MWP

Volume I: Non-Technical Summary

Ballinla Wind Farm

Ballinla Wind Farm Ltd.

August 2025

Contents

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MWP, Engineering and Environmental Consultants
Address: Park House, Bessboro Road, Blackrock, Cork, T12 X251, Ireland

www.mwp.ie

1. Introduction

Ballinla Wind Farm Ltd. (the 'Applicant') is seeking 10-year planning consent from An Coimisiún Pleanála (the competent Planning Authority) under Section 37E of the Planning and Development Act (as amended) for a proposed wind energy project in Co. Offaly, named Ballinla Wind Farm (Proposed Development). The Proposed Development comprises the construction of seven wind turbines, an onsite 110 kilovolt (kV) substation and all ancillary works in County Offaly (the Proposed Wind Farm), in addition to works along the TDR (the Proposed TDR), collectively herein referred to as the Proposed Development. The location of the Proposed Development site is shown in Figure 1-1. Malachy Walsh and Partners (MWP) have been engaged by the Applicant to prepare an Environmental Impact Assessment Report (EIAR) to accompany the planning application. A full description of the proposed development and development lands of the project is provided in Chapters 2 and 3 of Volume II of the EIAR.

This Non-Technical Summary (NTS) is the first volume of the EIAR for the proposed development. The other volumes which comprise the Environmental Impact Assessment Report are:

- Volume II: Main Environmental Impact Assessment Report.
- Volume III: Appendices.
- Volume IV: Photomontages.

The purpose of this NTS is to provide a concise overview in non-technical terms of the project, environmental effects and mitigation measures highlighted by the Environmental Impact Assessment (EIA) which are presented in detail in the main EIAR, Volume II.

1.1 The Applicant

The Applicant is a Special Purpose Vehicle Company (SPV) of Statkraft Ireland Limited. 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, which is also a global company in energy market operations, has 4,800 employees in 20 countries.

Statkraft entered the Irish market in 2018 and since then has almost tripled its workforce and tripled its development portfolio. In Ireland, Statkraft develops, owns and operates renewable energy projects across the technologies of onshore wind, offshore wind, solar, battery storage and grid services. By the end of 2022, Statkraft Ireland is on course to have an overall portfolio of circa 4,000MW.

Statkraft is one of the biggest renewable energy developers in Ireland with over 4GW pipeline of offshore, onshore, solar and grid services projects. The Statkraft Ireland team, which is based in Cork and Tullamore, Co. Offaly, has constructed a portfolio of almost 350MW of wind projects across the country, operates over 500MW and has an established track record in wind energy in Ireland, including the development and construction of Ireland's first 4-hour battery project which is collated at Cushaling Wind Farm.

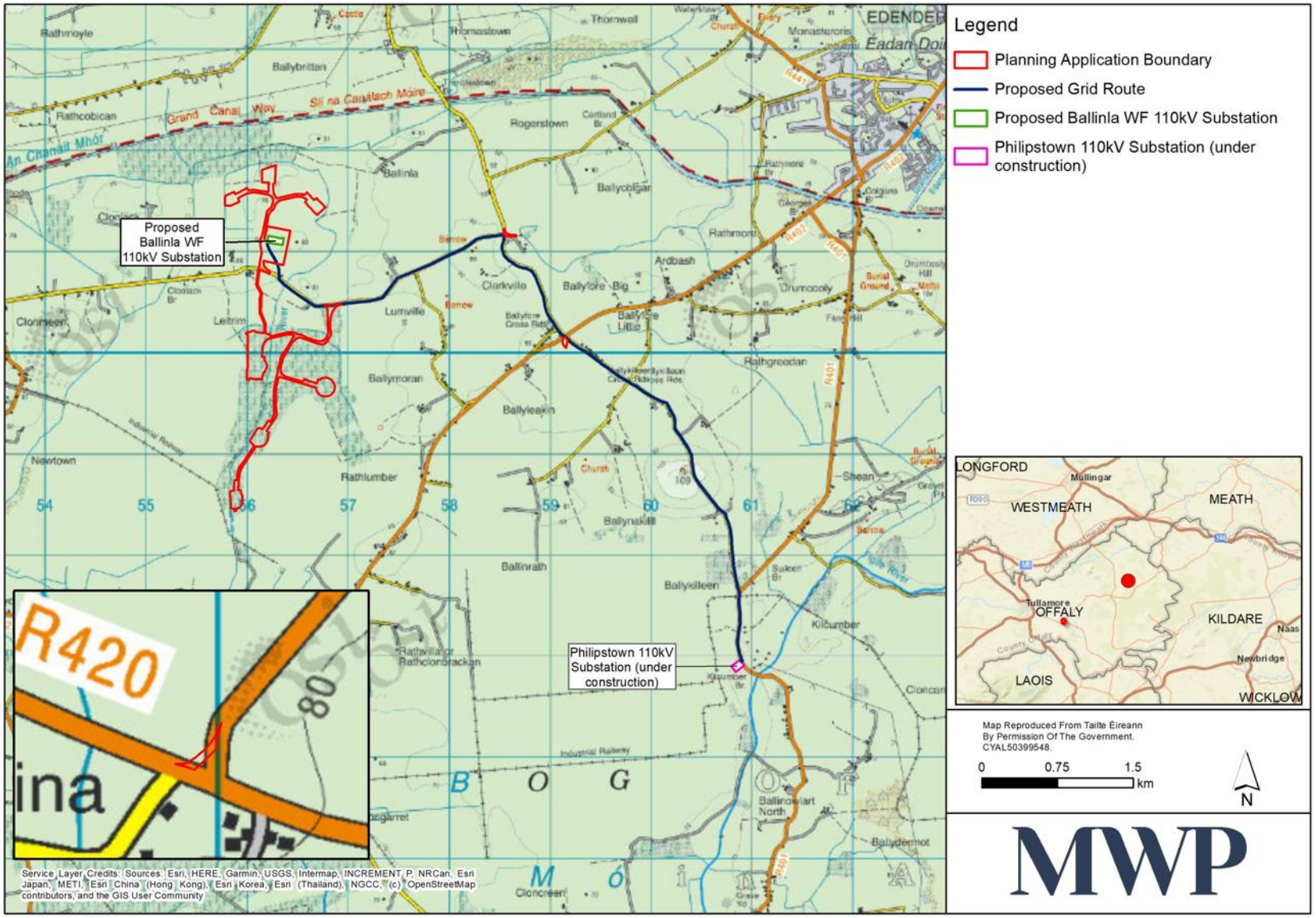

Figure 1-1: Site Location of the Proposed Development

1.2 Overview of Proposed Development

The Proposed Development to be assessed within this EIAR consist of the following elements:

- Seven Wind Turbine Generators (WTGs) (blade tip height 185m).
- Seven WTG foundations and hardstand areas.
- One electrical substation (110kV) including independent power producer (IPP) substation and wind farm operations compound with associated ancillary buildings, security fencing and all associated works.
- One LiDAR station based on the ground.
- Two new site entrances from the L5010.
- New and upgraded internal site access tracks.
- All associated underground electrical and communications cabling connecting the proposed turbines to the proposed onsite substation.
- The TDR including temporary works on sections of the public road network and private lands along the turbine delivery route on the L-5006 and the junction of the R-402 and R-420.
- One temporary construction site compound and additional mobile welfare unit.
- One spoil deposition area.
- Landscaping.
- Associated surface water management systems.

The project considered in this **EIAR** includes an underground grid connection cabling, connecting the onsite substation to the national electricity grid via the Philipstown 110kV Substation located opposite the Edenderry Power Station, Co. Offaly. The cabling will be located within the public road corridor or existing tracks for its entire length. The total length of the Proposed Grid Connection Route is approximately 8km, the full length of the Proposed Grid Connection Route is located within Co. Offaly. To ensure clarity, the Proposed Grid Connection Route will be the subject of a separate future planning application.

All elements of the Proposed Development listed above, and described in this chapter, have been assessed as part of this EIAR.

The layout of the Proposed Wind Farm is shown in **Figure 1-2**.

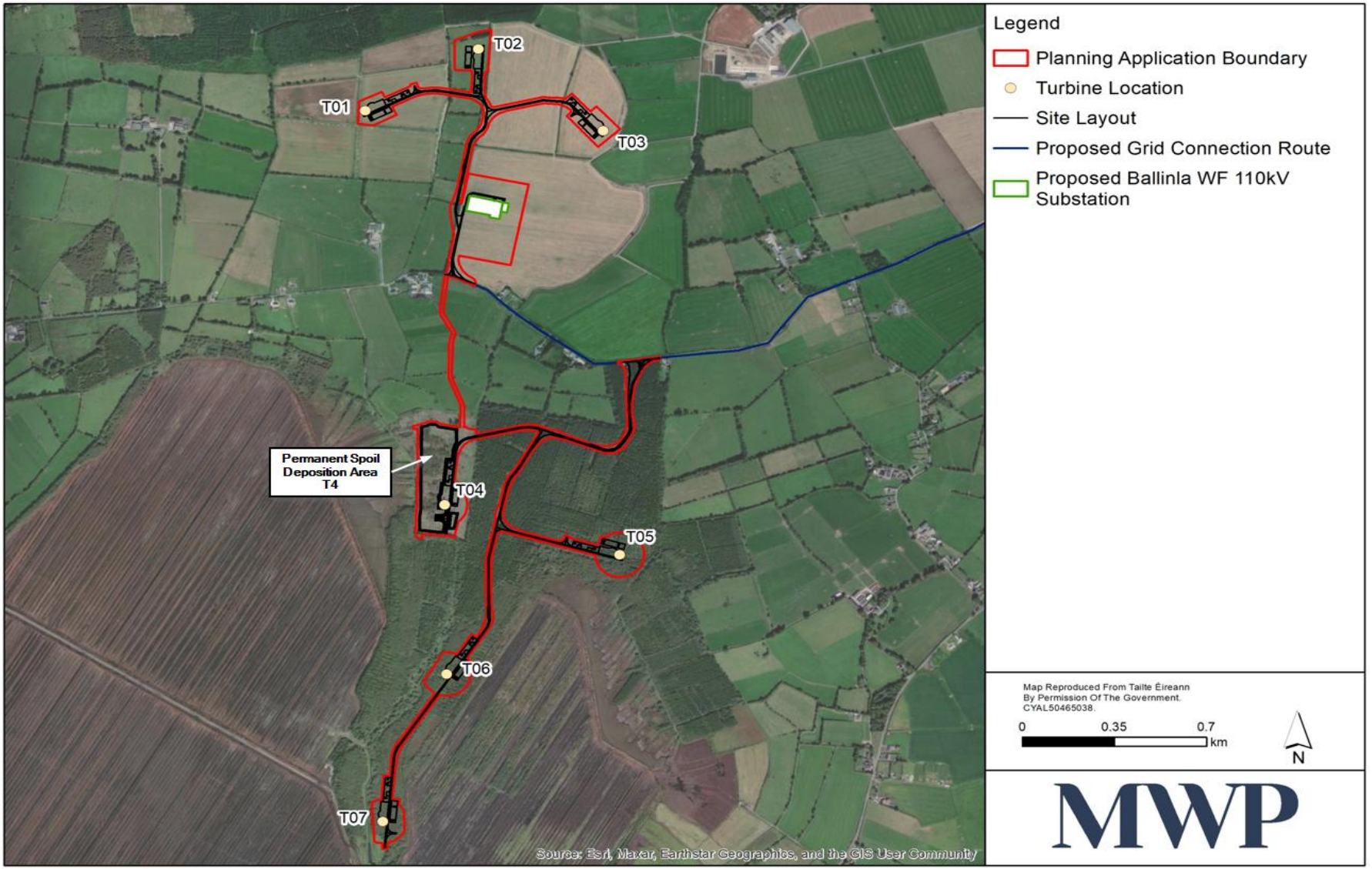

Figure 1-2: Proposed Wind Farm Layout

1.3 Site Location

The Proposed Wind Farm is located in a rural area of east Co. Offaly and is approximately 4km west of the Edenderry town boundary and 24km east of Tullamore. **Figure 1-1** outlines the location of the Proposed Wind Farm and Proposed Grid Connection Route, the area within this red line boundary is 42ha.

The Proposed Wind Farm is within the townland of Leitrim in the municipal district of Edenderry, Co. Offaly. The Proposed TDR will include development in the townlands of Leitrim, Ballyfore Big, Ballyleakin, and Ballina (Geashill By) Co. Offaly.

The Proposed Grid Connection will be a linear development within the townlands of Leitrim, Lumville, Ballinla, Clarkeville, Ballyfore Big, Ballyfore Little, Ballyeakin and Ballykilleen, in the local electoral area of Edenderry, Co. Offaly. The Proposed Grid Connection is 8km along the public roads from the Proposed Wind Farm southeast to the existing Philipstown 110kV substation adjacent to the Edenderry Power Station.

Existing land cover at the site consists of agricultural land in the northern section and coniferous commercial forest in the southern section. The Proposed Wind Farm is traversed by the L5010 local road which travels in an east west direction bisecting the Proposed Wind Farm. The Grand Canal is located to the north of the Proposed Wind Farm. The surrounding land includes agricultural fields, forestry and cutover peatlands.

Current land-use along the Proposed TDR and the Proposed Grid Connection comprises of public road corridor, public open space, pastures, mixed forestry and land principally used by agriculture with significant areas of natural vegetation.

1.4 EIA Study Area

The Proposed Development boundary (the red line) includes a total land area of approximately 42ha (see **Figure 1-3**). During the Proposed Development EIA scoping, landowner engagement and design process, the wider study area was examined for wind turbine suitability and potential environmental impacts. The Proposed Development area was substantially reduced in size, eliminating areas that were considered unsuitable, thereby concentrating on areas that were deemed appropriate for locating wind turbines and associated infrastructure. Therefore, the study area for the wind farm element (see also **Figure 1-3,** the yellow line) which is referred to in the figures throughout this **EIAR**, incorporates a larger assessment area than presented in the planning application drawings. The overall EIA Study Area is based on all elements of the proposed project including the Proposed Grid Connection, Proposed TDR, the planning boundary and adjacent lands. The main EIA Study Area, zones of influence and sensitive receptors will vary depending on the assessment being completed for the EIA. This is reflected accordingly in each chapter.

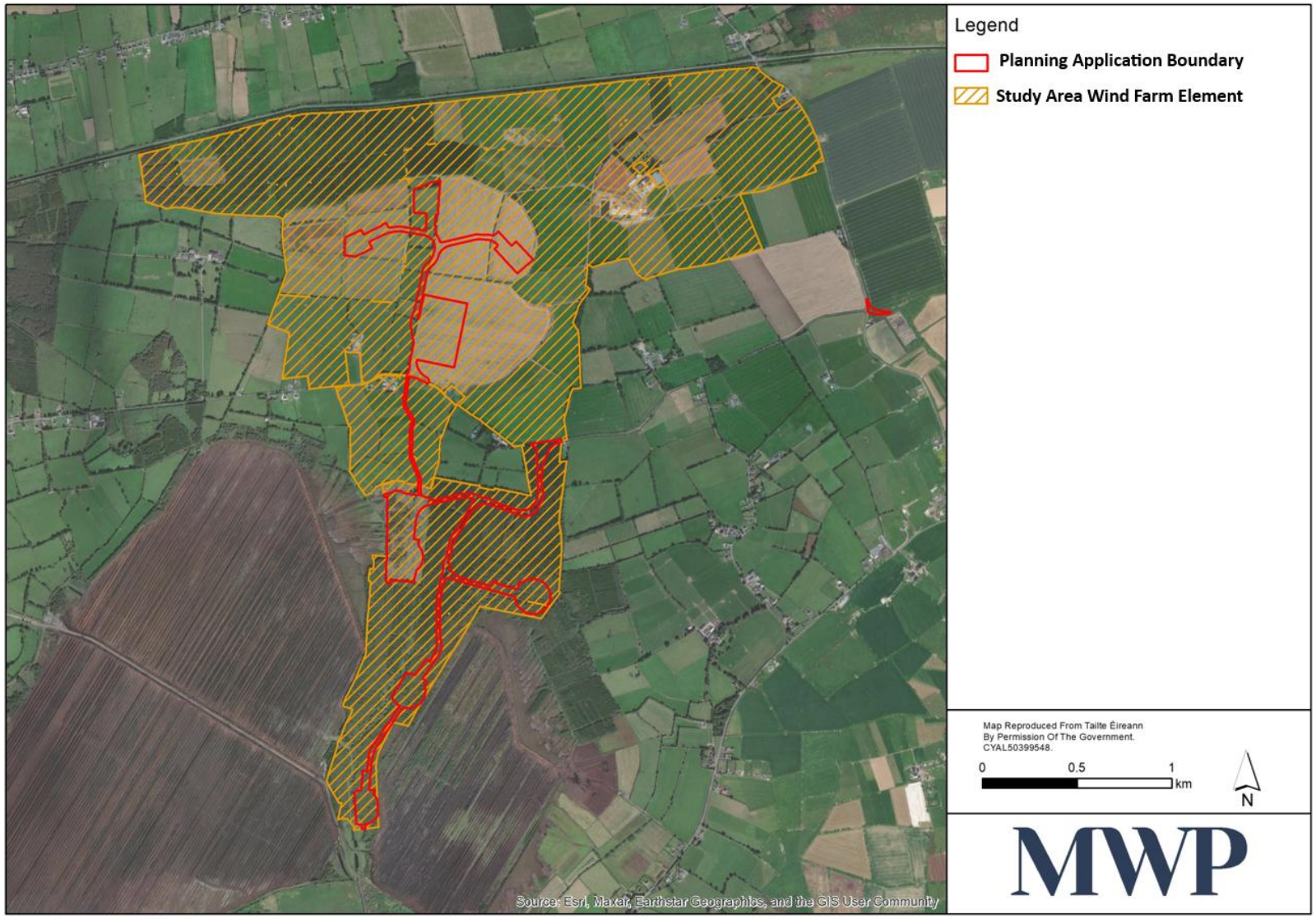

Figure 1-3: EIA Study Area (yellow line) and Proposed Development Boundary (red line)

2. Description of the Proposed Development

2.1 Overview

It is being proposed by the Applicant to develop a wind farm comprising of seven wind turbines in Co. Offaly with a maximum tip height of up to 185 metres, a hub height of 104m and a blade length of 79m. Each wind turbine will have a reinforced concrete base pad foundation with a central plinth above the base, which will support the tower.

The proposed development includes a 110kV substation within the wind farm for exporting power from the wind farm to the national electricity grid. The proposed 110kV substation will comprise an outdoor electrical yard and two single storey buildings (one for the system operator and one for the wind farm operator).

A network of underground cabling serving each turbine with electrical power and signal transmission will be installed along internal service tracks connecting to the substation compound. There will be no overhead power lines constructed on the site.

2.2 Construction Phase

It is envisaged that construction of the Proposed Development will commence in 2027 with an expected 18 month construction period. The start date is dependent on planning being granted, receipt of a grid connection offer from EirGrid, funding and all other ancillary permits being in place.

Typically, construction will occur within the hours 7.00am – 7.00pm, Monday to Friday and 7.00am to 4.00pm on Saturdays, which will be confirmed with the Local Authority. Due to the requirement for the concrete pours to be continuous, the working day may extend outside normal working hours in order to limit the traffic impact on other road users, particularly peak period school and work commuter traffic. Such activities are limited to the day of turbine foundation concrete pours, which are normally complete in a single day per turbine. Turbine and crane erections may also occasionally occur outside of these times in order to take advantage of low wind periods. Working hours will be confirmed at the outset of the Proposed Development and any changes in hours will be agreed with the Local Authority.

During the construction phase, the number of onsite construction personnel will vary for each phase of the development. Overall, it is envisaged that the Proposed Development would generate employment for up to 60 persons during the construction phase to include site contractors, onsite vehicle and plant operators, engineers, materials delivery personnel, environmental, and health and safety personnel.

It is expected that the civil works for the Proposed Grid Connection will require at least 10 personnel to complete the works. The electrical works will require less heavy machinery but more labour personnel, with typically 25 personnel to complete the works.

Primary access to the Proposed Wind Farm will be provided from the local public road (L5010), which links the L5006 in the east and the R400 to the west (refer to **Figure 2-1**). There will be two site entrances, one each to facilitate the northern and southern sections of the Proposed Wind Farm.

The proposed route to deliver wind turbine components is from the M6 via Tullamore to the Proposed Wind Farm site entrances.

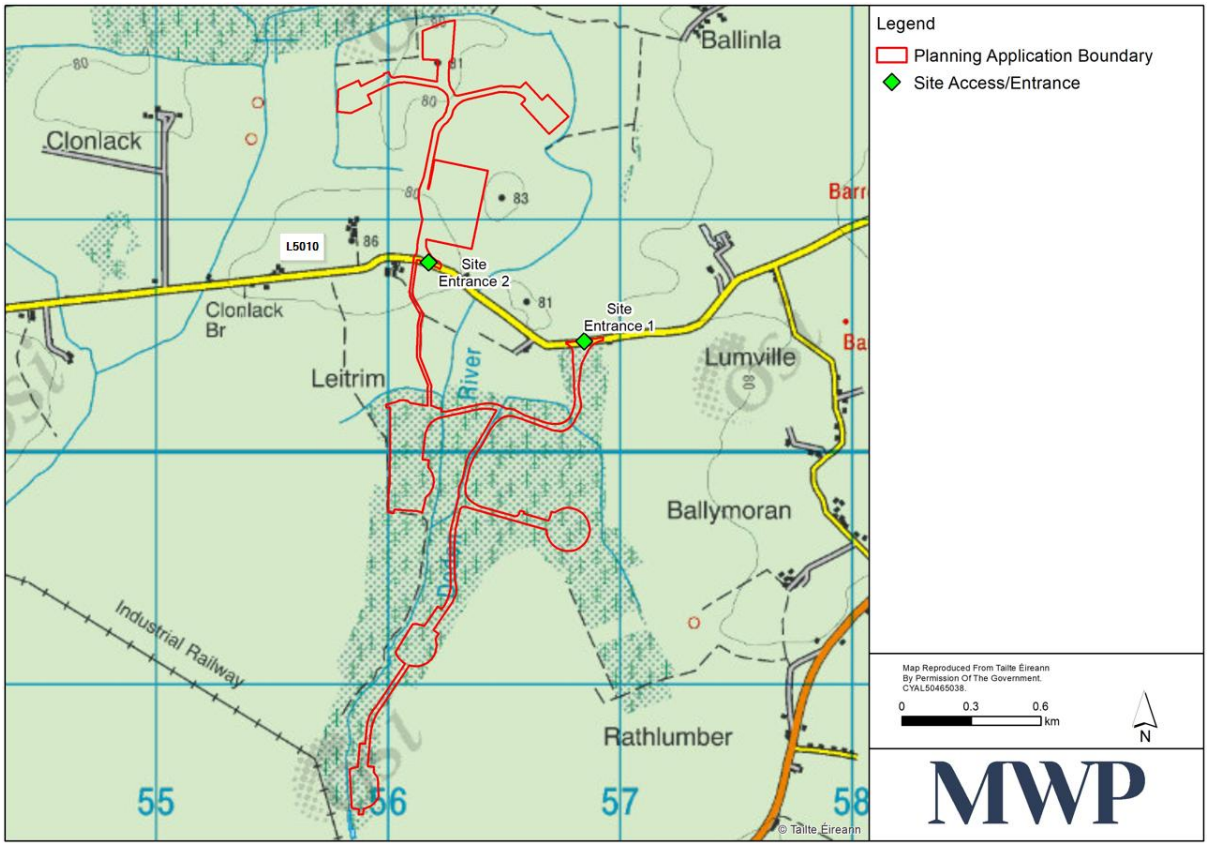

Figure 2-1: Site Access Points

One temporary construction compound will be set up upon commencement of the construction phase. The construction compound will be located on the northern section of the wind farm site beside the proposed 110kV substation and will have a footprint of approximately 4,750m².

A site drainage system will be constructed on the site so as to attenuate runoff, guard against soil erosion and safeguard downstream water quality.

Felling of commercial forestry is required mainly in the southern section of the Proposed Wind Farm. Felling will occur within and around wind farm infrastructure to accommodate the construction of the turbine foundations, hardstands, access tracks and turbine assembly. Overall, felling of approximately 21ha of forestry will be required.

There will be a requirement for replacement forestry lands, however these will be at a significant remove from the development site so there will be no cumulative impact. These lands will be subject to a separate independent technical and environmental approvals process.

All soils and subsoils generated from excavation works will be retained on site and reused in bunding, landscaping and localised earthworks. Excess spoil material will be stored on site in a permanent designated spoil deposition area near T4 (see **Figure 1-2**).

2.2.1 Production of Waste

All waste will be dealt with through the waste hierarchy of prevention, reuse, recycling and disposal. Any waste removed from the site will be done by a licenced waste contractor.

Wastewater from welfare facilities on site will drain to integrated wastewater holding tanks associated with the toilet units. The stored effluent will then be collected on a regular basis from site by a permitted waste contractor and removed to a licensed/permitted waste facility for treatment and disposal.

2.2.2 Emissions and Nuisances

The anticipated residues and emissions likely to be generated during the project lifetime are summarised in Table 2-1. These environmental effects have been identified, assessed and proposals for management of the anticipated disturbances and/or emissions are presented throughout relevant chapters of this EIAR.

Table 2-1 Emissions and Disturbance

	Aspect	Potential Emission/Disturbance	Assessment Provided
Construction /Decommissioning	Air	The main emissions to atmosphere during the construction stage of the project is from fugitive dust associated with the following activities: • Groundworks associated with the construction of the project infrastructure. • Transportation and unloading of crushed stone around the site. • Vehicular movement over potentially hard dusty surfaces such as freshly excavated and constructed access tracks and crane hardstanding areas. • Vehicular movement over material potentially carried off site and deposited on public roads. The movement of machinery, construction vehicles and the use of generators during the construction phase will also generate exhaust fumes containing predominantly carbon dioxide (CO_2), sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), and particulate matter (PM_{10}).	**EIAR Volume II Chapter 13** Air and Climate
	Noise	Traffic flows, excavation, mechanical machinery and electrical equipment typically used for construction projects would generate noise emissions.	**EIAR Volume II Chapter 10** Noise
	Water	Surface water runoff and discharges from construction working areas are likely during construction, although overall the quantity of surface runoff would not change overall as a result of the construction work. Occasional and low quantity discharges could arise from pumping in order to dewater foundation excavations. This would be discharged to the water management drainage system. Pollution sources could arise as a result of soil erosion or from oil/ fuel or chemical storage and use. Proposals for management of water quality and quantity from the Proposed Development are presented in EIAR Volume 3: Appendix 2-1: CEMP.	**EIAR Volume II Chapter 8** Water
	Traffic	The additional traffic, especially heavy goods vehicles associated with the construction phase, has the potential to cause disturbance to those using the local road networks.	**EIAR Volume II Chapter 15** Material Assets and **EIAR Vol III** Appendix 15
Operational	Air	Due to the nature of the project no significant point source or diffuse air emissions will be produced during its operation.	**EIAR Volume II Chapter 13** Air and Climate
	Noise	Potential noise disturbance from operational turbines and a proposed new 110kV on-site substation. Any perceived noise disturbance will be in compliance with limits.	**EIAR Volume II Chapter 10** Noise
	Water	No water emissions or pollution sources have been identified for the operational phase.	**EIAR Volume II Chapter 8** Water
	Shadow Flicker	In certain conditions, the movement of wind turbine blades could give rise to shadow flicker at nearby residential receptors. Any perceived shadow flicker at receptors will be eliminated through the installation of control modules.	**EIAR Volume II Chapter 16** Shadow Flicker

2.3 Operational Phase

The Proposed Development will have a lifespan of 35 years. Each wind turbine will be computerised to control critical functions, monitor wind conditions and report data back to a Supervisory Control and Data Acquisition (SCADA) system.

During the operation of the wind farm, the turbine manufacturer, the Applicant or a service company will carry out regular maintenance of the turbines. During the life of the project, it is envisaged that at least two permanent jobs will be created locally in the form of operator or maintenance personnel. In addition, operation and monitoring activities may be carried out remotely with the aid of computers connected via a telephone broadband link. However, routine inspection and preventive maintenance visits will be necessary to ensure the smooth and efficient running of the Proposed Wind Farm and require a minimal presence.

It is unlikely that the underground cable will require much maintenance during its operation but in the event a fault does occur, inspection of the fault can be carried out to determine what works to the ducting may be required.

2.4 Decommissioning

At the end of the estimated 35-year lifespan of the Proposed Development, the turbines will be decommissioned. The site will be decommissioned and reinstated with all seven wind turbines and towers removed. Removal of infrastructure will be undertaken in line with landowner and regulatory requirements and best practice applicable at the time.

The substation and the underground cabling associated with the Proposed Grid Connection will remain a permanent part of the national grid and therefore decommissioning is not foreseen. In the event of decommissioning, it will involve removing the cable from the ducting but leaving the ducting and associated supporting structure in place. The substation will remain in place and will previously have been taken in charge by the system operator, after the wind farm is connected to the national electricity grid.

2.5 Cumulative Assessment

The Proposed Development was considered in combination with other relevant plans and projects that could result in cumulative effects.

Land management practices in the wider area which are considered in combination with the effects of the project are agriculture and forestry. It is proposed that all agricultural activities within the planning boundary will cease for the duration of the construction and commissioning phase. Agricultural activities within the wider study area will continue and will be separated from construction activities by appropriate stock proof fencing. Forestry operations within the planning boundary will also cease and will resume again post commissioning of the wind farm.

In terms of the replacement forestry lands, there is no potential for significant cumulative effects associated with the sites and forestry operations due to geographical separation. The Applicant commits that the location of any replanting (alternative afforestation) associated with the project will be outside the zone of influence of the Proposed Development.

The potential cumulative impact of the Proposed Development has been assessed in accordance with Annex IV of the EIA Directive as amended which provides that the EIAR must contain a description of the likely significant effects of the project on the environment resulting from the cumulation of effects with other existing and/or

approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources.

The Proposed Development would positively cumulate with other wind farm developments in the region to advance in delivering local, regional, and national Green Energy targets. Wind turbines identified within 25km of the Proposed Development are listed below and illustrated in Figure 2-2.

- Cushaling Wind Farm (9- turbine) (Permitted and under construction).
- Cloncreen Wind Farm (21 - turbine) (existing).
- Mountlucas Wind Farm (28 - turbine) (existing).
- Yellow River Wind Farm (29 – turbine) (Permitted and under construction).
- Moanvane Wind Farm (12 – turbine) (Permitted and under construction).
- Dernacart Wind Farm, Co. Laois (8 – turbine) (Permitted).
- Drehid Wind Farm, Co. Kildare (11 turbines) (Submitted).

Other wind farms in planning that were also considered in cumulative effects, where relevant, are.

- Ballivor Wind Farm, Co. Meath and Co. Westmeath (Permitted).
- Clonarrow Wind Farm, Co. Offaly (Under FI request in planning).

The potential for cumulative effects is considered in the relevant chapters of this EIAR.

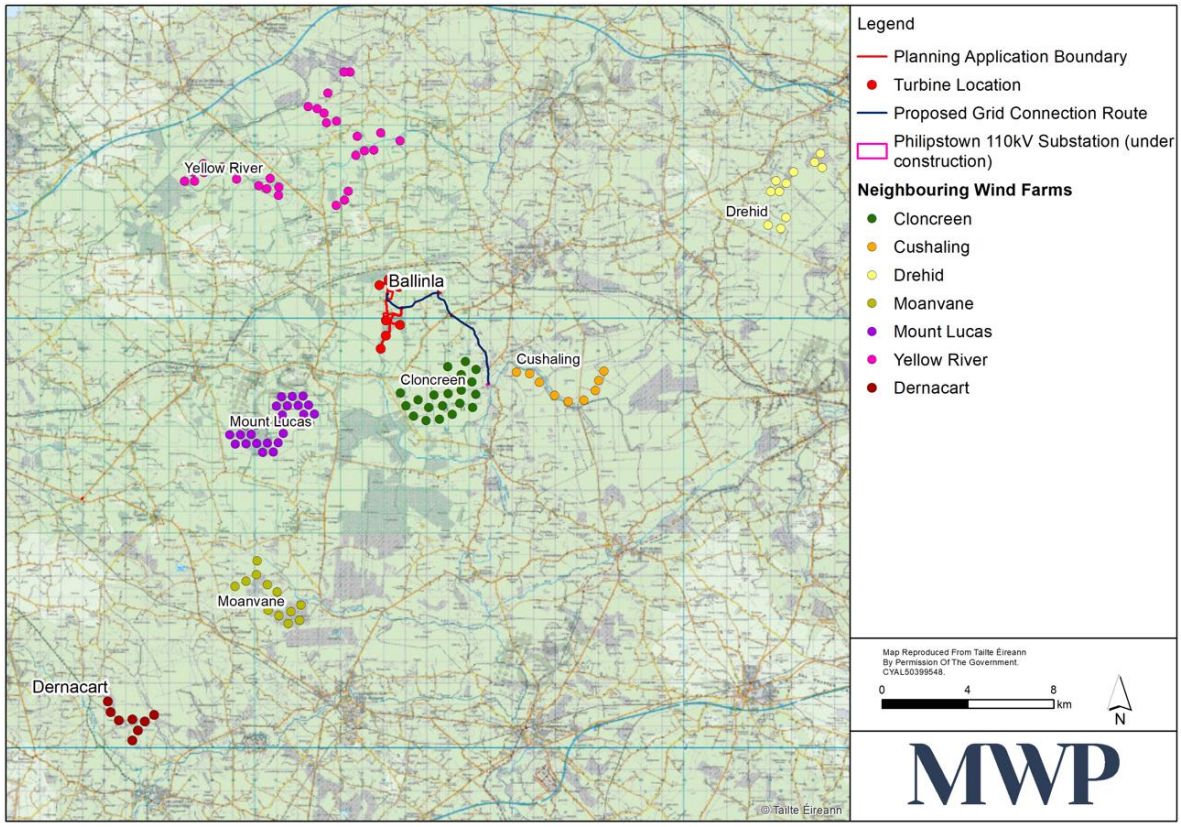

Figure 2-2: Wind Farm developments within 25km of the Proposed Development

The nearest proposed solar farms to the Proposed Development are listed as follows:

- Kilcush Solar Farm (21/598) – c. 117.47 hectares to include PV panels mounted on metal frames, 22 No. MV power stations (Permitted by Offaly County Council but not yet constructed).
- Obton Limited Oldcourt Solar Farm (22/327) – c. 121.55 hectares of solar panels on ground mounted frames and other ancillary works (Permitted by Kildare County Council)

Kilcush Solar farm is located approximately 7km south of the Proposed Development while Oldcourt is located approximately 10km east. The potential for cumulative effects is considered in the relevant chapters of this EIAR.

2.6 Risk of Major Accidents and Disasters

It is considered that there is no risk for the Proposed Development to cause major accidents and/or disasters or vulnerability of the project to potential disasters/accidents, including the risk to the project of both natural disasters and man-made disasters.

Given the temporary nature of the construction stage and the scale of the Proposed Development, as well as the environmental protection measures that will be implemented from the outset, the risk of disasters (typically considered to be natural catastrophes e.g., very severe weather event) or accidents (e.g., fuel spill, traffic accident or landslide) is considered low.

In the case of the occurrence of a severe weather event such as flooding during construction, construction work will cease. A scoping exercise was carried out to determine whether a detailed Peat Landslide Hazard and Risk Assessment was required for this site. This scoping exercise reviewed whether peat was present onsite. Peat was mapped on the GSI maps for the southern section of the site at the locations of four wind turbines. Site investigations found till on the northern section and peat in the southern section of the Proposed Wind Farm. The extents of the area were mapped, and peat probes were carried out. A peat stability risk assessment was carried out for the Proposed Development (see Appendix 9).

Overall, there is no risk of instability of the site, access tracks, turbine bases or Proposed Grid Connection from peat.

2.7 Impact of Climate Change

There is potential for the Proposed Development to be impacted by severe weather including increased wind and storms due to climate change. However, wind turbines are designed to withstand extreme weather conditions with brake mechanisms installed within the turbines so that they only operate under specific wind speeds and will shut-down during high wind speed events. Therefore, there is very low risk to the Proposed Development from high wind speeds.

Flood risk is considered in the Flood Risk Assessment (FRA) (Appendix 8) to determine whether the Proposed Development is at potentially vulnerable from extreme fluvial flooding events. The FRA concludes that the substation and T1 are in flood zone B and the Proposed Development may be vulnerable to flooding. As such the design of the Proposed Development has taken this into account. Flood risk has been effectively addressed through the integration of targeted design interventions within the Proposed Development. Once all mitigations in the FRA are implemented it also concludes that the development will not have an adverse impact on flooding outside of the Proposed Development boundary.

2.8 Alternatives Considered

The consideration of Alternatives is a mandatory part of the EIA process.

During the project design process, alternative wind farm layouts and scales were fully considered in order to find the optimum design solution for the site with the least level of environmental impact. The Alternatives chapter therefore outlines the site selection process, the process of design evolution for the Proposed Development, the reasonable alternatives considered during the project inception and design process including a comparison of the environmental effects and the principal reasons for proceeding with the current planning application. The following elements are considered further in this chapter:

- Site Selection.
- Project Design Process.
- Alternatives Considered.

The Proposed Development has been designed to minimise potential environmental impacts and to maximise wind potential on site. Design of the Proposed Wind Farm was guided by a step-by-step Environmental Impact Assessment (EIA) process, which identified suitable areas for turbines, access tracks, and infrastructure. This process emphasised the avoidance of environmentally sensitive or unsuitable locations and followed best practice through mitigation by design. More details on the project design and evolution can be read in Chapter 4 of Volume II of the EIAR.

The final site layout or final alternative (seven turbine layout) was determined based on multi-discipline inputs and consideration of topography, biodiversity, land and soils, hydrology, landscape, and engineering constraints and assessments. The development as proposed is the preferred option as it results in the least effects on resources and receptors while meeting the project objectives of a large scale renewable wind energy development.

3. Environmental Assessment

The EIAR has been carried out in accordance with the relevant legislative requirements and guidelines, including the Environmental Protection Agency (EPA) – 'Guidelines on Information to be Contained in an Environmental Impact Assessment Reports, 2022'. Specialist guidance as required for each of the environmental topics has also been used where appropriate.

A summary of each prescribed environmental factor considered in this EIAR is outlined in the following sections.

3.1 Population and Human Health

The scope of the Population and Human Health assessment considers the effects of the construction and operation of the Proposed Development in terms of how the proposal could affect, land use change, population and settlement, economic activity and employment, tourism and amenities, and health.

Settlement patterns in the greater region are generally small cluster settlements of houses and farmsteads, and linear settlements along local and regional roads. Edenderry is the closest town (population 7,888, CSO, 2022) settlement to the Proposed Development, located *c.*7km to the east. One other settlement of note is Rhode (population 841, CSO, 2022) which is located *c.*7.5km northwest of the Proposed Development.

The land on which the Proposed Wind Farm is traversed by the local road L5010. The northern section of the Proposed Wind Farm is agricultural land and pastures, with commercial woodland to the north. The southern section of the Proposed Wind Farm is commercial coniferous and mixed woodland. The area is accessible by the L5010, and most residential dwellings are along this route in small ribbon developments. The surrounding landscape is mostly made up of agricultural land and pastures with some areas of forestry, with ribbon development along the local county roads.

There is no recreational land use designated in the area of the Proposed Development. The closest recognised recreational route is the Grand Canal Walkway north of the Proposed Development. The closest school is Ballybryan National school, *c.* 3.8km north of the Proposed Development. Other education facilities within the vicinity are located in Edenderry (*c.* 6km), east of the site. Ballyfore GAA Club is located east of the southern section of the Proposed Development, *c.* 2km.

3.1.1 Construction Phase

During the construction phase of the Proposed Development, approximately 60 people will be employed over an 18-month construction phase which will have a direct, positive, short-term to temporary and moderate impact on employment in the local area.

Construction activities can cause a disturbance to the local community and are likely to pose temporary minor disturbances locally. The most notable of these disturbances relates to the generation of additional traffic on the local networks. Noise and safety implications are also a consideration. However, disturbances associated with the additional volumes of traffic will be moderate and principally be confined to the construction phase and will cease on completion of works. The construction phase will be managed to minimise the impact on the human environment and the local residents. Dust and noise impacts from construction works are not expected to cause a significant impact, with the implementation of mitigation measures. No significant negative effects on the local human environment are expected.

3.1.2 Operational Phase

The operational phase of the Proposed Development is not expected to present any adverse impacts on the human environment. Noise impacts associated with the operational phase will not be significant at receptors and will be below current guidelines. Shadow flicker impacts are unlikely to occur with a zero-shadow flicker policy.

The production of electricity by wind energy is environmentally-friendly and thus prevents risk of air pollution and risk to human health.

A landscape and visual impact assessment was carried out in relation to the Proposed Development. The turbine structures and their proposed position in a relatively flat, low-lying area, will have a visual consequence that is unavoidable. However, the extent of intrusion will vary in degree and significance according to viewing distance, the numbers and parts of turbines visible, the number of viewers affected and of course public perception. The assessment concludes that there will be no significant effects as a result of the Proposed Development.

In relation to the local community and a Community Benefit Fund, as set out in the terms of the Renewable Energy Support Scheme (RESS), all renewable energy projects must establish a Community Benefit Fund prior to commercial operations. RESS requires an annual contribution of €2/MWh for all projects. Furthermore, the Community Benefit Fund will provide a minimum payment of €1,000 to all dwellings located within a 1km radius from the Proposed Development and sets out that a minimum of 40% of the funds shall be paid to not-for-profit community enterprises.

3.1.3 Decommissioning Phase

At the end of its 35-year operational life, the Proposed Wind Farm will be decommissioned in accordance with a detailed Decommissioning Plan, which will be agreed with the relevant authorities at that time. All turbines, towers, and associated components will be dismantled and removed from the site using cranes similar to those used during construction. Where feasible, turbine components will be reused or recycled. Underground cables will likely be left in place to avoid unnecessary ground disturbance. Hardstand areas will be rehabilitated to match the surrounding landscape, and access tracks will remain for landowner use. Waste materials will be managed responsibly, with disposal carried out by licensed operators in line with environmental regulations. Overall, the decommissioning phase is expected to have minimal environmental impact, with effects significantly lower than those experienced during construction.

3.1.4 Cumulative Impacts

The cumulative impact assessment considered nearby existing, permitted, and proposed wind and solar energy developments in the vicinity of the Proposed Development, including Cloncreen, Mountlucas, Cushaling, Yellow River, and Moanvane wind farms, as well as several solar farms. While these developments contribute to a growing presence of renewable infrastructure in the region, the cumulative effects on population and human health are assessed as slight to moderate and long-term. Potential cumulative impacts such as noise, air quality, traffic, and shadow flicker were evaluated across relevant EIAR chapters and found to be either imperceptible or mitigated through standard best practice measures, including the use of Shadow Flicker Control Modules. Overall, no significant cumulative effects on population, settlement patterns, land use, tourism, or human health are anticipated as a result of the Proposed Development in combination with other nearby projects.

3.1.5 Mitigation

The potential for significant effects on the human environment will principally arise during the construction phase from traffic, noise and dust effects and during the operational phase from noise and shadow flicker effects. Mitigation in relation to these issues are outlined in their respective Chapters of this EIAR (Chapter 10 Noise, Chapter 16 Shadow Flicker, Chapter 11 Landscape and Visual, Chapter 13 Air and Climate, Chapter 15 Material Assets Traffic and Transport).

As there will be no significant effects, no additional mitigation measures are required for population and human health.

3.1.6 Conclusion

It is considered that, with the full implementation of the mitigation measures outlined throughout this assessment, the Proposed Development will not give rise to any likely significant effects on population and human health. Potential impacts associated with construction and operation have been identified and appropriately addressed through design and management strategies. As such, the Proposed Development is not expected to result in any significant adverse effects on land use, settlement patterns, local amenities, or human health.

3.2 Biodiversity

The biodiversity of the Proposed Development and environs is described in terms of designated sites, habitats, flora, fauna and biological water quality. Mitigation measures are specified to ensure that significant effects on these features do not occur. Studies and reporting were in line with best practice and recently produced guidance.

The information on the existing environment was obtained using publicly available information sources and by field surveys.

A Natura Impact Assessment (NIS), which considers the potential impacts of the proposed project, on the integrity of the relevant Natura 2000 sites, either alone or in combination with other plans or projects, with respect to the Conservation Objectives of Natura 2000 sites in question, has been prepared as a standalone document in the planning application.

The Proposed Development site does not lie within the boundary of any designated Natura 2000 site. Hence, the site of the proposed development does not form part of any Special Protection Area (SPA), Special Area of Conservation (SAC) or candidate Special Area of Conservation (cSAC).

A study of the Proposed Development and the surrounding immediate area was undertaken. Key habitats identified as Important Ecological Features within the study area have been evaluated as being of 'Local importance (higher value)' for a number of reasons including, their potentially important foraging, commuting, breeding, and resting habitat for fauna and being a species rich area. The habitats include Broadleaved woodland (WD1), Scrub (WS1), Hedgerows (WL1), Tree lines (WL2), Drainage Ditches (FW4) and Depositing Lowland Rivers (FW2).

Key fauna and flora identified as Important Ecological Features within the study area have been evaluated as being of 'Local importance (higher value)' for a number of reasons including their protection under national legislation and occurrence on the wind farm site. Not all of these ecological features were recorded during ecological surveys, but suitable habitat occurs. Examples of these include Badger, Pygmy Shrew, Red Squirrel, Otter, Pine Marten, Hedgehog, Irish Hare, Stoat, multiple bat species, terrestrial macro invertebrates (such as bees and butterflies), Frogs, Brook Lamprey and other fish species.

3.2.1 Construction Phase

The construction phase of the Proposed Development will require excavation and construction within the site, which will bring about habitat loss. It will have a potential negative impact on flora and fauna. A potential impact during construction is disturbance of sheltering or foraging species of fauna by the operation of machinery and other human activity. Decommissioning of the Proposed Wind Farm will have impacts potentially similar to construction impacts.

3.2.2 Operational Phase

The operational phase of the Proposed Development will not involve any additional removal of habitat nor any point source discharges, and there will be no other material releases that would cause adverse impacts on surface waters. Wind turbines, and their associated equipment, use lubricating and insulating oils in a closed system.

3.2.3 Decommissioning Phase

Ecological impacts during decommissioning are anticipated to be temporary and moderate in nature, particularly in relation to disturbance of fauna and potential sediment mobilisation. However, mitigation measures developed for the construction phase, such as careful timing of works, ecological supervision, and water quality protection protocols, will also be applied during decommissioning to minimise these effects. A detailed decommissioning plan will be agreed with the local authority prior to commencement, ensuring that any potential impacts are appropriately managed and that the site is reinstated in a manner that supports long-term ecological stability.

3.2.4 Cumulative Impacts

When considered alongside other renewable energy projects in the region, such as nearby wind and solar farms, the Proposed Development contributes positively to national climate and biodiversity goals. Overall, the cumulative impact of the project is assessed as long-term and imperceptible, provided that all mitigation measures are implemented effectively and that ongoing activities in the area are managed sustainably.

3.2.5 Mitigation

A Biodiversity Enhancement Plan is included in drawing 23882-MWP-00-00-DR-C-5426 outlining proposed enhancement measures for various habitats and species within the study area. Through the reinstatement of habitats within the Proposed Development site, as well as the implementation of mitigation measures and habitat management and monitoring, the Proposed Development will ensure biodiversity on the site is maintained and no net loss occurs.

General best practice construction mitigation measures will be followed, including working according to a Construction and Environmental Management Plan (CEMP), a draft of which has been prepared. A surface water management system forms an integral part of the project design as do a suite of avoidance measures including buffers and set back distances from watercourses and ecologically valuable habitats.

For bats specific buffers have been calculated for their protection and the riparian environment of the Leitrim Stream will be preserved.

The works will be supervised by an Ecological Clerk of Works (EcoW) who will review all method statements and monitor the construction phase to ensure that all environmental controls and mitigation is implemented in full. The project ecologist will be awarded a level of authority and will be allowed to stop construction activity if there is potential for adverse environmental effects.

3.2.6 Conclusion

It is considered that with the full implementation of the ecological mitigation measures outlined in the biodiversity chapter, the effects on important Ecological Features from potential construction, operation and decommissioning impacts will be avoided, reduced and mitigated sufficiently to ensure that no likely significant effects remain.

3.3 Ornithology

This assessment considered the potential effects the Proposed Development may have on birds within the study area and also on birds in the surrounding area. The methodology used for this study included desk-based research of published information and site visits to assemble information on the local receiving environment.

Field surveys were undertaken over a three-year period from Summer 2021 to Winter 2024/2025, to gather detailed information on bird distribution and flight activity in order to predict the potential effects of the Proposed Development on birds.

The bird surveys encompassed the following survey types:

- Vantage Point (VP) Surveys.
- Hinterland Surveys.
- Breeding Bird Transect Surveys.

- Winter Bird Transect Surveys.
- Breeding Wader Surveys.
- Hen Harrier Roost Surveys.
- Nocturnal Migration Audio Whooper Swan Surveys.
- Whooper Swan Migration Surveys Winter.

3.3.1 Construction Phase

During the construction phase, 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. Indirect loss can occur with high levels of activity and disturbance during the construction phase causing birds to vacate territories close to works, especially for species vulnerable to disturbance.

During the construction phase without mitigation the effects range from imperceptible to significant.

3.3.2 Operational Phase

The primary cause of direct effects on birds during the operational phase of a development is collision risk. Not all birds are susceptible to collision; it depends on the height that they fly and awareness. More modern turbines tend to have blades higher off the ground and are slower in rotation meaning there is increased avoidance. Collisions do happen and the collision risk was modelled to calculate the potential risk. The effect on the different bird species ranged from negligible to medium in significance.

3.3.3 Decommissioning Phase

Potential effects on ornithological features during the decommissioning phase are anticipated to be broadly similar in nature to those experienced during the construction phase, albeit generally of reduced magnitude and duration.

3.3.4 Cumulative Impacts

This assessment considers the potential cumulative impacts on birds, focusing on developments either in planning, construction, or operation phases. Emphasis is placed on potential cumulative effects that may arise that included habitat loss, disturbance/displacement, collision risk and displacement. The effects range from not significant to moderate.

3.3.5 Mitigation

Mitigation and monitoring measures are recommended to lessen the impact of the proposed development. These mitigations are broad and include:

Monitoring

A re-confirmatory bird survey will be undertaken in March or April prior to the commencement of construction to identify any new breeding territories or nesting activity.

A re-confirmatory bird survey for wintering birds will also be undertaken during the winter months.

Disturbance reduction

Nest Protection: Vegetation management during the bird breeding season will only proceed following thorough surveys confirming the absence of nesting birds. This approach is in compliance with the Wildlife Acts 1976 to 2012 (as amended) and relevant provisions of the EU Birds Directive transposed into Irish law.

Exclusion zones will be created around nesting bird locations.

Construction activities will generally be restricted to daylight hours to minimise disturbance to roosting and nocturnal bird species.

Collision monitoring

While no potential significant operational effects have been identified above local level, to ensure that the operational phase of the Proposed Development does not result in significant adverse effects on bird receptors, a comprehensive post-construction monitoring programme will be implemented. This programme is designed to assess the efficacy of mitigation measures, detect any unforeseen impacts, and inform management plans.

3.3.6 Conclusion

Once mitigations have been implemented the effects on birds are reduced. Residual effects for the majority of species range from Imperceptible to Slight. Slightly higher residual effects were identified for a number of species. however, none of these are Significant effects.

Long-term Moderate residual habitat loss effects are identified for merlin and woodcock based purely on assessment of habitat loss. however, the real effect is likely to be lower (i.e. Slight to Moderate), particularly for merlin due to absence of breeding records.

A Slight to Moderate residual effect is identified for golden plover, lapwing and kestrel. Not significant to Slight residual effects are identified for whooper swan. A Moderate residual effect is identified for snipe. however, the realised effect is likely to be lower (i.e. Slight to Moderate) due to the abundance of suitable habitat for breeding snipe.

It is noted that habituation over the lifetime of the Proposed Wind Farm is likely to reduce the magnitude of all of the above residual operational effects identified. A comprehensive operational monitoring regime is proposed to ensure that any changes to the baseline environment during operation can be identified, allowing for the implementation of mitigation measures if required.

No Significant residual effects have been identified for the operational phase of the Proposed Development.

3.4 Water

An impact assessment was carried out to determine whether the proposed development is likely to have a significant adverse effect on the hydrology and hydrogeological aspects of the environment and to propose mitigation measures to reduce any potential negative impact of the proposed wind farm.

The Proposed Wind Farm is within the Barrow Water Framework Directive (WFD) Catchment. The majority of the Proposed Grid Connection is also mapped with the Barrow WFD catchment with the exception of a small section of the northern portion of the site within the Boyne WFD Catchment. The Proposed Development is primarily

mapped to be within the Figile_SC_020 WFD Sub-Catchment, with the exception of a small section of the Proposed Grid Connection within Figile_SC_010. A small section of the Proposed TDR works are located within the Lower Shannon WFD Catchment and the Tullamore_SC_010 sub-catchment.

There are three EPA mapped watercourses, **Figure 3-1**, that flow within the Proposed Wind Farm site or landownership boundaries of the proposed site, these are:

- Rogerstown.
- Leitrim.
- Lumville.

One EPA mapped watercourse flows across the Proposed Grid Connection route:

- Leitrim.

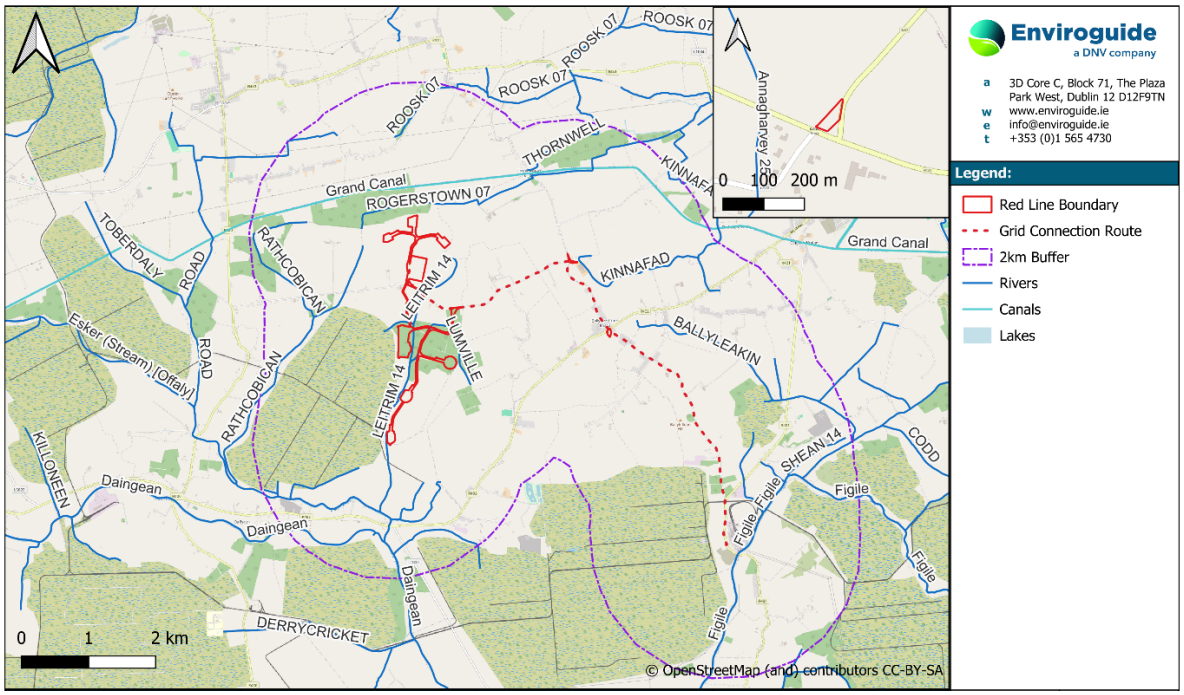

Figure 3-1: Surface Water Hydrology

A number of open drainage ditches were identified during the site walkovers. These drainage ditches were observed to contain standing water at the time of inspection were connected to the Leitrim Stream. The channels in the northern portion of the site are deep, widened, straight and generally have no significant vegetation within the main channel. The entirety of the Proposed Wind Farm is considered to drain to the Barrow Catchment. Only a small portion of the Proposed Grid Connection and the Proposed Ballyfore Big TDR works are likely to drain to the Kinnafad Stream and downstream Boyne catchment. The main channel of the Leitrim Stream in the southern portion of the Proposed Wind Farm is less modified though the channel is also deep, straight and no has significant vegetation within the main channel.

There is no identified direct hydrological connection between the Proposed Development and the Grand Canal.

Key findings of the Aquatic Ecology and Fish Report are that the watercourses at the Proposed Wind Farm are highly modified and degraded, consisting mainly of drainage ditches, small streams, and deepened rivers. The aquatic macroinvertebrate communities are common but show reduced diversity due to poor water quality,

which is rated as 'moderate' or 'poor'. The main water quality issues stem from agriculture, forestry, and past peat harvesting. Fish species present include three-spined stickleback, brown trout, and others, but salmonids are largely absent due to unsuitable conditions. High sediment loads negatively impact water quality and aquatic life.

The bedrock aquifer beneath the Proposed Development is mapped as a Locally Important Aquifer (Lm) which is generally moderately productive. Only the southern 1.4km of the Proposed Grid Connection is mapped as a Locally Important Aquifer (LI) which is moderately productive only in local zones. The range of groundwater vulnerability ranges across the Proposed development from Low to High with the Proposed Wind Farm site in an area of moderate vulnerability.

Flood Risk Assessment

A detailed flood risk assessment was carried out on the Proposed Wind Farm. Some of the wind farm infrastructure (T1 and the Substation) was found to be within a flood zone. An appropriate free board was built into the design of the Proposed Development so that there would be no impact on the infrastructure. The flood risk assessment concluded that once the proposed mitigation measures are implemented, the Proposed Development will not have an adverse impact on flooding elsewhere.

3.4.1 Construction Phase

During the construction period, the proposed development has the potential, through activities such as watercourse crossings, land reprofiling, and drainage modifications, to lead to impacts on hydrology and water quality, unless appropriate mitigation is applied.

Several minor crossings of the Leitrim Stream and its tributary drainage channels will be required. In the northern section of the site, all crossings will be constructed using bottomless culverts, with no in-stream works proposed. In the southern section, a clear-span bridge will be used to cross the Leitrim Stream, and in-stream works will be required for culvert installation on other minor watercourses. These works will be carried out in accordance with Inland Fisheries Ireland (IFI) guidance.

The drainage system of the site has been designed to maintain the existing hydrological flow regime at the site as much as possible. Sedimentation will be controlled through the designed drainage system which separates clean surface water runoff from dirty water runoff and introduces settlement ponds and overland flow discharge meaning that there will be no direct surface water discharges from the Proposed Development.

Oils and fuels will be handled using bunded tanks, spill kits and buffer zones to watercourses and storage in designated areas.

A buffer zones of 20m will be applied to EPA watercourses for new infrastructure with the exception of stream crossings. And monitoring of the watercourses will take place for given parameters to ensure that the designed surface water management system is working.

3.4.2 Operational Phase

During the operational phase of the Proposed Development, surface water and groundwater will be managed in accordance with best practice and sustainable drainage principles (SuDS). The drainage infrastructure installed during construction will remain in place and be maintained to ensure that runoff is treated and attenuated before being discharged to the surrounding environment. There will be no direct discharges to watercourses, and flow paths will be designed to mimic natural conditions, thereby protecting water quality and maintaining existing hydrological regimes.

The potential for sedimentation or pollution during operation is considered minimal. Operational activities will generate very low volumes of wastewater, which will be securely stored and removed offsite by licensed contractors. Hazardous materials such as lubricants and cooling fluids will be handled in accordance with strict environmental controls, including bunded containment and oil separators, to prevent any risk to water quality.

Flood risk has been addressed through embedded design measures, including elevating infrastructure above predicted flood levels with appropriate freeboard allowances. These measures ensure that the Proposed Development will not increase flood risk locally or downstream. Overall, with the implementation of these controls, no significant adverse effects on hydrology or hydrogeology are predicted during the operational phase.

3.4.3 Decommissioning Phase

At the end of its operational lifespan, the Proposed Wind Farm will be decommissioned in accordance with best practice and regulatory requirements. All turbines and towers will be removed, while hardstand areas and turbine foundations will be covered with soil and re-vegetated to match the surrounding landscape. Access tracks will remain for landowner use, and underground cables will likely be left in place to avoid unnecessary ground disturbance. The substation and grid connection infrastructure will remain as part of the permanent national grid. Decommissioning works will be carefully planned to minimise disruption and environmental impact, with mitigation measures similar to those used during construction. These include controls to prevent sedimentation, manage surface water, and avoid contamination of groundwater or nearby watercourses. Overall, the hydrological and hydrogeological effects during decommissioning are expected to be minor and temporary.

3.4.4 Cumulative Impacts

Cumulative impacts on hydrology and hydrogeology were assessed in relation to other existing and planned developments in the area, including nearby wind farms, solar farms, and agricultural and forestry activities. During the construction phase, there is potential for cumulative effects such as sedimentation, accidental spills, and changes to drainage patterns. However, these risks are considered low due to the implementation of standard environmental protection measures across all developments, including CEMPs and drainage controls. Operational cumulative impacts are expected to be negligible, as the Proposed Development will use sustainable drainage systems (SuDS) and will not discharge directly to watercourses. Overall, cumulative effects on water quality, water supply, and wastewater infrastructure are assessed as imperceptible and not significant.

3.4.5 Mitigation

A comprehensive suite of mitigation measures will be implemented to protect the water environment during all phases of the Proposed Development. During construction, a detailed CEMP will guide best practice procedures including sediment control, spill prevention, and wastewater management. In-stream works will follow Inland Fisheries Ireland guidelines, and watercourse crossings will use bottomless culverts or clear-span bridges to maintain natural flow and fish passage. Surface water will be managed using SuDS features such as swales, check dams, and settlement ponds. All hazardous materials will be stored in bunded areas, and emergency response plans will be in place. During operation, drainage systems will be maintained, and wastewater will be collected in sealed tanks and removed by licensed contractors. These measures ensure compliance with the WFD and protect both surface and groundwater quality throughout the life of the Proposed Development.

3.4.6 Conclusion

There will be no significant adverse residual impacts on the receiving hydrological and hydrogeological environment associated with the Proposed Development. This includes the hydrological and hydrogeological elements supporting protected sites.

There will be no impact to the existing WFD Status of water bodies associated with the Proposed Development including the Leitrim Stream, the Kinnafad Stream, the Figile River and downstream waterbodies and underlying groundwater bodies as a result of the Proposed Development taking account of design avoidance and mitigation measures where required.

3.5 Land and Soils

The Land and Soils chapter describes any prospective effects on land and soils due to the proposed development.

The study area for the Proposed Wind Farm is primarily in agricultural use in the norther section, north of the L5010, and coniferous and mixed commercial forestry in the south section, south of the L5010. The Proposed Grid Connection is along the local roads through mostly agricultural lands either side. The Proposed TDR is also on roads with works in third party lands that are temporary and on agricultural lands.

The Proposed Wind Farm site is described as being mostly flat land with one gentle slope in the area of the substation. The elevations range from 69.5 to 78.6m AOD across the whole wind farm site.

The underlying geology is primarily limestone, with the Edenderry Oolite Member dominating the Proposed Wind Farm. Subsoil conditions vary across the site, with the northern portion underlain by limestone-derived till and the southern portion by cut-over raised peat. Peat depths range from less than 0.5m to 4m. Site investigations confirmed that the area is generally stable, with no evidence of historical landslides or instability. The Proposed Grid Connection and Proposed TDR are similarly underlain by limestone-derived till, however, since much of the Grid Connection follows existing public roadways, it is expected that quaternary sediments in these areas will largely consist of made ground.

3.5.1 Construction Phase

During the construction phase, the Proposed Development will involve excavation and earthworks for turbine foundations, access tracks, hardstands, and underground cabling. These activities will result in the removal and movement of topsoil, subsoil, and peat, with approximately 84,714m³ of material excavated. Potential impacts include soil erosion, compaction, and slope instability, particularly in areas of peat and soft ground. Tree felling over approximately 21ha will also expose soils, increasing the risk of erosion.

A designated peat spoil deposition area has been identified within the Proposed Wind Farm to manage surplus excavated material. This area, located in a commercially forested zone cleared for turbine infrastructure, is designed to accommodate approximately 86,600m³ of material. It will feature engineered slopes to prevent peat slippage and will be allowed to naturally revegetate post-construction. The spoil deposition area has been assessed as part of the Peat Stability Risk Assessment and is considered to pose no risk of instability.

There is a risk of contamination from accidental spills of hydrocarbons, cement, or wastewater, which could affect soil quality and indirectly impact groundwater. However, these risks are considered manageable with the implementation of mitigation measures, including bunded storage, spill response protocols and erosion control techniques.

3.5.2 Operational Phase

The operational phase will result in a long-term change in land use from agricultural and forestry land to a renewable energy site. While the majority of the site will remain undeveloped or reinstated, permanent infrastructure such as turbine bases and access tracks will occupy a small portion of the land.

Minor soil erosion may occur early in the operational phase until vegetation is re-established. Routine maintenance activities pose a low risk of soil compaction or contamination, which will be mitigated through adherence to best practice procedures. Overall, operational impacts on land and soils are expected to be slight and not significant.

3.5.3 Decommissioning Phase

At the end of its operational life, the Proposed Wind Farm will be decommissioned in a manner that minimises environmental impact and restores the site as far as practicable. All turbines and associated infrastructure will be removed, with hardstand areas and turbine foundations covered with topsoil to encourage natural vegetation regrowth. Access tracks not required for future use will be allowed to revert naturally. Underground cables will likely be left in place unless environmental assessments at the time indicate removal is preferable. The substation and grid connection infrastructure will remain as part of the national grid. Decommissioning works will involve minimal earthworks and will follow best practice to prevent soil erosion, compaction, and contamination. Overall, the decommissioning phase is expected to have a slight positive effect on the land and soils environment due to site rehabilitation.

3.5.4 Cumulative Impacts

Cumulative impacts on land and soils were assessed in relation to other nearby developments, including wind farms, solar farms, and battery storage facilities. These projects are located several kilometres from the Proposed Development and are subject to their own environmental management plans. Given the static nature of soils and geology, and the localised nature of construction activities, the potential for cumulative impacts is considered low. All developments will implement mitigation measures such as pollution prevention protocols and reinstatement strategies. As a result, cumulative effects on land, soils, and geology are assessed as not significant, with a low magnitude and unlikely occurrence.

3.5.5 Mitigation

A comprehensive set of mitigation measures will be implemented to protect the land and soils environment during all phases of the Proposed Development. During construction, soil erosion and compaction will be minimised through careful site management, phased works, and the use of protective materials such as geotextiles and brash mats. Excavated soils will be reused for landscaping, and spoil will be deposited in a designated, engineered area. Measures to prevent contamination include bunded storage for fuels and chemicals, spill kits, and designated washout areas for concrete. Tree felling will follow Department of Agriculture guidelines, with runoff managed through silt traps and settlement ponds. During operation, maintenance activities will be confined to hardstand areas, and bunded systems will contain any potential spills. Decommissioning will follow similar protocols to construction, ensuring safe removal of infrastructure and restoration of the site. These measures ensure that no significant residual impacts on land and soils are expected.

3.5.6 Conclusion

The assessment concludes that, with the implementation of embedded design features and mitigation measures, the Proposed Development will not result in any significant adverse effects on the land and soils environment. Risks associated with erosion, compaction, contamination, and slope instability have been addressed through robust planning and site management strategies.

Cumulative impacts with other nearby developments are considered unlikely and not significant due to the localised nature of works and the application of environmental controls across all projects. The land and soils environment are expected to remain stable and resilient throughout the lifecycle of the Proposed Development.

3.6 Noise and Vibration

Potential noise and vibration effects during construction and operation of the Proposed Development were assessed. The main sources of noise from a wind turbine include aerodynamic noise (rotating blades in the air) and mechanical noise (gearbox (if not a direct drive system) and generator).

3.6.1 Construction Phase

During the construction of the Proposed Development, a range of activities including site preparation, turbine installation, access track construction, substation works and underground cabling will generate noise. These activities will be temporary in nature and are expected to occur primarily during daytime hours, minimising disruption to nearby residents.

Noise effects from construction are predicted to remain within acceptable limits at nearby homes, referred to as Noise Sensitive Locations (NSLs). The highest noise levels may occur briefly when works are closest to these homes, but such instances will be short-lived and not excessive. Construction traffic may lead to a slight increase in noise levels along some local roads. However, most of these changes will be imperceptible or minor and are projected to remain within acceptable thresholds.

Vibration effects are not expected to be perceptible at nearby homes due to the distance between the construction activities and residential areas. Techniques such as horizontal directional drilling (HDD), which will be used for underground cabling, are also unlikely to cause noticeable vibration.

Overall, the construction phase of the Proposed Development is anticipated to result in temporary, slight to moderate noise effects and imperceptible vibration effects. These impacts are not considered significant. Nonetheless, best practice noise control measures will be implemented throughout the construction phase to minimise any potential disturbance to the local community.

3.6.2 Operational Phase

Once operational, the wind turbines and the substation facility will generate noise which will propagate into the receiving environment. The predicted operational noise assessment demonstrated that predicted noise levels will comply with the noise limits set out in Wind Energy Development Guidelines. The significance of impact is assessed against the noise limits in the 2006 DoEHLG Wind Energy Guidelines. Noise modelling has been carried out in accordance with best practice guidelines and confirms that predicted noise levels at NSLs will remain within acceptable limits during operation. The turbines have been sited and designed to ensure compliance with these standards, and no significant noise impacts are expected. No other mitigation measures are required.

3.6.3 Decommissioning Phase

The decommissioning phase works will be similar in magnitude to the construction phase. therefore, the conclusions of the construction phase impacts can be assumed for the decommissioning phase.

3.6.4 Cumulative Impacts

Cumulative noise impact of the Proposed Development with the surrounding existing wind farms has been assessed. There will be no significant cumulative effects during the construction phase with other developments. There will be no cumulative operational effects with other development.

3.6.5 Mitigation

Although no significant noise effects have been identified during either the construction or operational phases of the Proposed Development, all activities will be managed in accordance with recognised best practice as set out in the CEMP. The measures will be adopted from best practice described in BS5228-1&2 +A1 2014 Code of Practice for the Control of Noise and Vibration on Construction and Open Sites. It will include a nominated community liaison officer tasked with responding in a prompt manner to any noise and vibration complaints which may arise.

3.6.6 Conclusion

In conclusion, the Proposed Development is not expected to give rise to any significant noise or vibration effects during either the construction or operational phases. While temporary noise may occur during construction, it will be managed in accordance with best practice and confined to daytime hours. Operational noise from turbines has been assessed and will remain within acceptable limits at nearby homes. Vibration impacts are predicted to be imperceptible throughout all phases of the development. Overall, the Proposed Development will be delivered in a manner that ensures minimal disturbance to the surrounding community, with appropriate noise management measures in place to safeguard residential amenity.

3.7 Landscape and Visual

Landscape and Visual Impact Assessment (LVIA) evaluates how development affects both the landscape as an environmental resource and the visual amenity of people, based on receptor sensitivity and the magnitude of change, following established guidelines. For the Proposed Development, this involved desktop analysis, design review, visualisation, route screening, and site visits. The study area spans a 20 km radius around the site, which is characterised by a mix of pasture, commercial forestry, and surrounding agricultural land, cutover peat bog, and woodland.

Visual effects have been assessed using a combination of tools, including Zone of Theoretical Visibility (ZTV) maps and Photomontages, combined with several site visits. 29 viewpoints were chosen to represent a range of receptors, which included selection from a wider list of locations, some of which had theoretical visibility but no actual visibility.

3.7.1 Construction Phase

3.7.1.1 Landscape Effects

There will be an intensity of construction phase 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 as well as being dispersed between the two turbine clusters. The proposed 110kV substation will be built as part of the Proposed Development. Set back from the local road, it will include buildings up to 8.55m high, constructed from plastered blockwork, with associated fencing and site levelling. While some vegetation will be removed, the site is well screened and will not be visually prominent in the surrounding landscape.

The existing landscape, comprising pasture, commercial forestry, and cutover peat bog, will experience limited physical alteration, with no significant long-term disruption to its character.

3.7.1.2 Visual Effects

During construction, the most notable visual effects will result from the erection of the proposed turbines, with lifting plant introducing additional vertical features into views. Construction-related activity will be short-term in nature and will cease once the Proposed Development becomes fully operational. Whilst these activities will generate temporarily heightened visual effects, their influence on perceived landscape character is considered modest in the context of movement that occurs throughout this landscape along road networks, and that associated with an operational wind farm. As such a greater proportional focus is placed on the long-term effects of the operation of the wind turbines on landscape character.

For visual receptors within the Central Study Area, this activity is likely to be discernible, and will generate a modest impact on visual amenity, albeit views are already influenced by wind turbines within the surrounding area. For visual receptors within the Central Study Area, the magnitude of visual impact at the construction phase is deemed to be 'High-Medium'. When combined with a generally 'Medium-Low' receptor sensitivity, the level of visual effect will be no greater than 'Moderate'. Even though the sensitivity of visual receptors on the Grand Canal and Croghan Hill, have higher sensitivity, the magnitude of impact reduces with increasing distance, broader context and screening of ground-based construction activity. Consequently, the significance of construction phase visual effects is not considered to be greater for these visual receptors.

It is not considered that the Proposed Development will generate significant visual effects at the construction phase.

3.7.2 Operational Phase

3.7.2.1 Landscape Effects

The Proposed Development will cause some physical changes to the land, but these will be minor and fit well within the surrounding rural landscape, which already includes farmland, peatland, forestry, and other wind farms.

The turbines will be most noticeable close to the site, where they may alter the local landscape character. However, nearby existing wind farms help reduce this impact, and the overall effect is considered modest due to the large scale of the surrounding area.

Within 1km of the site, the change to landscape character is rated as moderate-slight, with a negative but long-term and reversible impact. The Proposed Development will operate for 35 years, after which the turbines will be removed and the land restored.

The cabling associated with the Proposed Grid Connection will not have any visual impact during operation.

3.7.2.2 Visual Effects

During the operational phase of the Proposed Development, the turbines will be most visually prominent in the immediate vicinity of the site. However, the surrounding landscape already includes several existing wind farms, and the new turbines will be seen as part of this broader energy context. The area is characterised by agricultural land, peatlands, forestry, and infrastructure, making it generally well-suited to accommodate such development.

During the Operational Phase, the visual effects from the 29 viewpoints are summarised as follows.

- Two views (11 and 14a) were judged to be substantial - Moderate.
- Five views (2, 7, 12, 14b and 15) were considered Moderate
- Visual effects at five views (3, 10, 13, 16 and 29) are categorised as Moderate - Slight.
- Five views (1, 5, 8, 9 and 26) are categorised as Slight.
- Visual effects at 13 views were considered Imperceptible (4, 6, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27 and 28) and Neutral.

Designated Scenic Views

Designated scenic views were assessed at six viewpoints: VP7, VP18, VP21, VP26, VP27, and VP28. Of these, VP7 experienced the highest level of impact, rated as moderate. VP26, located over 17km away, had slight effects due to clear visibility of turbines within a broad lowland context. The remaining four designated viewpoints experienced imperceptible effects, largely due to screening and distance. Overall, no significant effects are expected at any designated scenic routes or views.

Local Community Receptors

Nine viewpoints (VP2, VP3, VP8, VP10, VP11, VP12, VP13, VP15, and VP16) were selected to represent local community receptors within 5km of the site. These reflect the views of residents, workers, and road users in the area. VP11 and VP12 recorded the highest significance of effect, deemed substantial–moderate, due to the sense of being surrounded by turbines at close quarters. VP2 and VP15 were rated moderate, with clear views of one turbine cluster and screened views of the other. The remaining local community viewpoints ranged from moderate–slight to slight, with visibility generally decreasing beyond 2km to 3km. These effects are not considered to be significant.

Visual Impacts on Centres of Population

Four of the 29 viewpoints were selected to represent population centres and these include VP1, VP19, VP22, VP24. All but VP1 recorded an 'Imperceptible' significance of impact due to viewing distance and intervening screening. Even at VP1 from the western outskirts of Edenderry, the significance was only deemed to be 'Slight' due to partial blade visibility above the vegetated skyline.

There is not considered to be any significant effects from the Proposed Development at any centres of population.

Visual Impacts at Tourism, Recreation and Heritage Features

Tourism, recreation, and heritage features were represented by viewpoints along the Grand Canal (VP14a and VP14b) and Croghan Hill (VP29). VP14a, located directly north of the site, recorded the highest impact due to prominent turbine visibility above canal-side vegetation.

One of the key considerations for this Proposed Development is the visual effects from the important recreational, heritage and amenity features of the Grand Canal, which runs 500m to the north of the Proposed Development at its closest point and Croghan Hill which is approximately 7.7km away to the northwest. The Grand Canal is specifically represented by VP14a and VP14b. Croghan Hill is represented by VP29 which is from its summit. The view from VP14b has a similar context but the turbines are slightly further away and more screened resulting in 'Moderate' effect. These effects are localised and diminish quickly along the canal corridor.

At VP29 from the summit of ancient volcano and burial ground of Croghan Hill the visual effect is deemed to be 'Moderate-Slight' and mainly due to the High sensitivity of this receptor as the magnitude of visual impact is 'Low'.

3.7.3 Decommissioning Phase

At the end of its operational lifespan, the Proposed Wind Farm will undergo a decommissioning phase, during which all turbines and associated infrastructure will be removed. Access tracks and grid infrastructure may remain in place if deemed beneficial for landowners or the wider network. The land will be reinstated and reseeded to match the surrounding landscape, with below-ground turbine bases left in situ to avoid unnecessary environmental disruption. The visual and landscape effects during decommissioning will be similar to those experienced during construction, involving temporary activity and movement of large components. These effects are expected to be short-term and moderate in nature, but not significant in planning terms. Within two to three years of completion, there will be little visible evidence of the wind farm's presence.

3.7.4 Cumulative Impacts

For cumulative impact with surrounding wind farms out to 20km in distance there were seven wind farms to be considered.

The key consideration in relation to the cumulative effects assessment of the Proposed Development is that all but two of the wind farms are existing developments. The only exceptions being the permitted Dernacart Wind Farm and planned Drehid Wind Farm. Dernacart Wind Farm is 20km away to the southwest and is marginal in terms of whether it needed to form part of the cumulative assessment at all because its turbines are all just outside of the study area. Drehid Wind Farm is only marginally closer at 18km east-northeast of the Proposed Development. The operational wind farms all formed part of the described baseline landscape condition and are contained in the baseline photography (existing views) of the photomontage set used for the visual impact assessment. As such, the main assessment of landscape and visual effects contained within this chapter is essentially a cumulative one and the relationship of the Proposed Development to existing wind farms.

A key cumulative element of this Proposed Development is that it serves as something of a spatial and visual bridge between the existing wind farms to the southeast (Cloncreen/Cushaling) and southwest (Mount Lucas) with that to the north (Yellow River).

Furthermore, the separation to these other developments is sufficient that they each appear as discrete entities and not a single sprawling collective. The more distant Moanvane, Dernacart and Drehid Wind Farms will not be readily visible with the Proposed Development except in distant vast elevated views such as from Croghan Hill. There will be little material cumulative effect arising from the proposed development in conjunction with these more distant developments.

It is considered that the Proposed Development contributes a 'Medium-Low' cumulative impact. When combined with the general 'Medium-Low' sensitivity of the receiving landscape, the cumulative effect is deemed to be 'Moderate-Slight'.

3.7.5 Conclusion

The Proposed Development has been carefully designed to integrate with its surrounding landscape, which is characterised by agricultural land, peatlands, forestry, and existing wind energy developments. While some visual and landscape changes will occur, particularly in the immediate vicinity, these are generally modest and not considered significant. The cumulative impact of the development is also limited, given the existing wind farm context. Effects during decommissioning will be temporary and reversible. Overall, the Proposed Development represents a well-considered addition to the local energy infrastructure, with landscape and visual impacts that are acceptable within the planning and environmental context.

3.8 Cultural Heritage

The assessment was completed using a combination of a desk-based assessment of available archaeological, historical, cultural and cartographic sources and a site inspection of the Proposed Development in August and October 2023.

There are no Recorded Monuments within or close to the Proposed Wind Farm. Some monuments occur in the wider vicinity. Of the monuments in the vicinity, ringforts/enclosures are the most numerous and also the closest monument type to the site boundary. Of the ringforts, four fall within distance of 900m to the nearest element of the proposal. two being at a little over 400m (RMP OF011-020 and OF011-021 at distances of 415m and 420m from Turbine 1.

There two Recorded Monuments in the immediate vicinity of the roadside where the Proposed Grid Connection will be excavated, one monument (RMP OF011-055) is located close to the L5019 road and the second (RMP RMP011-03501) close to the L5006 road.

3.8.1 Construction Phase

During the construction phase of the Proposed Development, there is no anticipated direct impact on any known archaeological monuments or protected structures, as none are located within the development boundary. However, several recorded monuments, including ringforts and enclosures, are located in the wider vicinity. While the risk of direct impact is low, there remains a possibility of encountering previously unknown subsurface archaeological material during groundworks. This potential impact will be mitigated through pre-construction surveys and archaeological monitoring during excavation works.

3.8.2 Operational Phase

The operational phase of the Proposed Development is not expected to result in any significant impacts on cultural heritage. Potential effects are primarily visual in nature. However, the turbines have been sited at sufficient distances—over 400m from known monuments and over 600m from historic buildings—to avoid adverse visual impacts. The low-lying topography of the site, combined with existing tree cover and forestry, further reduces the likelihood of visual intrusion on cultural heritage features.

3.8.3 Decommissioning Phase

No significant cultural heritage impacts are anticipated during the decommissioning phase. As mitigation measures will have been implemented during construction, and no known archaeological features are present within the site, the removal of infrastructure is not expected to affect cultural heritage. Any remaining underground infrastructure will be left in place unless future assessments suggest otherwise.

3.8.4 Cumulative Impacts

The assessment concludes that there will be no cumulative impacts on cultural heritage arising from the Proposed Development in combination with other existing or permitted developments in the area. The separation distances and nature of the surrounding projects ensure that no overlapping effects on archaeological or architectural heritage will occur.

3.8.5 Mitigation Measures

To safeguard cultural heritage, a programme of pre-construction geophysical survey and archaeological test trenching will be undertaken at turbine locations, the substation, and access roads. Archaeological monitoring will be carried out during all ground disturbance works, including topsoil stripping and excavation. These measures will be conducted under licence and in consultation with the Department of Housing, Local Government and Heritage and the National Museum of Ireland. All archaeological finds or features encountered will be appropriately recorded and preserved.

3.8.6 Conclusion

There are no known archaeological monuments or protected structures within the Proposed Development and no significant cultural heritage impacts are predicted. While there is a possibility of encountering unknown subsurface archaeology during construction, this risk will be effectively managed through a combination of survey, testing, and monitoring. Overall, the Proposed Development is not expected to result in any significant adverse effects on cultural heritage.

3.9 Air and Climate

The potential effects of the Proposed Development on local air quality and climate have been assessed.

3.9.1 Construction Phase

During the construction phase there will be dust emissions from the Proposed Development. Dust could be generated from excavation, movement of materials, and construction traffic, particularly during dry weather. However, the risk of significant dust impacts is considered low to medium, depending on proximity to sensitive receptors. Vehicle emissions, including nitrogen dioxide and particulate matter, are expected to be minimal and well below regulatory thresholds. Overall, construction-related air quality impacts are assessed as slight to not significant, short-term, and localised.

3.9.2 Operational Phase

During the operational stage impacts on air quality will be reduced greatly as the vehicle numbers are reduced to maintenance only. During the operational stage the benefits to air and climate will be realised as the Proposed Development generates electricity that would otherwise require the burning of fossil fuels and an increase in carbon into the atmosphere. The carbon calculator for the Proposed Development shows that the CO_2 footprint (87,000 tonnes CO_2 equivalent) of the Proposed Development will be paid back within 1.7 years. For the remaining 33.3 years of operation, the Proposed Development will be directly responsible for significant carbon savings. The Proposed Development will contribute to national climate goals by displacing fossil fuel-generated electricity, thereby reducing greenhouse gas emissions. The Proposed Development aligns with Ireland's Climate Action Plan 2025 and Offaly County Council's climate strategies. Over its lifespan, the wind farm is expected to deliver moderate, long-term, positive impacts on air quality and climate.

3.9.3 Decommissioning Phase

Decommissioning activities will involve dismantling turbines and restoring the wind farm site, with impacts similar to but smaller in scale than the construction phase. Dust and emissions from machinery will be managed through mitigation measures such as dust suppression and traffic controls. The turbine foundations will be covered with soil and revegetated, minimising environmental disturbance. Overall, decommissioning is expected to have low risk, short-term, and localised impacts on air quality.

3.9.4 Cumulative Impacts

The cumulative impact assessment considered nearby renewable energy projects, including wind and solar farms. These developments are sufficiently distant from Proposed Development to avoid overlapping dust effects. Collectively, the operational phase of these projects will contribute to significant reductions in greenhouse gas emissions and improvements in air quality. The cumulative impact is therefore assessed as long-term, significant, and positive for climate and air quality.

3.9.5 Mitigation

The risk of effects from dust is assessed as low to medium risk and mitigations will be but in place. In order to control dust, water will be sprayed on access roads to suppress the dust on these routes. Public roads will be regularly inspected and cleaned; wheel wash facilities will be used at the entrances to the site. Dust impacts from the proposed Development will be short term, negative and slight.

During the construction phase there will be emissions from vehicle exhausts. The movement of machinery, construction vehicles and the use of generators. In order to reduce these emissions, plant will be regularly maintained. The traffic management plan will be implemented and there will be speed limits on access tracks and no idling of engines.

Traffic levels for the construction period of the Proposed Development adhere to the TII criteria, which warrant a quantitative assessment of construction traffic and therefore are unlikely to cause an adverse effect on local air quality and will not have a significant effect on local, regional or national Air Quality Standards given the scale of the high levels of dispersion, and the limited duration of works.

3.9.6 Conclusion

The Proposed Development will facilitate decarbonisation objectives at local and national levels as set out in the National Climate Action Plan (DCCAE, 2023) and the Offaly County Development Plan 2021 - 2027, which states that it is an objective of Offaly County Council to ensure the security of energy supply by supporting the potential of the wind energy (and other renewable) resources of the County in a manner that is consistent with proper planning and sustainable development of the area.

The Proposed Development will support Ireland's transition to a low-carbon economy by generating renewable electricity and reducing reliance on fossil fuels. While minor, short-term impacts on air quality may occur during construction and decommissioning, these will be effectively mitigated. The operational phase will deliver substantial carbon savings, contributing to national and international climate targets. Overall, the Proposed Development is expected to have a positive, moderate, and long-term effect on air quality and climate.

3.10 Material Assets – Built Services

Based on a review of the Proposed Development and the suggested topic areas set out in the EPA guidelines (2022), the consideration of the projects impact on Material Assets is discussed in the context of built services. This includes transport infrastructure, electricity supply and infrastructure, telecommunications, aviation, water and wastewater infrastructure and waste management. In addition, having regard to a portion of the projects setting within an active forest plantation, commercial forestry resources have also been considered as a relevant material asset.

3.10.1 Construction Phase

During the construction phase, temporary impacts on air quality may arise from dust emissions and vehicle exhausts. Dust could be generated from excavation, movement of materials, and construction traffic, particularly during dry weather. The risk of significant dust impacts is considered low to medium, depending on proximity to sensitive receptors. Vehicle emissions, including nitrogen dioxide and particulate matter, are expected to be minimal and well below regulatory thresholds.

In terms of aviation, the construction phase will not involve activities that generate emissions at altitude, which are typically more impactful on climate. All emissions will be ground-based and localised. Overall, construction-related air quality impacts are assessed as slight to not significant, short-term, and localised.

3.10.2 Operational Phase

Once operational, the Proposed Development will not produce direct emissions to air. Minor emissions may arise from maintenance vehicles, but these are infrequent and negligible. Importantly, the wind farm will contribute to national climate goals by displacing fossil fuel-generated electricity, thereby reducing greenhouse gas emissions.

Unlike aviation, which contributes to high-altitude emissions with greater radiative forcing effects, the wind farm's renewable energy generation offers a low-carbon alternative that supports decarbonisation. Over its lifespan, the wind farm is expected to deliver moderate, long-term, positive impacts on air quality and climate.

3.10.3 Decommissioning Phase

Decommissioning activities will involve dismantling turbines and restoring the site, with impacts similar to but smaller in scale than the construction phase. Dust and emissions from machinery will be managed through

mitigation measures such as dust suppression and traffic controls. The turbine foundations will be covered with soil and revegetated, minimising environmental disturbance.

As with construction, emissions will be ground-based and will not contribute to aviation-related climate impacts. Overall, decommissioning is expected to have low risk, short-term, and localised impacts on air quality.

3.10.4 Cumulative Impacts

The cumulative impact assessment considered nearby renewable energy projects, including wind and solar farms. These developments are sufficiently distant from the Proposed Development to avoid overlapping dust effects. Collectively, the operational phase of these projects will contribute to significant reductions in greenhouse gas emissions and improvements in air quality.

In contrast to aviation, which remains a challenging sector to decarbonise, the cumulative impact of renewable energy developments like Proposed Development is long-term, significant, and positive for climate and air quality.

3.10.5 Mitigation Measures

A comprehensive set of mitigation measures will be implemented during construction and decommissioning to minimise dust and emissions. These include water spraying to suppress dust, covering loads, wheel washing, speed controls, and regular road cleaning. Construction vehicles will be maintained and idling will be prohibited.

While aviation emissions require international coordination and technological innovation to mitigate, the Proposed Development will implement proven, site-specific measures to ensure that no significant adverse effects occur locally.

3.10.6 Conclusion

The Proposed Development will support Ireland's transition to a low-carbon economy by generating renewable electricity and reducing reliance on fossil fuels. While minor, short-term impacts on air quality may occur during construction and decommissioning, these will be effectively mitigated. The operational phase will deliver substantial carbon savings, contributing to national and international climate targets.

3.11 Material Assets – Traffic and Transport

3.11.1 Construction Phase

The construction phase of the Proposed Development is expected to last approximately 18 months and will generate increased traffic volumes, particularly from heavy goods vehicles (HGVs) transporting materials and equipment. Peak daily traffic could reach up to 440 vehicles, including 360 HGVs, with the highest hourly peak involving 36 HGVs. While these volumes represent a noticeable increase on some local roads, they remain below thresholds set by Transport Infrastructure Ireland (TII) for significant impact. Temporary traffic management measures, including stop/go systems and signage, will be implemented to maintain safety and minimise disruption. Overall, the construction phase is anticipated to result in a slight to moderate, short-term impact on the local road network.

3.11.2 Operational Phase

Once operational, the Proposed Development will generate minimal traffic, limited to occasional maintenance visits. With only two operational staff and infrequent vehicle movements, the impact on the local road network will be negligible. No road upgrades or traffic management measures are required during this phase. The operational phase is therefore expected to result in a neutral, imperceptible, long-term impact on traffic and transport.

3.11.3 Decommissioning Phase

Decommissioning activities will mirror the construction phase in terms of traffic volumes and types, involving the removal of turbine components and restoration of the site. However, the scale of works will be smaller, and the grid infrastructure will remain in place. Temporary traffic management measures will again be employed to ensure safety. The decommissioning phase is expected to result in a slight, short-term impact on the local road network.

3.11.4 Cumulative Impacts

Cumulative traffic impacts were assessed in relation to other nearby renewable energy developments. Most of these projects are either completed or located at sufficient distance to avoid overlapping traffic effects. Where construction timelines do overlap, shared haul routes and receptors may experience temporary increases in traffic. However, all developments are subject to TMPs and CEMPs, which include mitigation measures to manage traffic. The cumulative impact is assessed as slight to moderate, short-term, and unlikely.

3.11.5 Mitigation

A comprehensive set of mitigation measures will be implemented during construction and decommissioning to manage traffic impacts. These include:

- Pre-construction condition surveys and ongoing monitoring of local road network within the immediate site vicinity.
- Provision of vehicle passing bays on the L5010.
- Temporary traffic management in accordance with Department of Transport guidelines.
- Wheel wash facilities to prevent debris on public roads.
- Road reinstatement following grid connection works, in line with national standards.

These measures will ensure that traffic impacts are effectively managed and that the integrity of the local road network is maintained.

3.11.6 Conclusion

The Proposed Development will have minimal long-term impact on traffic and transport. While construction and decommissioning phases will temporarily increase traffic volumes, these effects are manageable and will be mitigated through best-practice traffic controls. The operational phase will have negligible impact. Overall, the project is expected to result in no significant residual traffic impacts, with all phases carefully planned to ensure safety and minimise disruption.

3.12 Shadow Flicker

In terms of the overall project, shadow flicker relates solely to the operational wind turbines. Shadow flicker is defined as the alternating light intensity produced by a wind turbine as the rotating blade casts shadows on the ground and stationary objects, such as the window of a residence. Shadow flicker can only occur if there is an unobstructed direct line of sight from within a dwelling to a turbine. No flicker will occur when the turbine is not rotating or when the sun is obscured by clouds or fog.

3.12.1 Construction Phase

Shadow flicker is a phenomenon that only occurs when wind turbines are operational and casting moving shadows under specific sunlight and wind conditions. As such, there are no shadow flicker impacts during the construction phase of the Proposed Development.

3.12.2 Operational Phase

Shadow flicker was calculated for the proposed wind turbines using industry-standard simulation software Wind Farm, a tool which has been successfully applied to a number of similar studies around the world. In general, the shadow flicker assessment methodology involves the identification of houses within a defined study area, which have the potential to be adversely impacted by shadow flicker. In line with best practice guidance, the study area is usually limited to a distance (between a house and wind turbine) equivalent in length to 10 of the proposed wind turbine rotor diameters. In line with best practice, the scope of this assessment extends to a distance of 10 times the maximum rotor diameter (or 1.62 km). There are 141 residential properties within the 10x rotor diameter study area. Of the 141 properties assessed, shadow flicker could theoretically occur at up to 111 properties.

Once sunshine hours are factored in and the 2006 Wind Energy Development Guideline limits are introduced, only one 1 property exceeds the 2006 limit. However, the Applicant for the Proposed Development is committed to a policy of zero shadow flicker at all properties within the study area. This is achieved by installing shadow flicker modules on the turbines. This allows the turbines to be programmed to shut down during periods when shadow flicker is predicted to, and where conditions are present for it to occur. This strategy has been successfully employed at other wind farms. Therefore, no operational shadow flicker impacts are expected.

3.12.3 Decommissioning Phase

As with the construction phase, shadow flicker does not occur during decommissioning because turbines will be non-operational. Therefore, no shadow flicker impacts will arise during the decommissioning phase.

3.12.4 Cumulative Impacts

The only nearby wind farm with potential for cumulative shadow flicker effects is Cloncreen Wind Farm. A combined shadow flicker model was run to assess cumulative impacts, and the results showed no overlapping shadow flicker effects on any residential receptors. This confirms that the Proposed Development will not contribute to cumulative shadow flicker impacts in the area.

3.12.5 Conclusion

The Applicant's commitment to a zero shadow flicker policy ensures that the project will have no adverse effects on residential amenity from shadow flicker during its operational life..

3.13 Interaction of the Foregoing

There is potential for interactions between one aspect of the environment and another which can result in direct or indirect impacts, and which may be positive or negative.

A matrix has been generated to summarise the relevant interactions and interdependencies between specific environmental aspects (Refer to Table 3-1). It contains each of the environmental topics, which were considered as part of this environmental impact assessment, on both axes.

Table 3-1: Matrix of Interactions

	Population and Human Health	Biodiversity and Ornithology	Water	Land and Soils	Noise and Vibration	Shadow Flicker	Landscape & Visual	Cultural Heritage	Air Quality and Climate	Material Assets Built Services	Material Assets Traffic and Transport
Population and Human Health			C	C	C/O/D	O	C/O/D		C/O	C	C/D
Biodiversity and Ornithology			C	C	C/O/D				C		
Water	C	C/O		C						C	
Land and Soils		C/O	C		C		C	C	C		
Noise and Vibration	C/O/D	C/O/D		C							C/D
Shadow Flicker	O						0				
Landscape	C/O	O						C/O			C
Cultural Heritage				C			0				
Air Quality and Climate	C/O	C/O/D		C							
Material Assets Built services	C/O	C/O									C
Material Assets Traffic & Transport	C/D	C/O/D			C/O/D		C/D		C/D	C/D	

C	Construction Phase Effect
O	Operation Phase Effect
D	Decommissioning Phase Effect

	Interaction Occurs
	No Interaction