral field that is enclosed by existing fences. The proposed substation compound, which will be enclosed by a 2.4 metre high steel palisade fence. The most notable construction stage landscape impacts resulting from the proposed Onsite Substation and Control Building relate to the minor levelling of the site to form a level platform.

All internal site cabling will be underground and will follow site access tracks without the need for trenching through open ground. Indeed, the land cover of the Site will only be interrupted as necessary to build the structures of the Proposed Development and to provide access. Impacts from land disturbance and vegetation loss at the Site are considered to be modest in the context of this transitional foothill landscape setting that is influenced by an array of working rural land uses.

A permanent meteorological (Met) Mast will be erected on the western part of the Site. It will comprise of a 100 m high lattice steel mast with a shallow concrete foundation. The most notable construction stage effects will relate to the minor amount of ground excavation required to facilitate the shallow foundations for the steel mast structure.

The grid connection cabling will run from the Onsite Substation and Control Building across a combination of private lands and public roads generating land disturbance and associated movement of machinery and stockpiling of materials for both Options A and B. The proposed grid connection routes will include for directional drilling at up to 22 no. locations on Option A and 18 no. locations on Option B. No overhead lines are required for the connection. Connection works will involve the installation of ducting, joint bays, drainage and ancillary infrastructure. This will require delivery of plant and construction materials, followed by ground excavation laying of cables and subsequent reinstatement of trenches, and will result in minor and very localised construction stage landscape effects.

Site activity will be at its greatest during the construction phase due to the operation of machinery on Site and movement of heavy vehicles to and from Site. This phase will have a more significant impact on the character of the Site and cable routes than the operational phase, but it is a 'short-term' impact that will cease as soon as the Proposed Development is constructed and becomes operational (approximately 16-18 months) from the commencement of construction).

There will be some long term/permanent construction stage effects on the physical landscape in the form of Turbine Foundations and Hardstands, access tracks and an Onsite Substation and Control Building, but only the substation is likely to remain in perpetuity as part of the national grid network. It is likely, that with the exception of some residually useful access tracks, all other development features will be removed from the Site and it will be reinstated / restored to the prevailing land cover. Thus, the construction stage landscape effects of the Proposed Development are largely reversible.

There will be some construction stage effects on landscape character generated by the intensity of construction activities (workers and heavy machinery) as well as areas of bare-ground and stockpiling of materials as identified in the Construction and Environmental Management Plan (CEMP). Such effects will be temporary/short term in duration and are, therefore, not considered to be significant. Overall, construction stage landscape effects are considered to be of a **High-medium** magnitude.

11.6.3.3 Magnitude of Landscape Effect – Operational Stage

For most commercial wind energy developments, the greatest potential for landscape impacts to occur is as a result of the change in character of the immediate area due to the introduction of tall structures with moving components. Thus, wind turbines that may not have been a characteristic feature of the area become a new defining element of that landscape character. In this instance, existing wind turbines are familiar features in the immediate and Central Study Area and are characteristic features of the landscape within the Wider Study Area. Indeed, the entire Study Area encompasses up to 80+ existing turbines. Thus, the overall effect therefore, is one of intensification and extension of an established land use and not the introduction of a new and unfamiliar one

In terms of scale and function, the Proposed Development is well assimilated within the context of the Central Study Area. This is due to the broad scale of the landform, landscape elements and land use patterns. These attributes prevent the height and extent of the Proposed Development causing the type of scale conflict that can occur in more intricate landscape areas. The broad hills, ridges and mountaintop summits in the central surrounds of the Site comprise some utilitarian character due to the presence of working rural land uses such as agriculture and commercial scale forestry. Although the Proposed Development represents a stronger human presence and level of built development than currently exists on the Site, it will not detract significantly from the surrounding working upland landscape. It should also be noted that the Site encompasses several recently development looped walking trails some of which will share the proposed wind farm access tracks. Whilst the proposed development will be a defining feature along these trails and represents a marked increase in the intensity of built development here, it should be noted that walking trails and wind farm developments are not two incongruous forms of development. Indeed, there are many precedents throughout Cork and Ireland, where amenity trails such as these and wind farm developments exist in harmony. Indeed, as noted with regard to a linear amenity route adjacent to the permitted Boggeragh II Wind Farm, located in a similar upland landscape to the proposed development in the wider Cork area (Planning Ref: 10/08067), the Inspectors Report stated, "*The proposed development will involve the introduction of large structures into the landscape at a relatively near distance along part of the route. However, in the context of the assessment in relation to visual amenity and landscape above, I do not consider that the impact of the proposed development would significantly affect the recreational value of the walking route. I have no objection to the proposed development in this respect.*" It should also be noted that the Proposed Development will also result in the enhancement of some of these trails, which will also generate some localised positive effects at the site scale.

It is important to note that in terms of duration, this Proposed Development represents a long term, but not permanent impact on the landscape and is reversible. The lifespan of the project is 40 years, after which time it will be dismantled and Developer will comply with the decommissioning conditions agreed with the local authority. Within 2-3 years of decommissioning there will be little evidence that a wind farm ever existed on the Site.

In summary, there will be physical impacts on the land cover of the Site and cable route as result of the Proposed Development during the operational phase, but these will be relatively minor in the context of this working upland landscape that comprises pockets of existing wind energy development and areas of commercial conifer forest. The scale of the Proposed Development will be well assimilated within its landscape context without undue conflicts of scale due to the broad and elevated nature of the surrounding uplands. For these reasons the magnitude of the landscape impact is deemed to be **High-medium** within the Site and its immediate environs (c.1km) reducing to **Medium** for the remainder of the

Central Study Area. The quality of the landscape effects is deemed **Negative**. Beyond 5 km from the Site, the magnitude of landscape impact is deemed to reduce to **Low** and **Negligible** at increasing distances as the wind farm becomes a proportionately smaller and integrated component of the overall landscape fabric.

11.6.4 Magnitude of Landscape Effects - Decommissioning Phase

The Decommissioning phase will see a similar nature of effects to the construction stage due to the movement of heavy machinery within the site and to and from the Site removing turbine components. However, such effects will be temporary in duration and decreasing in scale as turbines are removed from view and the landscape is substantially reinstated to former uses. As with construction stage impacts, Decommissioning stage effects are not considered to be significant.

11.6.4.1 Significance of Potential Landscape Effects

The significance of landscape impacts is a function of landscape sensitivity weighed against the magnitude of landscape impact. This is derived from the significance matrix (**Table 11.3**) used in combination with professional judgement.

Based on a Medium sensitivity judgement and a High-medium magnitude of construction and decommissioning stage landscape effect, the significance of effect is considered to be <u>Substantial-moderate / Negative / Short-term</u> within and immediately around the Site during construction, but reducing quickly with distance and broader context.

Based on a Medium sensitivity judgement and a High-medium / Medium magnitude of operational stage landscape effect, the localised significance of effect is considered to be <u>**Substantial-moderate / Negative / Long-term**</u> within and immediately around the Site (within c.1km). Thereafter, significance will reduce to Moderate and Slight at increasing distances as the Proposed Development, where visible, will be perceived as a progressively smaller component of the wider landscape fabric even in the context of higher sensitivity landscape units / features such as the Lough Allua and the coastline.

11.6.5 Residual Visual Effects

In the interests of accessibility and so that this chapter remains focussed on the outcome of the visual assessment (rather than a full documentation of it), the visual impact assessment at each of the 30 selected representative viewpoint locations has been placed into **Appendix 11.1**. This section should be read in conjunction with both **Appendix 11.1** and the associated photomontage set contained in a separate booklet accompanying the EIAR. A summary table is provided below, which collates the assessment of visual impacts (**Table 11.8** below). A discussion of the results is provided thereafter.

Table 11.8 Summary of Visual Impact Assessment at Representative Viewpoint Locations (Appendix 11.1)

Visual Impact				
VP No.	**Distance to nearest turbine**	**Visual Receptor Sensitivity**	**Magnitude of Visual Impact**	**Visual Impact Significance**
VP1	10.8km – T2	High-medium	Low-negligible	**Slight-imperceptible / Negative / Long Term**
VP2	7.9km – T1	High-medium	Low	**Slight / Negative / Long Term**
VP3	7.3km – T2	Medium	Negligible	**Imperceptible / Neutral / Long Term**
VP4	12.4km – T6	High-medium	Low-negligible	**Slight-imperceptible / Negative / Long Term**
VP5	7.8km – T1	High-medium	Negligible	**Imperceptible / Neutral / Long Term**
VP6	6.0 km – T6	Medium	Low-negligible	**Slight-imperceptible / Negative / Long Term**
VP7	9.3km – T6	Medium	Low-negligible	**Slight-imperceptible / Negative / Long Term**
VP8	4.8km – T2	High-medium	Medium-low	**Moderate-slight / Negative / Long Term**
VP9	17km – T6	High-medium	Low-negligible	**Slight-imperceptible / Negative / Long Term**
VP10	1.7km – T2	Medium	Medium-low	**Moderate-slight / Negative / Long Term**
VP11	2.5 km – T6	Medium-low	Negligible	**Imperceptible / Neutral / Long Term**
VP12	4.4km – T6	High-medium	Medium-low	**Moderate-slight / Negative / Long Term**
VP13	4.1km T1	Medium	Medium-low	**Moderate-slight / Negative / Long Term**
VP14	1.1km – T1	Medium	High-medium	**Substantial-moderate / Negative / Long Term**
VP15	2.3km – T6	Medium-low	Negligible	**Imperceptible / Neutral / Long Term**
VP16	1.9km – T6	Medium	Medium	**Moderate / Negative / Long Term**
VP17	1.1km – T9	Medium	High-medium	**Substantial-moderate / Negative / Long Term**
VP18	714m – T7	Medium	High	**Substantial-moderate / Negative / Long Term**
VP19	2.3km – T7	Medium	Medium	**Moderate / Negative / Long Term**
VP20	1.5 km – T9	High-medium	High-medium	**Substantial-moderate / Negative / Long Term**
VP21	3.9km – T9	Medium	Medium-low	**Moderate-slight / Negative / Long Term**

Visual Impact				
VP22	1.7km – T7	High-medium	High-medium	**Substantial-moderate / Negative / Long Term**
VP23	2.0 km – T7	High-medium	Medium-low	**Moderate-slight / Negative / Long Term**
VP24	4.3km – T7	High-medium	Medium-low	**Moderate-slight / Negative / Long Term**
VP25	9.9km – T7	Medium	Low-negligible	**Slight-imperceptible / Negative / Long Term**
VP26	9.4km – T7	High-medium	Low	**Slight / Negative / Long Term**
VP27	5.9km – T9	Medium	Low	**Slight / Negative / Long Term**
VP28	10.6km – T9	Medium-low	Low-negligible	**Slight-imperceptible / Negative / Long Term**
VP29	16.7km – T9	High-medium	Low-negligible	**Slight-imperceptible / Negative / Long Term**
VP30	19.4km – T7	High	Low-negligible	**Slight-imperceptible / Negative / Long Term**

11.6.5.1 Visual Impacts on Designated Views

With regard to the proposed Project, there are a large number of scenic routes located throughout the Central and Wider Study Areas, which are represented by over 17 of the selected VRPs (VP1, VP2, VP3, VP4, VP5, VP6, VP8, VP9, VP12, VP13, VP20, VP22, VP23, VP24, VP27, VP29 & VP30). The nearest and most relevant scenic routes to the Proposed Development include the S28, S29, S32 and S33. All four routes will afford some visibility of the Proposed Development, whilst many also afford views of existing wind farm developments. It is also important to note that the depicted viewpoints along these scenic routes represent a static view. However, in reality, these routes are experienced as a journey and not as a series of fixed views. Thus, the representative viewpoints typically reflect the worst-case scenario in terms of turbine visibility. Furthermore, for many of these scenic routes, the proposed turbines have the potential to be heavily and, in some cases, entirely screened by surrounding terrain and vegetation.

<u>Scenic Route S28</u>

Scenic route S28 is located along the R584 regional road some c. 3.6km northwest of the Site and is described as "*Scenic road at the Pass of Keimaneig to Guagán Barra Views of the surrounding remote rural landscape & rugged mountains*". Located in a valley comprising the River Owvane, the scenic route is typically well enclosed by a combination of roadside vegetation and an elevated ridge to the west, and the upland terrain, which includes Doughill Mountain, Douce Mountain and Shehy More Mountain to the east and southeast. Whilst the ZTV identifies the potential for views of up to 8 turbines along the southern section of the route, the northernmost sections of this scenic designation will be entirely screened from the development. Viewpoint VP13 was included as a representative viewpoint from this scenic designation and affords a relatively clear view of the turbines, where they present on both sides of the Shehy More ridgeline in the distance. Although the turbines will marginally detract from the remote character of this route, they do not appear out of place in terms of their scale or function. Thus, the significance of visual impact was deemed 'Moderate-slight'. It is worth reiterating that large sections of this route are heavily enclosed by dense roadside vegetation, which in some cases, will entirely screen the view of the proposed turbines.

Scenic Route S29

Scenic route S29 is located along the R585 regional road that passes through the Cousane Gap and is situated some c. 1.3km south of the site at its nearest point. This scenic route designation is described as "*R585 Regional Road to Kealkill via Cousane Gap to Derragh Bridge Views of remote mountainous landscape*" and extends over c.14km in length. As a result of the considerable length of this scenic route designation, it will encompass varying sensitivities, ranging from more highly sensitive contained views or elevated broad views to more typical views of rolling working landscapes. One of the most visually sensitive parts of this route relates to where it passes directly through the Cousane Gap and is surrounded by steep rocky escarpments and provides a strong sense of enclosure. Several views were included to represent this scenic route due to its extensive nature, varying sensitivities and near distance to the Proposed Development. These include viewpoints VP20, VP22, VP23 and VP24. Both viewpoints, VP20 and VP22, represent the nearest potential views of the Proposed Development afforded from this scenic route designation, where the turbines will present in a dominant manner and be one of the defining built features along this section of the route. Although the turbines present in a dominant manner from both viewpoints, they are viewed in a relatively clear and legible manner and are considered well assimilated in this upland landscape context in terms of their scale and function. Although the turbines will detract from the scenic amenity in both views, this part of the scenic route designation is considered slightly less susceptible to change, as much of the surrounding landscape represents a working rural context comprising pastoral farmland and conifer forest plantation. Both VP20 and VP22 were classified with a visual impact significance of 'Substantial-moderate'.

VP23 is located along a meandering section of the R585 regional road scenic route as it progresses west towards the most enclosed section of the scenic route designation. A brief and partial view of the Proposed Development will be afforded from a bend in this section of the regional road. Up to four turbines have the potential to be viewed from here, with only the nacelles of two of these turbines visible. Whilst the moving turbine components have the potential to draw the eye along this brief section of the scenic route, they are viewed in the opposite direction to some of the more distinctive and rugged landscape features along this aspect of the route. Nonetheless, the turbines will marginally detract from the scenic amenity along this brief section of the route, which is characterised by little other built development. Overall, the significance of visual impact along this section of the route was deemed 'Moderate-slight'.

VP24 is located along an elevated section of the R585 regional road scenic route west of the Cousane Gap. This elevated section of the regional road corridor affords a broad view towards Shehy More Mountain and its surrounding elevated upland ridges and hills. The proposed turbines will be clearly visible in this eastern aspect of the view. Although the moving turbine components will likely draw the eye from this section of the scenic route, they are located at a distance of over c. 4km and are well assimilated in this landscape context in terms of their scale and function. Overall, the proposed turbines will result in a marginal detraction in the degree of scenic amenity afforded from this section of the route, and thus, the significance of visual impact was deemed 'Moderate-slight'.

Whilst it is considered that the S29 scenic route will be the most impacted scenic designation within the Study Area, it is important to note that this extensive route comprises various aspects of amenity, some of which will not be notably impacted by the Proposed Development. Indeed, some of the most susceptible aspects of visual amenity along this route will have no views of the Proposed Development, or else the turbines will be viewed in the opposite direction or offset from the main aspect of amenity – **Figure 11.12** refers.

<u>Scenic Route S32 and S33</u>

Both S32 and S33 afford elevated views in the direction of the Site and are represented by viewpoints VP8 (S33) and VP12 (S32). It is important to note that these static viewpoints only represent brief views of the Proposed Development from these scenic routes, which also comprise extensive sections where the proposed turbines will be entirely screened by the surrounding terrain and intervening vegetation. VP8 affords a clear and highly legible view of the Proposed Development from a locally elevated hilltop summit. The Proposed Development will be viewed in conjunction with the existing Shehy More turbines, which present at a slightly smaller scale in this view. Nonetheless, the Proposed Development will not appear out of place in this view, which is already characterised by existing wind energy development. Thus, the significance of visual impact was deemed 'Moderate-slight'. VP12 affords an elevated broad panoramic view across the surrounding uplands and lowlands, where the Proposed Development is visible along the rugged Shehy More ridgeline. Whilst the turbines are slightly offset from the main aspect of amenity to the south, they present in a condensed cluster and slightly disjointed manner, with turbines located on either side of Shehy Mores' principal ridgeline. Nonetheless, the proposed turbines will not appear incongruous in this broad view, which is currently characterised by views of the existing Shehy More wind turbines and distant turbines in the background of the view to the south. Overall, the significance of visual impact was deemed 'Moderate-slight'.

Other Scenic Designations

Aside from the Central Study Area, the Wider Study Area encompasses an array of scenic designations that cross elevated upland terrain, contained valleys, meandering lakeside roads and areas of the coastline. Many of these scenic designations, especially those elevated sections of scenic routes, afford views of existing wind energy developments, such as Shehy More Wind Farm, situated immediately northeast of the Proposed Development. Furthermore, it is also important to note that extensive sections of scenic route designation throughout the study area will afford no views of the Proposed Development due to a combination of surrounding terrain and intervening vegetative screening. Indeed, the selected representative views from scenic route designations have been chosen as they represent the worst-case scenario in terms of potential turbine visibility. The significance of visual impact at all other scenic route designations within the Wider Study Area ranged between 'Moderate-slight' to 'Imperceptible'.

Thus, whilst there will be some borderline significant impacts along the nearest sections of the S29 scenic route, however, impacts at scenic designations within the Study Area are **not considered to be significant**.

11.6.5.2 Visual Impacts on Local Community Views

Local Community views are considered to be those experienced by those people who live, work and move around the area within approximately 5 km of the Site. These are generally the people most likely to have their visual amenity affected by a wind energy proposal due to proximity to the turbines, a greater potential to view turbines in various directions, or having turbines as a familiar feature of their daily views. Local community receptors within the Central Study Area are represented by up to 16 VRPs (VP8, VP10, VP11, VP12, VP13, VP14, VP15, VP16, VP17, VP18, VP19, VP20, VP21, VP22, VP23 and VP24), many of which are also representative of scenic designations in the Central Study Area. The significance of visual impact at local community receptors ranged from 'Substantial-moderate' to 'Imperceptible', highlighting the varied degree of terrain and vegetative screening within the Central Study Area.

Viewpoints VP14, VP17, VP18, VP20 and VP22 were all classified with a significance of visual impact of 'Substantial-moderate' due to their near distance to the turbines, which will typically present with a dominant visual presence. Viewpoint VP18 represents one of the nearest potential views of the proposed turbines and is located in an elevated contained valley some c. 700 m from the nearest visible turbine. Whilst only five of the proposed turbines have the potential to be viewed here, turbine T7 presents at a prominent scale, further accentuated by the uphill views and contained nature of this upland valley. Nonetheless, the turbines are viewed well-spaced here and tend to present in a relatively legible manner, albeit at a prominent scale. It is also important to note that the more open visibility to the south across the distant terrain remains unaffected here. VP13 is located on the northern side of Shehy More's principal ridgeline and only has the potential to view up to four proposed turbines. Nonetheless, the turbines will be a prominent feature in this uphill view and relatively contained valley setting. Whist the turbines do not appear over-scaled, they represent a marked degree of visual change and will become one of the defining features of this contained valley. VP17 represents some of the nearest local receptors to the Site's southwest. The proposed turbines are viewed along a steeply sloping ridge that contains the view and will have a dominant visual presence, which is further heightened by the steep uphill nature of the view. Nonetheless, the turbines do not appear incongruous in terms of their scale or function across this broad elevated ridge. However, they will present with some negative aesthetic issues relating to the partial visibility of the proposed turbines rotating along the skyline ridge.

Viewpoints VP16 and VP19 were classified with a 'Moderate' significance of visual impact and will both afford relatively clear views of the turbines from a distance of c. 1.9km to the east and west of the Site, respectively. Whilst the turbines will be prominent built features in both views and will generate a notable increase in the intensity of built development in this upland setting, they do not present with any sense of overbearing, nor do they appear over-scaled in the context of the broad surrounding landscape features.

All other VRPs within the Central Study Area were classified with a significance of visual impact of 'Moderate-Slight' or less. Indeed, in some instances, VRPs representing the nearest local community to the west of the Site in the townlands of Shehy More and Coolmountain were classified with an 'Imperceptible' significance of impact due to the heavily contained nature of this aspect of the Study Area.

Overall, some of the nearest local community receptors will afford clear near distant views of the Proposed Development, where the turbines will present in a dominant manner and will generate some borderline significant visual impacts. Nevertheless, **it is not considered that the Proposed Development will result in 'significant' visual effects** at local community receptors as the proposed development is well offset from the nearest residential receptors and is well assimilated into this upland context in terms of its scale and function.

11.6.5.3 Visual Impacts on Centres of Population

As a result of the relatively remote location of the Proposed Development, there are no notable population centres within the Central Study Area. Indeed, the only population centre is Togher Village, which comprises a small cluster of residential dwellings, a church and a local school located just under c.5 km southeast of the Site. Viewpoint VP21 is the nearest representative of Togher Village and affords a clear view of the proposed turbines. Whilst the turbines have the potential to draw the eye and will be notable built features in the northwest viewing aspect, they present in a clear and legible manner and do not appear over-scaled or out of place. Thus, the significance of visual impact was deemed 'Moderate-slight'. All other centres of population are located in the Wider Study Area and represented by viewpoints VP3, VP7, VP25 and VP28. The significance of visual impact at these settlements was deemed between 'Slight-imperceptible' and 'Imperceptible', as many of these centres of population are located in low-lying areas a considerable distance from the Site and avail of a high degree of screening from surrounding terrain and intervening vegetation. Furthermore, whilst numerous other settlements are located within the Wider Study Area, they were not included as viewpoints for assessment as there was either very limited or no potential for visibility from these distant locations.

As a result of the reasons outlined above, it is **not considered that the Proposed Development will result in significant visual impacts** at Centres of Population within the Study Area.

11.6.5.4 Visual Impacts on Major Routes

The most notable major routes in relation to the Proposed Development include the R585 regional road and R584 regional road, both of which are also designated scenic routes within the Central Study Area and have been comprehensively summarised and assessed in section 11.6.5.1 above. Other notable major routes in the Wider Study Area include the N22 national primary and N71 national secondary routes. The N22 national primary route is located some c.17km northeast of the turbines and has a very limited potential to afford theoretic visibility of the Proposed Development. Due to the limited potential for turbine visibility and considerable distance from the Proposed Development, no VRP was included from the N22. Furthermore, even if briefly viewed from this considerable distance, the proposed turbines will only generate a significance of visual impact in the order of 'Slight-imperceptible'.

The N71 national secondary route traverses a section of the southwest quadrant of the Study Area and has intermittent potential to afford views of the Proposed Development from distances ranging between 14.4km from the site to 20 km from the Site. It is important to note that the principal aspects of visual amenity from this major route are typically in the opposite direction to the proposed wind farm towards the surrounding varied and scenic coastline. Viewpoint VP30, located at a cemetery adjacent to the N71 in Bantry, represents potential views from the N71 and affords a distant view of the turbines that present along the rolling terrain in the background. Furthermore, it is likely that the proposed turbines will only be discernible from here in the clearest viewing conditions, and even still, they will have no notable effect on the character of the surrounding coastal landscape. Thus, the significance of visual impact was deemed 'Slight-imperceptible' at worst. Brief intermittent views of turbines also have the potential to be afforded from other surrounding major routes, including the R584 in the wider northern half of the Site and several regional roads in the wider southeast quadrant of the Study Area. Nonetheless, due to the considerable distances from the Site and the high degree of screening in the direction of the Site, the significance of visual impact is considered to be no greater than 'Slight-imperceptible'.

As a result of the reasons outlined above, **it is not considered that any significant visual impacts will occur in respect of major route receptors.**

11.6.5.5 Visual Impacts on Tourism, Amenity and Heritage Features

Whilst a broad and varied agglomeration of tourism, amenity, and heritage features occur throughout the Study Area, almost all of these receptors occur within the Wider Study Area and therefore have limited potential to be notably impacted by the Proposed Development. One of the most notable tourism, amenity and heritage features is the Gougane Barra Complex, situated some c. 7.5 km northwest of the proposed turbines at its nearest point. Due to the heavily enclosed nature of this landscape setting, the ZTV identified no potential for visibility at a large proportion of the enclosed lakeside context. The only theoretical potential for turbine visibility is at the northeast tip of the Lough where the existing screening will likely entirely screen any view of turbine tips. Indeed, VP5 was included as a representative view from one of the only parts of Gougane Barra (northeast tip of the lake) with the potential for visibility of the proposed turbines (the ZTV indicated the potential for theoretic visibility of up to two turbines along the northeast extent of the lake). Nonetheless, as highlighted in VP5, there is extremely limited potential for any notable visibility of the proposed turbines. Furthermore, visibility of the partial blade tip of one turbine has the potential to be afforded, but only from a local access road between a gap in the roadside vegetation. Overall, it is not considered that this brief view of a turbine blade tip will have any influence on the highly scenic character of the Gougane Barra Complex.

It should also be noted that the proposed development is located along lands that encompass several newly developed looped walking trails that encompass local heritage features and a parking area. Viewpoint VP17 was selected to represent the parking area, which is located immediately southwest of the site and will encompass clear and prominent views of the turbines, resulting in a significance of visual effect of Substantial-moderate. Indeed, the looped trails will pass immediately adjacent to the proposed turbines, where their perceived scale will be at its greatest. Nonetheless, whilst the proposed turbines will have a dominant visual presence along sections of these trails, due to their slender forms, they will not obstruct views of neighbouring ridges or distant mountains. It should also be noted that wind energy development is a familiar feature along the elevated lands surrounding Shehy Moore Mountain, with an existing wind farm development comprising 11 turbines located just over 0.18 km northeast of the site. Thus, it is not considered that the proposed turbines will present as incongruous built features from these newly developed amenity trails. Refer to the AIA for a full assessment of impacts at all surrounding sites of archaeological, and/or cultural heritage significance

Several heritage features also occur within the wider surrounds of the Study Area and include castles, graveyards, stone circles and crannogs. Kealkill Stone Circle has the most notable potential to afford a clear view of the Proposed Development due to its locally elevated location along sloping terrain south of Kealkill. Viewpoint VP26 is representative of this heritage receptor, where a broad sweeping panoramic view is afforded across the wider landscape to the west, north and east. The proposed turbines will be visible in the eastern aspect of this view along Shehy More Mountain and to the south of the existing Shehy More Wind Farm turbines. Whilst the moving turbine components have the potential to draw the eye, they are viewed in the context of the existing turbines and, therefore, will not appear out of place. Furthermore, the proposed turbines represent a very small visual envelope in this broad panorama. As a result, the significance of visual impact at this receptor was deemed 'Slight'. It is important to note that all other VRPs within the study area were classified with a visual impact significance of 'Slight' or less. It is also worth noting that clear views of the Proposed Development have the potential to be afforded from several hiking and walking trails that traverse elevated lands and mountaintop summits. Nonetheless, many of the elevated sections of these routes already comprise views of other existing wind farm developments throughout the Wider Study Area. Thus, even if viewed from these elevated linear receptors, the Proposed Development will not appear out of place and instead represents the intensification of an already established land use.

As a result of the reasons outlined above, it is **not considered that the Proposed Development will result in significant visual impacts in respect of tourism, amenity and heritage features** within the Study Area.

11.6.5.6 Summary of Visual Impacts

Based on the visual impact assessments outlined in sections 11.6.5.1 to 11.6.5.5 above and in **Table 11.8** above, the residual visual impacts range between 'Substantial-moderate' to 'Imperceptible'. The majority of the most notable impacts relate to the nearest views of the Proposed Development, which principally represent scenic designations and local community receptors. Whilst the Proposed Development will have a dominant visual presence and will present at a considerable scale from some of the nearest views, the proposed turbines appear well accommodated in this upland landscape in terms of their scale and function. Whilst there will be some near significant impacts along the nearest surrounding scenic route designation (S29), the turbines typically present, offset from, or in the opposite direction from the main aspects of scenic amenity along this route.

The surrounding landscape is already strongly influenced by existing wind energy developments, most notably the existing Shehy More Wind Farm immediately northeast of the proposed Gortloughra turbines. As such, the Proposed Development will likely be perceived as a logical and visually coherent extension of this already established wind energy development, particularly when viewed from receptors to the north of the site, where the Shehy More turbines are already a prominent feature.

In terms of alignment with the landscape and visual objectives set out in the Cork County Development Plan, the proposed development has been carefully designed and sited in respect of these objectives. In particular, Objectives GI 14-12 to 14-14, which focus on preserving scenic amenity and the character of scenic route designations throughout the county, have been taken into account. A comprehensive assessment of scenic routes within the study area has been carried out as part of this LVIA. Based on this assessment, the

Proposed Development will not significantly detract from the prevailing landscape character or visual amenity afforded along these routes. While the turbines will be visible from certain sections, they are generally viewed either offset from or in the opposite direction to the main aspects of scenic amenity and will not block or heavily obstruct any sensitive viewing aspects. In this part of West Cork, where wind turbines are a familiar feature in similarly elevated upland settings, the proposed turbines are considered to be visually well accommodated.

Overall, whilst some of the nearest surrounding receptors will experience visual impacts close to significant, it is not considered that the proposed Project will result in significant visual impacts. Instead, the Proposed Development is a well-considered and appropriately scaled development that assimilates well within this robust upland context, and will, in many instances, be perceived as a natural extension of the neighbouring turbines.

11.6.6 Cumulative Impacts

Within the Study Area there are 20 operational wind farms, 5 consented/permitted wind farm developments, and 2 proposed wind farms currently in the planning system. It is noted that Maughanaclea Wind Farm was submitted for planning subsequent to the submission of the of the Proposed Development and has therefore not been assessed. The cumulative developments are set out below.

Table 11.9 Cumulative Windfarms within the Study Area

	Wind Farm	Status	No. of Turbines	Approximate Distance to Nearest Turbine [km]	Direction from the Proposed Development
1	Ballybane WF	Operational	21	18km	South-west
2	Barnadivane WF	Consented / Permitted	6	18.7km	East
3	Carrigarierk WF	Operational	5	5.22km	East
4	Carrigarierk 2 WF	Consented / Permitted	3	5.74km	East
5	Cleanrath WF	Operational	11	9.8km	North-east
6	Coomatallin WF	Operational	4	16.61km	South-east
7	Currabwee WF	Operational	7	13.05km	South-east
8	Derragh WF	Operational	6	9.79km	North
9	Derreenacrinnig WF	Proposed	7	7.08km	South-west
10	Garranareagh WF	Operational	4	19.58km	East
11	Gortyrahilly WF	Consented / Permitted	14	11.72km	North
12	Grousemount WF	Operational	38	9.89km	North-west
13	Inchamore WF	Consented / Permitted	5	18.49km	North
14	Kilgarvan II WF (Sillahertane)	Operational	10	11.75km	North
15	Kilgarvan I WF (Coomagearlahy)	Operational	15	16.63km	North-west

16	Kilgarvan II WF (Inchincoosh)	Operational	6	18.27km	North-west
17	Kilgarvan II WF (Lettercannon)	Operational	7	17.21	North-west
18	Kilgarvan Repower WF	Consented / Permitted	11	16.78km	North-west
19	Killaveenoge WF	Operational	10	12km	South-east
20	Kilvinane WF	Operational	3	17.7km	South-east
21	Midas WF (Coolknoohil)	Operational	11	14.02km	North
22	Lahanaght Hill WF	Operational	5	13.55km	South
23	Midas WF (Glanlee I)	Operational	6	15.39km	North
24	Midas WF (Inchee)	Operational	6	15.74km	North-west
25	Milane Hill WF	Operational	9	9.2km	South
26	Shehy More WF	Operational	11	0.56km	North-east
27	Maughanaclea Wind Farm*	Proposed	14	1.99km	South-west

*Submitted post submittal of Application and has not been assessed.

As per **Table 11.9** above, there are 20 operational wind farms, 5 consented/permitted wind farms, and 2 wind farm developments in the planning system within the Study Area. It is noted that Maughanaclea Wind Farm was submitted for planning subsequent to the submission of the Proposed Development. The nature of cumulative visibility within the Study Area is analysed below using the cumulative wireframe views contained in the photomontage booklet (a standalone accompanying document) and the cumulative ZTVs **(refer to Figure 11.13).**

Although the photomontages (separate booklet accompanying the EIAR) and Cumulative ZTV map in **Figure 11.13** relates principally to cumulative visual effects (i.e. utilising the selected VP set), it also informs the closely related assessment of cumulative landscape effects, particularly those relating to cumulative effects on the overall landscape character of the Study Area. The assessment below, therefore, relates to both cumulative visual effects and cumulative landscape effects.

In this instance, the Study Area comprises land on which there are a mix of existing wind farms, consented wind farms and proposed (in planning) wind farms. As a result, the cumulative assessment of wind farm developments within the Study Area will be broken into two categories: the current cumulative scenario and the potential future cumulative scenario. The current cumulative scenario will assess the cumulative effect of the proposed Gortloughra Wind Farm in respect of existing wind farm developments and consented wind farm developments. The potential future cumulative scenario will assess the proposed Gortloughra Wind Farm in respect of existing wind farms, consented wind farms and proposed (in planning) wind farms.

11.6.6.1 Current Cumulative Scenario

The cumulative ZTV map shows the potential cumulative visibility between the proposed turbines and all other existing, consented/permitted, and proposed developments within the 20 km Study Area. At present, there are 20 existing (operational) wind farms, 5 consented/permitted wind farm developments, and 2 proposed wind farm developments within the Study Area (with one (Maughanaclea Wind Farm) not assessed here).

The nearest existing wind farm to the Proposed Development is Shehy More Wind Farm, which is located on elevated lands approximately 0.56km to the North-east of the Site. The nearest proposed wind farm is Maughanaclea Wind Farm, comprising 14 turbines and located approximately 1.99km to the South-west of the Site.

Whilst wind energy development is a familiar feature of the Study Area, it is important to note that the majority of existing and consented/permitted developments are located outside the Central Study Area. Indeed, only a limited number of wind farm developments are located within the Central Study Area, most notably Shehy More Wind Farm and Carrigarierk Wind Farm, in addition to the proposed Maughanaclea Wind Farm.

It is noted that Maughanaclea Wind Farm application was submitted for planning subsequent to the submission of the Proposed Development (March 2026), which was originally lodged to Cork County Council in March 2025. It is included in the EIAR for reference but has not been assessed in the cumulative assessments as it was lodged subsequent to the Application.

The considerable number of existing, consented/permitted, and proposed wind farms and associated turbines within the Study Area is illustrated on the cumulative ZTV map (based on a bare-ground scenario – see **Figure 11.13**), which identifies that more than 83.1% of the Study Area has the potential to afford visibility of existing, consented developments in addition to the Proposed Development. Indeed, the high degree of existing turbine visibility is evident on the cumulative ZTV map, which shows that the Proposed Development only has the potential to be viewed in isolation for 2.3% of the Study Area. These areas are principally contained in the western extent of the Study Area, where the underlying terrain will likely screen the views of the neighbouring Shehy More turbines to the East of the Proposed Development. Only 16.9% of the entire Study Area has the potential to afford no visibility of existing, consented or the Proposed Development, which further reflects the fact that existing wind turbines are a familiar feature of this landscape context.

As the majority of existing and consented development is located outside of the Central Study Area and is well offset from the Proposed Development, the most notable potential for cumulative visual effects relates to the two existing developments contained within the Central Study Area. Indeed, the Shehy More development will generate the most notable cumulative effects with respect to the Proposed Development as it is located immediately to the northeast of the proposed Gortloughra turbines. Nevertheless, much of the cumulative intervisibility of the proposed turbines and the Shehy More, Carrigaerierk turbines relates to receptors located within the northern extent of the Study Area. In fact, there will be limited opportunities for combined views of the proposed turbines and the Shehy More turbines within the southern aspects of the central and Wider Study Area, aside from the most elevated ridges and peaks. Viewpoint VP8 highlights the cumulative intervisibility of the proposed turbines and the existing Shehy More turbines, which are located to the northeast of the Proposed Development. Whilst the existing Shehy More is slightly smaller in scale than the proposed turbines, there is no strong sense of scale conflict generated. Indeed, the Proposed Development will likely be viewed as an extension of the existing Shehy More Wind Farm development.

In terms of sequential cumulative effects, the proposed, consented and operational developments have the potential to be viewed from numerous linear receptors within the Study Area, including scenic routes, national waymarked walking trails throughout the central and Wider Study Area and major routes within the central and Wider Study Area. Some of the more notable linear receptors in relation to the Proposed Development include the scenic route designations within the Central Study Area. One of the most susceptible scenic routes is the S29 scenic route, which occurs to the south of the Site and passes through the Cousane Gap Whilst the cumulative ZTV identified the potential for theoretical cumulative visibility of the proposed, existing and consented development along this route, it is important to note that this does not account for screening from surrounding vegetation. In this instance, the eastern extent of the Cousane Gap scenic route affords a high degree of roadside vegetation in some areas, which, in combination with the dense layers of intervening vegetation throughout the Study Area, will heavily screen views of the existing two nearest wind farm developments. It is important to note that the Proposed Development will have no notable cumulative effect with any existing or consented developments on some of the most sensitive parts of this Cousane Gap scenic route. As per the representative viewpoints VP20, 22, 23 & 24, where there is no or very limited potential for intervisibility of the Proposed Development and other surrounding existing or consented developments. Nevertheless, other linear routes, such as scenic designations and waymarked walking trails, especially those that pass across elevated lands, will afford sequential views of the Proposed Development. However, as noted above, the most notable aspect of combined visibility of the Proposed Development relates to views of the proposed turbines in combination with the existing Shehy More turbines. Where other developments are visible, they tend to be viewed well offset from the proposed Gortloughra turbines, contained along ridges and peaks in the wider landscape.

Overall, whilst the Proposed Development will form part of an existing and consented array of 27 wind farm developments within the Study Area, it does not generate any notable cumulative visual effects, albeit it will result in a further sense of wind farm accumulation and dissemination within the Study Area. Nonetheless, any strong sense of wind farm proliferation is notably offset by the fact that only two other existing wind farm developments are contained within the Central Study Area, with the majority of existing and consented developments contained in the wider southern and northern half of the Study Area. On balance of the reasons above, it is considered that the Proposed Development will contribute to a cumulative landscape and visual impact in the order of **Medium** in respect of the current cumulative scenario. Despite the considerable number of existing wind farm developments within the Study Area, the Proposed Development is principally viewed distinctly separate to these and is most often viewed well-spaces along a broad rolling ridge in combination with the Shehy More Wind Farm turbines.

11.6.6.2 Potential Future Cumulative Scenario

Whilst the Proposed Development remains at the planning stage, it is important to consider the potential cumulative effects arising in combination with other wind farm developments currently within the planning system. Within the Study Area, one such proposed development has been identified, located within the Wider Study Area and illustrated in the potential future cumulative ZTV (refer to **Figure 11.14**). Derreenacrinnig Wind Farm represents the nearest of these, comprising 7 proposed turbines situated approximately 7.08km to the South-west of the Site. This development is notably offset from the proposed Gortloughra turbines, both by distance and by intervening rolling elevated ridgelines, which limit potential interaction.

As mentioned above, Maughanaclea Wind Farm is also a proposed development. However, its application was submitted subsequent to the Proposed Development (lodged with Cork County Council in March 2025). The Maughanaclea application, submitted in March 2026, is therefore included in the EIAR for contextual reference only and has not been assessed as part of the cumulative assessment.

As per the cumulative potential future baseline scenario ZTV, the potential for an additional degree of cumulative turbines visibility only increases by a very marginal degree, from 83.1% of the study area affording views of the Proposed Development and existing and permitted development to a maximum of 86.3% of the study area affording views in the potential future baseline scenario. Overall, due to the distance of the four proposed and in-planning developments from the Proposed Development turbines, it is not considered that the cumulative impacts will notably differ from those potentially experienced in the current cumulative scenario. Thus, it is considered that the proposed Gortloughra Wind Farm development will contribute to a cumulative landscape and visual impact in the order of **Medium** in respect of the potential future cumulative scenario.

11.7 SUMMARY OF SIGNIFICANT EFFECTS

It is not considered that there will be any significant effects on landscape and visual amenity arising from the Proposed Development.

11.8 STATEMENT OF SIGNIFICANCE

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 Development.

11.9 REFERENCES

- Environmental Protection Agency (EPA) publication 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports (2022) and the accompanying Advice Notes on Current Practice in the Preparation of Environmental Impact Assessment Reports;
- Landscape Institute and the Institute of Environmental Management and Assessment publication entitled Guidelines for Landscape and Visual Impact Assessment – Third Edition (2013);
- NatureScot: Assessing the cumulative landscape and visual impact of onshore wind energy developments (2021);
- Department of the Environment, Heritage and Local Government Wind Energy Development Guidelines (2006) and Draft Revised Wind Energy Development Guidelines (2019);

- Scottish Natural Heritage (SNH) Visual representation of wind farms: Best Practice Guidelines (version 2.2 - 2017); and
- Landscape Institute Technical Guidance Note (TGN) 06/19 Visual Representation of development proposals (2019)

12 MATERIAL ASSETS AND OTHER ISSUES

12.1 INTRODUCTION

This chapter of the EIAR assesses the impacts of the Project on material assets. The Project refers to all elements of the Gortloughra Wind Farm (**Chapter 2: Project Description**). The assessment will consider the potential effects during the following phases of the Project:

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

This chapter of the EIAR is supported by Figures provided in **Volume III**.

Table 12.1: Common Acronyms

Glossary of Common Acronyms	
EIAR	Environmental Impact Assessment Report
AOD	Above Ordanance Datum
BSc	Bachelor of Science
EMC	Electromagnetic Compatibility
EMF	Electromagnetic Fields
EWC	European Waste Catalogue
GIS	Geographical Information Systems
ha	Hectares
IAA	Irish Aviation Authority
km	Kilometre(s)
km2	Squared kilometre(s)
kV	KiloVolt(s)
L	Litre(s)
m	Metre(s)

Glossary of Common Acronyms	
m3	Cubic metre(s)
mm	Milimetre
MSc	Master of Science
nm	Nanometres
TDR	Transport Delivery Route

12.1.1 Statement of Authority

This chapter has been prepared by Jennings O'Donovan & Partners Limited. It was prepared by Shirley Holton with the assistance of Kathlyn Feeney and it was reviewed by Andrew O'Grady.

Andrew O'Grady is a Senior Environmental Consultant and holds a Bachelor (Hons.) Degree in Geography from University of Coventry and a MSc. in Environmental Resources Management from the Free University, Amsterdam. He has worked in environmental consultancy for over seventeen years and has prepared various Environmental Reports and EIARs. Andrew is the Project Manager and lead coordinator in the preparation of this EIAR. Andrew was the technical reviewer of this chapter.

Shirley Holton is an Environmental Scientist with over 3 years' experience in Environmental Consultancy. She graduated with a First-Class Honours Degree (BSc. Hons) in Environmental Science from the Institute of Technology, Sligo. She was also awarded with the Governing Body award for a BSc in Environmental Protection. Shirley's key capabilities include project management; using software such as WindPRO 4.1 and ArcGIS Pro; and the preparation of planning applications, Environmental Impact Assessment Reports, Feasibility Studies, Construction & Environmental Management Plans and management plans relating to surface water, peat, spoil and waste.

Kathlyn Feeney is a Graduate Environmental Scientist with a First-Class Honours Degree (BSc. Hons) in Environmental Science from Atlantic Technological University, Sligo. She forms part of the Environmental team responsible for preparing the EIAR Chapters. Kathlyn has experience writing EIARs, GIS, Feasibility Studies and Shadow Flicker analysis.

12.2 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

Chapter 1: Introduction, Section 1.9.2 outlines in detail, the assessment methodology and significance criteria undertaken during assessments for the EIAR. Section 1.6.1 outlines the national legislation and requirements and approach of an EIA, while **Chapter 4: Planning Policy Context** outlines the planning and legislative context to the Application. Under the specification and guidance of these outlining chapters, assessments have been undertaken on material assets.

Following preliminary consultations with key consultees during the scoping process, field surveys and desk-based assessments were undertaken. In line with the EIA Directive 2011/92/EU as amended by EIA Directive 2014/52/EU and current EPA Guidelines, this EIAR aims to focus the assessment solely on those elements likely to have a significant effect on the environment. Where a topic / factor identified has been addressed over more than one chapter, findings are briefly summarised. Other topics deemed unlikely to have a significant effect are outlined very briefly and 'closed out' with a summary of reasoning. Where negative effects on other topics/factors are predicted, the chapter identifies appropriate mitigation strategies therein. Economic assets of natural heritage include non-renewable resources such as minerals or soils, and renewable resources such as wind and water. These assets are addressed in **Chapter 8: Soils and Geology**, **Chapter 9: Hydrology and Hydrogeology**, and **Chapter 15: Air and Climate**. Tourism and amenity resources are addressed in **Chapter 5: Population and Human Health**. The cultural assets of Archaeology and Cultural Heritage are addressed in **Chapter 13: Cultural Heritage**. The transport network assets are addressed in **Chapter 14: Traffic and Transport.**

The material assets considered in this chapter include:

- Land Use
- Telecommunications
- Grid connection and Grid Network
- Air Navigation
- Quarries
- Utilities (gas, water, waste)
- Road and Rail Networks
- Recreational facilities and amenities

12.3 LAND USE

12.3.1 Baseline Environment

The Site is located 9.7 km north-west of Dunmanway, Co. Cork and 19 km south-east of the county boundary between Cork and Kerry. The Site is located on relatively high ground, at elevations ranging from 243 m AOD on the northern side of the site at the entrance 326 m, to 510 m AOD towards the middle of the Site and 306 m AOD on the southern side of the Site. A Site Location Map showing the Redline Boundary is detailed in **Figure 1.1**. The Project boundary, which comprises of all elements of the Project is outlined as **Figure 1.2.**

The Site is located within the townlands of an tSeithe Bheag (Shehy Beg), (Muscraí Gaeltacht), Gortloughra, Cloghboola and Inchinroe.

The townlands along which the two grid connection options transverse include:

- **Option A (Dunmanway):** an tSeithe Bheag (Shehy Beg), Gortloughra, Inchinroe, Cloghboola, Cornery, Garraí na Tórnóra (Garryantornora), Tuairín na Lobhar (Tooreenalour), Gort na Carraige (Gortnacarriga), Moneylea, Coolcaum, Coolmountain, Tullagh, Moneyreague, Togher, Cooranig, Keelaraheen, Neaskin, Ardcahan, Knockduff, Gurteennasowna and Ballyhalwick.
- **Option B (Carrigdangan):** an tSeithe Bheag (Shehy Beg), Gortloughra, Inchinroe, Cloghboola, Cornery, Garraí na Tórnóra (Garryantornora), Tuairín na Lobhar (Tooreenalour), Gort na Carraige (Gortnacarriga), Cooragreenane, Coolroe West, Gortnahoughtee, Derryleigh, Gortatanavally, Carrigdangan and Johnstown.

Temporary works will be required to accommodate the delivery of the turbine components. These temporary works are subject to a separate planning application but are assessed as part of this EIAR and are located in the townlands of Lackanashinnagh, Shanacashel, Mallow, Glan, Curradrinagh, Seanlárach (Shanlaragh), Kilnadur, Inchincurka, Carrigdangan, Johnstown, Commons, Derrygortnacloghy, Gortneadin, Carrignacurra, Cappanclare, Curraheen, Coolroe West, Cooragreenane, Gortaknockane, Gortnacarriga, Tooreenalour, Garraí na Tórnóra (Garryantornora), Cornery, Cloghboola, and Inchinroe.

The Site extends to 117.21 ha. The lands are under the ownership of third parties and the principal land use in the general area is comprised of agricultural sheep grazing, farmland and open mountain heath. Much of the lands are in private, third-party ownership. Land cover at the Site is mapped by Corine (2018) as wetlands/ peat bogs, with areas of pastures and very small areas of transitional woodland (www.epa.ie). No significant land use changes have been recorded by historic Corine mapping (1990-2018). No forestry land use exists within the Site.

The pre-planning site investigations show that there are vast areas of shallow peat of less than 0.5 m with some isolated and deep pockets of up to 3.8 m. The presence of peat on site and other constraints (section 2.7.1 of **Chapter 2: Project Description**) have influenced the project design. This is further detailed and assessed in **Chapter 8: Soils and Geology**.

The closest receptor, H53 (which is involved in the Project), is within 486 m of the closest turbine (T07), and experiences no shadow flicker. The closest receptor who is not involved, H10, is within 696 m of the closest turbine (T06) as shown on **Figure 1.3**.

12.3.2 Assessment of Potential Effects

During the construction, operational and decommissioning phases, the total land-take of the Proposed Development, including the Site Access Tracks, Turbine Hardstands, turning heads, Onsite Substation and Control Building, Temporary Construction Compound and Met Mast is approximately 5.3 ha. The Site has an area of 117.21 ha therefore the total land take is 4.5% of the Site. There will be 8 no. turbines located on or partly on agricultural lands. This will result in the change of use from agricultural use to windfarm use. This will have a long-term slight, negative impact on agricultural land use due to the land use change for the duration of the Proposed Development during construction and operation phases.

The Grid Connection Route options will be mainly in or alongside the existing roads and will be reinstated upon installation of cables. This will not permanently change the use of the land. The Turbine Delivery Route will require some widening works which have identified in **Section 12.3.1**. The effects of these works will be negligible in terms of land use.

The proposed Site Access Tracks and upgrade to existing tracks will improve access for surrounding agricultural use.

12.3.3 The 'Do-Nothing' Impact

If the Proposed Development does not proceed, lands in the vicinity of the Site will continue to be used for agricultural purposes. This would have a neutral effect.

12.3.4 Cumulative Effects

Land management practices in the wider area which are considered to have potential for cumulative effects with the Project are agriculture and forestry. All existing and approved projects in **Appendix 1.2** were considered for their potential cumulative impact on land use. This includes both large-scale and small-to-medium-scale developments.

The nearest wind farm is located 0.56km to the North-east of the Proposed Development (Shehy More Wind Farm). The nearest proposed wind farm is Maughanaclea Wind Farm, located approximately 1.99km to the South-west of the Proposed Development. It is noted that Maughanaclea Wind Farm was submitted for planning subsequent to the submission of the Proposed Development. Surrounding agricultural activities can and will continue during the construction, operational and decommissioning phases of the Proposed Development when fencing around the Site has been fully established.

Other projects outside the Site do not have the potential to reduce or increase the magnitude of effects of the Project on land use within the Project area. Therefore, this will not contribute to any significant cumulative effects during the construction/decommissioning or operational phases.

Due to the localised nature of the proposed construction/decommissioning works along the GCR options and TDR, there is no potential for significant cumulative effects in-combination with other local developments on the land use as all effects are directly within the Site.

12.3.5 Statement of Significance

No significant impacts are predicted on land use.

12.4 TELECOMMUNICATIONS

Microwave links need an unobstructed line of sight from end to end because blocked links will perform inadequately. It is therefore necessary to ensure tall wind turbines will not interrupt links. Impacts can include reflection, diffraction, blocking and radio frequency interference.

During operation, wind turbines have the potential to interfere with electromagnetic signals passing above the ground due to the nature and size of the wind farm.

Ireland saw the roll out of Digital Terrestrial Television, locally known as Saorview TV, in October 2010, incorporating the switchover from analogue to digital television. According to Ofcom (a regulatory UK body) (2009), *digital television signals are much better at coping with signal reflections, and digital television pictures do not suffer from ghosting*[1]. Ghosting is the replica of a transmitted image which is offset in position and is superimposed on top of the main image.

Since digital switchover, there have been very few reported cases of wind turbine interference with domestic analogue reception. Modern turbine blades are also typically made of synthetic materials which have a minimal impact on the transmission of electromagnetic radiation. Therefore, potential effects on television and radio signals from the Proposed Development will be negligible and are not considered further, given the advancements in technology.

12.4.1 Guidance

Potential telecommunication effects generated by the Project have been assessed with reference to the following documents:

- Cork County Development Plan, 2022 - 2028
- 'Best Practice Guidelines for the Irish Wind Energy Industry', published by the Irish Wind Energy Association (2012).
- Information about Electric & Magnetic Fields and the Electricity Transmission System in Ireland, EirGrid[2]
- Wind Energy Development Guidelines: Planning Guidelines, Department of Environment, Heritage and Local Government (DHPCLG) 2006[3].

12.4.2 Scoping and Consultation

Telecommunications providers were consulted about the Proposed Development. A summary of responses is outlined in **Table 12.2** and **Appendix 1.3** outlines full consultation responses.

Table 12.2: Summary of Consultations (Telecommunications)

[1] Ofcom (2009) *Tall Structures and Their Impact on Broadcast and Other Wireless Services*, OFCOM, United Kingdom. Available online at: https://www.ofcom.org.uk/__data/assets/pdf_file/0026/63494/tall_structures.pdf [Accessed 17/05/2023]
[2] Eirgrid (2014) *Information on Electric and Magnetic Fields*. Available online at : http://www.eirgridgroup.com/site-files/library/EirGrid/Information%20on%20Electric%20and%20Magnetic%20Fields.pdf [Accessed on 17/05/2023]
[3] Department of Housing, Planning, Community and Local Government (2006) Planning Guidelines. Available online at: https://www.gov.ie/en/publication/f449e-wind-energy-development-guidelines-2006/ [Accessed 17/05/2023]

Consultee	Response Date	Response
RTÉ *(2RN is the trading name of RTÉ Transmission Network DAC)*	7th January 2022 9th June 2023 5th April 2024	***Response received 7th January 2022:*** *The turbine locations have not changed since the initial scoping so Turbine 6 is sufficiently far away from our nearest path for it not to cause an issue.* *We would ask that a Protocol be signed between the Developer and 2rn should the site go ahead.* ***Response of 9th June 2023:*** *The new turbine locations make no difference to our earlier assessment, we have no fixed linking nearby but would request that a protocol be signed should the site go ahead.* ***Response received 5th April 2024:*** *If the turbine locations, particularly T6 have not changed, we have no objections to the proposed site.* *We would only ask that a protocol be signed between the developer and 2RN should the site go ahead.*
Virgin Media Television	22/12/2021 13/06/2023	***Response received 22nd December 2021:*** *I refer to your query of 22nd December about the above location. Virgin Media does not have any record of underground services at this location as indicated by your drawing.* ***Response of 13th June 2023:*** *Virgin Media does not have any record of underground services at this location as indicated by your drawing.*
Eir	25/02/2022 12/06/24 15/04/24	***Response received 25th February 2022:*** *We have no transmission services within the search area that will be affected.* ***Response received 12th June 2024:*** *We have no transmission links within the proposed area and it has no risk to the network.* ***Response 15/04/24:*** *We have no issue with these changes on the EirMobile and Eir fixed network.*
Vodafone Ireland	23/12/2021 09/06/2023	***Response received 23rd December 2021:*** *Based on the coordinates provided for the proposed turbines I can confirm there will be no impact to our Network.* ***Response received 9th June 2023:*** *Vodafone does not have any transmission in the area.*
Three Ireland	17/06/2021 09/06/2023	***Response received 17th June 2021:***

Consultee	Response Date	Response
	12/04/2024	*I have reviewed the turbine locations at the proposed Gortloughra windfarm and 3Ireland have no microwave links that could potentially be affected.* ***Response of 9th June 2023:*** *I've reviewed the new Turbine positions and they will have no impact on the Three Ireland Microwave Transmission network.* ***Response 12/04/24:*** *no additional comments on the proposed development*
Tetra Ireland	01/10/2021 20/06/2023 17/06/2024	***Response received on 1st October 2021:*** *"we anticipate no impact from the development in the area proposed, can you ensure the proposal is also reviewed by eir".* *Similar response received 20th June 2023 and 17th June 2024.*

12.4.3 Assessment Methodology

Consultation with telecommunications operators was initiated during the Scoping phase of this EIA to identify any potential microwave or telecommunication links that could be affected by the Proposed Development. Details of the Proposed Development were shared with link operators.

Any potential effects, which are associated with the operational phase of the Proposed Development, are classified as long-term effects. In the event that significant effects do occur, appropriate mitigation measures can be implemented such that there will either be a negligible effect, or no effect, on infrastructure as a result of the Proposed Development.

12.4.4 Assessment of Potential Effects

All potential effects, which are associated with the operational phase of the Proposed Development, are classified as long-term effects.

12.4.4.1 Construction Phase

During the construction phase, there are likely to be several sources of temporary electromagnetic emissions. Chief among these will be the brief use of electrical power tools and the use of electrical generators which may be brought onsite before mains electricity is provided. These devices are required by Irish and European law to comply with the EMC

Directive 2014/30/EU. Compliance with this Directive will mean that the electromagnetic emissions from these devices will not cause interference to other equipment and therefore no significant effects are likely.

Other potential effects during the construction phase are likely to be as a result of tall cranes used for constructing the turbines. These cranes will be beside the proposed turbines on the Turbine Hardstands. There are no telecommunication towers within the proximity of the Proposed Development, thus the effect can be classed as not significant.

A number of telegraph poles will likely need to be temporarily removed along local and regional roads to facilitate the transport of turbine components to the Site. This will have temporary, short-term effects on telecommunications in the locality which can be described as not significant and is further discussed in **Chapter 14: Traffic and Transport**.

12.4.4.2 Operational Phase

No telecommunication links have been identified during the scoping and consultation process. All responses received from telecommunications consultees have stated that the Proposed Development will have no effect on their telecommunications services.

12.4.4.3 Decommissioning Phase

Similar or less significant effects to those of the construction phase are likely.

12.4.4.4 The 'Do-nothing Impact'

If the Proposed Development does not proceed, there will be neutral impacts on telecommunications. This 'do-nothing' scenario would result in no interference in electromagnetic signals subject to the continuation of current activities and practices.

12.4.5 Mitigation Measures

All electrical elements of the Proposed Development are designed to ensure compliance with electro-magnetic fields (EMF) standards for human safety. The effects on human health are assessed in **Chapter 5: Population and Human Health**.

Mitigation measures were undertaken in the design phase through mitigation by avoidance i.e., the known routes of the telecommunication links were plotted and a buffer was applied to them, outside of which the proposed turbines were located.

12.4.6 Cumulative Effects

All existing and approved projects in **Appendix 1.2** have been considered for potential cumulative effects. There are 27 No. proposed, permitted or operational wind farms within 20 km of the Proposed Development. The closest wind farm to the Proposed Development is Shehy More Wind Farm, which is located approximately 0.56km North-east of the Proposed Development. The nearest proposed wind farm is Maughanaclea Wind Farm, located approximately 1.99km South-west of the Proposed Development.

Each Developer is responsible for engaging with all relevant telecommunications operators to ensure their proposals will not interfere with television or radio signals by acting as a physical barrier. Therefore, as each project is designed and built to avoid impacts arising, a cumulative impact cannot arise.

There will be no cumulative impacts relating to the Proposed Development and surrounding projects in relation to telecommunications.

12.4.7 Statement of Significance

No significant effects are predicted on telecommunications or radio reception as a result of the Proposed Development.

12.5 ELECTRICITY NETWORKS

12.5.1 Introduction

This section describes the transmission network and the anticipated connection option. It is not proposed to utilise any elements of the distribution network.

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.

There are 2 no. proposed Grid Connection Routes (GCRs) options. This element of the Project will be subject to a separate planning consent process but is assessed within this EIAR.

Grid Connection Route Option A measures 28 km in length while Grid Connection Route Option B measures 22 km in length and will be along public roads/verges and private lands.

It is proposed to construct a 110 kV Electrical Substation on the Site, as shown on **Figure 1.2**. This will provide a connection point between the proposed wind farm and the proposed grid connection point at either Dunmanway or Carrigdangan 110 kV substations. Electricity transmitted between the turbines and the Onsite Substation and Control Building on the Site will be at 33 kV.

Connection will be sought from the grid system operator by application to EirGrid. The Onsite Substation and Control Building will connect via underground 110 kV cables. At the existing Dunmanway or Carrigdangan 110 kV substation, the cable will connect into existing infrastructure within the confines of the Onsite Substation and Control Building and its compound. The Grid Connection will be constructed to the requirements and specifications of EirGrid and ESB Networks Limited.

12.5.2 Assessment Methodology

TLI Group were engaged to identify and analyse potential grid connection options for Gortloughra Wind Farm. This can be found in **Appendix 2.2.**

12.5.3 Assessment of Potential Effects

Due to the fact that all Wind Farm Internal Cabling will be underground as will the GCR from the Onsite Substation and Control Building to either Dunmanway or Carrigdangan, there will be no impact on the overhead electricity network.

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

There will be slight and short term effects on the electricity network during the connection of the Wind Farm to the national grid.

At either of the existing Dunmanway/ Carrigdangan 110 kV substations, the cable will connect into existing infrastructure within the confines of the Onsite Substation and Control Building and its compound. There is the potential that Eirgrid will consider future upgrades of the existing conductors associated with the 110 kV overhead lines leaving the either the Dunmanway or Carriqdangan 110kV substations.

12.5.4 The 'Do-nothing' Impact

If the Project does not proceed, there will be no offset to fossil fuel usage, and no provision of additional electricity in the local area.

12.5.5 Mitigation Measures

Mitigation by design and avoidance will minimise impacts on existing electricity networks.

- Confirmatory drawings for all existing services will be sought upon consultation with ESB Networks.
- Immediately prior to construction taking place, the area where excavation is planned will be surveyed by CAT scan (sub-surface survey technique to locate any below-ground utilities) and all existing services will be verified. Temporary warning signs will be erected.
- The as-built location of the installed ducts will be surveyed and recorded using a total station/GPS before the trench is backfilled to record the exact location of the ducts. The co-ordinates will be plotted on as-built record drawings for the grid connection cable operational phase.
- Clear and visible temporary safety signage will be erected all around the perimeter of the live work area to visibly warn members of the public of the hazards of ongoing construction works.

12.5.6 Cumulative Effects

All existing and approved projects in **Appendix 1.2** have been considered. There are 27 No. proposed, permitted or operational wind farms within 20km of the Proposed Development. There will be no cumulative impacts relating to the Proposed Development and surrounding projects in relation to electricity networks during the construction phase.

Potential negative cumulative effects on electricity networks are unlikely during the operational and decommissioning phases. This will be achieved through adopting mitigation by design and avoidance as set out in **Section 12.5.5.**

12.5.7 Statement of Significance

No significant negative impacts on the grid connection or grid network are anticipated. There will be a long-term slight positive residual impact on transmission infrastructure in the area (due to the installation of new infrastructure and provisions of additional renewable electricity). The chosen 110 kV substation has capacity to connect and therefore will not be affecting the distribution network. There is no impact on the distribution network, as it is not proposed to utilise any elements of the distribution network.

12.6 AIR NAVIGATION

Operating wind farms have the potential to cause a variety of adverse effects on aviation. Rotating wind turbine blades may have an impact on certain aviation operations, particularly those involving radar. The physical height of turbines can cause obstruction to aviation and the overall performance of communications, navigation and surveillance equipment. All structures over 150 m in height are required to have lighting to warn aviation traffic. The Proposed Development's ground to blade tip height of the wind turbines stands at 175 m during operation. The installation of aviation warning lighting for Gortloughra Wind Farm will be undertaken in line with best practice.

Kerry Airport is c. 48 km to the north-west. Cork Airport is c.55 km to the east of the Proposed Development.

12.6.1 Consultation

Consultation with the relevant aviation organisations was initiated during the Scoping process, to identify any potential aviation issues that could be affected by the Proposed Development. The findings are summarised in **Table 12.3**.

Table 12.3: Summary of Consultations (Aviation)

Consultee	Response
Cork Airport	No response received from Cork Airport. Dublin Airport were contacted regarding Cork Airport on 8th June 2023. Response received from Dublin Airport: *Daa along with AirNav Ireland (formerly the Air Navigation Service Provider division of the IAA) are responsible for ensuring the flight surfaces around Cork Airport are safeguarded. This is carried out using (amongst other things) the safeguarding grid as depicted below which extends 30 nautical miles from the airport:* *I have indicated the approximate location of the proposed wind farm at Gortloughra on the screenshot above just inside the 30nm limit. At this location the gird indicates that an obstacle greater than 600m elevation AMSL will need a formal assessment.* *The obstacle elevation AMSL is the existing ground/site elevation and the proposed obstacle height combined. With an approximate land elevation of 270m*

Consultee	Response
	at the site location, the height of the proposed turbines in this instance will be approximately 445m (175m + 270m), which is well below the 600m safeguarding value and so an Instrument Flight Procedures Assessment will not be required. *Separately, there are regulatory requirements that any obstacles greater than 100m above the existing ground elevation:* • *Must be notified to airspace@iaa.ie, and* • *A navigation warning light will be required*
Irish Aviation Authority	**Response received 6th January 2022:** *The Irish Aviation Authority (IAA) Air Navigation Services Division (ANSD) does not get involved in the planning process. The IAA ANSD is to be notified as detailed hereafter:* *According to S.I. 215 of 2005, Irish Aviation Authority (Obstacles to Aircraft in Flight), the IAA ANSD requires any person who seeks to erect a manmade object to notify the aerodrome operator of the intended operation **at least thirty days** in advance if the structure is to be erected in the vicinity of the aerodrome or the areas around the aerodrome and other protected surfaces associated with the aerodrome. Aerodrome Operators can be contacted via IAA AIP AD 1.3 INDEX TO AERODROMES AND HELIPORTS, to evaluate the impact of the intended operation on the protected airspace established for the aerodrome.* *Additionally, any person who seeks to erect a manmade object in excess of 45 metres anywhere within the state above ground or water surface level must also notify the IAA ANSD of the intended crane erection **at least thirty days** in advance, as a crane operating at or above this height may constitute an obstacle to air navigation. The IAA ANSD can be contacted via airspace@iaa.ie.* *The State requires electronic terrain and obstacle data (eTOD) in accordance with International Civil Aviation Organisation (ICAO) Annex 15 requirements which shall be surveyed by Ordnance Survey Ireland (OSi). The cost of this OSi surveyed data is to be borne by the developer. Additionally, the following data is to be supplied once construction is planned or commenced or available to the airspace team via airspace@iaa.ie:*

Consultee	Response

- *The WGS84 coordinates (In degrees, minutes and seconds) for each turbine?*
- *Height above ground level (to blade tip) and elevation above mean sea level (to blade tip)?*
- *Verification if it's a standalone wind farm or is merged with others. Does the wind farm have any alternative names?*
- *Horizontal extent (rotor diameter) of turbines and blade length where applicable?*
- *Lighting of the wind farm, which turbine(s) is/are lit, and what type of lighting?*

ICAO Light Type	Colour
Low-intensity Type A (fixed obstacle)	Red
Low-intensity Type B (fixed obstacle)	Red
Low-intensity Type C (mobile obstacle)	Yellow/Blue
Low-intensity Type D (follow-me vehicle)	Yellow
Low-intensity Type E	Red
Medium-intensity Type A	White
Medium-intensity Type B	Red
Medium-intensity Type C	Red
High-intensity Type A	White
High-intensity Type B	White

Response of 17th January 2022:

The development appears to be approximately 50km West of Cork Airport and 48km South East of Kerry Airport, as such, it is likely that the following general observations would be proffered during a formal planning process: In the event of planning consent being granted, the applicant should be conditioned to contact the Irish Aviation Authority to: (1) agree an aeronautical obstacle warning light scheme for the wind farm development, (2) provide as-constructed coordinates in WGS84 format together with ground and blade tip height elevations at each wind turbine location and (3) notify the Authority of intention to commence crane operations with at least 30 days prior notification of their erection.

Response received 23rd December 2022:

It is understood that the proposal relates to 9 x Wind Turbines with a blade tip height of 175ms above ground level.

Consultee	Response
	It is noted that the proposed wind farm is approximately 20kms North East of the nationally licenced Bantry *Aerodrome. We would recommend that you engage with the Licensee of the aerodrome to make them aware of your proposal:* *Contact details are as per Ireland's Aeronautical Information Publication:* *Post: ROWA Pharmaceuticals Ltd,* *Newtown,* *Bantry,* *Co. Cork* *Phone:+353 27 50077* *Phone: +353 86 8127336* *Fax: +353 27 50417* *Email: rowa@rowa-pharma.ie* **Response received 9th June 2023:** *The Authority has no specific requirements in relation to the completion of the EIAR.* *Based on the preliminary information provided, should a formal planning application be submitted, the Irish Aviation Authority will likely offer the following general observations:* *"In the event of planning consent being granted, the applicant should be conditioned to contact the Irish Aviation Authority to: (1) agree an aeronautical obstacle warning light scheme for the wind turbine development, (2) provide as-constructed coordinates in WGS84 format together with ground and tip height elevations at each wind turbine location and (3) notify the Authority of intention to commence crane operations with at least 30 days prior notification of their erection."* *Following the separation of the Irish Aviation Authority and Air Navigation Ireland (the IAA ANSP) from the 30th April 2023, Air Navigation Ireland has responsibility for the maintenance and safeguarding of en route communications and navigation*

Consultee	Response
	surveillance equipment in Ireland. Please forward the report for their review to: planning@airnav.ie *Please be advised that Paul Mullins has left the Authority. Audrey and Geraldine have transferred to the new entity – Air Nav Ireland.* **Response 05/04/24:** *The Authority has no observations on the proposed amendments or specific requirements for integration into the EIAR.* *Based on the preliminary information provided, should a formal planning application be submitted, the Irish Aviation Authority will likely offer the following general observations:* *"In the event of planning consent being granted, the applicant should be conditioned to contact the Irish Aviation Authority to: (1) agree an aeronautical obstacle warning light scheme for the wind turbine development, (2) provide as-constructed coordinates in WGS84 format together with ground and tip height elevations at each wind turbine location and (3) notify the Authority of intention to commence crane operations with at least 30 days prior notification of their erection."*
Bantry Aerordrome	**Response received 3rd May 2022:** *I have contacted the IAA and I have no comment to make on the proposed wind farm project.*
Department of Defence	**Response received February 2022** *"Nothing in the above observations shall be taken as a binding response by the Minister for Defence in the event that a planning application is made. The Minister reserves the right to comment on an actual planning application as and when it is submitted in accordance with the provisions of the planning regulatory code."* **Response 17/04/24:** *"Based on the information supplied and following consultations with the subject matter in the Irish Air Corps, the Department of Defence wishes to make the following observations:* *All turbines should be illuminated by Type C, Medium intensity, Fixed Red obstacle lighting with a minimum output of 2,000 candela to be visible in all directions of*

Consultee	Response
	azimuth and to be operational H24/7 days a week. Obstacle lighting should be incandescent or, if LED or other types are used, of a type visible to Night Vision equipment. Obstacle lighting used must emit light at the near InfraRed (IR) range of the electromagnetic spectrum, specifically at or near 850 nanometres (nm) of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light. *Any Irish Air Corps (IAC) requirements for are separate to Irish Aviation Authority (IAA) require.* *We would appreciate if you could keep us informed on any progress relating to this proposed development."*

12.6.2 Assessment of Potential Effects

Consultation with the Irish Aviation Authority and Cork Airport Ireland revealed that the Proposed Development is not predicted to have any effect on the operations of Cork Airport as the Proposed Development is outside their associated 'Outer Horizontal Surface' (over 15 km away). The Proposed Development is over 45 km from Kerry Airport and over 55 km from Cork Airport. No potential effects are predicted. The civil aviation guidelines for wind turbines covers a 30 km radius[4]. Therefore, no potential effects to air navigation were identified.

12.6.3 The 'Do-Nothing Impact'

If the Proposed Development were not to proceed, there would be a neutral effect on aviation operations.

12.6.4 Mitigation Measures

Although no potential effects were identified, the following mitigation measures proposed by the Irish Aviation Authority (IAA) and Department of Defence will be implemented:

- An aeronautical lighting scheme for the Proposed Development will be agreed with the IAA and will be installed.
- As-constructed coordinates in WGS84 format together with ground and tip height elevations at each wind turbine location will be provided to the IAA.

[4] CAA Policy and Guidelines on Wind Turbines, UK Civil Aviation Authority, 2016. https://publicapps.caa.co.uk/modalapplication.aspx?catid=1&pagetype=65&appid=11&mode=detail&id=5609 [Accessed online: 18/05/2023]

- The IAA will be notified of intention to commence crane operations with at least 30 days prior notification of their erection.
- Single turbine, structures or turbines delineating the windfarm will be illuminated by Type C, Medium Intensity, Fixed Red obstacle lighting with a minimum output of 2,000 candela to be visible in all directions of azimuth and will be operational H24/7days a week. Obstacle lighting will be incandescent or of a type visible to Night Vision equipment. Obstacle lighting must emit light at the near Infra-Red (IR) range of the electromagnetic spectrum, specifically at or near 850 nanometres (nm) of wavelength. Light intensity will be of similar value to that emitted in the visible spectrum of light.

12.6.5 Cumulative Effects

All existing and approved projects in **Appendix 1.2** have been considered. There are 27 No. proposed, permitted or operational wind farms within 20km of the Proposed Development. Each Developer is responsible for engaging with the aviation authority to ensure the proposals will not interfere with aviation radio signals by acting as a physical barrier. Therefore, as each project is designed and built to avoid impacts arising, a cumulative impact cannot arise. There will be no cumulative impacts relating to the Proposed Development and surrounding projects in relation to aviation during the construction phase.

Potential negative cumulative effects on aviation are unlikely during the construction, operational and decommissioning phases.

12.6.6 Statement of Significance

No significant impacts are predicted in terms of air navigation. In adherence to IAA Safety Regulations and ICAO Annex 15, aeronautical obstacle warning light schemes will be installed as requested by IAA. Co-ordinates of ground and tip height elevations at each wind turbine location as constructed will be provided to the IAA. IAA will be notified of the provision of the intention to commence crane operations within a minimum of 30 days prior to erection.

12.7 QUARRIES

Rock will be obtained on site from the on-site borrow pit. However, where the rock is found to be unsuitable for use in the construction of Turbine Hardstands and site access track, a local quarry will be used to source sub-base and base materials.

12.7.1 Introduction

Sub-base, and base materials for the Access Track and Turbine Hardstand construction will be sourced from nearby quarries, course crushed stone will also be imported for the final running layer. The crushed stone for construction of the Project will come from licenced quarries in the locality such as:

- Mid Cork Quarries
- Kilmichael Quarry
- McSweeney Bros
- Roadstone Castlemore
- Keohane Quarry
- Finbarr O'Neill Limited
- Roadstone Ballygarvan

These quarries will also be the source of crushed stone and concrete for widening works to the Turbine Delivery Route (**Chapter 14: Traffic and Transport**), Turbine Foundations and for Grid Connection works. The locations of these quarries in relation to the Proposed Development are shown in **Figure 14.1.**

12.7.2 Assessment of Potential Effects

Materials will be primarily sourced from the on-site borrow pit and site excavations. However, where this material is classed as unsuitable, quarries will be used. The construction of the Project will impact slightly on natural resources such as aggregates which will be sourced from a quarry in proximity to the Site (see list of potential quarries to be used in Section 12.7.1).

It is likely that a small amount of granular material may be required to periodically maintain access tracks during operation which could impact the source quarry. However, the decommissioning phase will have no impact on an offsite source quarry.

The use of imported material will have a slight, permanent negative impact on non-renewable resources of the area. This impact is considered to be imperceptible in the long-term.

12.7.3 The 'Do-Nothing Impact'

If the Project were not to proceed, there would be no impact on quarry operations in the area and quarrying activities would continue.

12.7.4 Mitigation Measures

- Existing tracks have been used where possible, and the layout was designed to minimise the length of new track required in order to reduce the requirement for such stone material.
- Local quarries have been identified to reduce impact on transportation (Please see **Chapter 14: Traffic and Transportation)**.
- The source quarry will be chosen based on stone which is chemically similar to that occurring at the Proposed Development. This will reduce hydrogeochemical impacts. (Please see **Chapter 8: Soils and Geology**)

12.7.5 Cumulative Effects

All existing and approved projects in **Appendix 1.2** have been considered.

The very nature of a quarry is that it will be subjected to cumulative effects as it is the source of stone for almost all developments in the area. Therefore, there will be cumulative impacts relating to the Project and surrounding projects in relation to quarries during the construction phase.

Potential negative cumulative effects on quarries are imperceptible/unlikely during the operational and decommissioning phases.

12.7.6 Statement of Significance

No significant negative impacts on local quarries are anticipated. There will be a slight, permanent negative residual impact on natural resources in the area.

This impact is considered to be imperceptible in the long-term.

12.8 UTILITIES

In order to assess the potential for significant effects on built services gas, water and waste in the vicinity of the Proposed Development, scoping requests were made to Irish Water and Cork County Council including Water Services and Environment departments. Refer to **Chapter 1: Introduction** and **Appendix 1.3** of this EIAR for details in relation to the EIA scoping exercise.

12.8.1 Assessment Methodology

A desk study of available information from the EPA did not identify any waste facilities, illegal waste activities, chemical monitoring points or industrial EPA licensed facilities within a 2 km radius of the Site. The nearest waste facility to the Proposed Development is the Macroom Civic Amenity Site (W0142) located approx. 20.5 km northeast of the Proposed Development.

12.8.2 Assessment of Potential Effects - Gas, Water Utilities

There are no gas mains located within the Site. There is therefore no potential for impact. Gas Networks Ireland website Dial Before you Dig[5] was consulted, which indicated that there are no existing gas services along either Grid Connection Routes.

In relation to water services within the Site, it has been assumed that there is the potential to encounter local water services.
The following water service features were identified along the Grid Connection Route Options:

- Air control valves
- Fitting
- Hydrant
- Mains Line
- Network Meter
- System Valve

Potential impacts arising from the Project relating to existing water services have been assessed and are detailed in **Chapter 9: Hydrology and Hydrogeology** and referred to in **Chapter 5: Population and Human Health** with accompanying mitigation measures.

[5] https://www.gasnetworks.ie/home/safety/dial-before-you-dig/dbyd/

12.8.3 Assessment of Potential Effects - Waste

Staff Facilities

During the construction, operational and decommissioning phases of the Proposed Development, there will be the typical waste generated in an office such as left-over food and sandwich wrappers. This is a non-hazardous waste. All such waste will be stored appropriately and safely from wind, rain and wild animals that often tear apart rubbish bags. The effects of this waste will be not significant.

Waste generated onsite is estimated to range between 0.005 kg and 0.189 kg per person per day.[6]

Sewage

It is proposed to install a rainwater harvesting system as the source of water for toilet facilities for the operational phase. Wastewater from the staff welfare facilities in the control building will be collected in a sealed storage tank which will then be collected by a licensed waste disposal contractor.

Change of use is sought for the existing agricultural site to a Temporary Construction Compound. This will involve the installation of temporary office buildings, providing meeting rooms and welfare facilities for the construction and maintenance staff.

The maximum wastewater production during construction is estimated to be the same as the maximum water consumption (2,000 litres per person, per day)[7].
Wastewater generated at the site Temporary Construction Compound and at the Onsite Substation and Control Building welfare facilities will be tankered off-site by a licensed waste collector to the nearest wastewater treatment plant, likely to be the Ballingeary Water Treatment Plant (D0431-01) which is located 5.7 km north of the Site. There will be no on-site treatment of wastewater and effects will be not significant during the construction, operational and decommissioning phases.

Concrete

[6] Based on 1 hour a day within communal facilities. Worldwide, waste generated per person per day averages 0.74 kilogram but ranges widely, from 0.11 to 4.54 kilograms. (World Bank) Available Online: https://datatopics.worldbank.org/what-a-waste/trends_in_solid_waste_management.html [Accessed 08/01/2024]

[7] Table 3 of the EPA WW treatment Manual (Treatment systems for Small Communities, Business, Leisure Centres and Hotels), Environmental Protection Agency, 1999. Quarry (Excluding Canteen) best reflects a construction site. [Available online: https://www.epa.ie/publications/compliance--enforcement/wastewater/EPA_water_treatment_manual_-small-comm_business.pdf]

Concrete will be used during the construction phase for the construction of Turbine Foundations, Onsite Substation and Control Building and Met Mast. There is no waste concrete expected from this construction work, therefore there will be no concrete waste impact during construction phase.
There will be no need for the use of concrete during the operational phase and effects are imperceptible.

Concrete structures will be left in place during decommissioning and allowed to naturally revegetate over time. This is the least impactful process of decommissioning. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant environmental nuisances such as noise, dust and/or vibration. As the Site will have already been altered, the impacts are imperceptible and permanent.

It is expected that 20 L – 30 L of concrete washout will be produced during the construction phase, which will be collected in designated skip(s) in a bunded area located in the designated concrete washout facility at the Temporary Construction Compound, located just south of the site entrance, between T1 and T2. This concrete waste (waste code 10 13 14; waste concrete and concrete sludge) will be disposed of at a licenced facility, as outlined in the CEMP, **Appendix 2.1** (Waste management plan no. 5).

Chemicals, Fuels and Oils

Oil waste and diesel are classified as hazardous waste/dangerous substance. There is no expected chemical/fuel/oil waste other than from rags and residual amounts in containers. Without mitigation, the effects would be slight and medium-term in duration. This would be in the form of leaching of chemical or fossil fuel contaminants into the soil, groundwater and/or surface waters onsite. However, through the implementation of the mitigation measures set out in **Chapter 8: Soils and Geology** and **Chapter 9: Hydrology and Hydrogeology**, the residual effects will be not significant in the construction/decommissioning phase. The storage/use of such liquids is not seen necessary on site during the operational phase; thus, the effects are imperceptible.

Refuelling

Vehicles will be refuelled off-site where possible. For vehicles that require being refuelled on-site, where possible all refuelling on site will be within the re-fuelling area within the Temporary Construction Compound. Only essential refuelling (e.g., cranes) will be carried

out outside of this area, and has been mitigated by design as outlined in section 12.8.6. Some refuelling of cranes may be required (to a lesser extent) during the decommissioning. As such, the residual effects are **not significant negative and temporary** during the construction phase and **not significant** during the decommissioning phase. There will be no need for refuelling during the operational phase and effects are **imperceptible**.
The storage/use of such liquids is not seen as necessary on site during the operational phase; thus, the effects are **imperceptible**.

Packaging

Packaging will be brought onsite during the construction, operational and decommissioning phases and can include cardboard, wood and plastics used to package turbine components. Packaging waste will be dealt with in accordance with the European Union (Packaging) Regulations 2014 (S.I. No. 282 of 2014[8]).

'A producer who supplies to another producer packaging material, packaging or packaged products shall comply with any reasonable request from the latter producer for data on the weight of the material or packaging concerned sufficient to enable the latter producer to comply with these Regulations.'

The occurrence of 10 kg of plastic per turbine blade, between 40 and 50 pallets and 50 to 60 cable drums are expected. This will be removed from Site for re-use by the contractor. Cable drums will be returned to the cable manufacturer for re-use.

This waste is non-hazardous, and the effects of this waste are not significant. This is on account of the fact the packaging waste will be removed from the Site and recycled and/or disposed of at licensed waste facility.

Metals

During Decommissioning, it is expected that some steel will be removed from surface level concreted plinths supporting the turbine sections. Steel can be reclaimed for re-use in future steel making production where required. However, steel enclosed in the reinforced concrete Turbine Foundation bases will remain in-situ. This waste is non-hazardous, and effects of leaching into soil and water table are considered not significant due to the differential placing of steel set within concrete foundation formations as well as the gradual nature of any

[8] https://www.irishstatutebook.ie/eli/2014/si/282

natural breakdown products. There will not be a requirement for additional drainage measures to be implemented during the Decommissioning phase of the Project. This has been assessed separately in **Chapter 9: Hydrology and Hydrogeology.**

Metal waste is non-hazardous, much of which can be reclaimed and re-used. The effects of this waste on re-cycling facilities will be **imperceptible** during construction, **imperceptible** during operational phase and **moderate negative and temporary** during the decommissioning phase.

Excavated Materials

Excavated materials, such as spoil and rock, will be required for habitat and ecological restoration, reprofiling and backfilling in accordance with the **Appendix 2.1 CEMP**. As such, excavated materials will not be classified as waste except along both Grid Connection Routes and at locations within the Site boundary where the widening of public roads occurs. Road surface material will be stored in slabs for reuse/recycling where appropriate. Material excavated from trenches in public roads not suitable for recycling will be disposed of to a licenced facility while in-situ excavated road surfacing material will be recycled.

General spoil waste will be transported to one of licensed facilities identified in **Appendix 2.1, Management Plan 5: Waste Management Plan**.

An estimated 10,775 m^3 of material will be excavated along Grid Connection Option A or 10,812 m^3 for Grid Connection Option B. Where excavated material from trenches in public roads does not meet the criteria set for recycling, it will be disposed of to a licenced facility. The top 100 mm layer of both Grid Route options, 17.96 km (Option A) or 18.02 km (Option B) x 600 mm wide grid route excavation area is potentially hazardous (containing Bitumen), this equates to 1,077.6 m^3 or 1,081.2 m^3 of potentially hazardous material respectively. This material falls under the European Waste Catalogue (EWC) code 17 05 03* (soil and stones containing hazardous substances[9]). This material will be transported by an authorised waste permit holder to a licensed facility. The closest licences facility accepting EWC 17 05 03* waste is the Heating Equipment & Thermal System Waste facility, located in Macroom, Co. Cork.

[9] EPA, 2018. 'Waste Classification List of Waste & Determining if Waste is Hazardous or Non-hazardous' Accessed on: 16/01/2025. Available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.epa.ie/publications/monitoring--assessment/waste/EPA_WasteClassificationGuidanceReport2019.pdf

The effect of this will be not significant however there will be slight to moderate effect in terms of waste material volume generated and the need to send this material for suitable disposal at a waste reception facility licenced for disposal of hazardous bituminous materials.

12.8.4 The 'Do-Nothing Impact'

If the Proposed Development were not to proceed, there would be no impact on the utilities or waste in the area.

12.8.5 Mitigation Measures – Gas, Water Utilities

Mitigation measures relating to existing water services have been assessed and are detailed in **Chapter 9: Hydrology and Hydrogeology** and referred to in **Chapter 5: Population and Human Health**.

12.8.6 Mitigation Measures – Waste

Staff Facilities

Provision for separation of waste streams will be provided so that e.g., paper, and cardboard waste and bottles may be recycled.

Sewage

It is proposed to install a rainwater harvesting system as the source of water for toilet facilities for the operational phase. Wastewater from the staff welfare facilities in the control building will be collected in a sealed storage tank.

All wastewaters will be tankered off-site (subject to agreement with Uisce Éieann) by a licensed waste collector to the nearest wastewater treatment plant namely, the Balllingeary Water Treatment Plant, which is located approximately 7.3 km north of the Proposed Development. There will be no on-site treatment of wastewater and effects will be not significant.

Concrete

During the construction phase:

Precast concrete will be used wherever possible i.e., formed offsite. Elements of the Project where precast concrete will be used have been identified and are indicated in the CEMP (**Appendix 2.1**). Elements of the Project where the use of precast concrete will be used include structural elements of watercourse crossings (single span / closed culverts) as well as Cable

Joint Bays. The below mitigation measures will apply where it is not possible to use precast concrete, e.g., the turbine foundations and joint bay pit:

- The acquisition, transport and use of any cement or concrete onsite will be planned fully in advance and supervised at all times by the Site Manager, Ecological Clerk of Works (ECoW) and/or Environmental Manager.
- Vehicles transporting such material will be relatively clean upon arrival onsite, that is; vehicle wheels will be washed/rinsed, removing cementitious material leaving the source location of the material. There will be no excess cementitious material on vehicles which could be deposited on trackways or anywhere else onsite. To this end, vehicles will undergo a visual inspection prior to entering or exiting the Site or progress beyond the contractor's yard. Vehicles will also be in good working order.
- Any shuttering installed to contain the concrete during pouring will be installed to a high standard with minimal potential for leaks. Additional measures will be taken to ensure this, for example the use of plastic sheeting or other sealing products at joints.
- Concrete will be poured during meteorological dry periods/seasons. This will reduce the potential for surface water run off being significantly affected by freshly poured concrete. This will require limiting these works to dry meteorological conditions i.e. avoid foreseen sustained rainfall (any foreseen rainfall event longer than 4-hour duration) and/or any foreseen intense rainfall event (>3 mm/hour, yellow on Met Eireann rain forecast maps). Work should not proceed during any yellow (or worse) rainfall warning issued by Met Eireann. This also will avoid such conditions while concrete is curing, in so far as practical.
- Ground crew will have a spill kit readily available, and any spillages/leaks of fuels or oils, or deposits will be cleaned/removed as soon as possible and disposed of appropriately.
- Pouring of concrete into standing water within excavations will be avoided. Excavations will be prepared before pouring of concrete by pumping standing water out of excavations to the buffered surface water discharge systems in place.
- Temporary storage of cement bound sand (if required) will be on hardstand areas only where there is no direct drainage to surface waters and where the area has been bunded e.g., using sand-bags and geotextile sheeting or silt fencing to contain any solids in run-off.
- No surplus concrete will be stored or deposited anywhere onsite. Such material will be returned to the source location or disposed of off-site appropriately. A temporary concrete washings area will be located at the egress from the Site.

Upon implementation of the above mitigation measures, the effects of the construction of the Proposed Development are considered to be not significant.

Chemicals, Fuels and Oils

A **Chemical and Waste Inventory will be kept**. This inventory will include:

- List of all substances stored onsite (volume and description)
- Procedures and location details for storage of all materials listed
- Waste disposal records, including copies of all Waste Transfer Notes detailing disposal routes and waste carriers used
- Any tap or valve permanently fixed to the mobile unit through which oil can be discharged to the open or when delivered through a flexible pipe which is fitted permanently to the mobile unit, will be fitted with a lock and locked shut when not in use
- Sight gauges will be fitted with a valve or tap, which will be shut when not in use sight gauge tubes, if used will be well supported and fitted with a valve
- Mobile units must have secondary containment when in use/out onsite

Under the EU Directive 95/55/EC all such dangerous substances will be conveyed in a container that compiles with the Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR). As such the manufacturer of each bowser will provide certification to contractors that the following:

- A leak-proof test certificate
- A copy of the Intermediate Bulk Container (IBC) approval certificate
- An identification plate attached to the container

Where mobile bowsers are used onsite, guidelines will be followed so that:

- Any flexible pipe, tap or valve will be fitted with a lock where it leaves the container and be locked shut when not in use;
- Flexible delivery pipes will be fitted with manually operated pumps or a valve at the delivery end that closes automatically when not in use. Where possible, a nozzle designed to dispense oil is used;
- The pump or valve will have a lock and be locked shut when not in use.

For loads in excess of 1000 litres (220 gallons), the bowser vehicle driver will have undergone training and hold a special license (Carriage of Dangerous Goods by Road regulations).

Refuelling

For vehicles that require being refuelled on-site during construction/decommissioning, where possible all refuelling onsite will be within the Temporary Construction Compound within the re-fuelling area. Only essential refuelling (e.g., cranes) will be carried out, outside of this area, but not within 50 m of any watercourse. In such cases a non-permeable High-density Polyethylene (HDPE) membrane will be provided beneath connection points to catch any residual oil during filling and disconnection. This membrane will be inspected and if there is any sign of oil contamination, it will be removed from site by a specialist licensed waste contractor. All vehicles will be well maintained and free from oil or hydraulic fuel leaks.

Packaging

In accordance with the waste hierarchy, packaging will be returned to the originator ahead of re-use or recycling. Where this is not possible, waste will be separated as appropriate and safely stored on Site prior to being removed from Site by a licenced waste contractor.

Metals

Waste metals from concrete reinforcing during construction and removal of metals during decommissioning etc. will have commercial value and will be re-used or recycled with the appropriate licensed waste contractor.

12.8.7 Statement of Significance

There are no gas mains located within the Site. There is therefore no potential for impact.

It has been assumed that there is the potential to encounter local water services during excavation works of the Project. Potential impacts arising from the Project relating to existing water services have been assessed and are detailed in **Chapter 9: Hydrology and Hydrogeology**.

There are no EPA-licensed or local authority-authorised waste facilities or activities located within the Site. The closest, authorised municipal waste facility is located approximately 19 km northeast of the Proposed Development in the townland of Macroom, County Cork.

The residual effects of waste produced as a result of the construction, operational and decommissioning phases of the Project are considered to be not significant.

12.9 ROAD AND RAIL NETWORK

There are no direct public services within the vicinity of the Site. The nearest public transportation is provided along R585, approximately 1.2 km south of the Proposed Development. The bus service no. 231 travels from Cork City to the Village of Ardgroom. Busses are available from Togher Village to a number of destinations including Galway and Limerick. Irish Rail provides services from Cork City to Dublin Heuston.

12.9.1 Assessment of Potential Effects

12.9.1.1 Construction Phase Impacts

Traffic on the road network generated by the construction phase, including the Turbine Delivery Route and Construction Haul Routes, of the Project will primarily consist of traffic related to either delivery of construction materials, or removal of excavated material from the Site for disposal. Construction Phase staff will also generate trips to and from the construction sites. The traffic impact on the road network during the construction phase will have slight negative temporary effects, this is discussed further in **Chapter 14: Traffic and Transport**.

Where roads are opened for the installation of electrical cables for the chosen Grid Connection route, moderate negative temporary effects are likely to arise on these roads during construction.

12.9.1.2 Operational Phase Impacts

During its operations phase, traffic generated by the Proposed Development will be related to the operation of the plant by employees and personnel, planned and periodic maintenance works. There will be slight negative effect, brief effects on the road network during the operational phase.

During the operational phase, there will be no potential impact on the TDR or GCR Options.

12.9.2 The 'Do-Nothing' Impact

If the Project were not to proceed, there would be no impact on the road and rail network in the area.

12.9.3 Mitigation Measures

12.9.3.1 Construction Phase

Mitigation measures relating to road and rail properties outside the Proposed Development footprint may be required. **Chapter 14: Traffic and Transport** details specific mitigation measures to be undertaken during the construction phase to eliminate and reduce any impact.

12.9.4 Cumulative Effects

A desktop study shows that there are no planned developments in the vicinity of the Project which will generate a significant number of new trips on the public road network. The Project is located close to the regional road network with links to the N22. National primary road. The results of the traffic analysis in **Appendix 14.1** show that the road and junction network will continue to operate with reserve capacity during construction, operation and decommissioning of the Proposed Development. An additional analysis was carried out to test the capacity of the junctions with the forecast growth on the public road network increased by an additional 10% to test the capacity of the L4067 / L4068 junction with additional development traffic which may arise in the future. The results of the analysis show that the road network will continue to operate with reserve capacity with additional development traffic during construction in 2035 and decommissioning in 2075. The results of the traffic analysis are included in **Appendix 14.1**

12.9.5 Statement of Significance

No significant negative impacts on local road and rail networks are anticipated.

12.10 RECREATIONAL FACILITIES AND AMENITIES

12.10.1 Introduction

The Site is located approx. 3 km northwest of the Bandon River Valley and 5 km south of the Lee River Valley. Both these areas are recognised as nationally significant tourism assets within the Cork CDP[10]. Both valleys are important for recreational amenity, heritage and as fishery areas. The Site is also located over 5 km north of the Mealagh River which terminates at Bantry Bay. The effects on the river network are further discussed in **Chapter 6: Biodiversity** and **Chapter 9: Hydrology and Hydrogeology**.

Sections of the Beara Gougane Barra Cycling Route traverse the northwestern side of the Site. It is a 318-kilometre-long route which commences in Cork City and finishes at the Beara Peninsula (Inchigeelagh) via Gougane Barra. It is a moderate 8-day (318 km) cycling route which can be broken up into ideal smaller half day (40 km) stages. This route is joined by the Pass of Keimaneigh to the west of the Site and the Beara to Breifne Way to the north.

The Beara to Breifne Way, Ireland's longest national waymarked walking/cycling trail runs 7 km north of the site. The Way runs almost the length of the country and takes the walker and cyclist to some of its most beautiful and least explored areas; along the coast of the Beara Peninsula, across six mountain ranges, along the banks of the River Shannon and through the lake regions of Roscommon and Leitrim. The Shehy Mountains are also located to the north of the Site, which are popular for adventure related tourist activities, with trails for walking and cycling.

The Site and a section (3.1 km in length) of both potential grid connection routes are located in An Gaeltacht Mhúscraí (the Múscraí Gaeltacht), which is 262 km^2 in size. The area has a rich history of traditional Irish music, poetry and dance. Known for its landscape, there are many nature walking trails within this area, offering picturesque views of the numerous lakes and mountainous areas within the landscape. The area is of significant cultural heritage value and is frequently visited by tourists.

Cork County provides angling tourism attractions, notably the Ballyhass lakes and River Lee. Each of these areas provide good trout fishing.

[10] https://www.corkcoco.ie/sites/default/files/2022-06/volume-1-main-policy-material.pdf

12.10.2 Assessment of Potential Effects

12.10.2.1 Construction Phase Impacts

The grid connection cabling will run from the onsite 110 kV Substation across a combination of private lands and public roads generating land disturbance and associated movement of machinery and stockpiling of materials for both Grid Connection options A and B. The proposed Grid Connection routes will include for directional drilling at up to 22 no. locations on Option A and 18 no. locations on Option B. No overhead lines are required for the connection. Connection works will involve the installation of ducting, joint bays, drainage and ancillary infrastructure. This will require delivery of plant and construction materials, followed by ground excavation laying of cables and subsequent reinstatement of trenches, and will result in minor and very localised construction stage landscape effects.

There will be some construction stage effects on landscape character generated by the intensity of construction activities (workers and heavy machinery) as well as areas of bare-ground and stockpiling of materials as identified in the Construction and Environmental Management Plan (**CEMP- Appendix 2.1**). The hill- walking routes at Shehy Mountain will be closed temporarily during the construction phase of the Proposed Development to allow for upgrade works and the erection of Cultural Heritage notice boards. Such effects will be temporary/short term in duration and are, therefore, not considered to be significant. Overall, construction stage landscape effects are considered to be of a High-medium magnitude.

12.10.2.2 Operational Phase Impacts

There will be physical impacts on the land cover of the Site and cable route as a result of the Project during the operational phase, but these will be relatively minor in the context of this working rural landscape that comprises pockets of existing wind energy development and areas of commercial conifer forest. The scale of the Project will be well assimilated within its landscape context without undue conflicts of scale with underlying landform and land use patterns. For these reasons the magnitude of the landscape impact is deemed to be High-medium within the site and its immediate environs (c.1 km) reducing to Medium for the remainder of the central Study Area. The quality of the landscape effects is deemed Negative. Beyond 5 km from the Site, the magnitude of landscape impact is deemed to reduce to Low and Negligible at increasing distances as the wind farm becomes a proportionately smaller and integrated component of the overall landscape fabric.

Existing trails will be open to the public during the operational phase and will have a positive effect.

12.10.3 Decommissioning Phase

The Decommissioning phase will see a similar nature of effects to the construction stage due to the movement of heavy machinery within the site and to and from the Site removing turbine components. However, such effects will be temporary in duration and decreasing in scale as turbines are removed from view and the landscape is substantially reinstated to former uses. As with construction stage impacts, Decommissioning stage effects are not considered to be significant.

12.10.4 The 'Do-Nothing' Impact

If the Proposed Development were not to proceed, there would be no upgrade of the existing recreational trails in the area. The cultural heritage notice boards would not be erected. There would be no positive effect on the recreational facilities and amenities of the area.

12.10.5 Mitigation Measures

Mitigation measures to reduce the visual impact of the Wind Farm were incorporated at the design stage. The Vestas V150 turbine was chosen due to its compact size and minimal tip height. The overall turbine blade tip height is 175m. The sitting of turbines on prominent ridgeline was avoided where possible.

Works on the TDR for abnormal loads between Port of Cork and Crookstown will be relatively minor in nature, for example temporary removal of street furniture and signage. The road widening and upgrade works from the R585 to the Site, including upgrades to bridges on the route will be a slight, positive, permanent benefit at the local level due to the improvements to the route for local residents and other road users in the area.

12.10.6 Cumulative Effects

All existing and approved projects in Appendix 1.2 have been considered. There are 27 no. proposed, permitted or operational wind farms within 20 km of the Proposed Development.

Potential negative cumulative effects on recreational facilities and amenities are unlikely during the operational and decommissioning phases.

12.10.7 Statement of Significance

No significant negative impacts on recreational facilities and amenities are anticipated.

15 AIR AND CLIMATE

15.1 INTRODUCTION

This chapter assesses the impacts of the Project on air and climate in section 15.2 and 15.3 respectively. The Project refers to all elements of the Gortloughra Wind Farm, including Grid Connection Route options and Turbine Delivery Route (**Chapter 2: Project Description**). Where negative effects are predicted, the chapter identifies appropriate mitigation strategies therein. The assessment considers the potential and in combination effects during the following phases of the Project:

- Construction
- Operation
- Decommissioning

This chapter of the EIAR is supported by the following Appendix documents provided in **Volume IV** of this EIAR:

- **Appendix 15.1 Scottish Government – Carbon Calculator Input and Output Data**

Table 15.1: Glossary of Common Acronyms

Glossary of Common Acronyms	
µg	Microgram
AOT_{40}	AOT_{40} is a measure of the overall exposure of plants to ozone. It is the sum of the excess hourly concentrations greater than 80 µg/m3 and is expressed as µg/m3 hours.
AQIH	Air Quality Index for Health
As	Arsenic
BSc	Bachelor of Science
C_6H_6	Benzene
CAFE	Clean Air for Europe
CAP	Climate Action Plan
Cd	Cadmium
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
COP	UN Climate Change Conference
CSO	Central Statistics Office
DOC	Dissolved Organic Carbon
EEA	European Environmental Protection Agency

Glossary of Common Acronyms	
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
EU	European Union
g	Gramme(s)
GIS	Geographical Information Systems
GW	Gigawatt(s)
Hg	Mercury
HGV	Heavy Goods Vehicle(s)
HSE	Health Service Executive
km/h	Kilometre(s) per hour
km	Kilometre(s)
kWh	Kilowatt hour(s)
LGV	Light Goods Vehicle(s)
m	Metre(s)
m^3	Cubic metres
MSc	Master of Science
MW	Megawatt(s)
NH_3	Ammonia
Ni	Nickel
NO_2	Nitrogen Dioxide
NO	Nitrogen Oxide
NOx	Nitrous oxides
O_3	Ozone
PAH	Polycyclic aromatic hydrocarbons
Pb	Lead
PM	Particulate matter
PM_{10}	Particulate matter (less than 10 micrometres)
$PM_{2.5}$	Particulate matter (less than 2.5 micrometres)
POC	Particulate Organic Carbon
ppb	Parts per Billion

Glossary of Common Acronyms	
SO_2	Sulphur dioxide
SOx	Sulphur oxides
UN	United Nations
WHO	World Health Organisation

15.1.1 Statement of Authority

This chapter has been prepared by Jennings O'Donovan & Partners Limited. It was prepared by Shirley Holton, with the assistance of John A Clancy and reviewed by Andrew O'Grady.

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15.1.2 Assessment Structure

In line with the revised EIA Directive and current EPA guidelines as listed in **Chapter 1: Introduction, Scoping and Consultation**, Section 1.6, the structure of this Air and Climate chapter is as follows:

- Assessment Methodology and Significance Criteria;
- Relevant legislation, standards and guidance;
- Description of baseline conditions at the Site;
- Identification and assessment of impacts to air and climate associated with the Project, during the construction, operational and decommissioning phases of the Project;
- Mitigation measures to avoid or reduce the impacts identified;
- Identification and assessment of residual impact of the Project considering mitigation measures, and
- Identification and assessment of cumulative impacts if and where applicable.

The desktop study as outlined in section 15.2 and 15.3 together with the other assessments detailed in this chapter are considered adequate to allow the competent authority to carry out an adequate assessment of the Project.

15.1.3 Consultation

Consultation with the relevant organisations was undertaken during the scoping stage of the EIA to identify any potential effects that could be attributable to the Proposed Development. A summary of the responses is detailed in **Table 15.2**.

Table 15.2: Summary of Consultation Response on Air Quality and Human Health

Consultee	Summary of Consultee Response
Health Service Executive	**Response received 5th January 2022:** *…Air Quality* *Due to the nature of the proposed construction works generation of airborne dust has the potential to have significant impacts on sensitive receptors. A Construction Environmental Management Plan (CEMP) should be included in the EIAR which details dust control and mitigation measures. Measures should include:* • *Sweeping of hard road surfaces* • *Provision of a water bowser on site, regular spraying of haul roads* • *Wheel washing facilities at site exit* • *Restrict speed on site* • *Provide covers to all delivery trucks to minimise dust generation* • *Inspect and clean public roads in the vicinity if necessary* • *Material stockpiling provided with adequate protection from the wind* • *Dust monitoring at the site boundary* • *Truck inspection and maintenance plan* • *Details of a road maintenance agreement between the wind farm operator and the Local Roads Authority to clarify responsibility for the upkeep and repair of access roads during the construction phase of the project…* *…Cumulative Impacts* *Table 3.2: 'Wind Farms within 20km of the Development' of the Scoping Report indicates that there are a number of existing and proposed wind farms within the vicinity of the proposed development.*

Consultee	Summary of Consultee Response
	All existing or proposed wind farm developments in the vicinity should be clearly identified in the EIAR. *The impact on sensitive receptors of the proposed development combined with other wind farm developments in the vicinity should be considered. The EIAR should include a detailed assessment of any likely significant cumulative impacts of the proposed renewable energy development.* *The EIAR should state clearly if there is any future proposal to further extend the proposed Gortloughra Wind Farm…*

15.2 AIR QUALITY

15.2.1 Assessment Methodology

This assessment of air quality involved the following:

- A desk study of the air quality baseline in the area of the Project and nationally;
- Identification and assessment of potential effects on receptors to dust and pollutants;
- An evaluation of the significance of effects compared to baseline conditions, and
- The identification of measures to avoid and mitigate potential effects

The EPA's Air Quality Index for Health (AQIH)[1] provides live information about the air quality at each air quality monitoring station. The data, which comes from automated monitoring stations (AMS) is updated at least once daily for each station. The AQIH mapping system shows that Air Quality at Macroom, Co. Cork is rated Index 2, representing good air quality (Index 1-3). The breakdown of the air quality classifications with regards to specific pollutants on human health as used by the AQIH is shown in **Table 15.3**.

Table 15.3: Air Quality Index for Health Classifications[2]

Four Bands of Air Quality	Index (1-10)	Ozone (µg/m³) 8 Hour Mean	Nitrogen Dioxide (µg/m³) 1 Hour Mean	Sulphur Dioxide (µg/m³) 1 Hour Mean	PM2.5 (µg/m³) 24 Hour Mean	PM10 (µg/m³) 24 Hour Mean
Good Air Quality	1	0 - 33	0 - 67	0 - 29	0 - 11	0 - 16
	2	34 - 66	68 - 134	30 - 59	12 - 23	17 - 33
	3	67 - 100	135 - 200	60 - 89	24 - 35	34 - 50
Fair Air Quality	4	101 - 120	201 - 267	90 - 119	36 - 41	51 - 58
	5	121 - 140	268 - 334	120 - 149	42 - 47	59 - 66
	6	141 - 160	335 - 400	150 - 179	48 - 53	67 - 75
Poor Air Quality	7	161 - 187	401 - 467	180 - 236	54 - 58	76 - 83
	8	188 - 213	468 - 534	237 - 295	59 - 64	84 - 91
	9	214 - 240	535 - 600	296 - 354	65 - 70	92 - 100
Very Poor Air Quality	10	241 or more	601 or more	355 or more	71 or more	101 or more

Guidance on the assessment of dust from demolition and construction (IAQM, 2024)[3] was consulted in the preparation of this chapter. The Guidance suggests that:

[1] https://airquality.ie/station/EPA-67
[2] https://airquality.ie/information/air-quality-index-for-health [Accessed 12 June 2024]
[3] Guidance on the assessment of dust from demolition and construction, January 2024 (Version 2.2). The Institute of Air Quality Management (IAQM), United Kingdom.

An assessment will normally be required where there is:

- *a 'human receptor' within:*
  - *- 250 m of the boundary of the site; and/or*
  - *- 50 m of the route(s) used by construction vehicles on the public highway, up to 250 m from the site entrance(s).*

Plate 15.1 describes the methodology of assigning sensitivity to receptors.

Table 2: Sensitivity of the Area to Dust Soiling Effects on People and Property [a][b]

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)[c]			
		<20	<50	<100	<250
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

[a] The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout. See **STEP 2B**, **Box 6** and **Box 9**.
[b] Estimate the total number of receptors within the stated distance. Only the highest level of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors <20 m of the source and 95 high sensitivity receptors between 20 and 50 m, then the total of number of receptors <50 m is 102. The sensitivity of the area in this case would be high.
[c] For trackout, the distances should be measured from the side of the roads used by construction traffic. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50 m from the edge of the road.

Plate 15.1: Sensitivity ranking of receptors (Source: IAQM, 2024)

Do Nothing Impact Assessment: This section outlines the impact if the Project were not to go ahead and the likely evolution thereof without the Project as far as natural changes from the baseline scenario.

Significance of effects: The significance of effects resulting from the Project is determined through consideration of a combination of the sensitivity of the receiving environment and the predicted level of change from the baseline state, as outlined in **Chapter 1: Introduction, Scoping and Consultation**, section 1.9.3. Where negative effects are predicted, appropriate mitigation approaches are identified.

Mitigation measures: The mitigation hierarchy approach, as outlined in **Chapter 1: Introduction, Scoping and Consultation** of Avoidance, Reduction/Elimination and

Remedy aims to avoid significant impact through embedded mitigation (avoidance), and where avoidance is not possible, through mitigation measures. Remedy, the lowest rung of the mitigation hierarchy is only considered where mitigation measures are not feasible or possible.

Cumulative Assessment: Other large developments (operational and in the planning process) within a 20 km of the Proposed Development (shown in **Appendix 2.4**), in conjunction with the Project, are assessed to determine the potential cumulative effects on Air Quality and Climate.

15.2.2 Relevant Legislation

The Ambient Air Quality and Clean Air for Europe (CAFE) Directive (Directive 2008/50/EC) incorporates revised provisions for sulphur dioxide (SO_2), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), benzene (C_6H_6) and carbon monoxide (CO). This replaced the Air Quality Framework Directive (96/62/EC) and first three Daughter Directives (1999/30/EC, 2000/69/EC, 2002/3/EC). The Fourth Daughter Directive (2004/107/EC) will be incorporated into the CAFE Directive at a later date and stands alone as a separate EU Directive.

The Fourth Daughter Directive (2004/107/EC) relates to arsenic (As), cadmium (Cd), nickel (Ni), and mercury (Hg) and polycyclic aromatic hydrocarbons (PAH) in ambient air and has been transposed into Irish legislation by the 'Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I. No. 58 of 2009)'.

The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) as amended by the Air Quality Standards (Amendments) and Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2016 (S.I. 659 2016).

The Clean Air for Europe (CAFE) Directive (Directive 2008/50/EC on ambient air quality), (as amended by Directive EU 2015/1480) encompasses the following elements:

- The merging of most of the existing legislation into a single Directive (except for the Fourth Daughter Directive) with no change to existing air quality objectives.
- New air quality objectives for $PM_{2.5}$ (fine particulate matter) including the limit value and exposure concentration reduction target
- The possibility to discount natural sources of pollution when assessing compliance against limit values

- The possibility for time extensions of three years (for particulate matter PM_{10}) or up to five years (nitrogen dioxide, benzene) for complying with limit values, based on conditions and the assessment by the European Commission.

The limit values of the CAFE Directive are set out in **Table 15.5**. Limit values are presented in micrograms per cubic metre (µg/m^3) and parts per billion (ppb). The notation PM_{10} is used to describe particulate matter or particles of ten micrometres or less in aerodynamic diameter. $PM_{2.5}$ represents particles measuring less than 2.5 micrometres in aerodynamic diameter.

Table 15.4 presents the limit and target values for ozone as per the Ambient Air Quality and Clean Air for Europe (CAFE) Directive (2008/50/EC).

Table 15.4: Limit values of CAFE Directive 2008/50/EC (Source: EPA)[4]

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m^3)	Limit Value (ppb)	Basis of Application of Limit Value
Sulphur Dioxide (SO_2)	Protection of human health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year
Sulphur Dioxide (SO_2)	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year
Sulphur Dioxide (SO_2)	Protection of vegetation	Calendar Year	20	7.5	Annual mean
Sulphur Dioxide (SO_2)	Protection of vegetation	1 Oct to 31 Mar	20	7.5	Winter mean
Nitrogen dioxide (NO_2)	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year
Nitrogen dioxide (NO_2)	Protection of human health	Calendar year	40	21	Annual mean

[4] Air Quality Standards. Available online: https://airquality.ie/information/air-quality-standards Accessed: [11/07/2024]

Pollutant	Limit Value Objective	Averaging Period	Limit Value (μg/m^3)	Limit Value (ppb)	Basis of Application of Limit Value
Nitric oxide (NO) + Nitrogen dioxide (NO_2)	Protection of ecosystems	Calendar year	30	16	Annual mean
PM_{10}	Protection of human health	24 hours	50	-	Not to be exceeded more than 35 times in a calendar year
PM_{10}	Protection of human health	Calendar year	40	-	Annual mean
$PM_{2.5}$ - Stage 1	Protection of human health	Calendar year	25	-	Annual mean
$PM_{2.5}$ - Stage 2	Protection of human health	Calendar year	20	-	Annual mean
Lead (Pb)	Protection of human health	Calendar year	0.5	-	Annual mean
Carbon Monoxide (CO)	Protection of human health	8 hours	10,000	8620	Not to be exceeded
Benzene (C_6H_6)	Protection of human health	Calendar year	5	1.5	Annual mean

Table 15.5: Target values for Ozone Defined in Directive 2008/50/EC

Objective	Parameter	Target Value from 2010	Target Value from 2020 onwards
Protection of human health	Maximum daily 8- hour mean	120 µg /m^3 not to be exceeded more than 25 days per calendar year averaged over 3 years	120 µg /m^3
Protection of vegetation	*AOT_{40} calculated from 1-hour values from May to July	18,000 µg /m^3 h^{-1} averaged over 5 years	6,000 µg /m^3 h^{-1}
Information Threshold	1-hour average	180 µg /m^3	180 µg /m^3
Alert Threshold	1-hour average	240 µg /m^3	240 µg /m^3

*AOT_{40} is a measure of the overall exposure of plants to ozone. It is the sum of the excess hourly concentrations greater than 80 µg/m^3 and is expressed as µg/m^3 hours.

15.2.3 Baseline Conditions

The Site

The Site is located in a rural area, typically ribbon development with the majority of receptors located to the east of the Proposed Development. A detailed description of the Site can be found in **Chapter 1: Introduction, Scoping and Consultation**.

Taking the above into consideration, JOD examined maps to identify sensitive receptors in the local area within a Study Area extending to a distance of 2km, with an additional 6 no. receptors located beyond the 2km radius also included, as outlined in Section 16.2.1. In total, 73 no. receptors were identified within the shadow flicker Study Area. The coordinates of each sensitive receptor and their distance to the closest proposed turbine are listed in **Table 15.6** and illustrated in **Figure 1.3**.

Table 15.6: Sensitive receptors within 2 km of the Proposed Development

House ID	Easting ITM	Northing ITM	Closest Turbine	Closest Distance to Turbine (m)
H1	512574	560249	T1	1459

House ID	Easting ITM	Northing ITM	Closest Turbine	Closest Distance to Turbine (m)
H2	512548	560240	T1	1483
H3	512576	560296	T1	1467
H4	512607	560021	T1	1401
H5	513258	560218	T1	787
H6	513280	560045	T1	730
H7	514664	561741	T2	1643
H8	517491	561675	T6	2337
H9	517560	561620	T6	2351
H10	516223	559500	T6	697
H11	516345	559495	T6	780
H12	516426	559436	T6	879
H13	516455	559391	T6	931
H14	516453	559491	T6	860
H15	516742	559597	T6	1045
H16	516913	559519	T6	1232
H17	517205	559763	T6	1432
H18	517186	559907	T6	1390
H19	516995	559974	T6	1194
H20	517058	560064	T6	1254
H21	517237	560043	T6	1433
H22	517355	560026	T6	1551
H23	517505	560096	T6	1701
H24	517525	560068	T6	1721
H25	517602	560034	T6	1799
H26	517766	560044	T6	1962
H27	517833	560174	T6	2032
H28	517746	560332	T6	1961
H29	515967	558698	T9	806
H30	516071	558608	T9	942
H31	516831	558505	T9	1661
H32	516331	558002	T9	1544
H33	516489	557893	T9	1730

House ID	Easting ITM	Northing ITM	Closest Turbine	Closest Distance to Turbine (m)
H34	516258	557871	T9	1599
H35	515815	557831	T8	1411
H36	512706	558535	T7	1543
H37	513035	558529	T7	1224
H38	512590	558155	T7	1767
H39	514019	558165	T7	703
H40	514606	558023	T8	868
H41	514826	557698	T8	1159
H42	514556	557258	T7	1616
H43	514715	557154	T8	1708
H44	514833	557430	T8	1427
H45	514870	557636	T8	1222
H46	515012	557597	T8	1272
H47	516168	557781	T9	1622
H48	512339	560424	T1	1727
H49	512089	560001	T1	1918
H50	511856	559964	T1	2152
H51	515138	562209	T2	2181
H52	511651	559779	T1	2364
H53	514062	558379	T7	486
H54	517177	559907	T6	1381
H55	517375	560081	T6	1571
H56	517485	560120	T6	1682
H57	517582	560131	T6	1779
H58	517565	560150	T6	1764
H59	517665	560186	T6	1866
H60	517712	560152	T6	1910
H61	517770	560146	T6	1968
H62	517793	560211	T6	1995
H63	517724	560209	T6	1926
H64	516185	558817	T9	945
H65	516326	559301	T6	919

House ID	Easting ITM	Northing ITM	Closest Turbine	Closest Distance to Turbine (m)
H66	517061	559769	T6	1290
H67	516482	559447	T6	912
H68	517190	559916	T6	1393
H69	517202	560097	T6	1399
H70	517121	559978	T6	1319
H71	517638	560049	T6	1834
H72	517727	560072	T6	1923
H73	517677	560204	T6	1879

Ireland

Ireland is recognised as having some of the best air quality in Europe[5]. However, larger towns and cities have experienced air pollution. The most recent published report on air quality in Ireland is the 'Air Quality in Ireland 2023' report published by the EPA in 2024[6]. This report provides an overview of the ambient air quality in Ireland in 2023. It is based on monitoring data from 115 stations across Ireland. The measured concentrations are compared with both EU legislative standards and WHO air quality guidelines[7] for a range of air pollutants.

Under the Clean Air for Europe Directive (CAFE Directive), EU member states must designate "Zones" for the purpose of managing air quality. For Ireland, four zones were defined in the Air Quality Standards Regulations (2011). The zones were amended on 1 January 2013 to take account of population counts from the 2011 CSO Census and to align with the coal restricted areas in the 2012 Regulations (S.I. No. 326 of 2012).

Results from the monitoring campaign during 2023 show:

- Ireland met all of its EU CAFE Directive legal requirements in 2023.
- Ireland failed to meet the WHO new air quality guidelines in 2022. WHO guideline values were exceeded at a number of monitoring sites for fine Particulate Matter ($PM_{2.5}$) and (PM_{10}), Ozone (O_3), Nitrogen Dioxide (NO_2). WHO guideline values for Sulphur dioxide (SO_2) were exceeded at one monitoring station.

5 https://www.euronews.com/green/2024/12/14/only-seven-countries-in-the-world-breathe-safe-air-three-of-them-are-in-europe
6 EPA (2024). Air Quality in Ireland Report 2023.
7 https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health [Accessed 12/06/2024]

The EU Commission has imposed targets on Ireland's emissions. Ireland's long-term energy policy framework is set out in the Climate Action Plan 2024 (**Chapter 4: Planning Policy Context, Section 4.6.2**).

15.2.3.1 Air Quality Zones

The main areas defined in each zone are:

- **Zone A**: Dublin
- **Zone B**: Cork
- **Zone C**: Other cities and large towns comprising Limerick, Galway, Waterford, Drogheda, Dundalk, Bray, Navan, Ennis, Tralee, Kilkenny, Carlow, Naas, Sligo, Newbridge, Mullingar, Wexford, Letterkenny, Athlone, Celbridge, Clonmel, Balbriggan, Greystones, Leixlip and Portlaoise.
- **Zone D**: Rural Ireland, i.e. the remainder of the State excluding Zones A, B and C.

The zones take account of population counts from the CSO Census and to align with the coal restricted areas in the 2012 Regulations (S.I. No. 326 of 2012). The Proposed Development lies within Zone D, which represents rural areas located away from large population centres.

The closest local monitoring site to the Project within the same air quality zone (Zone D) is Macroom, Co. Cork. Macroom indicative monitoring site is located approx. 23.3 km northeast of the Proposed Development. The nearest national meteorological monitoring site is Cork Airport Co. Cork, which is located approx. 49 km east of the Proposed Development.

15.2.3.2 Air Quality & Health

Environmental Protection Agency (EPA, 2020)[8], European Environmental Protection Agency (EEA, 2023[9] and World Health Organisation (WHO, 2014) reports estimate that poor air quality accounted for premature deaths of approximately 327,000 people in Europe in 2021, with 1,300 Irish deaths predominantly due to fine particulate matter ($PM_{2.5}$) in 2020 and 30 Irish deaths attributable to Ozone (O_3) in 2016[10] [11].

Particulate Matter ("PM") less than ten micrometres in size (PM_{10}) can penetrate into the respiratory system increasing the risk of respiratory and cardiovascular disorders. PM_{10} arises from direct emissions of primary particulate such as black smoke and formation of

[8] Ireland's Environment – An Integrated Assessment 2020, EPA, 2020, [Accessed 12/06/2024]
[9] https://www.eea.europa.eu/publications/harm-to-human-health-from-air-pollution/accessed 012th July 2024
[10] https://www.euro.who.int/en/health-topics/environment-and-health/air-quality/news/news/2014/03/almost-600-000-deaths-due-to-air-pollution-in-europe-new-who-global-report, [Accessed 12/06/2024
[11] Irelands Environment 2016 – An Assessment', EPA, 2016, [Accessed 12/06/2024]

secondary Particulate Matter in the atmosphere by reactions of gases such as sulphur dioxide (SO_2) and ammonia (NH_3).

Fine particulate matter, ozone, along with others including carbon dioxide (CO_2), nitrogen oxides (NO_x) and sulphur oxides (SO_x) are produced during the burning of fossil fuels for energy generation, transport or home heating. There are no such emissions associated with the operation of wind turbines. Therefore, the construction of wind turbines such as in the Proposed Development will result in lower environmental levels of such parameters, and consequential beneficial effects on human health.

15.2.4 Do Nothing Impact

If the Project was not to proceed, the opportunity to reduce emissions of carbon dioxide (CO_2), nitrogen oxides (NO_x), and sulphur dioxide (SO_2) to the atmosphere would be lost due to the continued dependence on electricity derived from coal, oil and gas-fired power stations, rather than renewable energy sources such as the Project. This would result in an indirect, negative impact on air quality.

15.2.5 Assessment of Potential Effects

15.2.5.1 Construction Phase

15.2.5.1.1 Dust Emissions

The main potential source of impacts on air quality during the construction phase of the Project are dust emissions arising from earthworks, construction of the new access tracks, the temporary storage of excavated materials, the construction of the Onsite Substation and Control Building, the movement of construction vehicles, loading and unloading of aggregates, materials or movement of material around the Site and delivery of turbines. There is potential for the generation of dust from excavations and from construction including construction of access tracks and hardstands and the trench for the cable ducting for the grid connection.

The potential nuisance issues arising from this are dependent on the terrain, weather conditions, (i.e., dry and windy conditions), and the proximity of receptors (**Table 15.6**). Dust from cement can cause ecological damage if allowed to migrate to water courses, though it is proposed that ready-mix concrete will be used with no on-site batching taking place. Therefore, this will not be a potential source of emissions. Potentially dust generating activities are as follows:

- Earth moving and excavation plant and equipment for handling and storage of soils and subsoils.

- Transport and unloading of stone materials for access track construction.
- Rock that is suitable will be extracted from the borrow pit, Turbine Foundation areas and the Onsite Substation and Control Building and this will be used in the construction of Site Access Tracks and Turbine Hardstands.
- Vehicle movements over dry surfaces such as Site Access Tracks and public roads.

Friable dust cannot remain airborne for a very long time. The distance it can travel depends on the particle sizes, disturbance activities and weather conditions. Larger dust particles tend to travel shorter distances than smaller particles. Particle sizes greater than 30 µm will generally deposit within approximately 100 m of its source, while particles between 10-30 µm travel up to approximately 250-500 m and particle sizes of less than 10 µm can travel up to approximately 1 km.[12].

Dust nuisance is most likely to occur at sensitive receptors within approximately 100 m of the source of the dust[13]. It is considered that the principal sites of friable dust generation will be the Turbine Foundations and Turbine Hardstands, and also along new Site Access Tracks. All turbines are situated greater than 486 m away from inhabited dwelling houses and therefore these principal sites of dust generation are greater than a 100 m distance from these sensitive receptors. In addition, existing vegetation such as trees and hedgerows in the vicinity will help to mitigate any airborne dust migrating off the Site. Any effects of dust on vegetation will be confined to the construction and possibly the decommissioning phases and be short-term, slight, negative impact.

If unmitigated, there would also be dust deposition arising from mud on public roads, resulting from traffic leaving the construction site. Impacts from dust deposition at sensitive receptors would give rise to nuisance issues for residents of those properties. The impact would be short-term, temporary and slight negative impact on sensitive receptors.

The potential impact from dust becoming friable and a nuisance to workers and local road users, if unmitigated, is considered, a slight, negative, short-term, direct impact during the construction phase.

[12] Guidance on the Assessment of Mineral Dust Impacts for Planning, Institute of Air Quality Management. 2016. Accessed online [12/06/2024] https://iaqm.co.uk/text/guidance/mineralsguidance_2016.pdf

[13] Guidance on the assessment of dust from demolition and construction, January 2024 (Version 2.2). The Institute of Air Quality Management (IAQM), United Kingdom.

15.2.5.1.2 Exhaust Emissions

Emissions from plant and machinery, including trucks, during the construction of the Project are a potential impact. The engines of these machines produce emissions such as carbon dioxide (CO_2), carbon monoxide (CO), Nitrogen Oxides (NO_x), and Particulate Matter (PM_{10} and $PM_{2.5}$).

The main sources of primary PM_{10} are incomplete burning of fossil fuels such as coal, oil and peat and emissions from road traffic, in particular diesel engines. Other sources of particulates include re-suspended dust from roads. Natural Particulate Matter includes sea-salt and organic materials such as pollens.

Nitrogen oxides (NO_x), include the two pollutants, nitric oxide (NO) and nitrogen dioxide (NO_2). Anthropogenic (human) activities such as power-generation plants and motor vehicles are the principal sources of nitrogen oxides through high temperature combustion. Nitrogen oxides are an important air pollutant by themselves but can also react in the atmosphere to contribute to the formation of tropospheric ozone (ozone in the air we breathe) and acid rain. Short-term exposure to nitrogen dioxide is associated with reduced lung function and airway responsiveness, and increased reactivity to natural allergens. Long-term exposure is associated with increased risk of respiratory infection in children.

Exhaust emissions associated with vehicles and plant machinery such as CO_2, NO_x, PM_{10} and $PM_{2.5}$ will arise as a result of construction activities. It is estimated that during the wind farm construction, an approximate total of 8,017 loads of material and building supplies will be delivered and removed from the Site (**Chapter 14: Traffic and Transportation**). This potential impact will not cause a significant negative effect and will be restricted to the duration of the construction phase and localised to work areas, thus the impact on air quality from an increase in exhaust emissions will be a short-term, slight negative impact. Mitigation measures to reduce the impact are presented in section 15.2.8**.**

15.2.5.2 Operational Phase

15.2.5.2.1 Dust Emissions

There will be a small number of light vehicles accessing the Site during the operational phase. This could lead to some localised dust being generated, though this will be small and sporadic as only approximately one to two site visits per week will occur at the Proposed Development.

Maintenance vehicles will access the Site periodically during the operational period, however, due to the low traffic movements involved, the impact will be imperceptible. The operational phase will result in positive impacts on air quality due to the displacement of fossil fuels as an energy source.

15.2.5.3 Decommissioning Phase

Impacts during the decommissioning phase of the Project are anticipated to be less than those arising during the construction phase. The decommissioning phase will be as follows:

- Removal of eight wind turbines and concrete plinths.
- Removal of permanent Met Mast.
- Removal of all associated underground Wind Farm Internal Cabling connecting the wind turbines to the Onsite Substation and Control Building. Ducting is to remain *in-situ.*

During the decommissioning phase, the Grid Connection infrastructure including the Onsite Substation and Control Building and ancillary electrical equipment will form part of the national grid and shall be left *in-situ*. The Onsite Substation and Control Building, internal ducts of the Project, and all Site Access Tracks, Turbine Hardstands within the Site will be left *in-situ*, resulting in no additional HGV movements and no impact from emissions from machinery along the cable route.

The Site Access Tracks and associated drainage systems will serve ongoing forestry and agriculture activity in the area. All other hard surfaced areas will be allowed to revegetate naturally. Based on the experience of the project team monitoring operational wind farm sites throughout the country, the approach of allowing these areas to revegetate naturally has proven to be very successful.

The decommissioning phase would be expected to last approximately 2-3 months, and any air quality impacts would be predicted to be imperceptible.

15.2.6 Mitigation Measures and Residual Effects

15.2.6.1 Construction Phase Mitigation

The main potential impact during the construction phase of the Project will be from dust nuisance at sensitive receptors close to the Site. Good practice site procedures will be followed by the appointed contractor to prevent dirt and dust being transported onto the local road network and all mitigation measures outlined in the CEMP (**Appendix 2.1**) will be implemented on site. Good practice site control measures will comprise the following:

- Site Access Tracks will be upgraded and built in the initial construction phases. These roads will be finished with graded aggregate which compacts, preventing dust.
- Approach roads and construction areas will be cleaned on a regular basis to prevent build-up of mud and prevent it from migrating around the Site and onto the public road network.
- Wheel wash facilities will be provided near the Site entrance to prevent mud/dirt being transferred from the site to the public road network.
- Public roads along the Construction Haul Routes will be inspected and cleaned daily. In the unlikely event that dirt/mud is identified on public roads, the roads will be cleaned. The wheel wash facility will be investigated and repaired if necessary.
- During periods of dry and windy weather, there is potential for dust to become friable and cause nuisance to nearby residences and users of the local road network. This requires wetting material and ensuring water is supplied at the correct levels for the duration of the work activity. The weather will be monitored so that the need for damping down activities can be predicted. Water bowsers will be available to spray work areas (Site and Grid Connection Route) and haul roads to suppress dust migration from the Site.
- Vehicles delivering materials to the site will be covered appropriately when transporting materials that could result in dust, e.g., crushed rock or sand.
- Exhaust emissions from vehicles operating within the Site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the Contractor by ensuring that emissions from vehicles are minimised through regular servicing of machinery.
- All machinery when not in use will be turned off.
- Ready-mix concrete will be delivered to the Site and no batching of concrete will take place on the Site. Only washing out of chutes will take place on Site and this will be undertaken at a designated concrete washout facility at the Temporary Construction Compound. The concrete wash water will be disposed of at a licensed facility as outlined in the Construction Environment Management Plan (CEMP) – Management Plan 5 Waste Management Plan (**Appendix 2.1**)
- Speed restrictions of 15 km/h on access roads will be implemented to reduce the likelihood of dust becoming airborne. Consideration will be given to how on-site speed limits are policed by the Contractor and referred to in the toolbox talks.
- Stockpiling of materials will be carried out in such a way as to minimise their exposure to wind. Stockpiles will be covered with geotextiles layering and damping down will be carried out when weather conditions require it.
- Earthworks and exposed areas/soil stockpiles will be re-vegetated to stabilise surfaces as soon as practicable.

- An independent, qualified Geotechnical Engineer will be contracted for the detailed design stage of the project and geotechnical services and will be retained throughout the construction phase, including monitoring and supervision of construction activities on a regular basis. The methodology statement will be signed off by a suitably qualified Geotechnical Engineer.
- A complaints procedure will be implemented on site where complaints will be reported, logged and appropriate action taken.

15.2.6.2 Operational Phase Mitigation

As the operation of the Project will have positive impacts on air quality, mitigation measures are considered unnecessary. Where turbine components are being replaced, the same mitigation measures as per the construction phase will apply.

15.2.6.3 Decommissioning Phase Mitigation

Mitigation measures during the Decommissioning phase will be similar to those employed during the construction phase as outlined above.

15.2.7 Cumulative Effects

In terms of cumulative impacts, negative cumulative impacts in relation to air quality would only occur if a large development was located in the vicinity of the Proposed Development and in the process of construction at the same time as the Project. The developments considered as part of the cumulative effect assessment are described in **Appendix 1.2**. There are a number of existing, consented and proposed wind energy developments within 20 kilometres of the Site.

In a worst-case scenario, cumulative air impacts may arise if the construction, operational and maintenance period and Decommissioning of any of the projects listed in **Appendix 1.2** occur simultaneously with the construction of the Project. Only those wind energy developments that would be under construction at the same time as the Project are relevant in the context of cumulative effect. The consented (not yet built) and the proposed wind energy developments within 20 km of the Site which may be seen in **Table 2.1** of **Chapter 2: Project Description**.

Cumulative impacts may arise if the construction, operational, maintenance or decommissioning period of these projects occurs simultaneously with the construction of the Project. This will result in slight increased traffic emissions, however, provided the mitigation measures are implemented and the mitigation measures proposed for other developments are implemented, there will be no significant cumulative effects on air quality. Projects for Cumulative Assessment have been included in **Appendix 2.4**.

During the operational phase emissions of carbon dioxide (CO_2), nitrogen oxides (NO_x), and sulphur dioxide (SO_2) or dust emissions from the Project and other projects listed in **Appendix 1.2**, will result from the operation and maintenance vehicles onsite. However, these emissions will be minimal resulting in insignificant long-term cumulative impact on air quality and climate.

Cumulative impacts during the decommissioning phase will be similar to the construction phase although slightly less as a result of the reduced works required during the decommissioning phase as some infrastructure will be left in-situ e.g., Turbine Foundations, and Site Access Tracks.

The nature of the Project and other energy developments within 20 km are such that, once operational, they will have a cumulative long-term, significant, positive effect on air quality.

15.2.8 Residual Impacts of the Project

Construction phase

With mitigation measures in place, any effects of dust emissions during the construction phase will be reduced **short term** and **imperceptible**.

With mitigation measures in place, the effects of exhaust emissions during the construction phase, will remain **short-term, slight negative** effect.

Operational phase

During the operational phase of the Project exhaust emissions will arise from occasional machinery use and Light-Good Vehicles (LGV) that will be required for occasional onsite maintenance works. The impact on dust emission during the operational phase will remain not significant. The impact on exhaust emissions during the operational phase will be not significant.

The wind energy created by the Project once it goes into operation, will avoid the production of electricity from coal, oil or gas-fired power stations resulting in emission savings of carbon dioxide (CO_2), nitrogen oxides (NO_x), and sulphur dioxide (SO_2). This will lead to a **Slight, Positive** and **Long-term** impact on air quality**.**

Decommissioning phase

With mitigation measures in place, any effects of dust emissions during the Decommissioning phase will be reduced to **imperceptible, negative** and **temporary**.

Mitigated, any effects of exhaust emissions during the Decommissioning phase will remain **not significant,** and **temporary.**

15.2.9 Summary of Significant Effects

This assessment has identified no potentially significant effects, given the mitigation measures embedded in the design which will be implemented in the Project.

15.2.10 Statement of Significance

The Project has been assessed as having no significant direct or indirect effects on air quality during the construction, operation or Decommissioning phases of the Project.

15.3 CLIMATE AND GREENHOUSE GASES

Greenhouse gases, if released in excessive amounts, can lead to increases in global temperatures known as 'global warming' or the 'greenhouse effect' which can influence the climate.

There are a wide range of gases known as greenhouse gases. The most critical greenhouse gases are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). There are also other greenhouse gases known as F-Gases, man-made gases used in refrigeration and air conditioning appliances. Greenhouse gases produced by human activities are changing the composition of the earth's atmosphere. Human activities that produce greenhouse gases include:

- Carbon dioxide emissions through burning fossil fuels such as coal, oil and gas and peat
- Methane and nitrous oxide emissions from agriculture
- Emissions through land use changes such as deforestation, reforestation, urbanization, desertification

Current projections indicate that continued emissions of greenhouse gases, including the burning of fossil fuel to produce electricity, will cause further warming and changes to our climate. Climate is predicted to have indirect and direct impacts on Ireland including:

- Rising sea-levels threatening habitable land and particularly coastal infrastructure;
- Extreme weather, including more intense storms and rainfall affecting our land, coastline and seas;
- Further pressure on our water resources and food production systems with associated impacts on fluvial and coastal ecosystems;
- Increased chance and scale of river and coastal flooding;
- Greater political and security instability;
- Displacement of population and climate refugees;
- Heightened risk of the arrival of new pests and diseases;
- Poorer water quality, and
- Changes in the distribution and time of lifecycle events of plant and animal species on land and in the oceans[14]

Climate change means a significant change in the measures of climate, such as temperature, rainfall, or wind, lasting for an extended period – decades or longer. Earth's climate has changed naturally many times during the planet's existence. However, currently

[14] https://www.gov.ie/pdf/?file=https://assets.gov.ie/293730/00ee6688-fc2a-4897-8077-de73280ec7fc.pdf#page=null [Accessed 04/07/2024]

human activities are significantly contributing to climate change through greenhouse gas emissions. The global average temperatures have increased by more than 1°C since pre-industrial times, and there is an 80% chance that the annual global average temperature will temporarily exceed 1.5°C above pre-industrial levels for at least one of the next five years[15].

At the UN Climate Change Conference (COP21) in Paris in 2015, 195 countries adopted the first-ever universal, legally binding global climate treaty called the Paris Agreement. The Paris Agreement sets out a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to below 2°C above pre-industrial levels and to limit the increase to 1.5°C. Under the Paris Agreement, Member States also agreed on the need for global emissions to peak as soon as possible, recognising that this will take longer for developing countries and to undertake rapid reductions thereafter in accordance with the best available science.

The Glasgow Climate Pact (COP26) of 2021 aims to limit the rise in global temperature to 1.5°C and finalise the outstanding elements of the Paris Agreement. The Glasgow Climate Pact is manifested across three United Nations climate treaties, including the United Nations Framework Convention on Climate Change (the COP), the Kyoto Protocol (the CMP), and the Paris Agreement (the CMA).

The United Nations Climate Change Conference (COP27) held in November 2022 resulted in countries delivering a package of decisions that reaffirmed their commitment to limit global temperature rise to 1.5°C above pre-industrial levels. The package also strengthened action by countries to cut greenhouse gas emissions and adapt to the inevitable impacts of climate change, as well as boosting the support of finance, technology and capacity building needed by developing countries. Governments took the ground-breaking decision to establish new funding arrangements, as well as a dedicated fund, to assist developing countries in responding to loss and damage.

The most recent United Nations Climate Change Conference was held in Baku, Azerbaijan in November 2024 (COP29). The main headline achievements were a $300 billion annual target for developing countries by 2035 under the New Collective Quantified Goal; progress in establishing a global carbon trading system managed by the UN (this framework has the potential to help reduce emissions while contributing to sustainable development,

[15] World Meteorological Organisation (WMO) Press Release, 05 June 2024, Available at: https://wmo.int/news/media-centre/global-temperature-likely-exceed-15degc-above-pre-industrial-level-temporarily-next-5-years [Accessed 23/09/2024]

particularly in developing countries); recognised role of trade in climate action by launching a multi-year work plan which includes consideration of the impacts of trade policies.

The Climate Action Plan 2024 as set out by the Department of the Environment, Climate and Communications provides a detailed plan for Ireland. It plans for taking decisive action to achieve a 51% reduction in overall greenhouse gas emissions by 2030 and setting us on a path to reach net-zero emissions by no later than 2050, as committed to in the Programme for Government and set out in the Climate Act 2023. This Plan makes Ireland one of the most ambitious countries in the world on climate.

The CAP 2024 shows how Ireland is putting climate solutions at the very heart of our social and economic development. Among the most important measures in the plan is a target of 9 GW from onshore wind, 8 GW from solar, and at least 5 GW of offshore wind energy by 2030.The provision of the Proposed Development will have a long-term positive impact by providing a sustainable energy source. Should the Proposed Development not proceed, fossil fuel power stations will be the primary alternative to provide the required quantities of electricity. This will further contribute to greenhouse gas and other emissions. It will also hinder Ireland in its commitment to meet its target to increase electricity production from renewable sources and to reduce greenhouse gas emissions as agreed at the Paris climate conference (COP21) in 2015, the Glasgow Climate Pact (COP26) in November 2021 and the Baku UN Climate Change Conference (COP29) in November 2024.

15.3.1 Assessment Methodology

This assessment of climate change and greenhouse gases involved the following:

- A desk-based assessment of the climate in the area of the Project and nationally (baseline description)

- The climate impact of the Project will be assessed using the Carbon Calculator Tool. This carbon calculator was specifically designed for assessing the climate impact of wind farms and was developed under the guidance of the Scottish Government, Scottish Environment Protection Agency (SEPA), Scottish Natural Heritage (SNH) and Forestry Research (impact assessment). Commonly used guidance produced by SNH in 2003 (in a technical guidance note) has been used to determine carbon payback in the absence of any more detailed methods to determine the impacts on soil carbon stocks. The use of the Scottish carbon calculator in assessing the climate impact and determining carbon payback for this Proposed Development is acceptable, as the peat habitat of Scotland is similar to Ireland and at similar latitudes, the simulated land-atmosphere interactions are applicable.

The methodology approach taken to evaluate the 'do nothing scenario', 'significance of effects', 'mitigation measures' and 'assessment of cumulative effect' is outlined in section 15.3.5.

The most recent climate projection iteration Regional Climate Model Predictions for Ireland (2021-2060)[16] has identified the following climatic trends as a result of climate change:

- Temperature: Mean monthly increase in temperatures typically between 1.25 °C and 1.5 °C.
- Precipitation: Change in the frequency and distribution (June shows a decrease of c. 10%; December shows an increase between 10 - 25%) and intensity (increase in the frequency of extreme precipitation - events may exceed 20 mm per day) in the Northwest. Rainfall events and cyclones (increase by 15%) compared with the climate of 2005, this is due to the increase in sea surface temperatures.
- River Flooding: Significant increase in more intense discharge episodes and an increase in the frequency of extreme discharges as increased temperatures will lead to greater amounts of water vapour in the atmosphere and an accelerated global water cycle.

15.3.2 Relevant Legislation and Guidance

Greenhouse gases are the subject of international agreements, such as the United Nations Framework Convention on Climate Change, Kyoto Protocol and the Paris Agreement. The Glasgow Climate Pact is manifested across these three United Nations climate treaties. These agreements along with International and National Policy and Legislation are discussed in **Chapter 4: Planning Policy Context**. This section will examine the carbon losses and savings from this Proposed Development and its impact on the Climate.

15.3.3 Existing Climate

The Köppen climate classification divides regions of the globe based on seasonal precipitation and temperature patterns. The five main groups are tropical, dry, temperate, continental, and polar. The Irish climate is defined as a temperate oceanic climate on the Köppen climate classification system[17]. Ireland's climate is mild, moist and changeable with abundant rainfall and a lack of temperature extremes. The country generally receives cool

16 CLIMATE CHANGE: Regional Climate Model Predictions for Ireland (2001-CD-C4-M2), EPA.

17 https://www.britannica.com/science/Koppen-climate-classification/World-distribution-of-major-climatic-types, [Accessed 12/06/2024]

summers and mild winters, and it is considerably warmer than other areas on the same latitude. Ireland's land mass is warmed by the North Atlantic Current all year and as a result does not experience a great annual range of air temperatures.

Nationally, the mean air temperature is generally between 9 and 11 °C. Annual rainfall totals on the west coast generally average between 1,000 mm and 1,400 mm with the wettest months being December and January and April being the driest month. The prevailing wind direction is between south and west. Average wind speed ranges from 3 m/s in south Leinster to 8 m/s in the extreme north of the country.

Cork Airport, Co. Cork, is the closest Met Éireann meteorological station with at least 30 years of historical data to the Proposed Development. For the purpose of the assessment of changes to the climate, meteorological data from Cork Airport over the period of 1994–2023 is shown in **Table 15.7**[18]. **Figure 15.1** shows the monthly mean air temperature and wind speed recorded at Cork Airport over the period of 1994–2023. Cork Airport is located 50 km east of the Proposed Development.

The mean annual air temperature between 1994 and 2023 was 10.1°C. Mean monthly temperatures ranged from 5.8°C in January to 15.2°C in July. Mean annual rainfall over this period was 1254.8 mm, with a maximum monthly mean rainfall of 148.9 mm in October and a minimum monthly mean rainfall of 80.0 mm in April.

[18]https://www.met.ie/climate/available-data/historical-data, [Accessed 01/08/2024]

Table 15.7: Cork Airport Meteorological Station Data Averages (1994–2023)

Month	Mean Air Temperature (°C)	Maximum Air Temperature (°C)	Minimum Air Temperature (°C)	Mean Maximum Temperature (°C)	Mean Minimum Temperature (°C)	Precipitation Amount (mm)	Grass Minimum Temperature (°C)	Mean Wind Speed (knot)	Highest Gust (knot)	Sunshine Duration (hours)
January	5.8	12.2	-1.8	8.3	3.3	129.6	-6.2	10.7	53.6	64.4
February	6.0	12.4	-1.3	8.7	3.2	103.4	-5.7	11.1	51.3	75.1
March	6.8	14.2	-1.0	9.9	3.7	93.1	-5.6	10.4	49.0	112.4
April	8.6	16.5	0.3	12.0	5.1	80.0	-4.5	9.7	44.8	164.2
May	11.0	19.9	3.1	14.6	7.4	80.3	-1.3	9.4	40.3	189.9
June	13.6	22.0	6.1	17.2	10.0	81.7	1.6	8.9	37.8	186.3
July	15.2	23.1	8.0	18.8	11.7	84.2	3.8	8.4	35.8	165.7
August	15.1	22.7	8.2	18.7	11.6	97.3	3.6	8.5	37.9	159.2
September	13.5	20.7	6.1	16.8	10.2	90.8	1.3	8.8	40.3	127.5
October	10.9	17.1	3.2	13.7	8.0	148.9	-1.2	9.8	47.6	97.7
November	7.9	14.2	0.4	10.5	5.3	125.7	-3.6	10.0	48.1	78.2
December	6.3	12.4	-1.0	8.7	3.9	139.7	-4.8	10.9	51.6	57.2
Annual	10.1	24.3	-3.1	13.2	7.0	1254.8	-7.6	9.7	61.5	1477.7

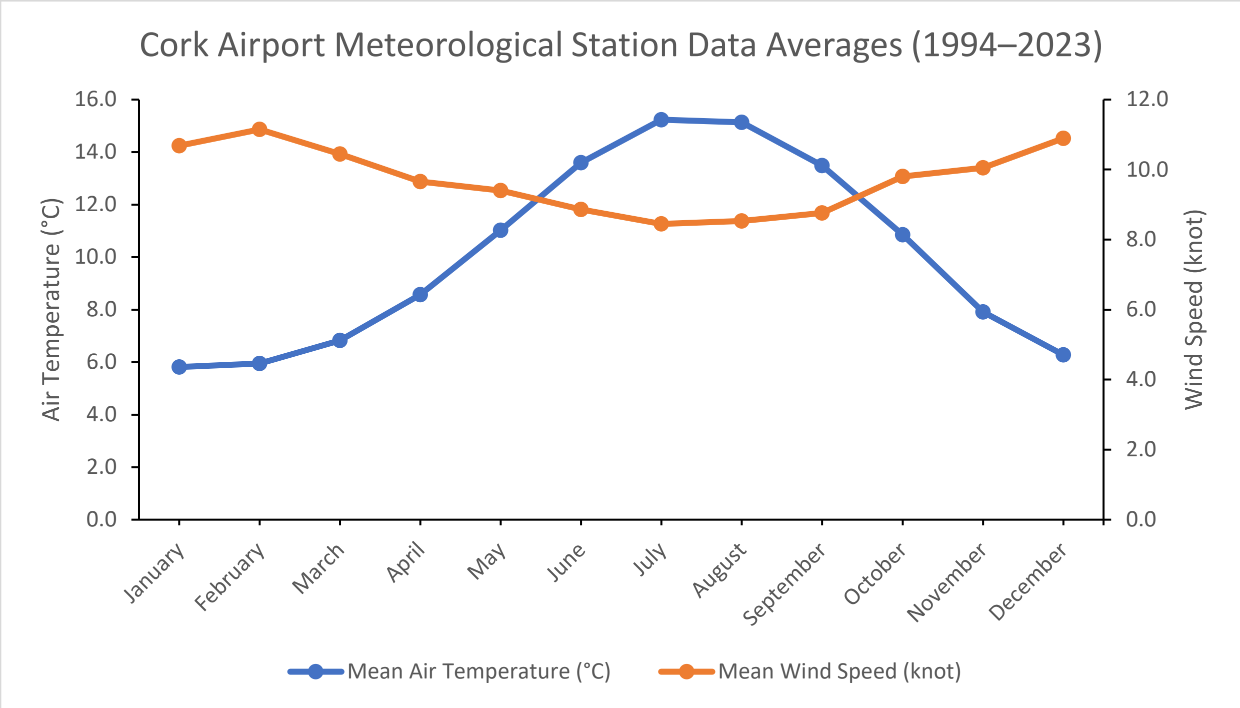

Figure 15.1: Cork Airport Meteorological Station Mean Air Temperature (°C) and Wind Speed (Knot) Data Averages (1994–2023)

15.3.4 Calculating Carbon Losses and Savings

15.3.4.1 Carbon Calculator

To assess the impact of the Project on the climate, the carbon emitted or saved as a result of the Project was determined using a carbon calculator. The Scottish Government have produced an online carbon calculator which aims to assess, in a comprehensive and consistent way, the carbon impact of wind farm developments. This is done by comparing the carbon costs of wind farm developments with the carbon savings attributable to the wind farm. The carbon calculation takes into account the carbon released from a number of sources during the construction, operational and decommissioning stages. These include the effects of drainage works on peat soils, changes in land use and wind turbine manufacture, transportation and construction. Also included in the assessment tool is the assessment of peat disturbance. The Scottish carbon calculator is used as currently, no carbon calculator specific to Ireland has been developed and the peat habitat of Scotland is similar to Ireland.

Assessments are also carried out to estimate the carbon saving over the lifetime of the Wind Farm, compared to electricity produced using fossil fuel. The assessment of carbon savings relates to the capacity of the Wind Farm over the number of years for which it is operational, site improvement works, (i.e., peatland improvement, habitat creation, etc.), and Site restoration works, (i.e., removal of infrastructure and restoration of previous site conditions), when the Wind Farm will be decommissioned.

The completed worksheet, including the assumptions used in the model, is provided in **Appendix 15.1** of this EIAR. The model calculates the total carbon emissions associated with the Project including manufacturing of the turbine technology, transport, construction of the Project and tree felling. The model, which is assessed for 6 MW per turbine, accounts for improvement works (see **Appendix 6.5: Habitat Enhancement Plan**) and the years taken for the site to return to its original characteristics but does not factor in the potential re-use of turbine components. All metal components can be recycled, while there is limited potential for the recycling/reuse of the fibreglass blades.

The model also calculates the carbon savings associated with the Project against three comparators:

i. Coal fired Electricity Generation;
ii. Grid mix of Electricity Generation, and
iii. Fossil fuel mix of Electricity Generation (oil, gas and coal)[19].

This is to compare this renewable source of electricity generation to traditional methods of electricity generation to assess the carbon savings and losses.

15.3.4.2 Carbon Losses

The potential carbon losses were assessed for the Project.

The main CO_2 losses due to the Project are summarised in **Table 15.8**. A copy of the input and output data is provided in the completed worksheet in **Appendix 15.1**.

[19] Ireland's energy imports comprise oil (56%), gas (31%) and coal (10%). http://ireland2050.ie/present/oil-and-gas/?q=where-does-ireland-get-its-electricity#:~:text=Ireland%20has%20only%20small%20proven,%25)%20and%20coal%20(10%25, [Accessed 12/06/2024]

Table 15.8: Carbon Losses

Origin of Losses	Total CO_2 Losses (tonnes CO_2 equivalent)
	Vestas V150 6.0 MW
Turbine manufacture, construction and decommissioning	41,108
Losses due to Backup	35,657
Losses due to reduced carbon fixing potential	669
Losses from soil organic matter	460
Losses due to Dissolved Organic Carbon (DOC) and Particulate Organic Carbon (POC) leaching	2,330
Felling of Forestry	0
Total Expected Losses	**80,224**

* Carbon sequestration describes the process in which carbon dioxide (CO_2) is removed from the atmosphere and subsequently stored through biological, chemical, or physical processes.

The majority of the peat covering the Site lies in the range of 0.0 - 0.5 m depth (**Chapter 8: Soils and Geology)**. The average peat depth across the Site measures 0.34 m (**Appendix 8.1: Peat Slide Risk Assessment**). The carbon calculator was therefore run based on an average peat depth of 0.34 m across the Site.

The carbon assessment shows that the proposed 8-turbine (48 MW) wind farm will result in total lifecycle emissions of 80,224 tonnes of CO_2 equivalent (t CO_2e) over its 40-year lifespan, including contributions such as 35,657t CO_2e from **(Appendix 15.1 losses due to backup).** Once operational, however, the project displaces fossil-fuel electricity on the grid and is estimated **(Appendix 15.1 grid-mix of electricity generated)** to save 30,464 tonnes of CO_2 per year.

The carbon payback calculation is therefore 80,224 ÷ 30,464 = **2.63 years**, meaning the project offsets all of its lifecycle emissions in just under three years which is very common for modern wind farms in Ireland.

Over the full 40-year period, the total avoided emissions are 30,464 × 40 = 1,218,560 tonnes of CO_2, and after subtracting the original lifecycle emissions (1,218,560 − 80,224), this results in a net saving of 1,138,336 tonnes of CO_2, or approximately 1.14 million tonnes avoided.

In terms of energy generation, Gourloughra Wind Farm estimates total lifetime output at 5,886,720 MWh **(Appendix 15.1 Energy output from windfarm over lifetime (MWh),** which equates to 5,886,720 ÷ 40 = 147,168 MWh per year.

Using a typical household electricity demand of about 4.2MWh per year in Cork, this annual output could supply 147,168 ÷ 4.2 = 35,000 homes. Although Gourtloughra Wind Farm has an initial carbon cost, it repays this within about three years and then provides decades of clean energy, ultimately delivering very substantial net carbon savings while supplying electricity equivalent to tens of thousands of homes.

Losses from soil organic matter, reduced carbon fixing potential, DOC and POC leaching and the felling of forestry account for the remaining 2,790 t CO_2 eq. The tonnes of CO_2 arising from ground activities associated with the Project is calculated based on the entire Project footprint being "Acid Bog", as this is one of only two choices, the other being Fen. The habitat that will be impacted by the Project footprint comprises predominantly agricultural land rather than the acid bog assumed by the model that gives rise to the tonnes (lower and higher range) and therefore the actual CO_2 losses are expected to be lower than this value.

The figures discussed above are based on the assumption that the hydrology of the Site and habitats within the site are not restored on decommissioning after its expected 40-year useful life.

However, at the end of the 40-year lifespan of the Project, the turbines may be replaced with newer models subject to a consent for the same being obtained. This would mean the carbon losses associated with not restoring the habitats hydrology at the Site would be offset by the carbon-neutral energy that the new turbines would generate.

15.3.4.3 Carbon Savings

The carbon calculator is pre-loaded with information specific to the CO_2 emissions from the United Kingdom's electricity generation plant, which is used to calculate emissions savings from proposed wind farm projects in the UK and similar data was not available for the Irish electricity generation plant. Therefore, these CO_2 emissions savings from the Project were calculated separately from the worksheet.

According to the model described above, the Project will give rise to total losses of **80,224t CO_2 eq.**

A simple formula is used to calculate carbon dioxide emissions reductions resulting from the generation of electricity from wind power rather than from carbon-based fuels such as peat, coal, gas and oil.

The formula is:

$$CO_2 \text{ (in tonnes)} = \frac{(A \times B \times C \times D)}{1000}$$

where:

A = The maximum capacity of the wind energy development in MW

B = The capacity or load factor, which takes into account the availability of wind turbines and array losses etc.[20]

C = The number of hours in a year

D = Carbon load in grams per kWh (kilowatt hour) of electricity generated and distributed via the national grid.

For the purposes of this calculation, the rated capacity of the Project is assumed to be approximately 48 MW. A load factor of 0.35 (or 35%) has been used for the Project.

There has been a strong reduction in the CO_2 emissions intensity of electricity generation, especially after 2016, with intensity falling below 300 g CO_2/kWh for the first time in 2020. It is now less than a third of its 1990 value[21]. The number of hours in a year is 8,760. The most recent data for the carbon load of electricity generated in Ireland is for 2024 and was published in Sustainable Energy Authority Ireland's (SEAI) December 2024 report, 'Energy in Ireland 2024'. The carbon intensity of Ireland's electricity was 254 gCO_2/kWh in 2023[22]. The below calculation for carbon savings is based on the latest emission factor for electricity in Ireland in 2023. This is most recent set of data for a full annual year. The emissions factor for electricity in Ireland in 2023 was 254 gCO_2/kWh.

[20] EirGrid, 2022, Enduring Connection Policy 2.2 Constraints Report for Area B Solar and Wind
[21] Energy-Related CO_2 Emissions in Ireland 2020 Companion Note to 2020 National Energy Balance October 2021, Sustainable Energy Authority of Ireland Online: https://www.seai.ie/publications/Energy-CO2-emissions-2020-Short-Note-FINAL.pdf [Accessed 12/06/2024]
[22] SEAI (2024) – Energy in Ireland 2024 Report [Accessed 08/01/2024]

The calculation for carbon savings as follows:

$$CO_2 \text{ (in tonnes)} = \frac{(48.0 \times 0.35 \times 8{,}760.0 \times 207.0)}{1000}$$

= 30,464 tonnes per annum

Based on this calculation, approximately 30,464 tonnes of carbon dioxide will be displaced per annum from the largely carbon-based traditional energy mix by the Proposed Development.

The Scottish Government carbon calculator, as presented above, estimates that 80,224 tonnes of CO_2 will be released to the atmosphere due to changes in the peat environment and as a result of the construction and operation of the Project. This represents a small proportion of the total carbon emissions that will be offset over the lifetime of the Proposed Development.

At an annual displacement rate of 30,464 tonnes of CO_2, the emissions associated with changes in the peat environment and the construction and operation of the Project will be offset in approximately 2.6 years of operation compared to the traditional fuel mix. Thereafter, the Proposed Development will deliver net carbon savings for the remainder of its operational life.

15.3.5 Do Nothing Impact

If the Proposed Development was not to proceed, greenhouse gas emissions, e.g., carbon dioxide, carbon monoxide and nitrogen oxides associated with construction and Decommissioning works would not arise. However, the greenhouse gas savings that would arise from the operation of the Proposed Development would also be lost leading to a long-term, moderate, negative impact.

15.3.6 Assessment of Potential Effects

This section assesses the impact of the Project on climate and Greenhouse Gases.

The effects of climate change on the Project in terms of the dangers with increased turbulant climate/weather events, resilience to lightening, ice build-up, possible flooding, storms etc. are assessed for potential effects and mitigation measures are detailed in **Chapter 17: Major Accidents and Natural Disasters**.

15.3.6.1 Construction Phase

Greenhouse gas emissions, e.g., carbon dioxide (CO_2), carbon monoxide (CO) and nitrogen oxides (NO_x) are associated with vehicles and plant utilised for construction activities. This potential impact will be slight, given the insignificant quantity of greenhouse gases that will be emitted and will be restricted to the duration of the construction phase. Therefore, this is a short-term, slight, negative impact. Mitigation measures to reduce this impact are outlined in section 15.2.7.

15.3.6.2 Operation Phase

The Project is a renewable energy project in that it will generate electricity from a renewable source. This energy generated will be in direct contrast to traditional energy and the associated emission of greenhouse gases from electricity-generating stations dependent on fossil fuels, thereby having a positive impact on the climate. The Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 40-year lifespan of the Project. The Project will assist in reducing carbon dioxide (CO_2) emissions (37,381 tonnes per annum) that would otherwise arise if the same energy that the Project will generate were otherwise to be generated by conventional fossil fuel plants. This is a long-term, moderate, positive effect on the climate.

15.3.6.3 Decommissioning Phase

Any impacts that occur during the Decommissioning phase are similar to that which occur during the construction phase. The mitigation measures prescribed for the construction phase of the Project will be implemented during the Decommissioning phase thereby minimising any potential impacts.

15.3.7 Mitigation Measures

It is considered that the Project will have an overall positive impact in terms of carbon reduction and climate.

The Project will assist Ireland in meeting a 51% reduction in overall greenhouse gas emissions by 2030. Also, it will aid in increasing the onshore wind capacity, as per the Climate Action Plan 2024 (CAP2024). The CAP 2024 commits Ireland to installing up to 9 GW of onshore wind capacity by 2030, in order to support the reduction in Ireland's greenhouse gas emissions.

15.3.7.1 Construction Phase

All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.

15.3.7.2 Operation Phase

The operation phase of the Project will have a positive impact on the climate due to the displacement of fossil fuels and therefore no mitigation is necessary for this phase.

15.3.7.3 Decommissioning Phase

Mitigation measures during the Decommissioning phase will be similar to those employed during the construction phase as outlined above.

15.3.8 Cumulative Effects

Potential cumulative effects on the climate between the Proposed Development and other developments in the vicinity were also considered as part of this assessment. The other developments considered as part of the cumulative effects assessment are described in **Appendix 2.4**.

During the construction phase of the Project and other developments within 20 km of the proposed turbines that are yet to be constructed, there will be minor exhaust emissions from construction plant and machinery and dust emissions from construction activities. In a worst-case scenario if any of these developments were constructed at the same time as this Project there will be short-term slight negative cumulative impact on climate due to exhaust and dust emissions.

The nature of the Project is such that, once operational, it will have a long-term, moderate, positive impact on the air climate. It is considered that the cumulative impact will be positive in terms of carbon reduction and the climate also.

During the operational phase emissions of carbon dioxide (CO_2), nitrogen oxides (NO_x), and sulphur dioxide (SO_2) or dust emissions from the Project and other projects listed in **Appendix 2.4**, will result from the operation and maintenance vehicles onsite. However, these emissions will be minimal. Therefore, there will be a long-term imperceptible negative cumulative impact on the climate.

Cumulative impacts during the Decommissioning phase will be similar to the construction phase although slightly less as a result of the reduced works required during the

Decommissioning phase as some infrastructure will be left in-situ e.g., Turbine Foundations and the Site Access Tracks.

The nature of the Project and other energy developments within 20 km are such that, once operational, they will have a cumulative long-term, significant, positive effect on climate.

15.3.9 Residual Impacts of the Project

15.3.9.1 Construction Phase

There will be a short-term imperceptible negative impact on Climate as a result of greenhouse gas emissions.

15.3.9.2 Operational Phase

There will be a long-term, moderate, positive impact on Climate as a result of reduced greenhouse gas emissions.

15.3.9.3 Decommissioning Phase

Any impacts and consequential effects that occur during the Decommissioning phase are similar to that which occur during the construction phase, albeit of less impact. For example, Turbine Foundations and Site Access Tracks will be left in-situ. No forest felling will take place during the Decommissioning phase.

15.3.10 Summary of Significant Effects

This assessment has identified no potential significant effects, given the mitigation measures embedded in the design and recommended for the implementation of the Project.

15.3.11 Statement of Significance

The Project has been assessed as having the potential to result in a short-term imperceptible, negative impact on Climate during construction. There will be long-term moderate, positive impact on Climate as a result of reduced greenhouse gas emission during the operational phase.

Potential cumulative impact of the Project with other energy developments including wind and solar within 20 km on climate was assessed as having a long-term, significant, positive impact on the Climate.

16 SHADOW FLICKER

16.1 INTRODUCTION

This chapter assesses the effects of the Proposed Development in terms of shadow flicker. The Proposed Development refers to elements of the application for the construction of Gortloughra Wind Farm as detailed in **Chapter 2: Project Description**. Where negative effects are predicted in relation to shadow flicker, the chapter identifies appropriate mitigation strategies therein. The assessment considers the potential effects during the operational phase of the Proposed Development.

Shadow flicker is an effect caused by the sun shining behind the rotating blades of a turbine relative to a nearby sensitive receptor which causes a momentary shadow on a window of that sensitive receptor. This shadow can appear as a flickering of sun light due to the rotating blades. Therefore, shadow flicker will only occur during the operational phase and not during the construction or decommissioning of the Proposed Development.

This chapter of the EIAR is supported by Figures provided in **Volume III** and by the following Appendix documents provided in **Volume IV** of this EIAR:

- **Appendix 16.1 Shadow Flicker Analysis**

Table 16.1: Glossary of Common Acronyms

Glossary of Common Acronyms	
BSc	Bachelor of Science
BSc Hons	Bachelor of Science (Honours)
EIAR	Environmental Impact Assessment
GIS	Geographical Information Systems
Hz	Hertz
m	Metre
MSc	Master of Science
MW	Megawatt
WEDGs	Wind Energy Development Guidelines

16.1.1 Statement of Authority

This chapter has been prepared by Kathlyn Feeney and reviewed by Andrew O'Grady and David Kiely of Jennings O'Donovan & Partners Limited.

Kathlyn Feeney is a Graduate Environmental Scientist with a First-Class Honours Degree (BSc. Hons) in Environmental Science. She forms part of the Environmental team responsible for preparing the EIAR Chapters. Kathlyn has experience writing EIARs, GIS, Feasibility Studies and Shadow Flicker analysis. She has a key interest in using software such as ArcGIS Pro and Wind PRO.

Andrew O'Grady is a Senior Environmental Consultant and holds a Bachelor (Hons.) Degree in Geography from University of Coventry and a MSc. in Environmental Resources Management from the Free University, Amsterdam. He has worked in environmental consultancy for over seventeen years and has prepared various Environmental Reports and EIARs. Andrew is the pre-planning stage project manager for the Gortloughra Wind Farm and has coordinated this EIAR.

David Kiely has 41 years' experience in the civil engineering and environmental sector. He has obtained a Bachelor's Degree in Civil Engineering and a Masters in Environmental Protection, has overseen the construction of over 60 wind farms and has carried out numerous soils and geology assessments for EIA's. He has been responsible in the overall preparation of in excess of 60 EIARs. David is the Project Director of this EIAR.

16.1.2 Assessment Structure

In line with the relevant legislation and guidelines identified in **Chapter 1**, Section 1.6 and the topic-specific guidance described below, the structure of this shadow flicker chapter is as follows:

- Assessment methodology and significance criteria
- Description of baseline conditions at the Site including the likely evolution of the baseline
- Limitations of the assessment
- Identification and assessment of effects of shadow flicker associated with the Development, during the construction, operational and decommissioning phases of the Development
- Mitigation measures to avoid or reduce the effects identified including shadow flicker control measures
- Identification and assessment of residual impact of the Proposed Development considering mitigation measures

- Identification and assessment of cumulative effects if and where applicable

The information presented in this chapter and associated appendices is considered appropriate to allow Cork County Council to carry out an adequate assessment of the Proposed Development.

16.2 SHADOW FLICKER

This chapter comprehensively assesses the potential shadow flicker effects of the operational stage of the Proposed Development. No shadow flicker will occur during the construction or decommissioning phases as shadow flicker occurs only when the rotating blades of a wind turbine cast a moving shadow over a building. The grid connection and turbine delivery route are not included in this assessment as shadow flicker relates to the turbines only, details on the grid connection and turbine delivery routes can be found in **Chapter 2: Project Description**.

16.2.1 Assessment Methodology

This assessment of shadow flicker involved the following:

- Evaluation of potential effects (see Section 16.2.6) includes predicting the shadow flicker effects on the sensitive receptors within the Study Area of the candidate model and comparing them against the Wind Energy Development Guidelines (2006)[1] limits of 30 hours per year and 30 minutes per day. The Proposed Development will commit to the zero-shadow flicker policy set out in the 2019 Draft Revised Wind Energy Development Guidelines (WEDG)[2]. The draft WEDGs were published in December 2019 and are subject to a consultation process. It is noted that at the time of writing, the Draft 2019 WEDGs have not yet been adopted and the 2006 Guidelines referred to above remain in place.
- Evaluation of the significance of effects using the methodology set out in **Chapter 1: Introduction, Scoping and Consultation**, Section 1.10
- Identification of measures to avoid and mitigate potential effects

The Study Area is defined as 10 times the widest possible potential rotor diameter within the range (10 x 150 m = 1,500 m). 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

[1] Department of Housing, Planning and Local Government, 2006. *Wind Energy Development Guidelines* (2006), Dublin. Government of Ireland. [Available Online: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.opr.ie/wp-content/uploads/2019/08/2006-Wind-Energy-Development-1.pdf]

[2] Department of Housing, Planning and Local Government, 2019. *Draft Revised Wind Energy Development Guidelines*, Dublin. Government of Ireland. [Available Online: https://assets.gov.ie/46097/6e68ea81b8084ac5b7f9343d04f0b0ef.pdf]

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*'.

As a precautionary measure, this was increased to 2,000 m for the inclusion of dwellings impacted in the cumulative assessment with the neighbouring Shehy More Wind Farm. Six receptors outside of the 2,000 m Study Area were also included in the analysis. Receptors H9, H8 and H63 were included due to the proximity of the Shehy More Wind Farm. Receptors H28, H62 and H64 were included due to their proximity to the 2,000 m range, for completeness. There are 73 No. receptors within the Study Area, six of these receptors fall outside the 2km but were included in the assessment due to reasons outlined above. All receptors can be viewed within **Appendix 16.1** and also in **Figure 1.3**.

A shadow flicker computer model (WindPRO 4.0) was used to calculate the occurrence of shadow flicker at relevant receptors to the Proposed Development. The sensitive receptors were identified using a combination of Tailte Éireann Maps, AutoCAD drawings and from internet mapping resources including *Eircode Finder*[3], *Google Street View*[4], *Google Earth*[5], *Bing Maps*[6], a planning permission search using the Cork County Council web resource[7] and from a site visit in May 2021 to the Study Area and subsequent door to door consultations carried out by the Developer. The desktop sensitive receptor search was originally completed in June 2021 with regular rechecks completed to see that no new receptors were identified within the Study Area. This was done virtually and in-person. The output from the calculations is analysed to identify and assess potential shadow flicker effects. Wind turbines, like other tall structures, can cast long shadows when the sun is low in the sky.

The 2019 Draft Revised Wind Energy Development Guidelines confirms that:
"*Shadow Flicker occurs when the sun is low in the sky and the rotating blades of a wind turbine casts a moving shadow which if it passes over a window in a nearby house or other property results in a rapid change or flicker in the incoming sunlight. The time period in which a neighbouring property may be affected by shadow flicker is completely predictable*."

[3] Department of the Environment, Climate & Communications, 2024. Eircode. Available at: https://www.eircode.ie/
[4] Google, 2024. Google Maps. Available at: https://www.google.ie/maps/@54.2769152,-8.486912,5266m/data=!3m1!1e3?entry=ttu&g_ep=EgoyMDI0MTExMi4wIKXMDSoASAFQAw%3D%3D
[5] Google, 2024. Google Earth. Available at: https://earth.google.com/web/@52.04407517,-8.83588611,395.62363557a,240042.8536512d,35y,4.84029754h,0.24009708t,360r/data=CgRCAggBOgMKATBCAggASg0I____________ARAA
[6] Microsoft, 2024. Microsoft Bing. Available at: https://www.bing.com/maps?cp=51.600141%7E-8.647658&lvl=9.8
[7] Cork County Council, 2024. Planning Viewer. Available at: https://corkcocoeur.maps.arcgis.com/apps/webappviewer/index.html?id=254568bc8931492eb72ab5446c411cb9

The candidate turbine for the Proposed Development which was assessed in this Chapter is a Vestas V150 6.0 MW with dimensions:

- Hub height: 100 m
- Rotor diameter: 150 m
- Blade tip height 175 m

Cumulative effects are also assessed in Section 16.2.8.

Where negative effects are predicted, this section identifies appropriate mitigation measures. The assessment considers the potential effects during the operational phase of the Proposed Development.

A shadow flicker computer model (WindPRO 4.0) was used to calculate the occurrence of shadow flicker at relevant receptors to the Proposed Development, this is discussed further in Section 16.2.3. The output from the calculations is analysed to identify and assess potential shadow flicker effects. This is further detailed in **Appendix 16.1**.

The 2006 Guidelines state that shadow flicker lasts only for a short period and happens only in certain specific combined circumstances. The circumstances required for shadow flicker to occur are:

- the sun is shining and at a low angle in the sky; and
- the turbine is directly between the sun and the affected sensitive receptor; and
- there is enough wind energy to ensure that the turbine blades are moving; and
- the turbine blades are positioned so as to cast a shadow on the receptor.

If any one of these conditions is absent, shadow flicker cannot occur.

The 2019 Draft Revised Wind Energy Development Guidelines (WEDG) also added the circumstance where:

"there is sufficient direct sunlight to cause shadows (cloud, mist, fog or air pollution could limit solar energy levels)"

and note that:

"Generally only properties within 130 degrees either side of north, relative to the turbines, can be affected at these latitudes in the UK and Ireland – turbines do not cast long shadows on their southern side".

Shadow flicker will have the potential to cause disturbance and annoyance to sensitive receptors where sunlight and wind conditions are calculated to do so. Persons with photosensitive epilepsy can be sensitive to flickering light between 3 and 60 Hertz (Hz). This is supported by research in recent years asserting that flicker from turbines must interrupt or reflect sunlight at frequencies greater than 3 Hz to pose a potential risk of inducing photosensitive seizures. The frequencies of flicker caused by modern wind turbines are less than 1 Hz and are well below the frequencies known to trigger effects in these individuals. **Chapter 5: Population and Human Health**, Section 5.3.6.8, concludes that there are no specific health and safety considerations in relation to the operation of a wind turbine based on peer reviewed scientific research publications. Therefore, any potential shadow flicker effect from the Proposed Development is considered an effect on residential amenity, rather than having the potential to affect the health of residents.

The 2006 Guidelines state that; '*Careful site selection, design and planning, and good use of relevant software to control the turbine operation can help avoid the possibility of shadow flicker in the first instance'*.

Modern wind turbines have the facility to measure sunlight levels and to reduce or stop turbine rotation if the conditions exist that would lead to any shadow flicker at neighbouring sensitive receptors.

The distance and direction between the turbine and sensitive receptors is of significance because:

- The duration of the shadow will be shorter the greater the distance (i.e., it will pass by quicker)
- The further a sensitive receptor is from an operating rotating turbine blades, the less shadow flicker will be experienced.

The path of the sun varies over the seasons resulting in a changing potential for a shadow to be cast throughout the year. Similarly, the sun's position in the sky over the course of a day is changing such that the shadow cast by a turbine is constantly changing. Shadow flicker is more likely to occur on sunny winter days when the sun is lower in the sky and shadows cast a greater distance from the turbine. Shadow flicker is more likely to occur to the east or west of the Site. This can be seen in **Appendix 16.1**.

16.2.2 Relevant Guidance

The relevant Irish guidance for shadow flicker is derived from the '*Wind Energy Development Guidelines*' (Department of the Environment, Heritage and Local Government (DoEHLG), 2006) the '*Best Practice Guidelines for the Irish Wind Energy Industry*' (Irish

Wind Energy Association, 2012), and the Draft Revised Wind Energy Development Guidelines (Department of Housing, Local Government and Heritage, 2019).

The 2006 Guidelines considers that:

"*At distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low. Where shadow flicker could be a problem, developers should provide calculations to quantify the effect and where appropriate take measures to prevent or ameliorate the potential effect, such as by turning off a particular turbine at certain times*".

The 2006 Guidelines also state that:

"*It is recommended that shadow flicker at neighbouring offices and dwellings within 500m should not exceed 30 hours per year or 30 minutes per day*".

The 2006 Guidelines state that shadow flicker lasts only for a short period of time and occurs only during certain specific combined circumstances, as follows:

- the sun is shining and is at a low angle in the sky, i.e., just after dawn and before sunset;
- the turbine is located directly between the sun and the affected sensitive receptor;
- there is enough wind energy to ensure that the turbine blades are moving.

Although the DoEHLG thresholds apply to dwellings located within 500 m of a proposed turbine location, for the purposes of this assessment, the guideline thresholds of 30 hours per year or 30 minutes per day have been applied to all sensitive receptors located within 2 km of the proposed turbines within the Site (as per IWEA guidelines, 2012[8]). The 2006 Guidelines state that at distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low. Despite this, all receptors within 2 km were included due to the potential cumulative impact of the Proposed Development and the existing Shehy More Wind Farm.

The adopted 2006 DoEHLG guidelines are currently under review, although the Draft 2019 WEDGs have not yet been adopted and the 2006 guidelines are still the adopted guidelines used. The Department of Housing, Local Government and Heritage released the 'Draft Revised Wind Energy Development Guidelines' in December 2019. The Draft Revised Wind Energy Development Guidelines (2019) provides for zero shadow flicker:

[8] Irish Wind Energy Association, 2012. *Best Practice Guidelines for the Irish Wind Energy Industry*, Cork: Wind Skillnet. [Available online: https://windenergyireland.com/images/files/9660bdfb5a4f1d276f41ae9ab54e991bb600b7.pdf]

"Computational models can be used to accurately predict the strength and duration of potential shadow flicker during daylight hours for every day of the year. A Shadow Flicker Study detailing the outcome of computational modelling for the potential for shadow flicker from the development should accompany all planning applications for wind energy development.

If a suitable shadow flicker prediction model indicates that there is potential for shadow flicker to occur at any particular dwelling or other potentially affected property, then a review of site design involving the possible relocation of one or more turbines to explore the possibility of eliminating the occurrence of potential flicker is required. Following such a review, if shadow flicker is not eliminated for any dwelling or other potentially affected property then clearly specified measures which provide for automated turbine shut down to eliminate shadow flicker should be required as a condition of a grant of permission."

The Draft 2019 Guidelines are based on the recommendations set out in the 'Proposed Revisions to Wind Energy Development Guidelines 2006 – Targeted Review in relation to Noise, Proximity and Shadow Flicker'[9] (December 2013) and the 'Review of the Wind Energy Development Guidelines 2006 – Preferred Draft Approach'[10] (June 2017).

The assessment herein is based on compliance with the current DoEHLG Guidelines limit (30 hours per year or 30 minutes per day). However, it should also be noted the Proposed Development will be brought in line with the requirements of the 2019 draft guidelines, which allows for no shadow flicker to impact an existing sensitive receptor, through effective implementation of the mitigation measures outlined herein.

16.2.3 Shadow Flicker Modelling

An industry standard wind farm assessment software package, WindPRO from EMD International Version 4.0 was used to prepare a model of the Proposed Development. The programme facilitates the analysis of a wind farm for possible shadow flicker occurrence at nearby houses. It allows for the production of maps, and shadow flicker prediction. The data output from the programme has been analysed and the receptors potentially vulnerable to shadow flicker were identified (as detailed in section 16.2.1). The significance of shadow flicker effects was assessed.

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[9] Environment, Community and Local Government, 2013. *Proposed Revisions to Wind Energy Development Guidelines 2006 – Targeted Review in relation to Noise, Proximity and Shadow Flicker. [Available online: file:///C:/Users/kfeeney/Downloads/132533_b946118f-d089-41b9-b15b-ae4266325ed6%20(1).pdf]*

[10] Environment, Community and Local Government, 2017. Review of the Wind Energy Development Guidelines 2006 – Preferred Draft Approach. [Available online: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://unece.org/DAM/env/pp/compliance/C2014-112_Ireland/frComm_03.09.2017/frCommC122_03.09.2017_update_att_1_Information_Note_on_Review_of_the_Wind_Energy_Development_Guidelines.pdf]

Generic windows of 2 m width, 2 m height and 0.5 m from bottom line above ground are applied in the model to each side of the house. The model assumes the receptor will not face any particular direction but instead will face all directions. These windows represent an approximation of the existing windows on the houses facing north, south, east and west and provide an estimate of potential shadow flicker to a window on each side of the house. The software determines the times of day/year when the sun will be in line with the rotational components of the turbine and the house/receptor, thereby having the potential to cause shadow flicker. The software outputs details of potential shadow flicker, in this case by mean and maximum duration of the shadow flicker events, days per year and times of occurrence and maximum hours per year and maximum minutes per day of shadow flicker.

The following data inputs were required and used to produce an estimate of the effect of shadow flicker from the wind farm:

- Digital elevation model of the Proposed Development and areas around all sensitive receptors within the model (10m resolution – OS X, Y, and Z data points)
- Turbine locations
- Turbine dimensions (i.e. rotor diameter of 150 m and hub height of 100 m)
- Receptor locations
- Bottom line height above ground 'window' (0.5 m above ground level)
- Wind speed and direction for the Site to determine the period that the wind turbines will be in operation from the different wind directions during the year

The software creates a mathematical model of the Proposed Development and its surroundings and uses this information to calculate specific theoretical times and durations of flicker effects for the identified sensitive receptors. The following 'worst-case' assumptions were initially incorporated into the shadow flicker modelling:

- there are no clouds and sunlight is always bright and direct
- the turbines are always rotating whereas this might not be the case due to maintenance works, break downs, wind speeds below the turbine threshold or curtailment
- there are no intervening structures or vegetation (other than topography) that may restrict the visibility of a turbine, preventing or reducing the effect
- a limit to human perception of shadow flicker is not considered by the model

The model operates by simulating the path of the sun during the year. The results of the model provide a calculation of theoretical specific times and durations of flicker effects for the identified sensitive receptors. The worst-case assumption is considered to be sufficient for the purposes of this assessment as it assumes the sky is always clear, the turbines are always aligned face-on to each window and that there is a clear and undisturbed line of sight between the windows of the receptors and the turbines (except where this is prevented due to topography). In reality, this will not occur; the turbines will not always be orientated as described, clouds will obscure the sun and line of sight may also be obscured (for example, from leaves on trees). Given the assumptions incorporated into the model, the calculations overestimate the duration of effects. The flicker effects will be substantially less than this and will not meet the results of the worst-case assumption.

The model also outputs a more realistic scenario, or "expected values". In this scenario, the only change in assumptions is that the statistically likely monthly sunshine frequency and wind direction frequency data is assessed. This assessment only changes the annual hours per year metric and is not applied to the daily data. This is because it could be sunny, with the wind coming from the relevant direction, on any individual day. The data used in the model was the:

- Long-term sunshine probability data from the closest station to the Proposed Development: Met Éireann synoptic station in Valentia, Co. Cork
- Long-term wind rose data from the SEAI Wind Mapping System (Site Centre ITM co-ordinates 514000E, 56000N)

16.2.4 Baseline Description & Likely Evolution of the Baseline

The Site is located in a rural area, typically ribbon development with the majority of receptors located to the east of the Proposed Development. Should the Proposed Development not proceed, the surrounding areas will remain the same. Shadow flicker is directly associated with the operation of turbines.

Taking the above into consideration, JOD examined maps to identify sensitive receptors in the local area within a Study Area, a distance of 2 km, with 6 no. receptors outside of the 2 km also included, as outlined in **Section 16.2.1**. There are 73 no. receptors within the shadow flicker Study Area radius. The coordinates of each sensitive receptor and its distance to the closest proposed turbine are listed in **Table 16.2** and are shown in **Figure 1.3**.

Table 16.2: Sensitive receptors within the shadow flicker study area

House ID	Easting ITM	Northing ITM	Closest Turbine	Closest Distance to Turbine (m)
H1	512574	560249	T1	1459
H2	512548	560240	T1	1483
H3	512576	560296	T1	1467
H4	512607	560021	T1	1401
H5	513258	560218	T1	787
H6	513280	560045	T1	730
H7	514664	561741	T2	1643
H8	517491	561675	T6	2337
H9	517560	561620	T6	2351
H10	516223	559500	T6	697
H11	516345	559495	T6	780
H12	516426	559436	T6	879
H13	516455	559391	T6	931
H14	516453	559491	T6	860
H15	516742	559597	T6	1045
H16	516913	559519	T6	1232
H17	517205	559763	T6	1432
H18	517186	559907	T6	1390
H19	516995	559974	T6	1194
H20	517058	560064	T6	1254
H21	517237	560043	T6	1433
H22	517355	560026	T6	1551
H23	517505	560096	T6	1701
H24	517525	560068	T6	1721
H25	517602	560034	T6	1799
H26	517766	560044	T6	1962
H27	517833	560174	T6	2032
H28	517746	560332	T6	1961
H29	515967	558698	T9	806
H30	516071	558608	T9	942
H31	516831	558505	T9	1661

House ID	Easting ITM	Northing ITM	Closest Turbine	Closest Distance to Turbine (m)
H32	516331	558002	T9	1544
H33	516489	557893	T9	1730
H34	516258	557871	T9	1599
H35	515815	557831	T8	1411
H36	512706	558535	T7	1543
H37	513035	558529	T7	1224
H38	512590	558155	T7	1767
H39	514019	558165	T7	703
H40	514606	558023	T8	868
H41	514826	557698	T8	1159
H42	514556	557258	T7	1616
H43	514715	557154	T8	1708
H44	514833	557430	T8	1427
H45	514870	557636	T8	1222
H46	515012	557597	T8	1272
H47	516168	557781	T9	1622
H48	512339	560424	T1	1727
H49	512089	560001	T1	1918
H50	511856	559964	T1	2152
H51	515138	562209	T2	2181
H52	511651	559779	T1	2364
H53	514062	558379	T7	486
H54	517177	559907	T6	1381
H55	517375	560081	T6	1571
H56	517485	560120	T6	1682
H57	517582	560131	T6	1779
H58	517565	560150	T6	1764
H59	517665	560186	T6	1866
H60	517712	560152	T6	1910
H61	517770	560146	T6	1968
H62	517793	560211	T6	1995
H63	517724	560209	T6	1926

House ID	Easting ITM	Northing ITM	Closest Turbine	Closest Distance to Turbine (m)
H64	516185	558817	T9	945
H65	516326	559301	T6	919
H66	517061	559769	T6	1290
H67	516482	559447	T6	912
H68	517190	559916	T6	1393
H69	517202	560097	T6	1399
H70	517121	559978	T6	1319
H71	517638	560049	T6	1834
H72	517727	560072	T6	1923
H73	517677	560204	T6	1879

*Landowner has financial involvement in the Project.

16.2.5 Limitations of the Assessment

The Shadow Flicker calculation is based on topography alone and excludes vegetation, buildings and other man-made structures. These factors cannot be accurately predicted due to the changeable nature of these variables. Vegetation, buildings and other structures may restrict the visibility of a turbine, preventing or reducing the effect of shadow flicker.

16.2.6 Assessment of Potential Effects

This assessment considers the potential shadow flicker effect of the Proposed Development on the surrounding sensitive receptors in terms of:

- Predicting and assessing the extent of shadow flicker experienced by all sensitive receptors within the shadow flicker Study Area; and
- Specifying mitigation measures, where deemed necessary.

The maximum expected daily shadow flicker for each receptor is outlined in **Table 16.3**. This is the highest amount expected across the whole year on any given day. All other days will experience no more than this amount of shadow flicker, pre-mitigation.

Other developments within 2 km are considered in this assessment of the Proposed Development for cumulative effects. Shehy More Wind Farm is located 560 m from the nearest turbine. The IWEA Guidelines recommend that all existing and / or permitted wind farm developments within 2 km of a proposed development should be considered in a cumulative shadow flicker assessment.

The calculation of the potential total hours of shadow flicker per year, the number of days per year that shadow flicker is possible, the maximum hours of shadow flicker per day for each receptor from the Proposed Development and the Shehy More wind farm is shown in **Table 16.3** and discussed under cumulative effects in Section 16.2.8. Full assessment outputs are in **Appendix 16.1** of the EIAR.

Table 16.3: Summary of Potential Shadow Flicker Listing for All Sensitive Receptors

Receptor ID	Gorthloughra Turbines only			Gorthloughra Turbines and Cumulative Wind Farms*		
	Worst Case Shadow [h/year]	Max. Shadow [h/day]	Expected Shadow [h/year]	Worst Case Shadow [h/year]	Max. Shadow [h/day]	Expected Shadow [h/year]
H1	09:09	00:24	01:30	09:09	00:24	01:30
H2	08:52	00:23	01:29	08:52	00:23	01:29
H3	09:04	00:24	01:25	09:04	00:24	01:25
H4	10:37	00:24	02:12	10:37	00:24	02:12
H5	49:48	00:56	08:22	63:01	00:56	11:16
H6	63:10	01:11	12:20	76:45	01:11	15:06
H7*	00:00	00:00	00:00	39:21	00:31	04:05
H8*	00:00	00:00	00:00	69:00	00:45	10:34
H9*	00:00	00:00	00:00	59:10	00:44	09:32
H10	70:03	00:39	13:11	70:03	00:39	13:11
H11	54:01	00:34	10:14	54:01	00:34	10:14
H12	45:29	00:32	08:32	45:29	00:32	08:32
H13	46:22	00:31	08:43	46:22	00:31	08:43
H14	39:25	00:31	07:28	39:25	00:31	07:28
H15	19:30	00:25	03:45	19:30	00:25	03:45
H16	29:29	00:24	05:18	29:29	00:24	05:18
H17	13:12	00:25	02:36	13:12	00:25	02:36
H18	17:28	00:25	03:24	17:28	00:25	03:24
H19	21:42	00:29	04:09	21:42	00:29	04:09
H20	13:19	00:28	02:46	13:19	00:28	02:46
H21	10:09	00:25	02:06	10:09	00:25	02:06

Receptor ID	Gorthloughra Turbines only			Gorthloughra Turbines and Cumulative Wind Farms*		
	Worst Case Shadow [h/year]	Max. Shadow [h/day]	Expected Shadow [h/year]	Worst Case Shadow [h/year]	Max. Shadow [h/day]	Expected Shadow [h/year]
H22	08:41	00:22	01:48	08:41	00:22	01:48
H23	07:07	00:21	01:25	07:07	00:21	01:25
H24	06:59	00:20	01:26	06:59	00:20	01:26
H25	06:30	00:20	01:20	06:30	00:20	01:20
H26	00:00	00:00	00:00	00:00	00:00	00:00
H27	00:00	00:00	00:00	00:00	00:00	00:00
H28	00:00	00:00	00:00	00:00	00:00	00:00
H29	30:42	00:31	06:12	30:42	00:31	06:12
H30	28:21	00:28	05:33	28:21	00:28	05:33
H31	22:17	00:22	03:50	22:17	00:22	03:50
H32	00:00	00:00	00:00	00:00	00:00	00:00
H33	00:00	00:00	00:00	00:00	00:00	00:00
H34	00:00	00:00	00:00	00:00	00:00	00:00
H35	00:00	00:00	00:00	00:00	00:00	00:00
H36	10:26	00:24	02:18	10:26	00:24	02:18
H37	36:46	00:31	07:58	36:46	00:31	07:58
H38	12:51	00:21	02:51	12:51	00:21	02:51
H39	00:00	00:00	00:00	00:00	00:00	00:00
H40	00:00	00:00	00:00	00:00	00:00	00:00
H41	00:00	00:00	00:00	00:00	00:00	00:00
H42	00:00	00:00	00:00	00:00	00:00	00:00
H43	00:00	00:00	00:00	00:00	00:00	00:00

Receptor ID	Gorthloughra Turbines only			Gorthloughra Turbines and Cumulative Wind Farms*		
	Worst Case Shadow [h/year]	Max. Shadow [h/day]	Expected Shadow [h/year]	Worst Case Shadow [h/year]	Max. Shadow [h/day]	Expected Shadow [h/year]
H44	00:00	00:00	00:00	00:00	00:00	00:00
H45	00:00	00:00	00:00	00:00	00:00	00:00
H46	00:00	00:00	00:00	00:00	00:00	00:00
H47	00:00	00:00	00:00	00:00	00:00	00:00
H48	06:32	00:20	01:01	06:32	00:20	01:01
H49	00:00	00:00	00:00	00:00	00:00	00:00
H50	00:00	00:00	00:00	00:00	00:00	00:00
H51*	00:00	00:00	00:00	19:18	00:40	03:09
H52	00:00	00:00	00:00	00:00	00:00	00:00
H53	00:00	00:00	00:00	00:00	00:00	00:00
H54	17:50	00:26	03:29	17:50	00:26	03:29
H55	08:26	00:22	01:43	08:26	00:22	01:43
H56	07:09	00:21	01:24	07:09	00:21	01:24
H57	06:29	00:19	01:15	06:29	00:19	01:15
H58	06:33	00:20	01:14	06:33	00:20	01:14
H59	05:48	00:19	01:03	05:48	00:19	01:03
H60	00:00	00:00	00:00	00:00	00:00	00:00
H61	00:00	00:00	00:00	00:00	00:00	00:00
H62	00:00	00:00	00:00	00:00	00:00	00:00
H63	00:00	00:00	00:00	00:00	00:00	00:00
H64	34:47	00:33	06:23	34:47	00:33	06:23
H65	57:57	00:34	10:43	57:57	00:34	10:43

Receptor ID	Gorthloughra Turbines only			Gorthloughra Turbines and Cumulative Wind Farms*		
	Worst Case Shadow [h/year]	Max. Shadow [h/day]	Expected Shadow [h/year]	Worst Case Shadow [h/year]	Max. Shadow [h/day]	Expected Shadow [h/year]
H66	29:49	00:28	05:40	29:49	00:28	05:40
H67	39:39	00:30	07:28	39:39	00:30	07:28
H68	11:50	00:25	02:25	11:50	00:25	02:25
H69	10:28	00:25	02:07	10:28	00:25	02:07
H70	12:36	00:26	02:36	12:36	00:26	02:36
H71	06:07	00:19	01:15	06:07	00:19	01:15
H72	00:00	00:00	00:00	00:00	00:00	00:00
H73	05:44	00:19	01:01	05:44	00:19	01:01

***Impacted by Shehy More Wind Farm only**

It can be demonstrated from the cumulative scenario in **Table 16.3**, that in total there will be 44 receptors out of 73 that will experience some degree of shadow flicker unmitigated and 29 receptors that will experience no shadow flicker. Two of these receptors H5 and H6, will be impacted cumulatively by the Proposed Development and Shehy More Wind Farm. Shadow flicker at the remaining receptors is caused by the Proposed Development. H6 is expected to experience 15 hours 06 minutes of shadow flicker in a year, which is the worst affected occupied receptor. Although, 02 hours and 26 minutes of the shadow flicker experienced at H6 is from the Shehy More Wind Farm only. The closest receptor, H53 (which is involved in the Project), is within 486 m of the closest turbine (T07), and experiences no shadow flicker. The closest receptor who is not involved, H10, is within 696 m of the closest turbine (T06).

There are four shadow flicker receptors, H7, H8, H9 and H51, which are impacted by the operational Shehy More Wind Farm only and these receptors will not experience shadow flicker from the Proposed Development.

None of the receptors are expected to experience more than the 2006 Guidelines recommended 30 hours or less of shadow flicker per year in any of the scenarios. However, 16 No. sensitive receptors exceed the 2006 Guidelines of a maximum 30 minutes of shadow flicker per day unmitigated. The Draft Revised Wind Energy Development Guidelines, December 2019, recommend that shadow flicker should not affect any sensitive receptor, therefore the relevant turbine (or turbines) must be shut down on a temporary basis until the potential for shadow flicker ceases. The mitigation measures to avoid exceedance of the 2019 Guideline's thresholds are outlined in Section 16.2.9.

As can be seen in the shadow flicker assessment attached as **Appendix 16.1** all of the proposed turbines give rise to some degree of cumulative shadow flicker, if unmitigated.

16.2.7 Assessment of Expected Shadow Flicker Impact

In order to calculate more realistic and '*real world'* occurrences of shadow flicker for the receptors that are identified as potentially vulnerable to shadow flicker (**Table 16.3**), it is necessary to identify the likely meteorological conditions which are expected to be experienced at the Site. To estimate the likely duration of sunshine occurrence at the Site, historical meteorological data from Met Éireann[11] is automatically uploaded by the software. Data from Valentia Observatory Station was used as this Met Éireann observatory is the

[11] https://www.met.ie/climate/available-data/historical-data

closest to the Site and also measures multiple environmental parameters (**Table 16.4**). This gives a good representation of data for the Proposed Development. This data was utilised to consider the probability of sunshine occurrence, and thus allow the determination of '*projected*' values for shadow flicker occurrence.

Table 16.4: Average daily sunshine hours from Valentia Observatory Station

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

The worst-case predicted hours for shadow flicker are reduced by the average time the weather is cloudy annually. As discussed; to estimate the impact of sunshine occurrence, historical meteorological data is utilised to consider the likelihood of sunshine (the sunshine probability) at different times of the year. This allows the determination of '*expected*' values for shadow flicker occurrence. This is achieved by applying a reductive factor to the worst-case total hours per year of shadow flicker. 'Long term average sunshine hours' refers to data collected by Met Éireann.

Table 16.3 shows the potential and the expected shadow flicker values per year which are likely to be experienced by each receptor. '*Potential sunshine hours'* refers to the intervening time period between modelled sunrise and sunset. Although the projected duration of shadow flicker is reduced substantially for each sensitive receptor, they are not eliminated entirely for all of the 73 receptors within the shadow flicker Study Area of the Proposed Development.

The expected daily shadow flicker cannot be predicted as this depends on multiple variable factors such as wind direction, wind speed, cloud cover and sunshine. These factors cannot be accurately predicted to give an expected minutes of shadow flicker per day. The maximum scenario in this assessment is based on the average sunshine and average wind direction for the site.

16.2.8 Cumulative Effects

Cumulative shadow flicker effects could arise if sensitive receptors 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 is one operational wind farm (Shehy More Wind Farm) within a 2 km range of the turbines that may cause cumulative effects.

The assessment showed 4 no. receptors H7, H8, H9 and H51, are predicted to be affected by the operational Shehy More Wind Farm and not the Proposed Development (**Table 16.3**). There are 2 No. receptors that are predicted to be affected by cumulative shadow flicker effects, namely H5 and H6. The installation of a blade shadow control system on all wind turbines will eliminate shadow flicker effects from the Proposed Development, therefore, removing cumulative shadow flicker effects. Mitigation of this shadow flicker is further discussed in section 16.2.9.

16.2.9 Mitigation Measures & Residual Effects

16.2.9.1 Likely Evolution of the Baseline

The shadow flicker effect is related to the operational phase of a wind farm. If the Proposed Development were not to proceed, the effects described in this chapter would not occur.

16.2.9.2 Construction Phase

The shadow flicker effect is associated with the operational phase of the wind farm and has been scoped out for the construction phase. During construction there will be no shadow flicker effect and therefore no mitigation is required.

16.2.9.3 Operational Phase

Shadow flicker control systems, consisting of light sensors and specialised software, will be installed on each of the wind turbines. The control system will calculate, in real-time:

- Whether shadow flicker has the potential to affect nearby sensitive receptors, based on pre-programmed co-ordinates for the sensitive receptors and turbines;
- Wind speed (can affect how fast the turbine will turn and how quickly the flicker will occur);
- Wind direction; and
- The intensity of the sunlight.

When the control system detects that the sunlight is strong enough to cast a shadow, and the shadow falls on a sensitive receptor or receptors, then the turbine will automatically shut down; and will restart when the potential for shadow flicker ceases at the effected receptors. Such systems are common in many wind farm developments and the technology has been well established. A case study in Scotland, which carried out a review of how light and shadow effects from wind farms are considered in the development planning process in

Scotland, found that the use of turbine shut-down control modules for turbines which were causing shadow flicker at nearby offices was successful[12].

The Developer is committed to a zero-shadow flicker strategy which means that the turbines shadow flicker module will be programmed to shut down whenever the conditions for shadow flicker at a property are met, irrespective of which turbine in the range is installed Under this approach there would be no shadow flicker experienced at any property, and therefore no impacts on any receptors. **Appendix 16.1** contains all calculated potential shadow flicker periods for each turbine. The relevant data will be input into the turbine control software. In the event that a complaint or complaints of shadow flicker are received by the Developer / site operator or by Cork County Council, the Developer will conduct an investigation, and the complaints frequency, duration and time of shadow flicker incident will be considered and specialist modelling software will be used to confirm the occurrence(s). Should the complaint persist, a shadow flicker survey involving the collection of light data will also be carried out at the receptor in which the complaint was made. Further refinement of the blade shadow control system will be conducted to eliminate the shadow flicker occurrence. This could result in the shutting off a turbine or turbines at specific times of day.

16.2.9.4 Decommissioning Phase

The shadow flicker effect is associated with the operational phase of the wind farm and has been scoped out for the decommissioning phase. During decommissioning there will be no shadow flicker effect and therefore no mitigation is required.

16.2.9.5 Residual Effects

The results of the shadow flicker assessment predict that Gortloughra Wind Farm has the potential to result in shadow flicker at a maximum of 44 receptors surrounding the Site, as shown in **Table 16.3**. The implementation of mitigation to cease operation of the turbines during periods of potential shadow flicker will see that no shadow flicker effects are experienced at any sensitive receptor within the Study Area. It is therefore considered that Gortloughra Wind Farm will comply with Draft 2019 Guidelines (and therefore the 2006 Guidelines) of no shadow flicker at neighbouring sensitive receptors within the Study Area. Following implementation of mitigation measures described in Section 16.2.9.3, the residual impact as a result of shadow flicker will be a neutral, imperceptible, long-term effect.

[12] ClimateXChange, 2017. 'Review of Light and Shadow Effects from Wind Turbines in Scotland' [Available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.climatexchange.org.uk/wp-content/uploads/2023/09/light_and_shadow_effects_from_wind_turbines_in_scotland_stages_1_and_2.pdf]

Accordingly, it is considered that there will be no residual impact as a result of shadow flicker.

16.3 SUMMARY OF SIGNIFICANT EFFECTS

This chapter has assessed the significance of potential effects of the Proposed Development on shadow flicker.

This assessment has identified the potential for shadow flicker to affect 44 no. out of 73 no. receptors within the shadow flicker Study Area, as shown in **Table 16.3**. It is proposed that a shadow control system be installed to eliminate shadow flicker from the Proposed Development. This assessment has identified that by installing a blade shadow control system on the proposed turbines, there will be no significant direct or indirect effects. Given that only effects of significant impact or greater are considered "significant" in terms of the EIA Directive the potential effects of the Proposed Development as a result of shadow flicker, when mitigated, are considered to be not significant. The Proposed Development has been assessed as having the potential to result in **neutral, imperceptible, long-term effects** overall with regards to shadow flicker.

18 INTERACTIONS OF THE FOREGOING AND A SUMMARY OF MITIGATION MEASURES

18.1 INTERACTIONS OF THE FOREGOING

18.1.1 Introduction

The foregoing topics in earlier chapters do not exist in isolation from each other and consequently, any impact on one element of the environment may also impact on another. The Irish Environmental Protection Agency have developed a simple matrix to show the key interactions and interrelationships between the environmental aspects of a development (**Table 18.1**). The interactions between impacts on different factors have been addressed as relevant throughout the EIAR (**Table 18.2**). The cumulative slight impact on a number of topics may result in a significant impact on another topic.

Appendix 18.1 summarises mitigation measures for all technical assessment chapters and **Appendix 18.2** provides a glossary of common acronyms.

18.1.2 Need for the Interactions of the Forgoing

Article 3 of Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment as amended by Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending ('EIA Directive') stipulates that

'*The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors: (a) population and human health; (b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC; (c) land, soil, water, air and climate; (d) material assets, cultural heritage and the landscape; (e) the interaction between the factors referred to in points (a) to (d).'*

18.1.3 Impact Interactions

Where any potential negative impacts have been identified during the assessment process, these impacts have been avoided by embedded design mitigation or at a minimum, reduced by the proposed mitigation measures.

18.2 SUMMARY OF MITIGATION MEASURES

This Chapter summarises mitigation measures proposed elsewhere in the EIAR. Chapters 5 to 17 of the EIAR outline the findings of the assessment of the predicted effects of the

Project on a topic-by-topic basis. The significance of these effects have been assessed using criteria defined in the topic chapters. In the context of The EPA Guidelines (2022), the significance of effects is categorised from imperceptible through to not significant, significant and profound with varying sub-categories.

18.2.1 Embedded Mitigation

Embedded mitigation includes design changes that were made to reduce or eliminate adverse effects, as well as normal good practice measures; these have avoided the majority of potentially significant effects. **Appendix 18.1** summarises mitigation measures for all technical assessment chapters.

The process of applying the embedded mitigation is set out in **Chapter 2: Project Description**. The key design aspects comprising embedded mitigation include:

- Avoiding inconsistent turbine spacing, outliers and excessive turbine overlapping to minimise visual confusion and ensure a balanced/compact array of key views;
- Achieving an appropriate scale of turbine, taking account of the landscape context;
- Upgrading existing tracks to be used as Site Access Roads at the Site;
- Respecting and understanding the ground conditions and topography of the Site; including avoiding effects on active peat where possible;
- Maximising the separation from residential dwellings, and
- Respecting other environmental constraints and associated buffer separations.

18.2.2 Specific Mitigation Measures

In addition to mitigation proposed to address significant adverse effects (**Appendix 18.1**), certain chapters have also proposed further measures to reduce effects that were assessed as 'Not Significant' before mitigation.

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. An outline of potential interactions between chapters/topics is presented in **Table 18.1**.

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

	Population & Human Health		Biodiversity		Ornithology		Soils & Geology		Hydrology and Hydrogeology		Noise and Vibration		Landscape & Visual Amenity		Material Assets and Other Issues		Cultural Heritage		Traffic & Transportation		Air and Climate		Shadow Flicker		Major Accidents and Natural Disasters	
	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																										
Biodiversity																										
Ornithology																										
Soils & Geology																										
Hydrology and Hydrogeology																										
Noise & Vibration																										
Landscape & Visual Amenity																										
Material Assets																										
Archaeology and Cultural Heritage																										
Traffic & Transportation																										
Air and Climate																										
Shadow Flicker																										
Major Accidents & Natural Disasters																										

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

Interaction or inter-relationship

No interaction or inter-relationship

Table 18.2: Interactions & Inter-relationships between Environmental Aspects of the Project

Interaction	Description
Population and Human Health & Hydrology and Hydrogeology	Impacts could be observed through flood risk polluting waters supply and also recreational fisheries; **Chapter 9: Hydrology and Hydrogeology** considers these aspects and concludes that there are there are no impacts.
Population and Human Health & Noise and Vibration	The noise assessment inherently covers any interaction as the methodology used and limits applied are designed to protect health and amenity.
Population and Human Health & Landscape and Visual	The construction phase of the Project will see a temporary introduction of machinery and the erection of eight turbines into a natural but already modified landscape. **Chapter 11: Landscape and Visual Amenity** assessed the landscape effects, the visual effects and the cumulative effects of the Project, including assessment from recreational scenic viewpoints, and was also informed by the findings of the Assessment. The interactions between the environmental aspects were carefully considered in the EIAR, particularly in the design of the turbine layout. Detailed zone of theoretical visibility maps (ZTVs), route screening analysis and photomontages were prepared to assess the level of impact. Based on the findings of the collective assessments it is considered that the Project will not give rise to any significant effects, either singly or in combination. Tourists to Ireland have become accustomed to the vision of turbines on the landscape and given the scenario where more windfarms will be built in Ireland in the future, the most widely held view is that this will not impact their likelihood to visit the area again.
Population and Human Health & Material Assets: 1. Air Navigation	1. Operating windfarms have the potential to cause a variety of adverse effects on aviation. Rotating wind turbine blades may have an impact on certain aviation operations, particularly those involving radar. The physical height of turbines can cause obstruction to aviation and the overall performance of communications, navigation and surveillance equipment. All

Interaction	Description
2. Telecommunications 3. Socio-economic	structures over 150 m in height are required to have lighting to warn aviation traffic. No significant impacts are predicted in terms of human beings and air navigation. In adherence to IAA Safety Regulations and ICAO Annex 15, aeronautical obstacle warning light schemes will be installed as requested by IAA, co-ordinates of ground and tip height elevations at each wind turbine location. 2. No telecommunication links were identified during the scoping and consultation exercise of the Project. 3. There is no potential for interference with the links from other windfarms in combination with the Project. No significant impacts are predicted on telecommunications or radio reception as a result of the Project. 4. The Project will provide opportunities for local suppliers to be engaged in the construction phase. This will be a minor beneficial impact. The developer will seek to secure positive benefits for the local/regional economy by encouraging the use of local labour, manufacture and suppliers where possible. They will hold 'Meet the Developer' days prior to construction to allow local contractors to engage with the process and maximise opportunities.
Population and Human Health & Air and Climate	Impacts on air quality during the construction and decommissioning phase may occur due to dust emissions from construction activities onsite and through increased traffic and associated exhaust emissions from construction traffic. These interactions have been considered as part of the EIAR (in **Chapter 15: Air and Climate** and in **Chapter 14: Traffic and Transport**), without significant effects being predicted and suitable mitigation measures provided to further reduce potential impacts. During the operational phase, the energy generated by the Project will offset energy and the associated emission of greenhouse gases from electricity-generating stations dependent on fossil fuels, thereby having a net positive effect on climate. In doing so, there will likely be reduced effects from climate change on human beings. The cumulative effect of the Project with other Irish renewable generation is considered to be a

Interaction	Description
	fundamental change in the climate effects of Ireland's energy supply, which is a **major, positive effect,** that is **Significant** (beneficial) under the EIA Regulations and will contribute to Ireland's binding emission reduction targets.
Population and Human Health & Cultural Heritage	Damaging a cultural asset could affect tourism; this has been considered in **Chapter 13: Cultural Heritage** and will not to be an issue.
Population and Human Health & Traffic and Transport	The construction and decommissioning phase will give rise to traffic movements of abnormal loads and is likely to create some short-term inconvenience for road users. A **Traffic Management Plan** (TMP) will be in place and minimise disruption insofar as possible. Suitable mitigation measures to reduce dust emissions have been outlined in **Chapter 14: Traffic and Transport.**
Population and Human Health & Shadow Flicker	The shadow flicker assessment identified sensitive receptors in the local area within a Study Area extending to a distance of 2 km, with an additional 6 no. receptors located beyond the 2 km radius also included, as outlined in Section 16.2.1. In total, 73 no. receptors were identified within the shadow flicker Study Area. The assessment identified no significant effects, as shadow flicker is unlikely to cause a nuisance to nearby inhabited dwellings. It is also noted that a turbine shut-down function is available, should mitigation be required. The potential effects of the Project from shadow flicker are considered to be **Not Significant**.
Population and Human Health & Major Accidents and Natural Disasters	A wind farm is not a recognised source of chemical pollution. Should a major accident or natural disaster occur, the potential sources of pollution onsite during both the construction and operational phases are limited. There is limited potential for significant natural disasters to occur at the Site. Ireland is a geologically stable country with a mild temperate

Interaction	Description
	climate. The potential natural disasters that may occur are therefore limited to flooding and fire. An Emergency Response Plan has been prepared and can be found in **Appendix 2.1: Construction Environmental Management Plan, Management Plan 1**.
Biodiversity & Ornithology	All interactions for any habitat or species including those associated with Special Protection Areas (SPA) or Special Areas of Conservation (SAC) are considered in the Natura Impact Statement and not considered further here.
Biodiversity & Hydrology and Hydrogeology	Potential for the discharge of pollutants such as sediment or hydrocarbons downstream to the Bandon River SAC and pNHA which could affect qualifying habitat and species. With the full implementation of mitigation measures the residual impact will have no adverse effects.
Biodiversity & Soils and Geology	Potential effects on biodiversity during the construction and decommissioning phase include disturbance to birds and mammals from loss / changes to habitat. Restoration will be undertaken in line with the **Habitat Management Plan** (**Appendix 6.5**).
Biodiversity & Major Accidents & Natural Disasters	Potential impacts on biodiversity during the construction and decommissioning phase could include disturbance to birds and mammals from loss / changes in habitat. The Project has been designed in accordance with the best practice measures described in detail in this EIAR and, as such, mitigation against the risk of major accidents and/or disasters is embedded through the design.
Ornithology & Noise	The ornithology assessment considers general disturbance to sensitive bird species, including that caused by the sources likely to occur during the construction and decommissioning of the Project. The potential effects on birds from noise will not be significant and temporary in nature.

Interaction	Description
Ornithology & Major Accidents and Natural Disasters	Potential impacts on biodiversity during the construction and decommissioning phase could include disturbance to birds from loss/ changes in habitat. The Project has been designed in accordance with the best practice measures described in detail in this EIAR and, as such, mitigation against the risk of major accidents and/or disasters is embedded through the design to ensure no such impacts will occur.
Soils and Geology & Hydrology and Hydrogeology & Landscape and Visual	The hydrogeological balance of the Site could be impacted by the amount of earth materials excavated. Adopting good practices, planning ahead and real time monitoring in more sensitive (>1 m peat depth) areas will ensure that any excavations associated with the Project will have minimal impact. These interactions have been considered as part of the EIAR, with suitable mitigation measures provided to minimise potential impacts. Application of the mitigation measures will reduce the risk of stability issues and impacts on hydrology and hydrogeology arising at a localised scale.
Soils and Geology & Landscape and Visual & Major Accidents and Natural Disasters	The unavoidable residual impacts on the soils and geology environment as a function of the Project is that there will be a change in ground conditions at the Site with the replacement of natural materials such as peat, subsoil and bedrock by concrete, subgrade and surfacing materials. Stability issues and slope failure arising from vehicular movement could cause significant local or at worst-case scenario landslide issues. Where suitable mitigation measures are applied and proper precautions and planning are executed effectively, the risk of such potential impacts will be significantly reduced and considered avoidable.
Soils and Geology, Landscape and Visual & Archaeology and Cultural Heritage	The construction and decommissioning phase pertaining to the Project will involve significant ground reduction and topsoil removal throughout the design layout footprint. No archaeological sites are located on the footprint of any proposed construction areas. There is a possibility of encountering unrecorded archaeological finds/features throughout these areas, during the

Interaction	Description
	construction and decommissioning phase and increasing the area of disturbed soil. If any sub-surface archaeological features are identified during archaeological monitoring they will be securely cordoned off, cleaned and recorded *in situ*. The National Monuments Service will then be notified and consulted to determine further appropriate mitigation measures, which may include preservation *in situ* (by avoidance) or preservation by record (archaeological excavation). These interactions were considered in the EIAR, both in the design of turbine layout and in the design of mitigation measures. Monitoring, including a watching brief in undisturbed portions of the footprint will be carried out. All records will be preserved where found. The operational phase will result in a range of indirect negative impacts of a visual nature on the wider setting of a number of recorded archaeological sites within the study area and the surrounding landscape which will range from not significant to moderate in significance.
Soil and Geology & Major Accidents and Natural Disasters	The Project has been designed in accordance with the best practice measures described in detail in this EIAR and, as such, mitigation against the risk of major accidents and/or disasters is embedded through the design. The Project has been designed in accordance with the best practice measures described in detail in this EIAR and, as such, mitigation against the risk of major accidents and/or disasters is embedded through the design.
Hydrology & Biodiversity	There is a potential for Fisheries to be impacted by a disturbance or contamination of watercourses during the construction period if the stated mitigation measures are not adhered to. However, the mitigation measures to protect watercourses outlined in **Chapter 6: Biodiversity**, **Chapter 8:Soils and Geology** and **Chapter 9: Hydrology and Hydrogeology** will be strictly adhered to which includes monitoring of Site water run-off during all phases of the Project.

Interaction	Description
Hydrology and Hydrogeology & Major Accidents & Natural Disasters	The Project will use the latest best practice guidance to ensure that flood risk within or downstream of the Site is not increased as a consequence of the Project, i.e., a neutral impact at a minimum. The risk of the wind farm contributing to downstream flooding is very low, as the long-term plan for the site is to retain and slow down drainage water prior to release. Robust drainage measures on the site will include swales, silt traps, check dams, settlement ponds and buffered outfalls. This has been addressed **in Chapter 9: Hydrology and Hydrogeology.**
Noise and Vibration & Traffic and Transportation	Traffic and Transportation will create noise onsite and along the Site Access Roads. Site contractors will be required to employ the best practicable means of reducing noise emissions from plant, machinery and activities, as advocated in BS 5228 and in Chapter 14: Traffic and Transport. Such potential effects are considered to be not significant.
Noise and Vibration & Major Accidents and Natural Disasters	Alarms (e.g., for security, fire) will be sounded in cases of emergency. The maintenance of these alarms is essential and any faulty alarm causing nuisance alerts will be replaced accordingly. Incidents such as explosions in the substation buildings will have a noise impact. However, proper maintenance and operation will make this risk unlikely.
Landscape and Visual & Material Assets	The Irish Aviation Authority (IAA) has outlined criteria regarding tall structures and the installation of an aeronautical obstacle warning light scheme for the Project. This has been addressed in **Chapter 1: Material Assets and Other Issues**.
Material Assets & Major Accidents and Natural Disasters	The Project is not connected to or in the vicinity of any site regulated under the Control of Major Accident Hazards Involving Dangerous Substances Regulations (SEVESO sites), therefore no significant effects associated with major industrial accidents involving dangerous substances are anticipated. Any technical fault at the Project would not impact the local or national energy supply. The extremely low frequency (ELF) electric and magnetic fields (EMF) associated with the operation of the proposed cables fully comply with

Interaction	Description
	the international guidelines for ELF-EMF set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), a formal advisory agency to the World Health Organisation, as well as the EU guidelines for human exposure to EMF. Accordingly, there will be no operational impact on properties (residential or other uses), construction staff, operational & maintenance staff or recreational users of the site as the ICNIRP guidelines will not be exceeded at any distances even directly above the cables.
Traffic and Transport & Biodiversity: Fisheries	During the construction phase, increased traffic could lead to increased sedimentation/pollution of watercourses as moving vehicles disrupt soil and emit pollutants. The interactions between these aspects were considered in the EIAR and mitigation has been embedded in the design of the Project. This assessment has identified no potentially significant residual effects on Fisheries from Traffic & Transportation from the Project.
Traffic and Transport & Major Accidents & Natural Disasters	The Project will utilise the existing road network during the construction phase. Construction related traffic will originate from the delivery of materials to site, removal of surplus excavated material from site and transport of employees to, from and throughout the Site. The localised traffic disruptions will be mitigated through the use of industry standard traffic management measures. Please see **Chapter 14: Traffic and Transport** and **Appendix 2.1** for details.

GORTLOUGHRA WIND FARM LIMITED

GORTLOUGHRA WIND FARM

CO. CORK

VOLUME I

NON-TECHNICAL SUMMARY (NTS)

August 2026

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DOCUMENT APPROVAL

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	Prepared by	Reviewed / Approved by
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GORTLOUGHRA WIND FARM LIMITED

GORTLOUGHRA WIND FARM, CO. CORK

VOLUME I NON-TECHNICAL SUMMARY REPORT

CONTENTS

1 NTS 1 INTRODUCTION

This Non-Technical Summary (NTS) summarises the Environmental Impact Assessment Report (EIAR) which accompanies the application for planning permission for Gortloughra Wind Farm, which is situated in the townlands of an tSeithe Bheag (Shehy Beg) (Muscraí Gaeltacht), Gortloughra, Cloghboola and Inchinroe, Co. Cork. The Site is located 9.7 km north-west of Dunmanway, Co. Cork and 19 km south-east of the county boundary between Cork and Kerry. The Site is located on relatively high ground, at elevations ranging from 243 m AOD on the northern side of the Site at the entrance 326 m, to 510 m AOD towards the middle of the Site and 306 m AOD on the southern side of the Site. The location of the Proposed Development is shown in **Figure NTS-1**.

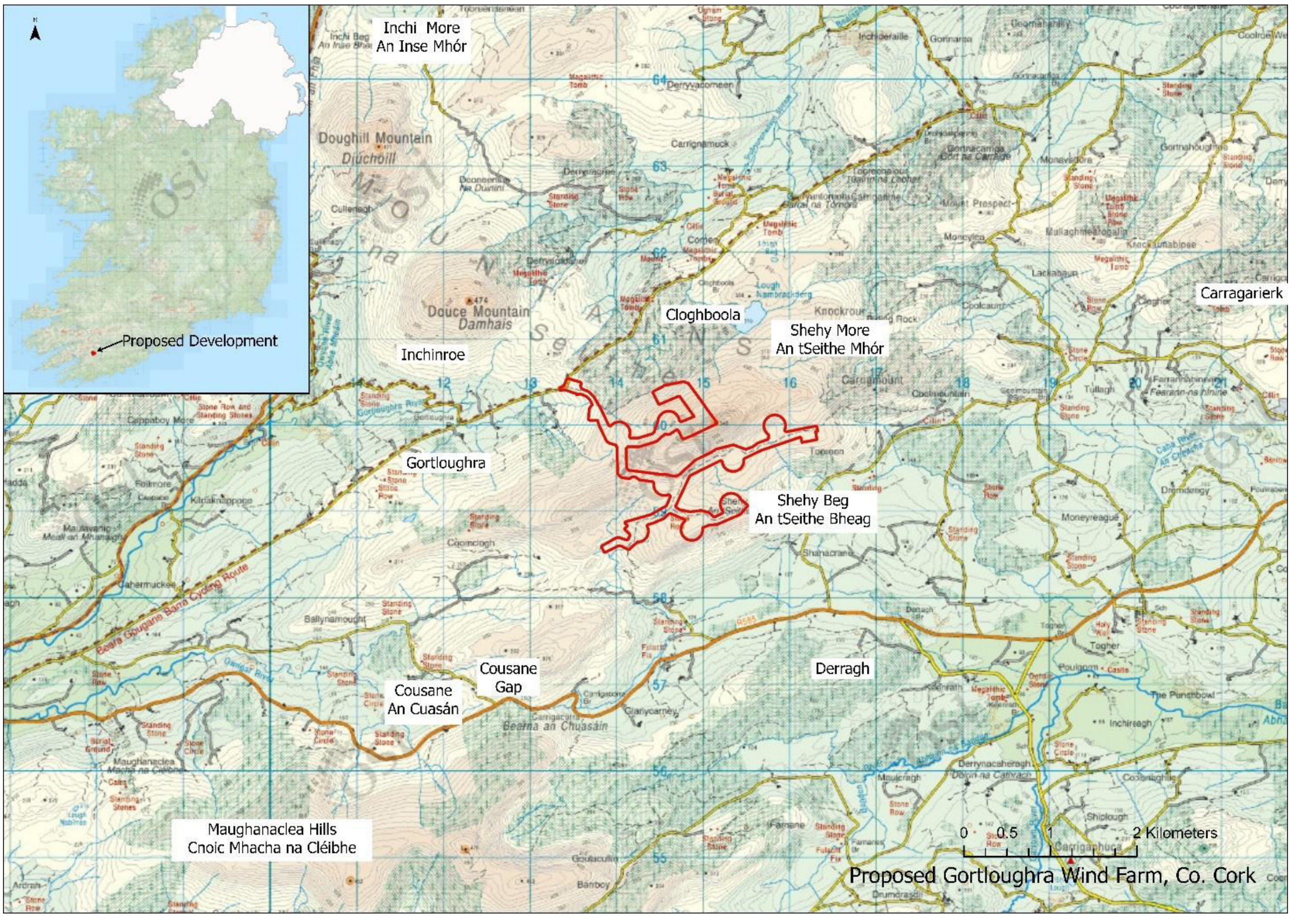

Figure NTS-1: Site Location

1.1 The Applicant

The Developer – Gortloughra Wind Farm Limited, is a subsidiary of Statkraft Ireland Ltd. Statkraft is a leading company in hydropower internationally and Europe's largest generator of renewable energy. The Group produces hydropower, wind power, solar power, gas-fired power and supplies district heating. Statkraft is a global company in energy market operations. Statkraft has more than 6,000 employees in over 20 countries.

1.2 The Project to be Assessed

Planning Permission is being sought by the Developer for the construction of eight wind turbines, permanent Met Mast and all ancillary works.

The Proposed Development will comprise of the following main components:

- Erection of eight wind turbines with an overall ground to blade tip height of 175 m consisting of a rotor diameter of 150 m; and a hub height of 100 m.
- Construction of permanent Turbine Hardstands and Turbine Foundations.
- Construction of one Temporary Construction Compound with associated temporary site offices, parking areas and security fencing.
- Installation of a Meteorological Mast with a height of 100 m.
- Development of one on-site borrow pit.
- Construction of new permanent internal site access tracks and upgrade of existing internal site access tracks to include passing bays and all associated drainage infrastructure.
- Development of a permanent internal site drainage network and sediment control systems.
- All associated underground electrical power and communications cabling connecting the wind turbines to the on-site substation.
- Biodiversity enhancement measures.
- Recreational community improvements including the erection of 4 No. permanent information boards relating to cultural heritage and upgrades to amenity tracks across the site.
- All associated site development works.

A 10-year planning permission and 40-year operational life from the date of commissioning of the entire wind farm is being sought.

This EIAR also assesses the construction of an on-site 110 kV substation and 2 no. GCR options along public roads:

- Option A: Dunmanway 110 kV substation; or
- Option B: Carrigdangan 110 kV substation.

While not part of the planning consent for this planning application, this EIA also assesses the works at 18 No. locations along the TDR from Port of Cork to Site and the underground

Grid Connection Route options from the Site to either the Dunmanway or Carrigdangan 110 kV Substations.

The 2006 Wind Energy Development Guidelines state that "*Planning Authorities may grant permission for a duration longer than 5 years if it is considered appropriate, for example, to ensure that the permission does not expire before a grid connection is granted*." It is, however, the responsibility of the applicants to request such longer durations in appropriate circumstances. This text is also repeated in the 2019 Draft Wind Energy Development Guidelines (2019) which have not yet been enforced. A 10-year planning permission and 40-year operational life from the date of commissioning of the entire wind farm is being sought.

The Proposed Development refers to all elements of the Gortloughra Wind Farm for which development consent is sought, the details of which are set out within **EIAR Chapter 2: Project Description**. These elements include the wind turbines site access tracks, Turbine Hardstands, Met Mast, Wind Farm Internal Cabling, borrow pit and Temporary Construction Compound. The entire Proposed Development is located within the county of Cork and will have an installed capacity of 48 MW.

The 'Site' refers to all land that falls within the Proposed Gortloughra Wind Farm Site Boundary identified in **Figure NTS-2**.

The 'Project' refers to the development works within the Redline Boundary in addition to the works on the Grid Connection Route Options, the Onsite Substation and Control Building; and lands along the Turbine Delivery Route which are outside the redline and landholding boundary.

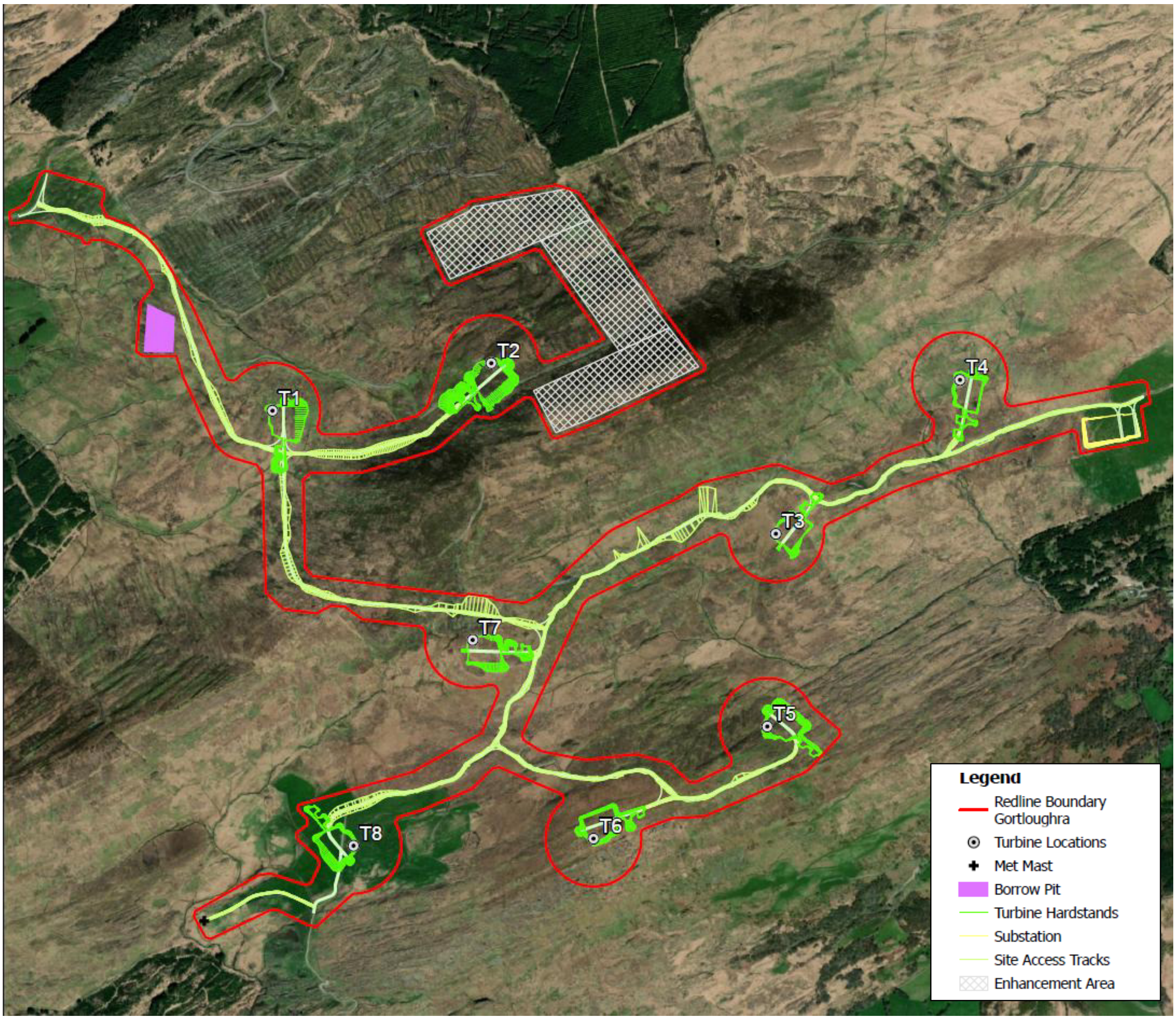

Figure NTS-2: Site Layout

The 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 Environmental Impact Assessment Report (Volume II)
- Supporting Figures (Volume III)
- Supporting Technical Appendices (Volume IV)

These documents inform readers of the nature of the Project, likely environmental effects and measures proposed to protect the environment during the construction, operational and decommissioning phases of the Project.

2 NTS 2 ENVIRONMENTAL IMPACT ASSESSMENT

An 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. Windfarms of the scale of the Proposed Development legally require an EIA to be carried out[1].

This 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 EIAR

2.1 Scoping

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 in September 2021 with a detailed Scoping Report being issued to consultees. Updates were issued in June 2023 and April 2024 to inform the consultees of updates to the Project. The requests were accompanied by a Description of the Project, a Site Location Map, an Overall Masterplan Drawing and a Scoping Letter. Scoping Opinions received are included as **EIAR Appendix 1.3** of **Volume IV**. This includes agreement on excluding from the EIAR, assessment of effects on certain receptors or features and where it was agreed there was no potential for significant effects.

2.2 Public Consultation

A multistage approach was given to public consultation (**EIAR Appendix 1.2**) comprising webinars, in person events, newspaper advertising, door to door public engagement and brochures / leaflet distributions. Ample opportunity was given for questions and queries in an accessible way.

[1] Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment

Public consultation for the Gortloughra Wind Farm comprised of two phases, the first conducted by EMPower, the former Developer of the Project, beginning in May 2021 and concluding in January 2024 when the Project was acquired by Statkraft. The second phase was conducted by the Statkraft Community Engagement Team from January 2024 - Present. The Statkraft Community Engagement team will continue to be contactable by the local community throughout the lifetime of the Project.

Public consultation was generally supportive of the Project with the main concerns raised during consultation being the Project's impact on visuals, water quality and biodiversity.

Environmental effects have been assessed throughout 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 has considered 'cumulative effects'. These are effects that result from cumulative changes caused by past, present or reasonably foreseeable actions together with the Proposed Development. A list of projects that were assessed for cumulative effects are included in **EIAR Appendix 2.4**.

3 NTS 3 PROPOSAL FOR THE GORTLOUGHRA WIND FARM

3.1 Wind Turbine Generator

The eight turbines will have a height from base to tip of 175 m consisting of a rotor diameter of 150 m and a hub height of 100 m. The turbines will be of a typical modern, three blade, horizontal axis design, light grey in colour and the finish of the tower and blades will be semi-gloss and semi-matt respectively.

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 final choice of turbine model is unknown at this stage, but the identified candidate turbine model used for assessments at this stage is a Vestas V150 for the purposes of EIA and planning approval. This reflects a machine that would have the worst-case environmental effects, i.e. tallest/loudest (for that model)/longest blades etc. This precautionary approach provides that the effects are likely only to be as predicted or less.

Each turbine will have a generator with a maximum capacity of 6 MW giving an overall capacity of the wind farm of 48 MW. 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

3.2 Access to the Proposed Development

The Proposed Development will be accessed via the existing site access track which adjoins the Site to the L8544. Where possible, the existing site access track will be kept, utilised and upgraded as necessary to access the proposed turbine locations. The existing site access track will connect to the proposed new site access tracks, which will be retained throughout the operational life of the Proposed Development to enable maintenance of the turbines and replacement of any turbine components.

It is currently proposed that the turbine nacelles, tower hubs and rotor blades will be landed at the Port of Cork. From there, they will be transported to the Site via the N28, N40, N22, R585, R587 and the L8544 to the upgraded site entrance. The proposed turbine component delivery route is shown in **Figure NTS-3**. The final delivery route for the turbines will be confirmed by the turbine supplier and subject to their detailed route assessments. The potential effects of transporting them and other materials is set out in section **NTS-14** and **EIAR Chapter 14: Traffic and Transport** of the EIAR. Works will be required at 18 no. locations along the haul route but will involve minor works such as temporary, surface level civil works to create load bearing surfaces.

Figure NTS-3: Proposed Turbine Delivery Route

3.3 Grid Connection

Connection will be sought from the grid system operators by a separate application to ESB Networks Limited. TLI assessed possible connection options for the Proposed Development. The Onsite Substation and Control Building will connect via underground 110 kV cable to either the Dunmanway (Option A) or Carrigdangan (Option B) ESB 110 kV substations. The overall length of Option A GCR between the Onsite Substation and Control Building and the existing Dunmanway 110 kV substation is approximately 28 km, of which, approximately 3.98 km is within the Site with the remainder located along the L8776 and the R587. The overall length of Option B between the substation and the existing Carrigdangan 110 kV substation is approximately 22 km, of which, approximately 3.98 km is within the Site with the remainder located along the L8776 and the L4607. The grid connection can be summarised as follows:

- **Option A - Underground Grid Connection to Dunmanway 110kV Substation** utilising sections of UGC in public road, primarily regional roads, and private lands. [28 km]
- **Option B - Underground Grid Connection to Carrigdangan 110kV Substation** utilising sections of UGC in public road, primarily regional roads, and private lands. [22 km]

The Grid Connection Route options can be seen in **Figure NTS-4**.

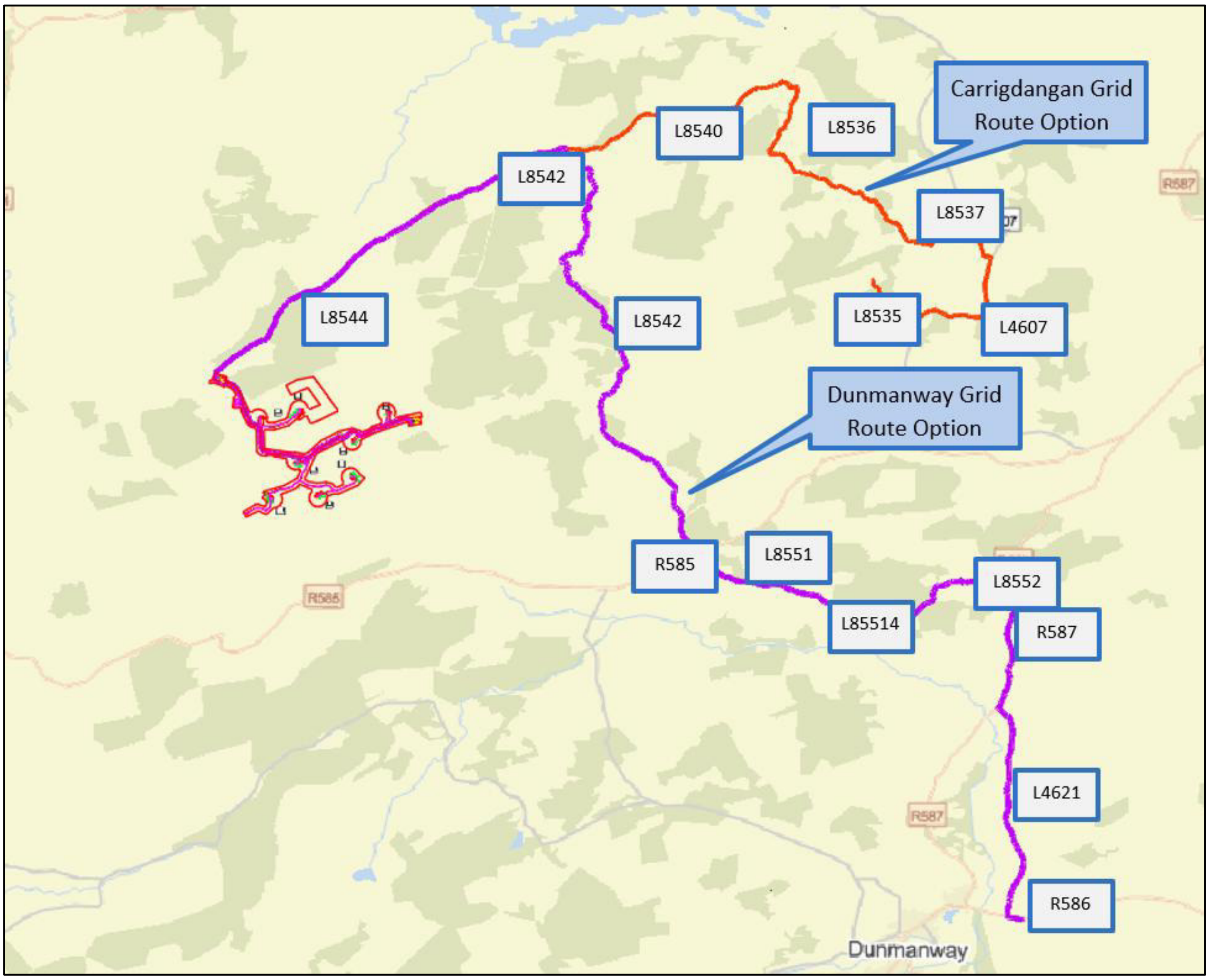

Figure NTS-4: Grid Connection Route Options

3.4 Construction Phase

The construction phase of the Project will take approximately 16-18 months in total. Working hours for construction activity will be from 07:00 to 19:00 throughout the week, with reduced working hours at weekends.

The turbines will be located across a wide area of hillside, however the land taken by the turbines and other infrastructure is a very small proportion of this, and efforts have been made to use existing infrastructure rather than using new land, thereby reducing the amount of new land take required for the Proposed Development. The Site extends to 117.21 ha. The lands are under the ownership of third parties and the principal land use in the general area is comprised of agricultural sheep grazing, farmland and open mountain heath.

The area designated for enhancement extends to 20 ha.

The applicant 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.

3.5 Site Restoration

A Habitat Management Plan, included as **EIAR Appendix 6.4** has been prepared to mitigate for the ecological effect of habitat loss as a result of the Project. The plan sets out measures for peat management and restoration. Site restoration will involve the restoration of site access track and Turbine Hardstand verges and the temporary decommissioning and construction compound to provide a natural ground profile. Restoration will be undertaken at the earliest opportunity to minimise storage of turf and other materials.

Figure NTS-2 shows the areas designated for habitat enhancement.

3.6 Operational Phase

The operational lifespan for the Proposed Development is 40-years. During the operational phase, turbine and infrastructure maintenance will be ongoing and regular. This is expected to continue to employ approximately 1 or 2 people on a permanent basis for regular operational and maintenance activities.

4 NTS 4 SITE SELECTION AND DESIGN

The layout design has evolved through a series of iterations, to avoid or minimise potential effects, including effects on views, hydrology, peat, ecology and fisheries, ornithology and noise. Technical criteria such as wind speed, prevailing wind direction, existing infrastructure, topography and ground conditions were considered during the design process, in response to guidance documents, survey findings and responses from consultees. Overall, it is considered that the proposal represents an optimum fit within the technical and environmental parameters of the Project.

5 NTS 5 LEGAL AND POLICY FRAMEWORK

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

Moreover, the EU Habitats[2] and Birds[3] Directives were considered for ensuring the highest standards for the protection of the Irish biodiversity.

The Climate Action Plan 2024 sets out ambitious and legally binding targets for Ireland. The goal is that Ireland will achieve net-zero greenhouse gas emissions no later than 2050 and a reduction of 51% by 2030. The Proposed Development will contribute towards meeting those targets also by following instructions provided by the draft 2019 Wind Energy Guidelines.

The Proposed Development will contribute to the generation of renewable energy in Ireland, fulfilling the requirement set by international policies, National Planning Policy, Regional Planning Policy and the Cork Development Plan policies and objectives.

[2] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora
[3] DIRECTIVE 2009/147/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 November 2009 on the conservation of wild birds

6 NTS 6 POPULATION AND HUMAN HEALTH

A desk-based collection of data and consultation with local stakeholders was carried out to identify the potential effects of the construction, operational and decommissioning phases of the Project. Population, settlement patterns, economic activity, employment, land use and topography, tourism, human health and property value are assessed in **EIAR Chapter 5: Population and Human Health**. Four geographical Study Areas were outlined for this assessment, namely, the area of

- Study Area 1: the Project and Environs (Electoral Divisions (EDs) Bealanageary, Douce and Garrown (153 km^2));
- Study Area 2: Cork County (7,316 km^2),
- Study Area 3: Southwest Region (12,120 km^2); and
- Study Area 4: Ireland (70,273 km^2).

In terms of population, the impact of the construction and decommissioning phases on Study Area 1 is predicted to be slight positive and short-term in nature should workers relocate to the area. The potential effects on population during the operational phase will be imperceptible. The potential effects on population during the construction, operational and decommissioning phases on the remaining Study Areas will also be imperceptible.

The potential effects on settlement patterns on Study Area 1 is predicted to be slight positive where increased local business is attracted to the area during the construction, operational and decommissioning phases. The potential effects on settlement patterns on the remaining study areas will be imperceptible.

Employees involved in the construction of the Project will most likely use local shops, restaurants and hotels/accommodation. Therefore, there will be a slight, positive impact on employment and economic activity in the Region during the construction and decommissioning phases. There will be imperceptible effects during the operational phases in all Study Areas.

The majority of the Site is agricultural sheep grazing, farmland and open mountain heath and is in the ownership of private third-party landowners. It is not expected that there will be any significant impacts associated with the Proposed Development during the construction, operational or decommissioning phases of the Project. There will be no significant effects in study areas 2 to 4 during construction, operational or decommissioning phases in relation to land-use and topography.

Based on the findings of the collective assessments in **EIAR Chapter 5: Population and Human Health** (Section 5.3.5 and 5.4.5), it was considered that the Project will not give rise to any significant effects. Overall effects of the Project with regards to tourism are considered to be, slight, negative during the construction, operational and decommissioning phases.

EIAR Chapter 5: Population and Human Health addresses electromagnetic fields, shadow flicker, noise, air quality, water contamination, traffic and accidents/disasters however, more detailed assessments are included in **EIAR Chapter 16: Shadow Flicker Analysis**; **EIAR Chapter 10: Noise**; **EIAR Chapter 15: Air Quality**; **EIAR Chapter 9: Hydrology and Hydrogeology**; **EIAR Chapter 14: Traffic and Transport**; **EIAR Chapter 17: Major Accidents and Natural Disasters**. These chapters conclude that the effects on human health, once mitigation measures are implemented, is not significant.

The operation of a wind farm at the Site would not significantly impact on property values in the area. The Proposed Development will have a long-term imperceptible impact on property values in Study Area 1 and will have no impact in the surrounding Study Areas.

7 NTS 7 BIODIVERSITY

A desktop assessment was carried out to collate available information on the ecological baseline of the proposed land-holding and surrounding area. Consultation was undertaken with current landowners as well as relevant statutory and non-statutory agencies. In addition to the above the following research was also undertaken:

- A review of the National Biodiversity Database Centre (NBDC) to identify the presence or otherwise of protected species occurring within close proximity to the proposed Site;
- A review of the NPWS online database to identify the presence or otherwise of designated conservation areas (i.e. SPAs, SACs, NHAs etc.);
- A review of Site-specific Conservation Objectives (SSCO) mapping, published by the NPWS, for SACs and SPAs;
- A review of EPA water quality data, on-line mapping and catchment information;
- A review of relevant Inland Fisheries Ireland (IFI) reports;
- A review of the online Bat Conservation Ireland Batlas;
- A review of the New Atlas of the British and Irish Flora (Preston et al., 2002);
- Review of aerial photography, satellite imagery and historical mapping for the proposed Site.

A Natura Impact Statement has been prepared for the Proposed Development (DEC, 2025) and accompanies this planning application. The NIS assesses if the integrity of European Sites will be adversely affected.

The European Sites occurring in the wider area surrounding the Site are listed in **NTS-Table 7.1**. Those European Sites that are hydrologically connected to the Site include the Bandon River Special Area of Conservation (SAC). There is a tenuous connection between the Proposed Development and The Gearagh SAC, owing to the location of the Turbine Delivery Route (TDR) widening locations and Grid Connection Route Option B being located within the Lee catchment. It is noted that a section of the Site falls into the Lee catchment, however no watercourses occur in the vicinity of this section of the Site and there are no hydrological pathways connecting the Site to watercourses of this catchment. The TDR widening locations and Grid Connection Route Option B are located at a remote distance upstream of the The Gearagh SAC, approximately 12 km, and is separated from this SAC by Lough Allua. Lough Allua, which is located downstream of the TDR widening locations and the proposed Grid Connection Route Option B is listed as a proposed Natural Heritage Area (pNHA), Lough Allua pNHA (Site Code: 001065).

NTS-Table 7.1: European Sites within the vicinity of the Project

SITE CODE	SITE_NAME	Distance	Nearest element of project	In/Out Further Examination
surface water catchment pathway				
2189	Farranamanagh Lough SAC	36km	wind farm	Out - no pathway
106	St. Gobnet's Wood SAC	11.3	haul route	Out - no pathway
		17.1	wind farm	
1371	Mucksna Wood SAC	24	wind farm	Out - no pathway
2280	Dunbeacon Shingle SAC	28	wind farm	Out - no pathway
2281	Reen Point Shingle SAC	31	wind farm	Out - no pathway
109	Three Castle Head to Mizen Head SAC	50	wind farm	Out - no pathway
1040	Barley Cove to Ballyrisode Point SAC	41	wind farm	Out - no pathway
1890	Mullaghanish Bog SAC	16	haul route	Out - no pathway
		22	wind farm	
90	Glengarriff Harbour and Woodland SAC	19	wind farm	Out - no pathway
108	The Gearagh SAC	6	haul route	Out - no pathway
		15	wind farm	
1043	Cleanderry Wood SAC	46	wind farm	Out - no pathway
1873	Derryclogher (Knockboy) Bog SAC	9	wind farm	Out - no pathway
1879	Glanmore Bog SAC	39	wind farm	Out - no pathway
1881	Maulagowna Bog SAC	25	wind farm	Out - no pathway
93	Caha Mountains SAC	21	wind farm	Out - no pathway
102	Sheep's Head SAC	29	wind farm	Out - no pathway
2171	Bandon River SAC	0	grid route	In - hydrological pathway; disturbance pathway
		8	wind farm	
1342	Cloonee and Inchiquin Loughs, Uragh Wood SAC	27	wind farm	Out - no pathway
2158	Kenmare River SAC	24	wind farm	Out - no pathway
SPAs				
surface water catchment pathway				
4109	The Gearagh SPA	8	haul route	Out - no special conservation interest species recorded
		17	wind farm	
4155	Beara Peninsula SPA	45	wind farm	Out - outside foraging range
4156	Sheep's Head to Toe Head SPA	39	wind farm	Out - outside foraging range
4162	Mullaghanish to Musheramore Mountains SPA	11	haul route	Out - outside foraging range
		18	wind farm	
4030	Cork Harbour SPA			in - Lesser Black-backed Gull foraging range
Foraging Range pathway				
4175	Deenish Island and Scariff Island SPA	66	wind farm	in - Lesser Black-backed Gull foraging range

SITE CODE	SITE_NAME	Distance	Nearest element of project	In/Out Further Examination
4030	Cork Harbour SPA	37	haul route	in - Lesser Black-backed Gull foraging range

Existing Ecological Baseline

The habitats identified as occurring within the Site and TDR are listed in **NTS-Table 7.2** and **NTS-Table 7.3**.

NTS-Table7.2: Primary Associated EU Annex I Habitat Types

Annex I Code	Annex I Short Name in this report	Corresponding Level 3 Fossitt Habitat	Annex I Full Title Interpretations of these Annex I habitats in a European context are available from European Commission 2013 (EUR28).
			EU Annex I habitats marked by an asterisk (*) are deemed to be priority habitats that are in danger of disappearing within the EU territory.
4030	Dry heath	Dry heath HH1	European dry heath
Annex 1 habitat Adjacent to the proposed development site			
4010	Wet heath	Wet heath HH3	North Atlantic Wet heath with Erica Tetralix
4060	Alpine and Sub-Alpine heath	Montane heath HH4	Alpine and Boreal heaths
8220	Siliceous Rocky Slopes	Siliceous rocky slopes with chasmophytic vegetation	Exposed siliceous rock

NTS-Table7.3: Primary Fossitt 2000 Habitat Communities recorded at the Site during surveys

Fossitt 2000 Code (s)	Name of Fossitt 2000 Habitat Communities	Brief Description* *The brief descriptions below, are based on the Site Habitat Surveys – refer to the Guide for Habitats in Ireland (Fossitt, 2000) for further information regarding these Habitat Classifications.
FW1	Eroding Watercourse	Eroding watercourses occur at the widening locations: • 12C (the Gortnalour Stream, EPA Code: 19G20); • 17A (the Lagneeve, EPA Code: 19GL08 • 18B (the Gortnarea Stream, EPA Code: 19G22); and • 21 (un-named and un-coded stream). The watercourse crossed at each of these locations are located within the Lee [Cork]_SC_010 sub-catchment. Bridge widening will be required at the widening location

Fossitt 2000 Code (s)	**Name of Fossitt 2000 Habitat Communities**	**Brief Description*** ***The brief descriptions below, are based on the Site Habitat Surveys – refer to the Guide for Habitats in Ireland (Fossitt, 2000) for further information regarding these Habitat Classifications.**
		12C, at the existing crossing of the Gortnalour Stream, approximately 2.5 km upstream of this stream's confluence with the River Lee.
GA1	Improved agricultural grassland	Improved agricultural grassland dominates the land cover at the TDR widening locations 7; 22; 29; 28. These species include an abundance of *Lolium perenne, Holcus lanatus, Alopecurus pratensis, Ranunculus repens, R. acris, Trifolium repens, Trifolium pratense, Cirsium arvense, Cirsium vulgare* and *Urtica dioica*.
GS2	Dry meadows and grassy verges	This habitat consists of roadside verges with a range of commonly occurring grasses and forbs occurring. This habitat is present at the TDR widening locations 18B; 19; 20A; 21; 21A; 22
GS4	Wet grassland	Wet grassland occurring within and surrounding the proposed development site is characterised by species-poor stands of *Juncus effusus*. This habitat is present at TDR 14.
WL1	Hedgerows	The hedgerows occurring at the TDR locations are dominated by Crataegus mongyna and Salix species. Hedgerows occur at the TDR locations 7; 12C; 14; 17a; 29.
WS1	Scrub	The scrub habitat occurring at the TDR locations is dominated by Crataegus mongyna, Salix species, Rubus fruticosus agg. with Ilex aquifolium and Pteridium aquilinum also prevalent. Scrub occurs at the TDR locations 12C; 14; 17C; 17D; 20; 20A
HH3	Wet heath	Wet heath vegetation occurs along the roadside verge at TDR 20B. The vegetation at this location consists of Calluna vulgaris, Erica tetralix and Molinia caerulea. Ulex europeaus is also occurring.
HD1	Dense bracken	Dense bracken occurs at TDR 14; 19A and 20. The dense bracken habitat is dominated by dense mono-specific stands of Pteridium aquilinum.
BL3	Buildings and artificial surfaces	The land cover within the TDR widening locations 12C; 14; 17a; 20; 21; 21A and 22 is dominated by buildings and artificial surfaces.

The entire stretch of Grid Connection Route Option A and Option B from the Site to the existing ESB substations at Dunmanway and Carrigdangan will be located within the footprint of existing public road corridors.

Horizontal directional drilling will be used to cross watercourses along the route. There are 22 crossings on Option A and 18 on Option B. At these bespoke locations, the electrical cable ducts will be drilled underground below the watercourses. The launch and receptor pits required for the horizontal directional drilling will be positioned within the existing road corridor.

The habitat occurring along the cable route is entirely comprised of road surface which is representative of buildings and artificial surfaces (BL3).

NTS-Table 7.4: Summary Results of the Aquatic Surveys that were undertaken at the Site (WQ1-WQ4) on 13th September 2022

Water Quality Site	WQ1	WQ2	WQ3	WQ4	WQ5
River/Stream Name	Gortloughra Stream	Shanacrane East Stream	Shanacrane East Stream	Shehy Beg Stream	Shehy Beg Stream
River Sub-basin	Coomhola sub-catchment	Bandon SC 010 sub-catchment	Bandon SC 010 sub-catchment	Bandon SC 010 sub-catchment	Bandon SC 010 sub-catchment
River/Stream Order	1st Order	2nd Order	2nd Order	2nd Order	2nd Order
Margaritifera sensitive area	Yes	Yes	Yes	Yes	Yes
EPA code	21I15	20S11	20S11	20S15	20S15
EPA Q-Value	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
Q-Value	Q4 – 5	Q4 – 5	Q4 – 5	Q4 – 5	Q4 – 5
WFD Class	A	A	A	A	A
WFD Status	Good	Good	Good	Good	Good
Salmonid Suitability	Marginal salmonid spawning and nursery habitat.	Important salmonid spawning and nursery channel.	Important salmonid spawning and nursery channel	Important salmonid spawning and nursery channel	Important salmonid spawning and nursery channel

The Site and the Grid Connection Route is located within the Lee, Cork Harbour and Youghal Bay Catchment Area, the Bandon-Illen Catchment Area and the Dunmanus-Bantry-Kenmare Catchment Area in Hydrometric Areas 19, 20 and 21 respectively. The Proposed Development and Grid Connection Route Options are located within three WFD sub-catchments. These include the Lee [Cork]_SC_010 sub-catchment, the Bandon_SC_010 sub-catchment and the Coomhola_SC_010 sub catchment. These three sub-catchments occur within catchment that are listed as a *Margaritifera* Sensitive Areas.

The Site is intersected by four EPA mapped rivers or small streams, with sixteen rivers or small streams being located either within or in relative proximity to the Redline Boundary. Many of these streams merge to form larger channels. These small channels have been numbered 1 – 16 for the purpose of ease of identification (and are shown on **Figure 9.3** and **Figure 9.4** in **Volume III**.). The Site also contains multiple unmapped small natural and artificial drainage channels. Eight EPA mapped channels located north of the summit of Shehy More (Streams 1 - 8), are tributaries of the Gortloughra River which in turn is a tributary of the Owvane River, which is also referred to as the "*Ouvane River*". The

Gortloughra River has the EPA name designation of "*Inchiroe*" and has a stream order of 3. The Gortloughra River flows for approximately 2 km west of the Site until it merges with the Owvane River. The Owvane River has the EPA name designation of "*Owvane (Cork)*" and has a stream order of 4. The Owvane River flows in a south-westerly direction to the north of Kealkill before ultimately draining into Bantry Bay at Ballylickey.

Eight small channels are located south of the summit of Shey More (Channels 9 – 16, inclusive), all of which are tributaries of the River Bandon. Six of these small channels have a stream order of 1 and are unnamed streams. Two of these channels have a stream order of 2 and have the EPA names of "*Shehy_Beg*" and "*Shanacrane_East*". Six channels located in the south-eastern area of the Site all merge into the "*Shehy_Beg*" River to the south-east of the Site in the townland of Tooreen. The Shehy Beg River ultimately merges with the Bandon River, approximately 4km to the south-east of the Redline Boundary. Two channels drain the south-west portion of the Site, namely the "*Shanacrane_East*" and a small unnamed stream. Both of these streams ultimately merge and continue as the EPA named "*Shanacrane_East*" which merges with the Bandon River approximately 3.8 km southwest of the Redline Boundary.

This figure also indicates the locations used for Aquatic Monitoring Points (WQ 1 – 4). The results of aquatic surveys are summarised in **NTS-Table 7.4**. Locations surveyed differed between small order streams to larger order rivers surrounding the Site.

Fauna

Bats, Terrestrial Mammals, Herpetofauna, Kerry Slug, Protected Terrestrial Invertebrates, Fisheries and Invasive Alien Species were all assessed as part of the EIAR.

<u>Bats</u>

Desktop Study

The review of existing BCI records of bat species in the area of the Site indicates that at least six of the nine known Irish species of bat have been recorded within a 10 km radius of the Site. These bats include *Pipistrellus* sp. soprano pipistrelle, Leisler's, brown long-eared, Daubenton's, Myotis species (unidentified to species) and lesser horseshoe bat. Of these species, *Pipistrellus* sp., soprano pipistrelle, brown long-eared bat, Daubenton's bat and lesser horseshoe bat have been recorded roosting within a 10 km radius of the Site. Review of NBDC (10 km grid squares W15 and W16) indicates that soprano pipistrelle, unidentified *Pipistrellus* sp., Leisler's bat, Daubenton's bat, whiskered bat, and lesser horseshoe bat have previously been recorded within 10 km of the Site.

Review of the NPWS Lesser Horseshoe bat database indicates that there are no records of roosts within a 2.5 km buffer (Core Sustenance Zone (CSZ)) of the Redline Boundary (NPWS 2018).

The Cave Database for the Republic of Ireland does not hold any records of caves within a 4 km radius of the Redline Boundary.

Survey work undertaken for Carrigarierk Wind Farm, located c.5.5 km to the east of the proposed Gortloughra Wind Farm at its closest point, recorded common pipistrelle, soprano pipistrelle, Leisler's, whiskered/Brandt's, brown long-eared and lesser horseshoe bat.

Roost Survey

No dwellings or other buildings are present within the Site and its environs. Structures present within the Site are limited to five culverts over the small watercourses draining the Site. Three of the culverts did not support any features of potential use by roosting bats. Two of the culverts supported some crevices that would be of potential use by bats but neither culvert had any associated habitat features such as scrub or riparian woodland that would be favoured by roosting bats. No evidence of bats was observed at any culvert within the proposed site.

The cover of broadleaved trees at the Site is low; no large mature trees were recorded during the site surveys. No trees with suitability as roosting or resting places for bats were recorded at this site.

Transect Survey

Three species of bats were recorded during the bat transect surveys. These comprised Common pipistrelle, followed by Leisler's bat and Soprano pipistrelle. The most commonly recorded species was Common pipistrelle. Activity during transect surveys was low with the highest number of bat passes recorded during any night of transect survey amount to 9. No bat activity was recorded during any of the three no. transects completed at the Site during the 2021 bat survey season.

Static Survey

A total of nine species of bats were recorded during the static detector monitoring.

<u>Terrestrial Mammals – Badger and Otter</u>

The lower sections of the Shanacrane East, Gortloughra and Shehy Beg Streams downstream of the Site provide suitable foraging habitat for otters. The upper sections of these streams, near their sources adjacent to and within the Site provide limited foraging habitat for otters owing to the spate conditions and variable flow rates in these upper sections, with limited fisheries resource.

No evidence indicating the presence of otters, their holts or couches were observed along the stretch of the Shanacrane East, Gortloughra and Shehy Beg Streams downstream of the Site.

No badgers or their setts were observed during field surveys within the Site. The upland grassland and heath habitat on thin layers of soil and peat with rock at or close to the surface limits the suitability of the Site to support badgers and their setts.

No evidence of other mammal species such as fox, pine marten, Irish stoat, red squirrel, hedgehog and pygmy shrew were recorded during surveys. However, these species are likely to occur in the surrounding area.

Herpetofauna

Common frog (*Rana temporaria*) was frequently recorded within the Site. This species was recorded breeding in pooling water in depressions and in flushed habitat. Common lizard or smooth newt were not recorded during field surveys. However, the upland habitat with exposed rock within the Site provides suitable habitat for both these species and they are likely to occur within and surrounding the Site.

Kerry Slug

Kerry Slug occur within the landholding having been recorded on exposed siliceous rock habitat during torch light searches of suitable habitat at the Site. Kerry slug are known to occur in this area having previously been recorded in the neighbouring townland of Torreen to the southeast and during baseline ecological surveys for the Shehy More Wind Farm.

Protected Terrestrial Invertebrates

The food plant of the marsh fritillary larvae *Succisa pratensis* occurs rarely on Site and as such the Site does not offer suitable habitat for supporting this species.

Marsh fritillary has been recorded in the wider surrounding area with records for this species held of the townland of Torreen, approximately 1 km to the southeast of the Site.

Fisheries

The three principal watercourses draining the Site are of a similar character and are representative of the Eroding Upland River (FL2) habitats. Each of the watercourses are representative of upland spate rivers characterised by fast water flow and incised banks. Each of the streams are subject to variable flow rates that are dependent on precipitation rates, with spate conditions occurring during periods of higher rainfall and ebb flows resulting during periods of low rainfall or dry conditions. During ebb flows much of the stream bed along these streams can be subject to drying out. The morphology of the Shanacrane East and Shehy Beg Stream at the Site is representative of high-gradient upland A/B-type zone (Rosgen, 1996) which are characterised by first order streams over high gradients, with steps and pools boulder strewn beds with cobbles and gravels and a straight profile. The Gortloughra Stream is located in an area of more gently sloping ground and is more representative of C-type zone (Rosgen, 1996). Shading occurs along the Shanacrane East and Shehy Beg Streams downstream of the Site caused by adjacent broad-leaved woodland.

The overall evaluation of these three watercourses for their potential to support salmonids and lamprey species is set out in **NTS-Table 7.5**.

NTS-Table 7.5: Summary of Salmonid & Lamprey Habitat downstream of the Site

Watercourse	Salmonid Habitat	Lamprey Habitat
Gortloughra Stream	Supports important salmonid spawning and nursery habitat downstream of Site. Marginal salmonid spawning and nursery channel upstream adjacent to Site	No lamprey species present in stream.
Shanacrane Stream	Upstream sections of stream within and near proposed wind farm site not used by salmonids. Supports important salmonid spawning and nursery habitat downstream of Site.	Lamprey species absent but suitable habitat occurs along this stream downstream of the Site.
Shehy Beg Stream	Upstream sections of stream within and near proposed wind farm site not used by salmonids. Supports important salmonid spawning and nursery habitat downstream of Site.	Lamprey species absent but suitable habitat occurs along this stream downstream of the Site.

As outlined in **NTS-Table 7.5**, the three primary streams draining the Site support conditions at the Site that are overall not representative of optimal spawning or nursery habitat for salmonids. These findings are supported by McGinnity et al. (2003) and Hendry et al. (2003) who note that salmonid watercourses are generally restricted to 2nd order and higher watercourses, whilst 1st order streams are unsuitable for spawning and the early life stage of salmonids. The 1st order nature of these streams within the Site, along with their propensity for variable flow rates and the drying out of sections of river bed during periods of drier weather conditions are identified as the principal factors reducing the potential to support salmonids.

All three streams draining the Site, downstream of the Site, are representative of salmonid watercourses and provides suitable spawning and nursery habitat for salmonids.

In addition to the fisheries surveys completed for the Project, Inland Fisheries Ireland (IFI) (Gordon et al., 2021) completed a catchment-wide survey of the Bandon River between August and September 2021. A total of 35 no. sites were surveyed as part of the catchment-wide survey. Of these survey sites 4, 5 and 6 occur in the vicinity of the Project. Survey sites 5 and 6 are located along the Shanacrane East Stream approximately 3.5 km and 5.5 km downstream of the Site. Survey site 4 is located along the Caha River at Coolmountain Bridge, which is crossed by the proposed Grid Connection Route Option A. Other survey sites occurring in the local catchment area upstream of the Project include survey site 2, 3, 9 and 10. Results for the 2021 survey are compared with results from a previous round of IFI survey completed during 2019.

The IFI have recorded a decline in fish ecological status at Site No. 4 and 3, no improvement from moderate status at Site No. 9 and 10; no change in Good status at Site No. 5; and an improvement in status at Site No. 5.

In terms of the wider all catchment-area survey Site No. 2, 3 and 4 were the only sites where a deterioration in fish ecological status was recorded. Of the 35 survey sites, 13 sites improved whilst 16 site remained unchanged in the wider catchment area survey.
The IFI offered likely causes for the deterioration at Site No. 2, 3 and 4 as being related to pressures caused by nutrient enrichment, habitat modification and fish passage issues.

<u>Invasive Alien Species</u>
No non-native invasive species were identified within the Site. *Rhododendron ponticum* and *Prunus laurocerasus* occur in the surrounding area and downstream of the Site.

Potential Effects
A full assessment of potential effects is included in **EIAR Chapter 6**. Where negative potential effects are predicted, measures are included to mitigate these effects. Once all mitigation measures are implemented the residual effects are Not Significant. The potential effects, mitigating measures and residual effects are summarised in **NTS-Table 7.6**.

NTS-Table 7.6: Assessment of Residual Effects

Biodiversity Receptor	Impact	Significance	Probability	Mitigation	Residual Impact
European Sites	Potential for the discharge of pollutants such as sediment or hydrocarbons downstream to the Bandon River SAC and pNHA which could affect qualifying habitat and species.	The significance of impact will depend upon the magnitude of the pollution event (i.e. the levels of pollution released). Any pollution event with the potential to result in short to long-term perturbations to conservation objective targets of qualifying feature of interest will represent a significant effect.	Likely	Minimise ground disturbance. Timing of works and implementation of surface water management and control measures. Implementation of all mitigation measures set out in Section 6.7, Chapter 8 & 9 and within the Natura Impact Statement (DEC, 2025). The implementation of mitigation measures will negate the potential for this impact to arise.	No residual adverse effects
NHAs	No impact. No NHAs within the zone of influence of the Development.	N/A	None	None Required	No residual impact
pNHAs	Potential for the discharge of pollutants such as sediment or hydrocarbons downstream to the Bandon River pNHA and Lough Allua pNHA which could affect	The significance of impact will depend upon the magnitude of the pollution event (i.e. the levels of pollution released). Any pollution event with the potential to result in short to long-term perturbations to	Likely	Minimise ground disturbance. Timing of works and implementation of surface water management and control measures. Implementation of all mitigation measures set out in Section 6.7, Chapter	No residual adverse effects

Biodiversity Receptor	Impact	Significance	Probability	Mitigation	Residual Impact
	qualifying habitat and species.	feature of interest will represent a significant effect.		8 & 9 and within the Natura Impact Statement (DEC, 2025). The implementation of mitigation measures will negate the potential for this impact to arise.	
Wet heath	Loss of habitat to the footprint of the Proposed Development.	Permanent loss of EU Annex 1 wet heath habitats (see Table 6.13)	Certain	Mitigation measures for habitats are set out under Section 6.7.1. A Habitat Management Plan has been prepared. This includes for the restoration of approximately 20 Ha of wet heath within the Site. The extent of wet heath associated with this area will be greater than the c. 0.3 Ha that will be lost to the footprint of the Proposed Development.	Permanent loss of habitat to the footprint of the Proposed Development (see Table 6.13).
Wet grassland	Potential for loss of c. 0.58 Ha of species-poor wet grassland	Slight at the local scale	Certain	Mitigation measures for habitats are set out under Section 6.7.1.	Permanent loss of habitat to the footprint of the Proposed Development (see Table 6.13).

Biodiversity Receptor	Impact	Significance	Probability	Mitigation	Residual Impact
Acid grassland	Loss of habitat to the footprint of the Proposed Development.	Permanent loss of acid grassland habitat to the footprint of the Site (see Table 6.13).	Certain	Mitigation measures for habitats are set out under Section 6.7.1.	Permanent loss of habitat to the footprint of the Proposed Development (see Table 6.13).
Aquatic Habitats	Potential for the discharge of pollutants such as sediment or hydrocarbons downstream to aquatic habitats.	The significance of impact will depend upon the magnitude of the pollution event (i.e. the levels of pollution released). Any pollution event with the potential to result in short to long-term perturbations to the status of receiving aquatic habitats.	Likely	Minimise ground disturbance. Timing of works and implementation of surface water management and control measures. Implementation of all mitigation measures set out in Section 6.7, Chapter 8 & 9 and within the Natura Impact Statement (DEC, 2025). The implementation of mitigation measures will negate the potential for this impact to arise.	Imperceptible
Fisheries and Aquatic Fauna	Potential for the discharge of pollutants such as sediment or hydrocarbons downstream to aquatic habitats that support	The significance of impact will depend upon the magnitude of the pollution event (i.e. the levels of pollution released). Any pollution event with the potential to result in short to long-	Likely	Minimise ground disturbance. Timing of works and implementation of surface water management and control measures. Implementation of all mitigation measures set	Imperceptible

Biodiversity Receptor	Impact	Significance	Probability	Mitigation	Residual Impact
	fisheries and aquatic fauna.	term perturbations to the status of receiving aquatic habitats to support fisheries and aquatic fauna.		out in Section 6.7, Chapter 8 & 9 and within the Natura Impact Statement (DEC, 2025). The implementation of mitigation measures will negate the potential for this impact to arise.	
Otters	Potential for indirect impacts to otters as result of perturbations to aquatic habitats downstream that are relied upon by otter or provide suitable habitat for otters.	The significance of impact will depend upon the magnitude of the pollution event (i.e. the levels of pollution released). Any pollution event with the potential to result in short to long-term perturbations to the status of receiving aquatic habitats to support otters.	Likely	Minimise ground disturbance. Timing of works and implementation of surface water management and control measures. Implementation of all mitigation measures set out in Section 6.7, Chapter 8 & 9 and within the Natura Impact Statement (DEC, 2025). The implementation of mitigation measures will negate the potential for this impact to arise.	Imperceptible
Bats	Potential impacts during the operation phase associated with the risk of fatalities posed by operating wind turbines to high risk species that	Potential for impacts to the local population of Soprano pipistrelle and Common pipistrelle populations.	Possible	Implementation of mitigation measures set out in Section 6.7.3.1.2 and 6.7.3.2.1 and set out in further detail in Appendix 6.2.	The adjudged worst-case scenario is that, during operation, the turbines may possibly cause injury or death to a few individual

Biodiversity Receptor	Impact	Significance	Probability	Mitigation	Residual Impact
	comprise pipistrelle species and Leisler's bat.				specimens of Leisler's bat as it is a high-flying species (10 m to 70 m+). However, the amount of time spent hunting at the upper height limit cannot be assessed accurately due to the maximum distance (60 m to 80 m) of detection of this species by ultrasound detectors, but most activity and time can be expected to occur in the mid-region of the species hunting altitude i.e. 40 m. The resulting effect of the development on local bat populations, with implemented mitigation measures, is considered to be a Slight to Imperceptible Residual Negative Reversible Effect and in the Local Context with the favourable conservation status (FCS) of bat species

Biodiversity Receptor	Impact	Significance	Probability	Mitigation	Residual Impact
					being unaffected and all species confirmed or expected on or near the study areas are predicted to persist.
Herpetofauna	Mortality resulting from construction works. Loss of foraging habitat.	Potential for impacts to the local common frog populations.	Likely	Minimise ground disturbance. Timing of works. Habitat management measures as part of the Habitat Management Plan. Implementation of mitigation measures set out in Section 6.7.2.1.6.	Imperceptible
Terrestrial Invertebrates	Loss of habitat.	Potential for impacts to the local terrestrial fauna populations.	Likely	Minimise ground disturbance. Timing of works. Habitat management measures as part of the Habitat Management Plan.	Imperceptible

8 NTS 8 ORNITHOLOGY

EIAR Chapter 7: Ornithology assesses the potential effects of the development on ornithology. The construction, operational and decommissioning phases of the Project, have the potential to result in four main effects on birds:

- Habitat loss
- Collision with turbines
- Disturbance / Displacement
- Barrier effect

A desk study and consultation were carried out to collate and review available information, datasets and documentation sources pertaining to the Site's natural environment. A part of this review, records available on the NPWS and the National Biodiversity Data Centre websites were reviewed, in addition to records of rare/sensitive species within the 10 km grid squares overlapping the Site.

The Project is not located within any European site or nationally designated site for conservation. The potential for effects on designated sites is fully described in the Natura Impact Statement that accompanies this application.

Over 5 full years (including breeding, migration and winter seasons) of ornithology surveys were undertaken at the Site to establish the distribution, and abundance of bird populations around the Site, and the wider hinterland. These surveys followed recognised best practice guidance on bird survey methodology for wind farms and the timing of survey. The 5 years of surveys undertaken was significantly greater than the 2 years specified in industry standard guidance and provides a robust baseline to inform the assessment. This information was used to inform the design of the wind farm layout and the assessment of potential effects.

The following surveys were undertaken to inform the assessment:

- Vantage Point (VP) surveys were carried out at the Site monthly from April 2019 to September 2024 inclusive. The total survey effort over the 5-year survey period (5 x summer seasons, and 5 x winter seasons) was over 1,147 hours.
- 5 years of Breeding Bird Transects and Winter Bird Transects.
- A total of five years of monthly hinterland surveys were carried out between October 2019 and September 2024 (32 hinterland sites).
- Breeding wader walkover surveys (5 years 2020 to 2024)
- Merlin Survey

- Red Grouse Survey

NTS-Table 8.1 details the key bird species recorded over the 5 year period.

NTS-Table 8.1: Bird species record during the 5 year survey period.

Species	BoCCI	Details
Buzzard	Green	This species was recorded a total of 37 times across all breeding seasons and 6 times during three winter seasons over the five-year survey period. Records indicate the Site is used to commute over / through, and as occasional hunting grounds.
Chough	Amber	Chough were recorded across every season of the five-year survey period. Of the 51 records of Chough, only twelve occurred within the 500m buffer zone over five full years of surveys, and the remainder are predominantly concentrated to the north-west of the buffer zone. Although breeding was recorded during Hinterland surveys in Shanacrane c. 0.82km south-east of the Proposed Development, no breeding was recorded within the Site. All records within the flight activity survey area indicate Chough were flying through/over the Site.
Cormorant	Amber	There is only one record of Cormorant within the flight activity study area, and the remainder are located outside of the 500m buffer zone, near Lough Nambrackderg.
Dunlin	Red	Dunlin were recorded within the 500m buffer zone only once in five years. No breeding or roosting habitat available within the site.
Great Black-backed Gull	Green	This species was recorded twice within the 500m buffer zone. No breeding habitat available within the site.
Goldcrest	Amber	This species was observed during breeding bird transects and hinterland surveys.
Golden Plover	Red	41 records were made across the five years of surveys. A total of 25 occurred within or partially

Species	BoCCI	Details
		intersected the 500m buffer zone over the entire 5-year period, an average of 5 flights per year. The roosting or breeding occurs within the site.
Grey Heron	Green	Grey Heron were observed 13 times during flight activity surveys. A total of 11 of these records occurred outside of the 500m buffer zone, near Lough Nambrackderg, which is situated c. 1.08km from the Site. No breeding habitat available within the site.
Grey Wagtail	Red	This species was recorded during the breeding season walkover surveys. No breeding habitat available within the site.
Hen Harrier	Amber	There are six observations of Hen Harrier within the study area, comprising both adults and juveniles. Hen Harrier were recorded within the 500m buffer zone on a very infrequent basis consider the lack of sightings over five full years of surveys.
House Martin	Amber	House Martin were observed seven times during breeding season flight activity surveys as a secondary target species. No breeding habitat available within the site.
House Sparrow	Amber	Sparrows were recorded once during flight activity surveys during the 2020/21 non-breeding season. No breeding habitat available within the site.
Kestrel	Red	Kestrel have been recorded 69 times within the study area across the five-year flight activity survey period. Observations have confirmed Kestrel are regularly using the Site but no breeding habitat available.
Lesser Black-backed Gull	Amber	The vast majority of sightings occurs outside the site. With a very low number within 500 m of a turbine (NatureScot prescribed buffering distance) However, this species was recorded flying at rotor-swept height within the buffer zone on six occasions.
Linnet	Amber	Linnet were observed four times during breeding season flight activity surveys as a secondary target

Species	BoCCI	Details
		species. No woodland habitats within the site and scrub habitat is marginal.
Meadow Pipit	Red	Meadow Pipit were recorded across flight activity surveys, and winter and summer walkover surveys.
Peregrine	Green	Peregrine were recorded infrequently across the five-year survey period, the predominantly brief observations consisted of Peregrine (adults and juveniles) flying over and hunting within the 500m buffer zone. No breeding behaviour was observed within the Site over the five year period
Red Grouse	Red	Good-quality Red Grouse habitat is limited within the proposed site, there is suitable habitat on the north-western ridge of Shehy Mountain. This area of suitable habitat is located c. 200-250m from proposed turbines. Red Grouse occur in low densities on site, with a total of two birds flushed in 1km grid square W1459 and another two birds recorded in 1km grid square in W1359. There is a limited amount of intact heather moorland on site due to overgrazing.
Redwing	Red	Wintering species recorded occasionally (13 times) over the 5 winters season. While the habitat present would not be considered typically optimal for the species, it has been recorded traversing the site.
Sand Martin	Amber	Only two records of Sand Martin were made during breeding season flight activity surveys. This species nests in sand banks or crevices in walls and bridges. As such there is no potential for the Site to support breeding birds.
Skylark	Amber	Skylark typically use open habitats with some low-lying vegetative cover (typically grassland and heath) for breeding and foraging purposes. While overgrazing of these habitats within the site by sheep has greatly limited the amount of suitable habitat for Skylark, the species continues to forage and nest

Species	BoCCI	Details
		within the heath and grassland habitats within the Proposed Development and the greater area.
Snipe	Red	Snipe were observed primarily during the non-breeding season. However, the majority of records are located outside of the 500m buffer zone. Over the 5 years of breeding wader surveys the species was only recorded on one occasion.
Sparrowhawk	Green	Sparrowhawk were recorded 26 times over five years of flight activity surveys, where both adults and juveniles were observed on a very infrequent basis. No breeding or roosting was recorded.
Starling	Amber	No breeding was recorded onsite and records indicate this species was commuting through the Site.
Swallow	Amber	Flocks of up to 160 birds were observed 56 times during breeding season flight activity surveys. No breeding habitat is available within the site.
Swift	Red	A single observation in 5 years of surveys was recorded of this species in 2023, where two individuals were recorded hunting in the north-east of the study area.
Teal	Amber	Teal were observed within the 500m buffer zone on one occasion in five years. However, successful breeding of Teal has been confirmed in the surrounding environment outside the site.
Wheatear	Amber	Wheater were recorded breeding in the study area.
Whinchat	Red	This species was recorded once during winter walkovers, where one individual was observed flying during the 2023/24 non-breeding season.
Willow Warbler	Amber	Willow Warbler were observed on two occasions during breeding season walkovers.

With the implementation of mitigation measures as presented in this report, the Decommissioning/Construction Environmental Management Plan and a Habitat Management Plan the potential impacts are reduced to the level of not significant, while providing wide ranging benefits to species found on the site. The ornithological assessment is based upon the observed field data and findings, published information and research and best practice guidance. Overall, it is considered that with the implementation of mitigation, the Proposed Development will have an Imperceptible to Slight Reversible Residual Effect and in the local context on birds. It will result in a Moderate Reversible Residual Effect to Kestrel and Slight Reversible Residual Effect to Red Grouse due to disturbance/displacement during the operational phase. In relation to barrier effect a Long-term Slight to Moderate effect in the local context on Kestrel and Golden Plover is predicted. However, habituation over the lifetime of the wind farm is likely to reduce these effects. There are considered to be no significant cumulative operational effects on bird species as a result of the Proposed Development.

9 NTS 9 HYDROLOGY, GEOLOGY AND THE WATER ENVIRONMENT

Chapters 8: Soils and Geology and **Chapter 9: Hydrology and Hydrogeology** of the EIAR evaluates the effects of the Proposed Development arising from the construction/decommissioning and operational phases on the soils and geology and hydrology, hydrogeology resource within and surrounding the Site. Both assessments for the Project were based on desk studies and site surveys. The desk study assessment included consultation with the following information sources via online map viewers websites and databases:

- Environmental Protection Agency (EPA)
- Geological Survey of Ireland (GSI)
- Ordnance Survey of Ireland (OSI)
- Met Éireann (MET)
- National Parks & Wildlife Services (NPWS)
- Office of Public Works (OPW)
- Water Framework Directive (WFD)
- Cork County Council
- The Local Authority Waters Programme (LAWPRO)
- Inland Fisheries Ireland (IFI)
- Teagasc (Agricultural Agriculture & Food Authority)
- Department of Housing, Planning and Local Government, National River Basin Management Plan 2018-2021
- Department of Housing, Local Government and Heritage, The Water Action Plan 2024: A River Basin Management Plan for Ireland
- Myplan.ie; National Planning Application Map Viewer
- Sustainable Energy Authority of Ireland (SEAI), Wind Atlas

- Planning Reference: PL04.243486 Shehy More Windfarm EIAR
- Planning Reference: 21/5372 Carrigarierk 2 Windfarm EIAR

At a regional scale, the Site, both Grid Connection Route options, and the TDR are located within three separate catchment areas, including the Lee, Cork Harbour and Youghal Bay Catchment Area, the Bandon-Illen Catchment Area and the Dunmanus-Bantry-Kenmare Catchment Area in Hydrometric Areas 19, 20 and 21 respectively.

The GSI maps and website for this area shows that the majority of the Site is underlain by Devonian age sedimentary "*Old Red Sandstone*" (Ardaturrish Member and Old Head Sandstone Formation). Outcrops of bedrock are present throughout the Site, particularly within the upland (central) parts of the Site around Shehy More. From information obtained from the GSI and EPA websites, the following soils are understood to exist on the Site:

- Shallow rock covers the majority of the Site with minor areas of blanket peat and glacial till (based on the GSI online mapping). Peat is absent from most of the Site and from the vast majority of the Grid Connection Route Options and Turbine Delivery Route;
- Glacial till derived from the underlying sandstone and shale covers approximately 10% or less of the main Site area and around 50% of the Grid Connection Route Options and Turbine Delivery Route; and,
- Approximately 50% or more of the main Site has very shallow/exposed bedrock and hence has little or no superficial geology cover.

There are statutory designated sites located downstream of the Study Area that are hydrologically connected to the Proposed Development, including Bandon River SAC. Furthermore, the WFD status of the surface water network associated with the Site ranges from Good to High and is considered highly sensitive in general.

A Flood Risk Assessment (Stage 1) was carried out and indicates that the estimated net increase of surface water runoff in a worst-case scenario wettest month of January (3.25% relative to the area of the Site), this is considered a slight, or not significant impact. The proposed drainage system at the Proposed Development will be designed with the capacity to accommodate the 1 in 100-year storm with a 6-hour duration.

There are no mapped wells, springs or boreholes within 2.4 km of the Site. It has been conservatively assumed that all dwellings located in close proximity to the Redline Boundary have the potential to maintain a groundwater well for abstraction However, the potential for such wells to be impacted by the Proposed Development is low considering the groundwater aquifer in the region is classified as Poor, and productive only at a local scale.

Peat depths on site were measured by peat probing at a total of 354 locations and ranged in depth between 0.0 m and 3.8 m. Peat depth classification within the Study Area is predominantly Rock/Very Shallow Peat/Topsoil (0.0 m - 0.5 m).

A Slope Stability Risk Assessment was carried out by Garne Geotechnical Services which concluded that the risk of a significant movement of peat soils occurring within the footprint of the Proposed Development Infrastructure is Low to Negligible.

Standard, good-practice measures will be implemented to minimise the potential for effects such as pollution, erosion or changes to groundwater and surface water flows at the Proposed Development to occur. These established and effective measures are described in **Chapter 8: Lands, Soils and Geology – Section 8.5 Mitigation Measures and Residual Effects** and **Chapter 9: Hydrology and Hydrogeology – Section 9.5 Mitigation Measures and Residual Effects**.

With mitigation measures in place, the Proposed Development has been assessed as having the potential to result in effects of varying significance, however many are considered avoidable with the exception of the following unavoidable effects:

- There will be a change in ground conditions at the Site with the replacement of natural materials such as peat, subsoil and bedrock by concrete, subgrade and surfacing materials. This is a localised, imperceptible to slight, neutral, permanent impact during the operational phase.
- The potential loading of suspended solids in surface water runoff at the Site particularly in relation to excavation works during the construction phase of the Proposed Development. While the loading of suspended solids in runoff is unavoidable, if precautionary and mitigation measures, as described are implemented, concentrations of suspended solids can be reduced to acceptable levels prior to runoff being intercepted by the surface water network associated with the Site. Achieving this implies minimal effects on surface water features which conforms to baseline.
- There will be some local changes to how water flows at the Site, this is considered a likely, neutral to negative, slight to moderate significance, localised impact of the Proposed Development which conforms to baseline.

Other potential effects have the potential to be significantly adverse, for example, a significant fuel spill, however applying the precautionary principal, mitigation measures, and proper planning, the likelihood and significance of such potential effects can be dramatically reduced.

- A Water Framework Directive Compliance Assessment has also been prepared and is attached to Appendix 9.3 of the EIAR in Volume IV. With the implementation of the proposed mitigation measures, a deterioration in WFD status is not anticipated in any waterbody.

During the construction/Initial Decommissioning and operational phases of the Proposed Development, a number of established good practice measures will be put in place to minimise peat disturbance, peat stability, and loss and compaction of soils. With effective and well managed mitigation measures in place, no significant residual effects on geology and peat are predicted as a result of the Proposed Development.

10 NTS 10 NOISE

EIAR Chapter 10 has assessed the significance of the potential effects of the Project during operation, construction, and decommissioning of the Project.

Noise will be emitted temporarily by plant and equipment and vehicles used during the construction phase. The main noise sources will be associated with the construction of the Turbine Foundations, Turbine Hardstands, Grid Connection Route Options, with lesser sources being site access tracks and construction of an Onsite Substation and Control Building. Decommissioning noise levels are assumed to be in the same order as construction levels and will be of temporary duration. Construction and decommissioning works will typically be more than 480 m from the nearest property (noise receptor), making the potential for noise and vibration impacts considered to be not significant.

The effects of noise from the operation of the Proposed Development have been assessed using 2006 Guidelines with the methodology described in ETSU-R-97 and the Institute of Acoustics (IOA) Good Practice Guide. Noise levels during operation of the Proposed Development have been predicted using the best practice of calculation technique and they have been compared with the noise limits in the WEDG06 and a recent 2023 An Bord Pleanála decision (ABP-313750-22).

The main sound heard from wind turbines is the 'swish' from the movement of the blades through the air. Modern turbines are designed to minimise noise and planning conditions are used to ensure compliance with specified noise limits. The assessment of operational noise has been undertaken in accordance with best practice and following the latest guidelines. It has been shown that noise due to the Proposed Development, including cumulative effects with operational and consented wind farms will meet all current guidelines at all local properties.

For this assessment background noise levels were carried out at six residential locations in the vicinity of the Site during one continuous measurement period, firstly between 21st February and 21st March 2022. 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 ISO9613-2:1996 under a range of operating wind speeds standardised to 10 m above ground level.

The predicted noise levels have been compared with the appropriate noise limits based on the 2006 Guidelines and taking into consideration the recent 2023 An Bord Pleanála decision. There were no exceedances of the 43 dB night-time limit at any receptors identified through operation of the Proposed Development.

The noise levels predicted at the nearest receptors are orders of magnitude below the level at which risk of hearing damage, or indeed negative health effects are possible. Noise during construction of the Proposed Development and decommissioning will be managed to comply with best practice, legislation and guidelines current at that time so that effects are not significant.

11 NTS 11 LANDSCAPE AND VISUAL

EIAR Chapter 11: Landscape and Visual Amenity describes the landscape context of the Proposed Development and assesses the likely landscape and visual impacts of the scheme on the receiving environment. Although closely linked, landscape and visual impacts are assessed separately. Landscape Impact Assessment (LIA) relates to assessing effects of a development on the landscape as a resource in its own right and is concerned with how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character. Visual Impact Assessment (VIA) relates to assessing effects of a development on specific views and on the general visual amenity experienced by people. Cumulative landscape and visual impact assessment is concerned with additional changes to the landscape or visual amenity caused by the Proposed Development in conjunction with other developments.

In accordance with relevant guidelines, the Study Area used for the LVIA is 20 km. Production of the Landscape and Visual Impact Assessment involved baseline work in the form of desktop studies and fieldwork followed by professional evaluation by qualified and experienced Landscape Architects. The landscape assessment considers potential effects on the receiving and surrounding 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 with consultees through the EIA Scoping process) including scenic amenity designations, centres of population, transport routes and local community views using 30 viewpoints from representative / sensitive visual receptor locations. Photomontages have been prepared for the viewpoints and the figures also include a wireline of the Proposed Development on its own and a wireline with all other cumulative developments.

This is a varied and dynamic landscape that comprises a multitude of landforms and landscape features. Indeed, much of the Study Area comprises elevated rolling hills, ridges and rocky outcrops, with the Site situated along an elevated ridge that extends in a general east–west direction southwest of the summit of Shehy More. Shehy More rises to a maximum elevation of c. 545.6 m AOD and is one of the most elevated parts of the Central Study Area, whilst the most elevated part of the Site rises to a height of c. 446 m AOD. In terms of watercourses, several small streams descend from the elevated lands that contain the Site in all directions. Several of these flow into the Ouvane River, which is the nearest notable watercourse to the Site and flows in the southwesterly direction some c. 3.5 km northwest of the Site. In terms of land use, the Central Study Area generally comprises extensive areas of mountain moorland and sizeable commercial conifer forests. Jagged rocky outcrops and areas of scrubby vegetation are also typical in the most elevated upland parts of the study area, whilst the lower winding valleys are characterised by pastoral farmland and areas of transitional scrub. Due to the site's relatively remote location, there are no notable settlements within the Central Study Area. Nonetheless, the Wider Study Area comprises several notable settlements, including Bantry, Drimoleage and Dunmanway. The central and wider study also encompasses numerous existing wind farm developments, the nearest of which is Shehy More Wind Farm (c. 180 m North-west), which is situated immediately north of the Site and extends across the northern extents of Shehy More Mountain.

Due to the remote character of much of the Central Study Area, which comprises upland hills, ridges and mountaintop summits, there is a relatively modest rural population density. With regard to settlements, the only settlement within the Central Study Area is Togher Village, which is located c. 4.7 km southeast of the nearest turbine. Aside from this, the only other notable centres of population are small linear clusters of dwellings and cross-road settlements. Whilst the Wider Study Area shares similar characteristics to the Central Study Area, there is a more notable agglomeration of settlements. The most notable of these is the coastal town of Bantry, Ballingeary, Inchigeelagh, Kealkill, Dunmanway and Drimoleague. The most notable major transport route in relation to the Proposed Development is the R585 regional road, which traverses the Study Area in an east-west direction through the Cousane Gap and is located some c. 1.3 km south of the turbine array at its nearest point. The R584 is the only other major route within the Central Study Area, some 3.5km northwest of the Site. Aside from these routes, the Central Study Area also encompasses several local roads, the nearest of which is the L8776 local road, which traverses east-west through the Study Area and is some c. 750 m North of the Site.

Due to the varied nature of the landform in the study area, there are numerous amenity features including the Wild Atlantic Way tourist driving route, the Eurovelo Cycling route and several notable walking routes including the Slí Gaeltacht Mhuscrai, the Beara Way and the Sheep's Head Way national waymarked walking trail. The Gougane Barra complex itself is also a notable tourism and recreation receptor within the Study Area and St Finabarr's Church and notable heritage feature located along a small island on the lake. In addition to amenity features, the Study Area also encompasses an array of heritage features dotted throughout the 20 km extents.

With regard to landscape designations, the Proposed Development is situated entirely within the Landscape Character Type '15a Ridge and Peaked Upland', which is classified with a; 'High' landscape sensitivity; 'High' Landscape Value; and 'Local' level Landscape Importance. The Central Study Area also encompasses two other contrasting LCTs and includes 'LCT 12b - Rolling Marginal and Forested Middleground' located immediately to the east of the Site and 'LCT 16b – Glaciated Cradle Valleys' located c. 2 km south of the nearest proposed turbine. LCT12b is classified with a 'Medium' landscape sensitivity; 'Medium' Landscape Value; and 'Local' level Landscape Importance, whilst LCT16b is classified with a 'Low' Landscape Sensitivity; 'Medium' Landscape Value; and 'Local' level Landscape Importance. Numerous other LCTs also occur throughout the wider study area. It should be noted that the Proposed Development is not located in an area recognised as High Value Landscape (HVL), however and the nearest HVL designation is located some 6.1 km northwest of the site.

In terms of visual designations, numerous scenic route designations outlined in the current Cork CDP are contained throughout the Study Area, with the nearest of these situated at the Cousane Gap to the south of the Site. All of the scenic routes and views in both Cork and Kerry that fall inside the ZTV pattern were investigated during fieldwork to determine whether actual views of the Proposed Development might be afforded. Where visibility may occur, a viewpoint has been selected for use in the visual impact appraisal.

With regard to landscape impact, for most commercial wind energy developments, the greatest potential for landscape impacts to occur is as a result of the change in character of the immediate area due to the introduction of tall structures with moving components. Thus, wind turbines that may not have been a characteristic feature of the area become a new defining element of that landscape character. In this instance, existing wind turbines are familiar features in the immediate and Central Study Area and are characteristic features of the landscape within the Wider Study Area. Indeed, the entire Study Area encompasses up to 80+ existing turbines. Thus, the overall effect therefore, is one of intensification and extension of an established land use. In terms of scale and function, the Proposed Development is well assimilated within the context of the Central Study Area. This is due to the broad scale of the landform, landscape elements and land use patterns. These attributes prevent the height and extent of the Proposed Development causing the type of scale conflict that can occur in more intricate landscape areas. The broad hills, ridges and mountaintop summits in the central surrounds of the Site comprise some utilitarian character due to the presence of working rural land uses such as agriculture and commercial scale forestry. Although the Proposed Development represents a stronger human presence and level of built development than currently exists on the Site, it will not detract significantly from the surrounding working upland landscape.

The visual impact assessments for each of the 30 selected viewpoint locations are contained in **EIAR Appendix 11.1** and are summarised within **EIAR Chapter 11** based on receptor type.

Due to the varied nature of the landform within the Study Area and due to the high number of designated scenic views located throughout the Study Area, up to 30 viewpoints were selected to represent visual receptors within the Study Area. Residual visual effects ranged between 'Substantial-moderate' to 'Imperceptible'. The majority of the most notable impacts relate to the nearest views of the Proposed Development, which principally represent scenic designations and local community receptors. Whilst the Proposed Development will have a dominant visual presence and will present at a considerable scale from some of the nearest views, the proposed turbines appear well accommodated in this upland landscape in terms of their scale and function. Although there will be some near significant impacts along the nearest scenic route designation (S29), the turbines typically present, offset from, or in the opposite direction from the main aspects of scenic amenity along this route. It is also important to note that the Proposed Development will not be visible from some of the more scenic sections of this route.

The surrounding landscape is already strongly influenced by existing wind energy developments, most notably the existing Shehy More Wind Farm immediately northeast of the proposed Gortloughra Wind Farm turbines. As such, the Proposed Development will likely be perceived as a logical and visually coherent extension of this already established wind energy development, particularly when viewed from receptors to the north of the Site, where the Shehy More turbines are already a prominent feature.

In terms of alignment with the landscape and visual objectives set out in the Cork County Development Plan, the Proposed Development has been carefully designed and sited in respect of these objectives. In particular, Objectives GI 14-12 to 14-14, which focus on preserving scenic amenity and the character of scenic route designations throughout the county, have been taken into account. A comprehensive assessment of scenic routes within the Study Area has been carried out as part of this LVIA. Based on this assessment, the Proposed Development will not significantly detract from the prevailing landscape character or visual amenity afforded along these routes. While the turbines will be visible from certain sections, they are generally viewed either offset from or in the opposite direction to the main aspects of scenic amenity, and will not block or heavily obstruct any sensitive viewing aspects. In this part of West Cork, where wind turbines are a familiar feature in similarly elevated upland settings, the proposed turbines are considered to be visually well

accommodated and will not appear incongruous, nor will they appear over-scaled in the context of the surrounding broad scale land uses and landscape features.
Overall, whilst some of the nearest surrounding receptors will experience visual impacts close to significant, it is not considered that the Proposed Development will result in significant visual impacts. Instead, the Proposed Development is a well-considered and appropriately scaled development that assimilates well within this robust upland context, and will, in many instances, be perceived as a natural extension of the neighbouring turbines.

In terms of the potential for cumulative impacts, the cumulative assessment was divided into the current cumulative scenario and the potential future cumulative scenario. The current cumulative scenario presents the potential cumulative effects of all existing and consented developments within the Study Area. In terms of the current cumulative scenario, the Proposed Development will form part of an existing and consented array of 25 wind farm developments within the Study Area. Nonetheless, it does not generate any notable cumulative visual effects, albeit it will result in a further sense of wind farm accumulation and dissemination within the Study Area. Nonetheless, any strong sense of wind farm proliferation is notably offset by the fact that only two other existing wind farm developments are contained within the Central Study Area, with the majority of existing and consented developments contained in the wider southern and northern half of the Study Area. On balance of the reasons above, it is not considered that the Proposed Development will contribute to a significant cumulative landscape and visual impact in respect of the current cumulative scenario. Despite the considerable number of existing wind farm developments within the Study Area, the Proposed Development is principally viewed distinctly separate to these and is most often viewed well-spaces along a broad rolling ridge in combination with the Shehy More Wind Farm turbines.

Whilst still currently in-planning, it is important to consider the potential cumulative effects of the Proposed Development in combination with proposed wind farm developments that are currently in the planning system. In this instance there are 2 other developments, all of which are contained within the Wider Study Area. As per the cumulative potential future baseline scenario Zone of Theoretic Visibility mapping, the potential for an additional degree of cumulative turbines visibility only increases by a very marginal degree. Overall, due to the distance of the four proposed and in-planning developments from the Proposed Development turbines, it is not considered that the cumulative impacts will notably differ from those potentially experienced in the current cumulative scenario.

12 NTS 12 MATERIAL ASSETS AND OTHER ISSUES

EIAR Chapter 12: Material Assets considers a number of other issues associated with the Proposed Development, including potential effects on Land Use, Telecommunications and Electromagnetic Interference, Grid Connection and Grid Network, Air Navigation and Waste Management.

12.1 Land Use

During the construction, operational and decommissioning phases, the total land-take of the Proposed Development, including the site access tracks, Turbine Hardstands, turning heads, Onsite Substation and Control Building, Temporary Construction Compound and Met Mast is approximately 5.3 ha. The Site has an area of 117.2 ha therefore the total land take is 4.5% of the Site. There will be 8 no. turbines located on or partly on agricultural lands. This will result in the change of use from agricultural use to windfarm use. This will have a long-term slight, negative impact on agricultural land use due to the land use change for the duration of the Project during construction and operation phases.

The Grid Connection Route Options will be mainly in or alongside the existing roads and will be reinstated upon installation of cables. This will not permanently change the use of the land. The Turbine Delivery Route will require some widening works which have identified in **EIAR Section 12.3.1**. The effects of these works will be negligible in terms of land use.

No significant negative impacts are predicted on land use.

12.2 Telecommunications

During the construction phase, there are likely to be several sources of temporary electromagnetic emissions. Chief among these will be the brief use of electrical power tools and the use of electrical generators which may be brought onsite before mains electricity is provided. These devices are required by Irish and European law to comply with the EMC Directive 2014/30/EU[4]. Compliance with this Directive will mean that the electromagnetic emissions from these devices will not cause interference to other equipment and therefore no significant effects are likely.

Other potential effects during the construction phase are likely to be as a result of tall cranes used for constructing the turbines. These cranes will be beside the proposed turbines on

[4] DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility

the Turbine Hardstands. There are no telecommunication towers within the proximity of the Proposed Development, thus the effect can be classed as not significant.

A number of telegraph poles will likely need to be temporarily removed along local and regional roads to facilitate the transport of turbine components to the Site. This will have temporary, short-term effects on telecommunications in the locality which can be described as not significant and is further discussed in **EIAR Chapter 14: Traffic and Transport**.

No telecommunication links have been identified during the scoping and consultation process. All responses received from telecommunications consultees have stated that the Proposed Development will have no effect on their telecommunications services.

No significant effects are likely during the decommissioning phase.

12.3 Electricity Networks

Wind Farm internal cabling and the GCR Options from the Onsite Substation and Control Buildings to Dunmanway/ Carrigdangan will be underground, there will be no impact on the overhead electricity network.

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

At the existing Dunmanway/ Carrigdangan 110 kV Substation, the cable will connect into existing infrastructure within the confines of the Onsite Substation and Control Building and its compound. There is the potential that EirGrid will consider future upgrades of the existing conductors associated with the 110 kV overhead lines leaving the Dunmanway/ Carriqdangan 110kV substation.

An upgrade of the existing transformer of the Dunmanway/ Carriqdangan Substation is likely to be required. Such upgrades will have a slight, positive short-term effect in terms of upgrading of critical infrastructure.

12.4 Air Navigation

Consultation with the Irish Aviation Authority and with Cork revealed that the Proposed Development is not predicted to have any effect on the operations of Cork as the Proposed Development is outside their associated 'Outer Horizontal Surface' (over 15 km away). The Proposed Development is over 45 km from Kerry Airport and over 55 km from Cork Airport.

No potential effects are predicted. The civil aviation guidelines for wind turbines covers a 30 km radius[5]. Therefore, no potential effects to air navigation were identified.

12.5 Waste Management

Waste will be generated onsite during the construction and decommissioning phases of the Project. All rubbish and waste/excess materials will be removed from Site to an appropriate licenced facility from where it will be reused/recycled, where possible, or disposed of accordingly.

The residual effects of waste produced as a result of the construction, operational and decommissioning phases are considered to be **not significant**.

12.6 Quarries

The construction of the Project will impact slightly on natural resources such as aggregates which will be sourced from the quarries in proximity to the Site (EIAR Section 12.9.1).

Materials will be primarily sourced from the on-site borrow pit and site excavations. However, where this material is classed as unsuitable, quarries will be used.

It is likely that a small amount of granular material may be required to maintain site access tracks during operation which could impact the source quarry. However, the decommissioning phase will have no impact on the source quarry.

The use of imported material will have a slight, permanent negative impact on non-renewable resources of the area. This impact is considered to be imperceptible in the long-term.

[5] CAA Policy and Guidelines on Wind Turbines, UK Civil Aviation Authority, 2016. https://publicapps.caa.co.uk/modalapplication.aspx?catid=1&pagetype=65&appid=11&mode=detail&id=5609 [Accessed online: 18/05/2023]

13 NTS 13 CULTURAL HERITAGE

Chapter 13 of the EIAR presents an assessment of the cultural heritage effects of the Proposed Development. The assessment considers the construction, operation and decommissioning phases and is based on programmes of desktop research and site inspections carried out to identify and record any known or potential archaeological, architectural and other cultural heritage constraints which may be subject to effects arising from the Proposed Development.

The desktop research included consulting with a range of relevant sources, including the following:

- Record of Monuments and Places;
- Sites and Monuments Record;
- National Monuments in State Care;
- Preservation Orders;
- Database of Irish Excavation Reports;
- National Museum of Ireland Topographical Files
- Record of Protected Structures;
- National Inventory of Architectural Heritage;
- Local histories and other publications; and
- Historic Mapping and Aerial/Satellite/LiDAR imagery.

There are ten recorded archaeological sites located within the Redline Boundary and these comprise 1 no. standing stone pair (CO093-024----), 1 no. mass-rock (CO093-084----), 5 no. hut sites (CO093-078001-, CO093-078002-, CO093-078004-, CO093-085---- and CO093-086----), 2 no. enclosures (CO093-087---- and CO093-078003-) and 1 no. field boundary (CO093-114----). The chapter presents descriptions, photographs and location mapping for each of these archaeological sites. The Proposed Development has been designed to avoid their locations, and all examples will be preserved *in situ* within protective cordons that will be maintained for the duration of the construction phase.

The Proposed Development has the potential to contain unknown sub-surface archaeological remains and pre-construction archaeological test trenching and archaeological monitoring of ground works during the construction phase will, therefore, be carried out by a suitably qualified archaeologist under licence by the National Monuments Service. 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 National Monuments Service are consulted to determine further appropriate mitigation measures, which may include preservation in situ (by avoidance) or preservation by record (archaeological excavation).

There are an additional 88 recorded archaeological sites located within 2 km of the Redline Boundary, and these include a notable concentration of hut sites, enclosures and field boundaries located within the environs of the southern end of the Site. While the majority of these sites individually possess little surviving surface remains, as a combined group within a relatively undisturbed area they are considered to retain a high value as an archaeological landscape. The operational phase of the Proposed Development will result in a medium magnitude change to the setting of these archaeological sites as a combined group which will result in a long term (reversible), indirect, significant adverse effect.

An assessment of potential indirect visual effects on archaeological monuments with notable visual sensitivities within the wider landscape was also carried out and this included reviews of Zone of Theoretical Visibility mapping. There are five National Monuments in State Care and two archaeological sites subject to Preservation Orders (PO) located within 10 km of the Site and none of these are located within 5 km of the proposed turbine locations. An assessment of their locations in relation to the Proposed Development did not reveal any likely significant indirect effects on their wider settings. The recorded archaeological resource within lands extending for 5 km from the Proposed Development was also reviewed to determine if this area contains monument types with potentially visually sensitive ritual alignments. This revealed the presence of 2 no. stone circles. 6 no. wedge tombs, 4 no. stone rows and 4 no. standing stone pairs located in private landholdings within this area. A review of their recorded alignments in combination with their locations and distances in relation to the Proposed Development revealed that none of these monuments have recorded alignments that directly intersect with the proposed turbine locations. The operational phase will result in long term, indirect, not significant to moderate, adverse visual effects on the wider settings these monuments.

Given the nature of the wind farm turbines there are no mitigation measures that can address indirect, adverse visual effects on cultural heritage receptors within the wider landscape, but it is noted that these effects will be reversed following the Decommissioning phase.

The Proposed Development will entail the establishment of an amenity trail within the Site that will include information signage within the environs of archaeological sites located in proximity to site access tracks. This aspect of the Proposed Development will facilitate public access to elements of cultural heritage resource within private lands which will result in a slight, permanent, indirect, positive effect.

14 NTS14 TRAFFIC AND TRANSPORT

EIAR Chapter 14: Traffic and Transport out the effects on traffic as a result of the Project.

The assessment considers the potential effects of traffic generated by the Project during the following phases:

- Construction of the Project.
- Construction of proposed Grid Connection Route Options for two separate options in the public road network between the Onsite Substation and Control Building and Dunmanway 110 kV Substation (Option A) or Carrigdangan 110 kV Substation (Option B). The Onsite Substation and Control Building and chosen Grid Connection Route Options will be subject to a separate planning application.
- Transportation of turbine components on the public road network between the Port of Cork and the Proposed Development. The Turbine Delivery Route (TDR) works will be subject to a separate planning application.
- Operation and maintenance of the Proposed Development.
- Decommissioning of the Proposed Development.

The potential effects identified in the chapter include wind farm traffic generation, magnitude and significance of effects, air quality, noise and vibration, pedestrians and vulnerable road users and driver delay.

Figure NTS-3 shows the proposed Turbine Delivery Route for the Project.

The estimated timescale for the completion of the construction phase is 16 to 18 months, inclusive of all works to access tracks, access routes, Onsite Substation and Control Building and erection and commissioning of turbines and Grid Connection Route Options works. It is estimated that during the wind farm construction, an approximate total of 8,017 loads of material and building supplies will be delivered and removed from the Site. The majority of HGV movements to and from Site will occur during the first ten months of the construction period and will be associated with site access track construction, Turbine Hardstand construction and Turbine Foundation construction.

It is estimated that 55-60 staff light goods vehicles (LGV) will visit the Site daily during the peak construction period. Parking for staff will be provided within the Temporary Construction Compound and within the works area during Grid Connection Route Options and TDR enabling works. No parking will be allowed for construction workers on the public road network in the vicinity of the Site.

Construction HGV's, LGV's and private vehicles are subject to government HCV, LCV, ADR and NCT emissions tests. A full air quality assessment is included in **EIAR Chapter 15** and summarised in **NTS 15 Air and Climate**.

There is likely to be some noise and vibration due to the predicted short-term increase in HGV movements along the Construction Haul Routes to the Proposed Development. The increased traffic volumes may cause disturbance to residents living along the local road network on the Project Construction Haul Route, Turbine Delivery Route and Grid Connection Route Options. Due to the relatively low number of trips generated per day in relation to existing traffic volumes on the national and regional road network, the restrictions on working hours and the short-term nature of the construction and Decommissioning phases, the effects of noise and vibration are not predicted to be significant. Construction HGV's, LGV's and private vehicles are subject to government HCV, LCV and NCT noise and suspension tests. A full noise and vibration assessment is included in **EIAR Chapter 10** and summarised in **NTS 10 Noise**.

The Traffic and Transport Assessment (**EIAR Appendix 14.1**) gives details of traffic junctions in the vicinity of the Site and the Traffic Management Plan (**EIAR Appendix 14.2**) gives details of works duration, traffic management, road closures and diversions.

Pedestrian and other vulnerable road users may be affected by the works at the Proposed Development entrance, Construction Haul Routes, Turbine Delivery Route enabling works, Grid Connection Route Options works and increased vehicle movements during construction and delivery of turbine components. The construction of the Site entrance and modifications to the public road network at various locations along the Turbine Delivery Route will be carried out under a road opening licence and traffic management plan which will accommodate pedestrians at the works locations. The effect of the works on pedestrian safety is therefore assessed to be medium sensitivity for a short-term duration. Pedestrian facilities may be altered for short periods during the transportation of turbine components. During these periods alternative arrangements will be put in place for pedestrians.

The traffic analysis carried out in the Traffic and Transport Assessment in **EIAR Appendix 14.1** at the L4607 / L4608 junction shows that drivers will experience short delays due to increased traffic volumes during the wind farm construction and Decommissioning periods. In 2035 vehicles joining the L4607 from the L4608 will experience a delay of 7 seconds without development construction traffic and a delay of 11 seconds with the additional traffic generated by wind farm construction. In 2075 vehicles joining the L4607 from the L4608 will experience a delay of 7 seconds without development decommissioning traffic and a delay of 12 seconds with the additional traffic generated by wind farm decommissioning. The effects of the additional traffic volumes are assessed as slight and temporary with a duration of 16 months.

Enabling works on the public road network will be carried out using traffic management and temporary traffic signals at locations where it is not possible to maintain two-way traffic. Analysis carried out in the Traffic and Transport Assessment in **EIAR Appendix 14.1** shows that vehicles will experience delays of approximately 75 seconds when the lights are in place on the L4607 and the R585. The effects of the additional traffic volumes are assessed as slight and short term. The location and duration of works requiring temporary traffic lights is detailed in the traffic management Plan in **EIAR Appendix 14.2**.

The delivery of turbine components will take place outside peak traffic periods to avoid disruption on the public road network. The TDR for the transportation of turbine components consisting of dual carriageway will have unrestricted passing opportunities and no delays to public road users are expected. There is potential for momentary delay to public road users in the urban areas surrounding the Port of Cork at the R585 transshipment areas, R585 / L4607 junction, L4607 / L4608 junction and on the local road network leading to the Site entrance. Following assessment, it is concluded that delays to traffic due to turbine delivery will be imperceptible and momentary in duration.

The construction of Grid Connection Route Options works on public roads will require road closures on local roads where the road width is too narrow to support traffic flows. The road closures will result in delays to public road users and increased journey times. Following assessment, it is concluded that these effects will be slight / moderate and short term.

This assessment has identified that the potential effects of the Proposed Development on traffic and transport during the construction and decommissioning periods are considered to be, **Not Significant to Moderate** on the national and regional road network and **Moderate to Significant** on the local road network. The significant effects of construction works and increased traffic volumes at sensitive locations such as south of Inchigeelagh village and the local road network in the vicinity of the Proposed Development will occur for a short period of time during the construction and decommissioning periods. During the construction and decommissioning periods, general and specific mitigation measures will be put in place to minimise disruption. The potential effects of the Proposed Development on traffic and transport during the operation of the Proposed Development are considered to be **Not Significant** on the public road network.

15 NTS 15 AIR AND CLIMATE

EIAR Chapter 15: Air and Climate assess 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. Mitigation measures for the reduction of dust are outlined in the **EIAR Chapter 15: Air and Climate**.

The closest receptor, H53 (which is involved in the Project), is within 486 m of the closest turbine (T07), and experiences no shadow flicker. The closest receptor who is not involved, H10, is within 696 m of the closest turbine (T06).

After mitigation, the residual effects were assessed as having the potential to result in a short-term imperceptible, negative impact on climate during construction. There will be long-term moderate, positive impact on climate as a result of reduced greenhouse gas emission during the operational phase.

The layout of the Proposed Development 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 Proposed Development does not contain any element, which will produce Greenhouse Gas emissions or odorous emissions in operation. Indeed, the Proposed Development 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 Proposed Development, such that generation from other sources (which emit carbon dioxide) are offset.

Ireland has set a target to achieve a 51% reduction in overall greenhouse gas emissions by 2030, setting a path to reach net-zero emissions by no later than 2050. The target for 2030 is to generate 80% of the country's electricity from renewable sources. The Proposed Development will contribute 48 MW of installed capacity. The calculation contained within **EIAR Chapter 15: Air and Climate** states that approximately 30,464 tonnes of carbon dioxide will be displaced per annum from the largely carbon-based traditional energy mix by the Proposed Development. 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.

In isolation, the Proposed Development will have a significant positive effect on carbon savings and cumulatively, it will have a significant positive effect when considered with Ireland's renewable energy deployment.

16 NTS 16 SHADOW FLICKER

EIAR Chapter 16 contains a detailed analysis on shadow flicker, the effect caused by the sun shining behind the rotating blades of a turbine relative to a nearby sensitive receptor. This has the potential to cause a momentary shadow on a window of the sensitive receptor. This shadow can appear as a flickering of sun light due to the rotating blades. Therefore, shadow flicker will only occur during the operational phase of the Proposed Development.

A shadow flicker computer software (WindPRO 4.0[6]) was used to calculate the occurrence of shadow flicker at relevant receptors to the Proposed Development. The Study Area is defined as 10 times the widest possible potential rotor diameter within the range (10 x 150 m = 1,500 m). This was increased to 2,000 m for the inclusion of dwellings impacted in the cumulative assessment with the neighbouring Shehy More Wind Farm. Six receptors outside of the 2,000 m Study Area were also included in the analysis.

This assessment has identified the potential for shadow flicker within the study area. In total, 44 of the 73 assessed receptors are predicted to experience some degree of shadow flicker, while 29 receptors will experience none. Two receptors, H5 and H6, are expected to be cumulatively impacted by both the Proposed Development and the Shehy More Wind Farm.

To address potential effects, it is proposed that a shadow control system be installed. This system operates by shutting down the relevant turbine during periods when shadow flicker conditions are likely to occur, thereby eliminating any impact on affected receptors.

Given that only effects of significant impact or greater are considered "significant" in terms of the EIA Directive the potential effects of the Proposed Development as a result of shadow flicker, when mitigated, are considered to be not significant. The Proposed Development has been assessed as having the potential to result in neutral, imperceptible, long-term effects overall with regards to shadow flicker.

[6] https://www.emd-international.com/windpro/

17 NTS 17 MAJOR ACCIDENTS AND NATURAL DISASTERS

Chapter 17 of the EIAR describes the major accidents or natural disasters, the hazards which have the potential to affect the Project and consequently have potential impacts on the environment. These include accidents during construction and operation caused by operational failure and/or natural hazards. The assessment of the risk of major accidents and/or disaster considers all factors defined in the EIA Directive that have been considered in this EIAR, i.e., population and human health, biodiversity, land, soil (peat stability), water, air and climate and material assets, cultural heritage and the landscape.

A desk-study has been completed to establish the Baseline environment for which the proposed risk assessment is being carried out. This will influence both the likelihood and the impact of a major accident or natural disaster. Local and regional context has been established prior to undertaking the risk assessment to develop an understanding of the vulnerability and resilience of the area to emergency situations.

The scenario with the highest risk score in terms of the occurrence of major accident and/or disaster was identified as 'Contamination' of the Project and risk of 'Industrial Accident Fire/Gas Explosion' during the construction, operation and decommissioning phases. The Project has been designed and built in accordance with the best practice measures set out in this EIAR and, as such, mitigation against the risk of major accidents and/or disasters is embedded through the design.

The risk of a major accident and/or disaster during the construction of the Project is considered 'low' in accordance with the 'Guide to Risk Assessment in Major Emergency Management' (DoEHLG, 2010).

18 NTS 18 INTERACTIONS OF THE FOREGOING

Any potential impact on one element of the environment as a result of the Project may also impact on another. **Chapter 18** of the EIAR provides a summary of the interactions and interrelationships between environmental aspects 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.

NTS Table 18.1 outlines the different environmental aspects which have potential to interact because of the Project. Interactions have been clearly identified in the early stages of the Project and where the potential exists for interaction between environmental impacts, the EIAR specialists have taken the interactions into account when making their assessment. 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 Proposed Development.

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

	Population & Human Health		Biodiversity		Ornithology		Soils & Geology		Hydrology and Hydrogeology		Noise and Vibration		Landscape & Visual Amenity		Material Assets and Other Issues		Cultural Heritage		Traffic & Transportation		Air and Climate		Shadow Flicker		Major Accidents and Natural Disasters	
	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																										
Biodiversity																										
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Soils & Geology																										
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Noise & Vibration																										
Landscape & Visual Amenity																										
Material Assets																										
Archaeology and Cultural Heritage																										
Traffic & Transportation																										
Air and Climate																										
Shadow Flicker																										
Major Accidents & Natural Disasters																										

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

Interaction or inter-relationship

No interaction or inter-relationship