FEHILY TIMONEY

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED FAHY BEG WIND FARM, CO. CLARE

VOLUME 2 – MAIN EIAR

CHAPTER 11 – POPULATION, HUMAN HEALTH & MATERIAL ASSETS

Prepared for: RWE Renewables Ireland Ltd.

RWE

Date: November 2022

Core House, Pouladuff Road, Cork
T12 D773, Ireland

T: +353 21 496 4133 E: info@ftco.ie

CORK | DUBLIN | CARLOW

www.fehilytimoney.ie

TABLE OF CONTENTS

11. POPULATION, HUMAN HEALTH & MATERIAL ASSETS 1

11.1 Introduction 1
11.2 Methodology 2
11.3 Population 7
11.3.1 Existing Environment - Population 7
11.3.2 Potential Impacts on Population - Construction 10
11.3.3 Potential Impacts on Population - Operational 11
11.3.4 Potential Impacts on Population - Decommissioning 11
11.3.5 Mitigation Measures - Population 12
11.3.6 Residual Impacts - Population 12
11.4 Socio-Economics, Employment and Economic Activity 12
11.4.1 Existing Environment – Socio-economic, Employment and Economic Activity 12
11.4.2 Existing Environment – Socio-economic, Employment and Economic Activity 14
11.4.3 Potential Impacts – Socio-economics, Employment and Economic Activity - Construction 15
11.4.4 Potential Impacts – Socio-economics, Employment and Economic Activity – Operational 16
11.4.5 Potential Impacts – Socio-economics, Employment and Economic Activity – Decommissioning 20
11.4.6 Mitigation Measures – Socio-economics, Employment and Economic Activity 20
11.4.7 Residual Impacts – Socio-economics, Employment and Economic Activity 20
11.5 Land Use 21
11.5.1 Existing Environment – Land Use 21
11.5.2 Potential Impacts – Land Use - Construction 25
11.5.3 Potential Impacts – Land Use - Operation 26
11.5.4 Potential Impacts – Land Use – Decommissioning 27
11.5.5 Mitigation Measures – Land Use 27
11.5.6 Residual Impacts – Land Use 28
11.6 Recreation, Amenity and Tourism 28
11.6.1 Existing Environment – Recreation, Amenity and Tourism 28
11.6.2 Potential Impacts – Recreation, Amenity and Tourism - Construction 31
11.6.3 Potential Impacts – Recreation, Amenity and Tourism - Operation 32
11.6.4 Potential Impacts – Recreation, Amenity and Tourism - Decommissioning 34
11.6.5 Mitigation Measures – Recreation, Amenity and Tourism 34

11.6.6 Residual Impacts – Recreation, Amenity and Tourism 34
11.7 Human Health & Safety 34
11.7.1 Existing Environment – Human Health & Safety 35
11.7.2 Potential Impacts – Human Health & Safety - Construction 36
11.7.3 Potential Impacts – Human Health - Operation 37
11.7.4 Potential Impacts – Human Health – Decommissioning 46
11.7.5 Mitigation Measures – Human Health & Safety 46
11.7.6 Residual Impacts – Human Health 49
11.8 Renewable, Non-Renewable Resources and Utility Infrastructure 49
11.8.1 Existing Environment – Renewable, Non-Renewable Resources and Utility Infrastructure 49
11.8.2 Potential Impacts – Renewable, Non-Renewable Resources and Utility Infrastructure - Construction 50
11.8.3 Potential Impacts – Renewable, Non-Renewable Resources and Utility Infrastructure - Operational 52
11.8.4 Potential Impacts – Renewable, Non-Renewable Resources and Utility Infrastructure – Decommissioning 53
11.8.5 Mitigation Measures – Renewable, Non-Renewable Resources and Utility Infrastructure 54
11.8.6 Residual Impacts – Renewable, Non-Renewable Resources and Utility Infrastructure 54
11.9 Do-Nothing Scenario 55
11.10 Cumulative Impacts 55
11.11 Conclusion 56
11.12 References 59

LIST OF FIGURES

Page

Figure 11-1: Site Location Map 6
Figure 11-2: Residential Receptors within 1.55km vicinity of the Wind Farm Site 8
Figure 11-3: Corine Land Cover Map 24

LIST OF TABLES

Table 11-1: Electoral Divisions Associated with the Study Area 7
Table 11-2: Population of Study Area 9
Table 11-3: Population Density between 2006 – 2016 (Persons per square kilometre) 10

11. POPULATION, HUMAN HEALTH & MATERIAL ASSETS

11.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) examines the potential effects of the proposed Fahy Beg Wind Farm on Population and Human Health and Material Assets. The chapter includes a description of the existing environment in respect of population, human health and material assets and considers the likely effects arising from the proposed project during construction, operation and decommissioning under the following elements:

- Population;
- Employment and Economic Activity;
- Land Use;
- Recreation, Amenity and Tourism;
- Human Health and
- potential for the project to cause accidents and/or natural disasters and the vulnerability of the project to potential disaster/accidents; and
- Renewable Resources, Non-renewable Resources and Utility Infrastructure.

There are a wide range of sources of effects from the project with potential to impact on the elements listed above, which focus on human interaction with the proposed project. The assessment presented in this chapter draws upon the findings of other chapters throughout the EIAR, including air quality, noise, shadow flicker, traffic & transport, landscape and visual impacts and telecommunications & aviation are addressed separately in Chapters 6, 7, 12, 13, 15 and 16 of Volume 2 of this EIAR respectively. Potential impacts associated with lands, soils and geology are discussed in Chapter 9 and potential effects associated with hydrology and water quality are discussed in Chapter 10 of this EIAR. In addition, other assessments are set out including those relating to potential effects on population statistics, socio-economics, changes to land use, facilities, human perception, human safety and potential impacts to resources.

Material assets relating to transport infrastructure are dealt with in Chapter 13: Traffic and Transportation. Material assets with respect to natural resources are considered in Chapter 9: Lands, Soil and Geology, Chapter 10 Hydrology and Water Quality, Chapter: 6 Air Quality and Climate, and Chapter 8: Biodiversity. Assets of Archaeological, Architectural, and Cultural Heritage are considered in Chapter 14 of Volume 2 of this EIAR. The findings of these chapters in terms of the potential and residual impacts on population and human health are drawn upon in this chapter.

Throughout this chapter the 'project' refers to the elements of the project for which consent is being sought as set out in Chapter 3. This comprises the wind farm site including turbines, hardstandings, met mast, substation, access tracks, associated infrastructure, grid connection and works involving the Turbine Delivery Route (TDR).

For assessment purposes the proposed project is separated into three distinct elements:

- The Wind Farm Site (also referred to in this EIAR as 'the Site');
- The Grid Connection Route; ((also referred to in this EIAR as 'the GCR')
- The Turbine Delivery Route (also referred to in this EIAR as 'the TDR');

These three areas make up the wider 'Study Area'.

This assessment considers the turbine range parameters which has been selected for this project as described in Chapter 1 Introduction and Chapter 3 Development Description. The plans and particulars submitted with this application for consent are precise and provide specific dimensions for the turbine structures which incorporates a small range in dimensions. The turbine specifications will have a hub height ranging from 102.5 to 110m and a rotor diameter ranging from 131m to 138m with a tip height ranging from 169m to 176.5m. Each chapter of this EIAR has fully assessed the full spectrum of different scenarios within this range in turbine specification and the ultimate final turbine selection will fall within the parameters of this range.

The exact make and model of the turbine will be dictated by a competitive tender process, but it will not exceed the maximum or minimum size envelope set out above.

11.2 Methodology

This chapter of the EIAR has been completed in accordance with the guidance set out by the Environmental Protection Agency (EPA), in particular, the Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (EPA, May 2022), The Government of Ireland's Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August, 2018) and the European Union's guidance document: Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report as per Directive 2011/92/EU as amended by 2014/52/EU. The determination of significance of impact is in line with the EPA's Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (EPA, May 2022).

Population

Demographic data has been sourced from the Central Statistics Office (CSO)'s Census of Ireland (2006 to 2016) records. Demographic information relating to the State, County Clare, County Tipperary and the 'Study Area' has been assessed to establish the existing demographic trends. The demographic analysis of the study area as set out in this Chapter is defined in terms of Electoral Divisions (EDs), within which the wind farm site boundary is contained and within which the grid connection works and TDR are contained. Therefore, for the purpose of this aspect of the assessment, there are three separate areas contained within the 'Study Area' as follows:

- The wind farm site is located within the EDs of Fahymore, Lackeragh and O'Briensbridge;
- The grid connection element of the project is located in the EDs of Fahymore, Cloghere and Ballyglass;
- The turbine delivery route ('TDR') is contained within the EDs of Fahymore, O'Briensbridge, Killaloe, Ballina and Birdhill before the TDR meets a motorway at the M7 Motorway located to the south of Ballina.

It should be noted that the EDs of Fahymore, Lackeragh, O'Briensbridge, Cloghere, Ballyglass and Killaloe are located within County Clare. Whilst the EDS of Ballina and Birdhill are located in County Tipperary.

The Study Area including the Main Wind Farm Site, BEMP lands, Grid Connection and TDR are identified in Figure 11-1. For the purposes of the assessment of potential effects on population trends, the TDR area covers electoral divisions where works are proposed.

Areas of the TDR located along national primary routes have been screened out as effects are likely to be imperceptible due to the limited nature of the proposed works along these routes and the capacity of the routes to accommodate large vehicles and loads associated with the delivery of turbine components to the main wind farm site.

Eircode data (2020), Geodirectory data, and planning application lists sourced from Clare County Council, An Bord Pleanála and the Department of Housing and Local Government's EIA Portal have been assessed to identify any commercial or residential receptors in proximity to the proposed development. These sources were assessed in 2022. Eircode and Geodirectory data provides locations (geographic coordinates) for registered addresses. This information was ground-proofed with a house survey where a surveyor travelled the Wind Farm Site and identified locations of all residential receptors in proximity to the proposed wind farm. A desktop house survey was carried out for the Grid Connection and TDR where temporary works are proposed. A planning search was conducted to identify permitted unbuilt dwellings and planned dwellings which do not appear on Eircode or Geodirectory Databases and are not visible from ground proofing exercises.

The data gathered has informed the consideration of impacts on the existing population within the immediate environs of the proposed development and allows for a comprehensive assessment of the potential effects on population trends which may occur during the construction, operational, and decommissioning phase of the proposed development.

Socio-Economics

A socio-economic profile of the existing environment was established using live register data (2019 to 2022) and Census (2016) data to outline an employment profile of the study area. Peer reviewed research from the Institute for Sustainable Futures and the European Wind Energy Association was referred to in order to estimate the employment which the proposed development has the potential to create through the construction, operation and decommissioning phases of the proposed development, and the impact this employment will have on the study area.

Land Use

Land use in the area was examined to determine potential impacts on existing land use patterns which may arise because of the proposed development. Corine Land Cover data (2018) was studied and observations were carried out throughout the ground-proofing survey to determine land uses in the study area. The impact of the proposed development was then considered with regard to these land uses. As detailed in Chapter 5, the Felling Section of the Department of Agriculture, Food and the Marine have requested that potential impact to land use, i.e., the conversion of forestry to another type of land use, should be considered in the EIAR.

Recreation, Amenity & Tourism

With regard to Recreation, Amenity and Tourism, Fáilte Ireland published a guideline document on tourism and environmental impacts in 2011 entitled 'Guidelines on the Treatment of Tourism in an Environmental Impact Statement'. This document has been considered and is referred to in Section 11.6 of this Chapter. The document informed the methodology used in assessing potential impacts on Recreation, Amenity and Tourism. A profile of tourism in the region was established through examination of Fáilte Ireland Statistics in order to indicate the strength of Recreation, Amenity and Tourism in the surrounding region. Recreation and amenity facilities and attractions in the area were identified through a desktop study and distances from the proposed development were established. Potential impacts as a result of the proposed development were then considered in relation to the tourism profile, amenity and recreation facilities and attractions of the area.

Human, Health & Safety

The assessment on human health and safety has regard to the Environmental Protection Agency's (EPA US) Human Health Risk Assessment process which provides information on potential human health impact. CSO data (2016) and reports published by the Department of Health were examined to establish a baseline health profile of the study area. Criteria of potential impacts on human health was extracted from this literature in order to assess potential effects on human health as a result of the proposed development. A desktop examination of potential hazardous land uses in the study area was carried out and vulnerability of the project to natural disaster was assessed through a desktop geographical study and literature review. The assessment was further informed by field surveys and slope stability assessment which were completed as part of the EIA process. Potential impacts to human health as described throughout this EIAR are detailed in this Chapter, including potential impacts on air quality, noise and traffic and potential impacts on human safety including potential for flood risk and slope failure.

Renewable Resources, Non-renewable Resources and Utility Infrastructure

An examination of material assets was carried out which includes renewable and non-renewable resources and utility infrastructure. A desktop study established material assets of the area such as quarries and peat bogs, in line with Geological Survey Ireland's scoping response as detailed in Chapter 5. Infrastructure and various telecommunications companies were contacted during the scoping process to identify infrastructure in the area. Potential impacts on the identified material assets as a result of the proposed development were then examined.

As outlined in Chapter 5: EIA Scoping, Consultation, and Key Issues, prior to preparing the EIAR, statutory authorities and other relevant bodies were consulted. Key items of relevance to Population, Human Health and Material Assets, as raised by these parties have been addressed and referenced within this Chapter of the EIAR where relevant.

Consultation responses of relevance to the population, human health and material assets assessment were received from the Department of Agriculture, Food and the Marine, Irish Water and Geological Survey Ireland as well as from the wider community through public consultation. The consultation responses received have been given due consideration in the formation of this chapter.

Cumulative Effects

In relation to cumulative effects for Population, Human Health, and Material Assets, the potential effect of the proposed project 'in combination' with other projects, constructed, proposed or permitted has been assessed. The cumulative impact assessment provides a baseline from which a full environmental assessment of the potential effects arising from the project in combination with other plans and projects can be considered comprehensively. A search for proposed, consented and existing projects was conducted within 20km of the proposed project to identify development in proximity to the Wind Farm Site, GCR and TDR.

A 20km distance from the Wind Farm Site was considered a reasonable zone of influence for the purpose of assessing potential cumulative effects on population, human health and material assets, considering the size and extent of the project, the nature of the impacts and the receiving environment of the wider area. The geographic extent of the cumulative assessment is considered on a case-by-case basis, in line with the Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (European Commission, 1999).

The 20km radius from the proposed turbines is considered relevant in line with the recommended study area for the zone of theoretical visibility of proposed wind farm projects as set out in the Wind Energy Development Guidelines (2006) which cites the use of a 20 km radius for blade tips greater than 100m. This represents a visual study area for potential cumulative projects but also represents an appropriate study area for other potential cumulative effects including traffic, noise, water quality and air quality. It is considered that potential impacts beyond this distance are imperceptible.

Other less significant projects were also examined in close proximity to the Wind Farm Site, TDR and GCR where construction and operation of proposed, consented or existing projects may be affected by the construction activities of the proposed Fahy Beg Wind Farm project. All development within 250m of the TDR nodes and the GCR were examined for potential cumulative effects. It is considered that potential impacts posed by small scale projects beyond this distance will be imperceptible.

Monthly planning searches from April 2021 to TBC 2022 were carried out to identify proposed development in proximity to the Wind Farm Site, Grid Connection Route and TDR. This included a search for major infrastructure projects in the zone of influence; large residential, renewable energy or commercial developments in the zone of influence; proposed or consented development within the immediate environs of the proposed project; as well as an examination of relevant plans and policies for the area as detailed in Chapter 4: Policy. Cumulative impact is further detailed in Section 11.10.

Mitigation Measures

Where potential significant effects have been identified, mitigation measures have been proposed. Residual impact is then considered which details potential impacts following implementation of mitigation measures.

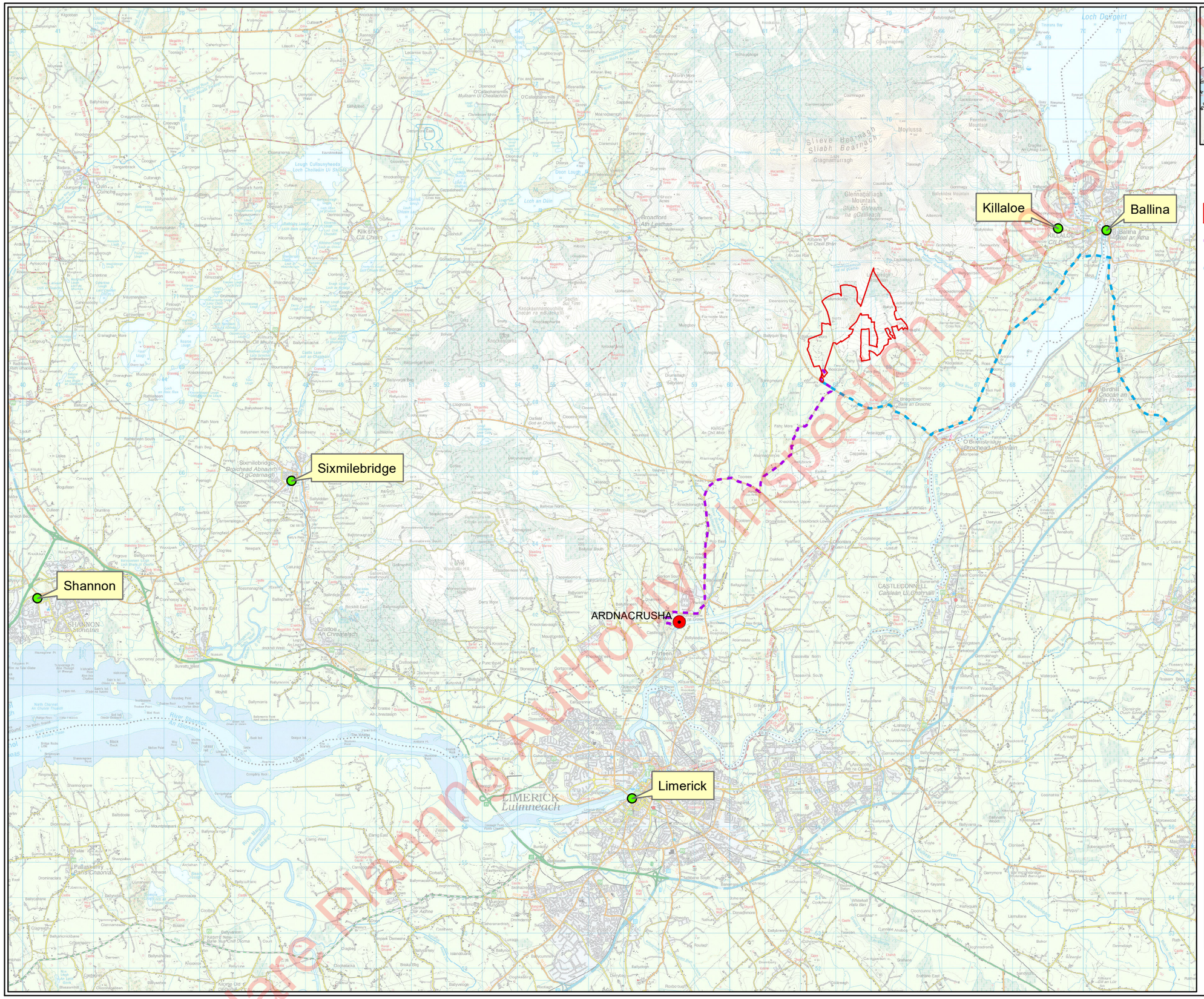
Do-nothing Scenario

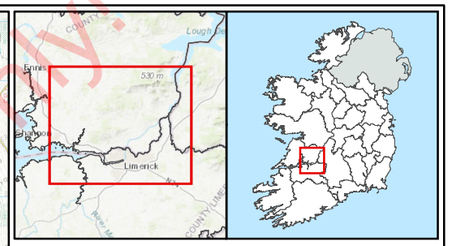
A do-nothing scenario is outlined, in line with requirements of the EIA Directive 2014 (As Amended) which states: "The environmental impact assessment report to be provided by the developer for a project should include a description of …. an outline of the likely evolution of the current state of the environment without implementation of the project". This section details the likely evolution of the receiving environment in the future should the proposed project not be carried out.

References

Finally, all material which contributed to the establishment of the baseline conditions and assessment of potential impacts are referenced in Section 11.2.

Path: R:\Map Production\2020\P20-003\Workspace\EIAR\P20-003_GIS_Fig11-1_Project_Location_Map_A3.mxd





Legend

- Ardnacrusha Substation (110kV)
- Wind Farm Site
- Grid Connection Route
- Turbine Delivery Route

TITLE:	Project Location Map		
PROJECT:	Fahy Beg Wind Farm, Co. Clare		
FIGURE NO:	11.1		
CLIENT:	RWE Renewables Ireland Ltd.		
SCALE:	1:105000	**REVISION:**	0
DATE:	15/11/2022	**PAGE SIZE:**	A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

N W E S

0 2 4 8 Kilometers

11.3 Population

Population relates to the people living in an area. Assessing the demographic makeup of an area can reveal insightful information to guide environmental considerations of a proposed development. This section provides an overview of the population profile for the Study Area, County Clare and the State between the Census years of 2006 and 2016 to create a baseline demographic profile of the receiving environment and identify potential impacts on demographic trends arising as a result of the proposed project.

The study area for the purpose of assessing population has been chosen based on Electoral Divisions (EDs) within which the proposed Wind Farm Site, proposed Turbine Delivery Route and Grid Connection Route are located. As illustrated in Figure 11-1, this encompasses the EDs as set out in Table 11-1:

Table 11-1: Electoral Divisions Associated with the Study Area

Electoral Division of the Study Area (2016)			
Wind Farm Site		**Grid Connection**	**Turbine Delivery Route**
Fahymore (County Clare)		Fahymore (County Clare)	Fahymore (County Clare)
Lackeragh(County Clare)		Cloghera (County Clare)	O'Briensbridge (County Clare)
O'Briensbridge (County Clare)		Ballyglass (County Clare)	Birdhill (County Tipperary)
			Killaloe(County Clare)
			Ballina (County Tipperary)
			Lackareagh(County Clare)

11.3.1 Existing Environment - Population

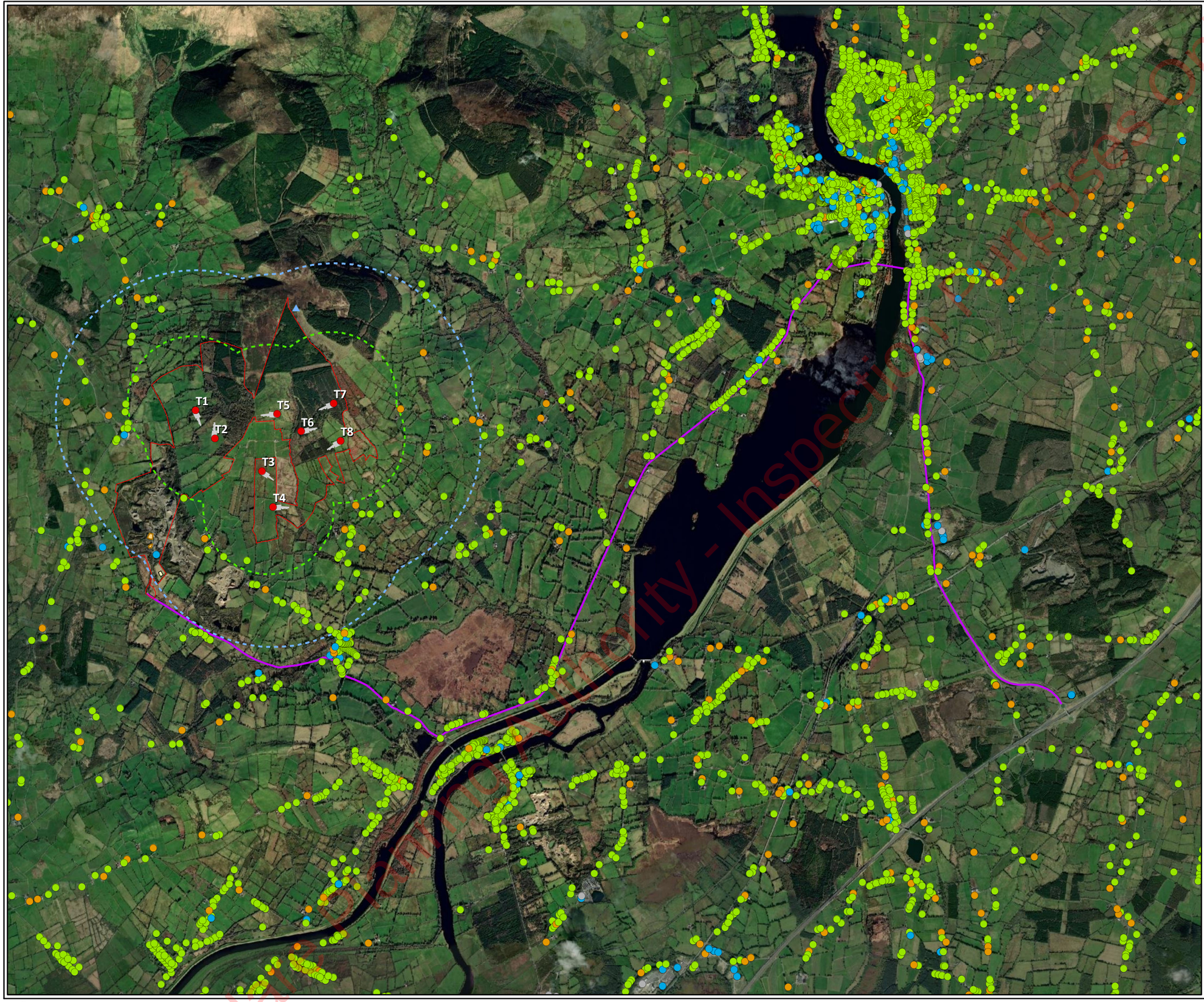
Population Growth

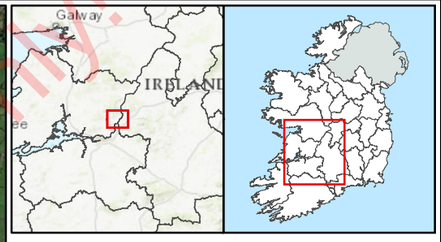
The proposed project is located in east County Clare, northwest of the town of Bridgetown and west of Killaloe with part of the Turbine Delivery Route located in East County Tipperary. The area is predominantly rural in character consisting of one-off houses focused around the local road network.

According to Eircode data 2020, there are approx. 173 no. residential dwellings within 1.55km of the turbine locations[1]. Of these 173 dwellings, 28 no. are also registered as commercial. There are also approx. 20 permitted dwellings yet to be constructed within 1.55km of the proposed turbine locations. Figure 11-2 illustrates the residential receptors within the vicinity of the Wind Farm Site according to Eircode (2020) and Geodirectory data. This information is supported by the ground proofing survey and planning application search.

[1] Based on straight line distances from centre of the proposed turbine locations

Path: R:\Map Production\2020\P20-003\Workspace\EIAR\P20-003_GIS_Fig11-2_NearbyResidentialReceptors_A3.mxd





Legend

- Site Boundary
- Turbine Layout 700m Buffer
- Turbine Layout 1.5km Buffer
- Substation
- Construction Compound
- Turbine Hardstanding Area
- Turbine Delivery Route
- Turbine Layout
- Met Mast

Eircode

- Residential
- Commercial
- Residential and Commercial
- Unknown

N W E S

0 0.5 1 2 Kilometers

TITLE:	Nearby Residential Receptors		
PROJECT:	Fahy Beg Wind Farm, Co. Clare		
FIGURE NO:	11.2		
CLIENT:	RWE Renewables Ireland Ltd.		
SCALE:	1:40000	**REVISION:**	0
DATE:	05/08/2022	**PAGE SIZE:**	A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

Population statistics for the State, Clare County, Tipperary County and the 'Study Area' (EDs associated with the proposed wind farm site, grid route and TDR) set out in Table 11-2:

Table 11-2: Population of Study Area

Area	Population			% Population Change		
	2006	2011	2016	2006-2011	2011-2016	2006-2016
State	4,239,848	4,588,252	4,761,865	+8.2%	+3.8%	+12.3%
Clare County	110,950	117,196	118,817	+5.6%	+1.4%	+7.1%
Tipperary County	149,244	158,754	159,553	+6.4%	+0.5%	+6.9%
Wind Farm Site	1009	1106	1101	+9.6%	-0.4%	+9.1%
TDR	5612	6485	6879	+15.6%	+6.1%	+22.6%
Grid Route	6236	6785	6515	+8.8%	-4%	+4.3%

The data presented in Table 11-2 demonstrates that the population within the Turbine Delivery Route has seen the strongest population growth between 2006 and 2016 with a figure that is double the State's figure and more than three times that of figures for County Clare and County Tipperary. Within the Wind Farm Site EDS and the GCR EDS, there was a decrease in population between 2011 and 2016 below the State and County figures, however the population growth rate of the Wind Farm Site EDs study area remained higher than the County averages between 2006 and 2016 but below State Averages.

Population Density

The population density recorded within the State, County Clare and the Study Area during the 2006, 2011 and 2016 Census are set out hereunder in table 11-3. For 2006 and 2011, the Study Area has a low population density associated with sparse rural settlement. This is in contrast to the State-wide and County-wide population densities which show greater figures, with Clare County population density over double that of the Study area for 2006 and 2011 and State population density approximately 3 times that of the study area for all three years. However, 2016 figures show that the population density for the Grid Connection Route are significantly higher than state and counties figures. Higher figures for 2016 within the Turbine Delivery Route may be attributed to a growth in the towns of Killaloe and Ballina and village of O'Briensbridge falling within the Turbine Delivery Route ED. Additionally, higher population density figures in 2016 within the Grid Connection Route may be attributed to a growth in population in the village of Ardnacrusha and Parteen falling within the Grid Connection Route ED.

Table 11-3: Population Density between 2006 – 2016 (Persons per square kilometre)

Area	Population Density (Persons per square kilometre) 2006	Population Density (Persons per square kilometre) 2011	Population Density (Persons per square kilometre) 2016
State	60.3	65.3	67.8
Clare County	32.2	34	34.4
Tipperary County	34.7	36.9	37.1
Wind Farm site	16	16.1	26.1
GCR	19	19.1	147.4
TDR	22.8	22.9	69.6

11.3.2 Potential Impacts on Population - Construction

The potential effects on population and demographic trends arising from the proposed project during its construction phase relate to potential population increase or decrease.

During the construction phase of the project, it is likely that many of the workers travelling to the site will do so from outside of the area. This is due to the large numbers expected to be employed at the project site. It is expected that workers from the locality within the immediate area will also be employed, however, the relatively low population available in the area, combined with a high percentage of employed persons, as identified in Table 11-5 in the following section, indicates that there is a limited available work force in the project area and therefore many workers employed at the construction site are likely to travel from the surrounding catchment of County Clare and possibly counties Limerick and Tipperary also.

This will give rise to short-term/brief population growth at the wind farm site during working hours. This is associated with the direct employment of construction workers, trades people, labourers and specialised contractors. The construction phase of the wind farm site has potential to create between approximately 39 and 44 jobs. The employment projections are set out in section 11.4.2.

The population of the Wind Farm Site ED recorded in the 2016 Census was 1,101 persons. An estimate of between 39 and 44 jobs associated with the construction works has potential to increase the population of the Study Area by between 3.5% and 4%. However, this increase is associated with daily construction works and therefore the population of the Study Area will increase daily during construction hours and return back to normal outside of working hours resulting in a brief increase to population numbers on a daily basis over the 12-18 month construction period. As construction work is temporary, it is unlikely that workers will take up residence in the area of the Wind Farm Site, however, it is likely that some workers will stay in accommodation within the Study Area or at nearby towns. Overall, this will result in a slight, short-term increase in population resulting in a slight, short-term neutral impact.

The construction works associated with the grid route will be undertaken on a rolling basis with short sections of road closed for short periods before moving onto the next section. It is expected that these works will be conducted over an approximate 12-18 month period. The population of the Grid Connection area will receive a slight increase in numbers during working hours. However, due to the transient nature of the grid route works, this is expected to have an insignificant temporary and neutral impact on the population of the Grid Connection area.

Similarly, the temporary accommodation works associated with the TDR route are limited to 4 no. points along the route. It is expected that there will be a slight increase in numbers at these points along the TDR route during working hours for the construction of the accommodation works and temporary removal of furniture/signage/poles, however, as the works are limited, this temporary increase in population is considered brief to temporary and insignificant.

It is unlikely that permanent impact to population in the Wind Farm Site, TDR or Grid Connection will occur, in terms of changes to population trends or population density as a result of the construction phase.

11.3.3 Potential Impacts on Population - Operational

Once constructed, it is envisaged that there will be direct and indirect employment associated with the operational phase of the proposed project. Opportunities for mechanical-electrical contractors and craftspeople to become involved with the operation and maintenance of the project will arise.

As set out in section 11.4.3 it is expected that the operational phase of the proposed development (wind farm site) could create between 9.4 and 15.4 long term jobs (with an installed capacity of between approximately 31.2-38.4MW). These jobs include operations and maintenance, back-office support and indirect jobs created by other activities related to installed turbines including IPP/utilities, consultancy firms, research institutions, universities and financial services.

Although only a small proportion of these jobs are likely to be based in the Wind Farm Site, the operational phase will give rise to temporary, slight population increase in the Wind Farm Site during working hours as a result of operations and maintenance occurring at the site. This impact is expected to be imperceptible.

It is unlikely that the population of the Grid Connection and TDR will be impacted during the operational phase of the Fahy Beg Wind Farm as further works and activities in these areas are not envisaged.

11.3.4 Potential Impacts on Population - Decommissioning

The decommissioning phase of the proposed project is described in Section 3.8 of this EIAR and provides for the removal of turbines and associated infrastructure from the site. The potential impacts associated with the decommissioning phase in relation to population trends will be similar to those associated with the construction phase but of a reduced magnitude.

A construction crew will be required for dismantling the infrastructure and carrying out remediation where necessary. As the decommissioning of the project is expected to be less intensive than the construction phase, it is likely that less construction workers will be required for this phase. During the decommissioning phase, the population of the Wind Farm Site will increase daily during working hours and return back to normal outside of working hours.

As removal works will be of relatively short duration, it is unlikely that workers will take up residence in the Wind Farm Site, however, it is likely that some workers will stay in accommodation within the area of the Wind Farm Site or nearby towns, resulting in potential temporary population increases. The decommissioning phase is therefore likely to result in a slight, temporary increase in population within the Wind Farm Site and nearby towns, producing a slight temporary impact on population trends. It is not likely that the decommissioning phase will result in any permanent impact to population in terms of changes to population trends and density.

The grid route element of the project will remain in situ following decommissioning. There is no expected impact on population trends in the Grid Connection area as a result of the decommissioning phase. Similarly, there is no expected impact on population trends across the TDR as a result of the decommissioning phase.

11.3.5 Mitigation Measures - Population

As there are no significant impacts predicted on population trends and population density, no mitigation measures are required.

11.3.6 Residual Impacts - Population

The residual effects of the proposed project with respect to population are associated with operation and maintenance jobs during the operational phase of the Fahy Beg Wind Farm. This is likely to result in a temporary slight, neutral impact on population statistics due to population increase in the Wind Farm Site during working hours. As per the assessment of operational impacts, any impact to the population of the Wind Farm Site in terms of changes to population trends will be imperceptible. It is therefore unlikely that long term residual impacts will occur to population and demographic trends as a result of the proposed project.

11.4 Socio-Economics, Employment and Economic Activity

This section provides a comprehensive overview of the socio-economic, employment and economic activity associated with the receiving environment, including the Wind Farm Site, TDR, Grid Connection Route, together with County Clare, County Tipperary itself and the State as a whole. This provides an understanding of the overall socio-economic profile of the receiving environment and the potential effects arising from the proposed Fahy Beg Wind Farm.

11.4.1 Existing Environment – Socio-economic, Employment and Economic Activity

Live register data (CSO, 2019) provides information relating to the number of people registering for Jobseekers Benefit, Jobseekers Allowance, or for various other statutory entitlements. The figure is useful to gauge unemployment estimations for an area, however, it is noted that the Live Register data includes part-time workers (working up to three days per week), seasonal workers and casual workers who are entitled to Jobseekers Benefit or Jobseekers Allowance and therefore, cannot be relied upon entirely for conclusive employment data. Furthermore, 2020 and 2021 saw a significant increase in unemployment throughout the country due to the COVID-19 pandemic. Live register data is presented below in Table 11-4 for the State and County Clare and Tipperary.

Table 11-4: Total Population aged 15-64 for State, Clare County and Tipperary County 2016:

	Total Population Aged 15+ 2016
Clare County	**93,245**
Tipperary county	**122,347**
State	**3,755,313**

Table 11-5: Live Register Data for Cork County and the State July 2019 –July 2022

	July 2019	July 2020	July 2021	July 2022
Clare County	**4,713**	**5,809**	**4,228**	**4,929**
Tipperary county	**8381**	**8269**	**6740**	**6684**
State	**206,396**	**244,562**	**184,213**	**196,700**

Source: CSO & data.gov.ie

Between 2019 and 2022, unemployment trends in County Clare and Tipperary and the State experienced a fluctuation of both decreases and increases, where numbers recorded on the live register dropped by 4.7% and 20.2% throughout the State and County Tipperary respectively, however, there has been a growth in the numbers recorded on the live register of 4.6% in County Clare in the same period. Any increase especially in July 2020 and July 2021 is likely in part-due to the negative economic impact associated with COVID-19, numbers of people on the live register increased from July 2019 to July 2020 by 18.5% across the State and by 23.3% across Counties Clare. Whilst in County Tipperary, the numbers on the live register decreased by 1.3% during the same period. These numbers have since increased by 6.8% across the State and by 16.6% across County Clare between July 2021 and July 2022. However, the number of people on the live register decreased from July 2021 to July 2022 by 0.8% across County Tipperary.

Taking account of the 2016 Census population figures for those aged 15 to 64 along with those detailed in section 11.3.1, this represents an unemployment rate of 5.2% across the State, and an unemployment rate of 5.3% and 5.5% across Counties Clare and Tipperary, indicating a slightly greater average unemployment rate for the two counties as a whole compared to the State.

The Census (2016) has published figures of Ireland's working population aged 15 to 64 for Electoral Divisions, allowing for a greater insight into the Study Area's socio-economic profile.

The basic indicator for employment is the proportion of the working-age population aged 15+ who are employed. Table 11.5 sets out the percentage of the total population aged 15+ who were in the labour force during the 2016 Census. Table 11.5 also sets out those who were not in the labour force, this includes students, retired people, those unable to work, persons performing home duties etc.

11.4.2 Existing Environment – Socio-economic, Employment and Economic Activity

Live register data (CSO, 2019) provides information relating to the number of people registering for Jobseekers Benefit, Jobseekers Allowance, or for various other statutory entitlements. The figure is useful to gauge unemployment estimations for an area, however, it is noted that the Live Register data includes part-time workers (working up to three days per week), seasonal workers and casual workers who are entitled to Jobseekers Benefit or Jobseekers Allowance and therefore, cannot be relied upon entirely for conclusive employment data. Furthermore, there was a significant increase in unemployment throughout the country due to the COVID-19 pandemic, however, the impacts of this have largely receded. Live register data is presented below in Table 11-4 for the State and County Clare.

Table 11-6: Economic Status of the Total Population Ages 15+ in 2016

	Status	State	County Clare	County Tipperary	Wind Farm Site	TDR	Grid Connection
% of Population aged 15+ which are:	At Work	53.4%	52.8%	50.2%	63.1%	61.3%	62.3%
	First time job seeker	0.8%	0.7%	0.8%	1%	0.3%	0.2%
	Unemployed	7.1%	6.9%	7.8%	2%	2.7%	2.7%
	Student	11.3%	11.4%	10.7%	11.7%	9.2%	11.7%
	Home duties	8.2%	8%	9.1%	11.7%	11.5%	11.4%
	Retired	14.4%	15.9%	15.7%	6.7%	11.2%	8.3%
	Unable to work	4.3%	3.9%	5.3%	3.4%	3.4%	3%
	Other	0.4%	0.3%	0.4%	0.3%	0.3%	0.4%

As set out in Table 11-5, overall, the principal employment status in 2016 across the State, County Clare, County Tipperary and the Study Area is 'at work' with between 50.2% and 53.4%. However, the figures for the Wind Farm Site, GCR and TDR are between 61.3% and 63.1% which are figures above those at State and County level. The Study Area has a larger percentage of persons 'at work' compared to County Clare and the State with an average of approx. 10 percentage points more. Thus, those unemployed within the Study Area is less than that of the State and County, while the percentage of retired persons compared to the State and County is lower.

The Census (2016) also indicates the employment composition of Electoral Divisions, an important element of the socio-economic profile of an area. As detailed in Table 11-6, the employment sectors for each of the areas show similarities with professional services, manufacturing industries and commerce and trade having the largest share across the State, County and Study Area.

The Study Area has a higher percentage of employment from the Professional Services Industry compared to the State and County. Overall, the economic profile of the Study Area does not show any major disparities when compared to the National and County-wide average socio-economic statistics.

County Clare has a slightly lower unemployment rate compared to the State. This is reflected in the unemployment numbers recorded in the 2016 Census for the Study Area which are on average lower than the State. In general, the baseline conditions of the study area show healthy socio-economic characteristics.

Employment activities within the Study Area consists mainly of agriculture and forestry as detailed in Section 11.5: Land Use. Centres of employment in the greater area include Killaloe-Ballina which has a range of town centre services and industry. Smaller villages in proximity to the study area including Bridgetown, O'Briensbridge and Broadford which provide local services including shops, pubs and food places.

Table 11-7: Industry Distribution by Area in 2016

Persons at Work by Industry	State	County Clare	County Tipperary	Wind Farm Site	TDR	Grid Connection
Agriculture forestry & fishing	4.4%	6.9%	10.6%	11.3%	24.7%	7.8%
Building & construction	5.1%	5.1%	5.2%	4.7%	5.3%	11.8%
Manufacturing industries	11.4%	15.5%	15.2%	28%	15.7%	17.9%
Commerce and trade	24%	18.3%	20.2%	19.2%	18.4%	19.2%
Transport and communications	8.5%)	7.9%	44.7%	5.5%	8.6%	8.7%
Public administration	5.3%	5.6%	5.6%	4.7%	5.1%	5.2%
Professional services	23.5%	22.5%	22.9%	26%	25.6%	25.2%
Other	17.8%	18.1%	15.6%	13.9%	14.9%	11.2%

11.4.3 Potential Impacts – Socio-economics, Employment and Economic Activity - Construction

The site preparation and installation of the Fahy Beg Wind Farm will create temporary employment within the study area.

According to the Institute for Sustainable Futures document (2015), approximately 3.2 jobs are created per MW of wind energy development during the construction and installation phase, the report assumes a 2-year construction period.

Based on this employment estimate and an approximate two-year construction phase, approximately 100-123 jobs could be created during the construction phase (for an installed capacity of approx. 31.2-38.4 MW.

According to the European Wind Energy Association's (EWEA) Report 'Wind at Work' (2009), 1.2 jobs per MW are created during installation of wind energy projects based on 1 year construction period.

Using this figure, a projection of approximately 37.5 to 46 jobs could be created as a result of the construction of the proposed development which could have an installed capacity ranging from 31.2 to 38.4MW , depending on the turbine to be selected within the range proposed. e selected within the range.

The Sustainable Energy Authority of Ireland' 2015 report 'A Macroeconomic Analysis of Onshore Wind Deployment to 2020' puts direct construction jobs from wind farm developments at 1.07 jobs per MW based on 1 year of construction. Using this figure, a projection of approximately 33.4 to 41.1 jobs could be created as a result of the construction of the proposed development which could have an installed capacity ranging from 31.2 to 38.4MW , depending on the turbine to be selected within the range proposed.

Therefore, considering the minimum and maximum MW that could be installed on the site, it is estimated that between 33.4 and 100 direct and indirect jobs respectively could be created during the construction phase of the proposed project. It is not expected that all these jobs will be based at the wind farm site, however, the employment of tradespeople, labourers, and specialised contractors for the construction phase will have a direct, short-term significant, positive impact on employment in the study area.

It is likely that there will be direct employment for people living in the Study Area who may be qualified for construction related roles. Materials will also be sourced in the general locality where possible. This will assist in sustaining employment in the local construction trade. Furthermore, local businesses in the nearby towns of Bridgetown, O'Briensbridge, Killaloe and Ardnacrusha will likely receive a slight indirect positive economic impact due to the influx of workers to the area who will require services such as shops and food places.

As a result, the construction phase of the proposed development will have a short-term, significant positive impact on the employment profile of the area and a short-term slight, positive impact on local businesses and services in the nearby towns and villages of the Study Area.

11.4.4 Potential Impacts – Socio-economics, Employment and Economic Activity – Operational

11.4.4.1 Economic Value & Employment Potential

The proposed project will contribute to achieving Ireland's energy targets as set out in the Climate Action Plan 2021, which has a target of 80% of electricity generated from renewable sources by 2030. With a target increase in onshore wind of 8.2GW by 2030, the Fahy Beg Wind Farm has the potential to contribute to 0.4% of this total.

The Sustainable Energy Authority of Ireland's (SEAI) Energy in Ireland 2021 Report states that wind energy provided Ireland with 39% of its electricity in 2020, up 7% from 2019. The use of renewable energy reduced CO2 emissions by 6.6 million tonnes in 2020, avoiding additional costs related to fossil fuel imports for that year. It is estimated that wind energy alone resulted in the avoidance of approximately 4.5 million tonnes of CO2 emissions in 2020. These savings will continue to rise with the installation of further wind energy and other renewable energy developments. Increased renewable electricity production as a result of the operational phase of the proposed development will likely have a positive medium to long-term economic effect due to the cost savings associated with the avoidance of fossil fuel imports. This will also act cumulatively with other proposed, consented and existing renewable energy projects throughout the country in providing cost savings, as discussed in section 11.10.

Once the proposed Fahy Beg Wind Farm is constructed, it is envisaged that there will be direct and indirect employment associated with the operational phase of the proposed development. Opportunities for mechanical-electrical contractors and craftspeople to become involved with the operation and maintenance of the project will arise.

According to the European Wind Energy Association's (EWEA) Report 'Wind at Work' (2009), 0.4 long-term jobs are created per MW of total installed capacity. These jobs include operations, maintenance, back office support and indirect jobs created by other activities related to installed turbines including IPP/utilities, consultants, research institutions, universities and financial services.

A study carried out by the Institute for Sustainable Futures (2015) estimates that the operational and maintenance job output for a wind farm is 0.3 jobs per MW of total installed capacity based on an average of 7 studies examined. SEAI's 2015 report 'A Macroeconomic Analysis of Onshore Wind Deployment to 2020' estimates 0.34 jobs per MW for operations and maintenance of new wind turbines and in the wider electricity supply sector.

Therefore, based on these estimates and considering an installed capacity of between 31.2-38.4MW, the operational phase of the proposed Fahy Beg Wind Farm could produce between 9.4 and 15.4 jobs.

Although only a small proportion of these jobs are likely to be directly based at the Wind Farm Site, it is likely that the indirect jobs the operational phase will support, such as consultants, research institutions, universities and financial services, will provide an indirect, long-term slight, positive effect to the employment profile of the wider economy of County Clare.

It is likely that there will be direct employment available for people living in the Study Area who may be qualified for jobs associated with operation and maintenance. It is therefore considered that the operational phase of the proposed development has potential for an indirect, long-term slight, positive effect on employment in the Study Area, nearby towns and wider County Clare.

Rates and development contributions paid by the developer will contribute significant funds to Clare County Council which will likely be used to improve the services available to the people of the County. Business rates will also contribute significantly throughout the lifetime of the windfarm. General council services will benefit from rates and development contributions which include road upkeep, fire services, environmental protection, street lighting, footpath works etc., along with other local community initiatives and supports. Based on the installed capacity of the project the Business Rates could represent an annual contribution of between €600,000 and €1,000,000 per annum to the County. This is likely to have a slight positive, long-term effect on resources of the Local Authority during the operational phase.

The terms of the Renewable Energy Support Scheme (RESS) states that all projects looking for support under the new RESS will need to meet pre-qualification criteria including the provision of a community benefit fund. This is discussed further in the following section.

11.4.4.2 Proposed Community Benefit Scheme

As set out in the terms of the Renewable Energy Support Scheme (RESS), all renewable energy projects applying for RESS will require a **Community Benefit Fund** prior to commercial operations of the project. The contribution for RESS 1 (2020), the first renewable energy auction under the new support program, required a contribution of €2/MWh for all projects.

Furthermore, as part of RESS 1, the Community Benefit Fund will provide a minimum payment per annum of €1,000 to all dwellings located within a distance of 1 kilometre radius from RESS 1 projects and a minimum of 40% of the funds shall be paid to not-for-profit community enterprises, focusing on education, energy efficiency, sustainable energy and climate action, in line with UN Sustainable Development Goals, 4, 7, 11 and 13.

A Good Practice Principles Handbook was published in 2021 setting out a range of principles, including the need to ensure community participation in fund decision-making via the establishment of a local committee which should ensure successful dispersal of funds throughout the community.

It is expected that for each megawatt hour (MWh) of electricity produced by the wind farm, the project will contribute €2 into a community benefit fund for the RESS period i.e. the first 15 years of operation. If this commitment is revised in upcoming Government Policy, the figures will be adjusted accordingly. Additionally after the aforementioned 15 years, RWE Renewables Ireland Ltd has committed to maintaining a Community Benefit Fund for the full lifetime of the windfarm in line with best practice and guidelines.

Fahy Beg has a proposed installed capacity range of between 31.2 Mw and -38.4MW which could mean €173,000 to €208,000 per annum is paid into the fund every year for 15 years. The amount of funding will be dependant on the final capacity and the amount of electricity generated by the wind farm when operational.

The provision of the Community Benefit Fund will have a significant long-term, positive effect on the socioeconomic profile of the study area and wider area, providing a regular payment to near neighbours of the project and providing for projects which will benefit the community as a whole, bringing long-term socio-economic benefits.

11.4.4.3 Property Values

In the absence of any Irish studies on the effect of wind farms on property values, this section provides a summary of the largest and most recent studies from the United States and Scotland.

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

The main conclusion of this study is as follows:

> "*Based on the data and analysis presented in this report, no evidence is found that home prices surrounding wind facilities are consistently, measurably, and significantly affected by either the view of wind facilities or the distance of the home to those facilities. Although the analysis cannot dismiss the possibility that individual or small numbers of homes have been or could be negatively impacted, if these impacts do exist, they are either too small and/or too infrequent to result in any widespread and consistent statistically observable impact*."

This study has been recently updated by LBNL who published a further paper entitled "A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States", (Hoen, et al. 2013). This study analysed more than 50,000 home sales near 67 wind farms in 27 counties across nine U.S. states yet was unable to uncover any impacts to nearby home property values. The homes were all within 10 miles of the wind energy facilities - about 1,100 homes were within 1 mile, with 331 within half a mile.

The report is therefore based on a very large sample and represents an extremely robust assessment of the impacts of wind farm development on property prices. It concludes that:

> *"Across all model Specifications, we find no statistical evidence that home prices near wind turbines were affected in either the post-construction or post announcement/pre-construction periods."*

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

A further study was commissioned by Renewable UK and carried out by the Centre for Economics and Business Research (Cebr) in March 2014. Its main conclusions are:

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

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

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

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

Although there have been no empirical studies carried out in Ireland on the impacts of wind farms on property prices, the literature described above demonstrates that at an international level, wind farms have not impacted property values in the local areas.

It is a reasonable assumption based on the available international literature, that the provision of a wind farm at the proposed location would not impact on the property values in the area and will therefore have a long-term imperceptible impact.

11.4.5 Potential Impacts – Socio-economics, Employment and Economic Activity – Decommissioning

The potential impacts associated with the decommissioning phase in relation to socio-economics, employment and economic activity will be similar to those associated with the construction phase but of a reduced magnitude.

A construction crew will be required for dismantling the infrastructure and carrying out remediation where necessary. As the decommissioning of the project is expected to be less intensive than the construction phase, it is likely that less construction workers will be required for this phase. During the decommissioning phase employment opportunities will be available at the Wind Farm Site and outlying areas. The influx of construction workers to the Wind Farm Site will have a temporary to short-term indirect positive impact on local businesses and services contributing to the local economy, similar to that of the construction phase but of lesser magnitude.

There will be a temporary to short-term slight, positive impact to socio-economics, employment and economic activity in the Wind Farm Site associated with the employment of construction workers within the vicinity of the development during the decommissioning phase.

11.4.6 Mitigation Measures – Socio-economics, Employment and Economic Activity

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

11.4.7 Residual Impacts – Socio-economics, Employment and Economic Activity

The residual effects of the development with respect to socio-economics is considered to be slight positive effect with respect to employment. This is as a result of the employment opportunities associated with the operation and maintenance of the development. There will also be a temporary slight positive economic effect from income spent by construction workers in the local area.

As detailed in section 11.4.3.2, the Community Benefit Fund associated with the Renewable Energy Support Scheme (RESS) will provide a significant long-term, positive impact to socio-economic profile of the Wind Farm Site and greater community.

The terms of the Community Benefit Fund will also promote social-inclusion across the community as a minimum of 40% of the funds shall be paid to not-for-profit community enterprises, focusing on UN Sustainable Development Goals, 4, 7, 11 and 13 which include education, energy efficiency, sustainable energy and climate action.

Rates payments and development contributions have potential to improve service provision throughout County Clare and in the local area. This will likely have a slight positive, residual effect on resources of the Local Authority.

A positive residual effect is also envisaged in that wind energy decreases the cost of electricity. A cost benefit analysis of wind energy in Ireland was published by Baringa in association with IWEA in January 2019 (Baringa, 2019). The study indicates that the more renewable energy (low-cost) produced, the less dependency on fossil fuels is required which costs more per MW.

The report states that the savings involved with wind energy outweigh the amount of funding provided to support wind energy through the public service obligation levy, therefore the more wind power produced, the less electricity will cost. The proposed project will result in a slight long-term positive impact for electricity users throughout the country.

Overall, the residual effect associated with socio-economics, employment and economic activity as a result of the proposed development is considered long-term significant and positive.

11.5 Land Use

This section assesses the compatibility of the land use of the proposed project with the current land use. The determination of the potential effects on the existing land use is assessed for the construction, operation and decommissioning phases of the proposed project. Potential impact on sensitive land uses in the area of the proposed development have been examined in this section.

11.5.1 Existing Environment – Land Use

The proposed Wind Farm site is located in an area of improved agricultural lands with extensive areas of conifer woodland throughout. The lands of the wind farm site are accessed via the western boundary of a disused quarry site. The site has existing agricultural tracks currently used for farming activities. The primary agricultural activity at the wind farm site is pasture farming. The wind farm site also consists of beech dominated mixed broadleaved woodland and localised areas of wet grassland. There are 37 dwellings located within 1km of the proposed development.

There are two wind farms located within 25km of the site. These consist of the Knockastanna Wind Farm and the Templederry Wind Farm. There is a quarry located immediately to the south of the wind farm site. The closest settlement is the village of Bridgetown, located approximately 1.5km to the southeast.

The proposed GCR will be installed in the public road. Land use observed along the grid route consists of arable and pasture farmlands, one-off houses and farmsteads. The Corine Landover data shows the grid route extending over agricultural pastures (code 231). There are approximately 87 no. one-off houses along the be 10.612km grid route. The proposed point of connection to the national grid is the Ardnacrusha Substation which is a long-standing electricity substation and compound located adjacent to the Ardnacrusha hydro-station on the River Shannon.

Large components associated with the wind farm construction will be transported to the Site via the identified turbine delivery route (TDR). The TDR includes the following roads:

- N69
- N18
- M7
- R494 (Planned Killaloe Bypass)
- R463
- R466.

The subject lands are generally open and are free from buildings and structures that would hinder generating capacity. The North-Western Parcel surrounds an existing residential dwelling with agricultural sheds and outbuildings on its south-western boundary. The Central Parcel surrounds an existing residential property on three sides, it is understood that the owners will continue to access their dwelling using the existing access from the adjacent laneway. This access will not be required for the proposed solar farm but would be required for underground cable to link the Central Parcel with North-Western Parcel.

Hedgerows and tree lines, typical to general pattern of field boundaries within the Irish landscape, are present on site. In line with industry practice these will be retained as part of the project design. The site is made up of c. 52 no. agricultural fields, bounded by hedgerows and tree lines. Internal and perimeter field boundaries comprising hedgerows and tree lines will generally be required to be retained for ecology and landscape protection and are treated as exclusions areas.

There are no recorded archaeological monuments within the site boundary. There are 5 no. features listed on the Sites and Monuments Record located within 500m of the subject lands, however given the types of feature listed and their distance from the site, these are not considered a constraint on solar farm development.

There are 2 no. 110kV transmission line crossing the site, one of which traverses the Central Parcel and the other which crosses the South-Eastern Parcel from the existing 110kv Tullahennel Substation located c. 7km north east of the lands (see figure 3 in Appendix 1). The transmission lines extend for 338 m of the Central Parcel and 644 m of the South Eastern Parcel. Exclusion corridors of 19 m have been applied to each of the OH lines (9.5m on either side of the line) with an increased exclusion area of 46m applied to the associated supporting timber poles (23m on either side of each wooden pole). These result in an exclusion of c. 2.37ha of land suitable for panel arrays.

There are 3 no. residences located within 100m of the North-Western Parcel; 7 no. residences within 100m of the Central Parcel; and 2 no. properties within a 100m distance of the South-Eastern Parcel (see Map Figure 3 for location of all adjacent residences). Exclusion areas for protection of residential amenity may be required for these. The exact distance to be used for site screening and landscape management measures will be determined during project design. For the purposes of this feasibility study an exclusion of 35m from the site boundaries has been applied.

Site walk-over survey for ground conditions confirmed areas of peaty topsoil in the North-Western Parcel and cut-over peat deposits in the Central Parcel. There were no areas of exposed bedrock located within the proposed site. In general ground conditions across the site were found suitable for installation of solar PV development and associated electrical infrastructure. Confirmation with ground investigation will be required for siting of major infrastructure components such as the site substation.

A preliminary high level Flood Risk Assessment of the lands has been undertaken (see Appendix 2). The assessment considered desktop-based review, site inspection by FT Engineers, preliminary stream channel modelling and available topography mapping, and found no exclusions were required.

A site walkover survey of the site ecology identified a number of Badger Setts within the project lands, the standard 50m exclusion required by NPWS has been applied to these Badger setts. Baring the badger setts, there are no significant obstructions on the lands which cannot be taken into account during solar farm design.

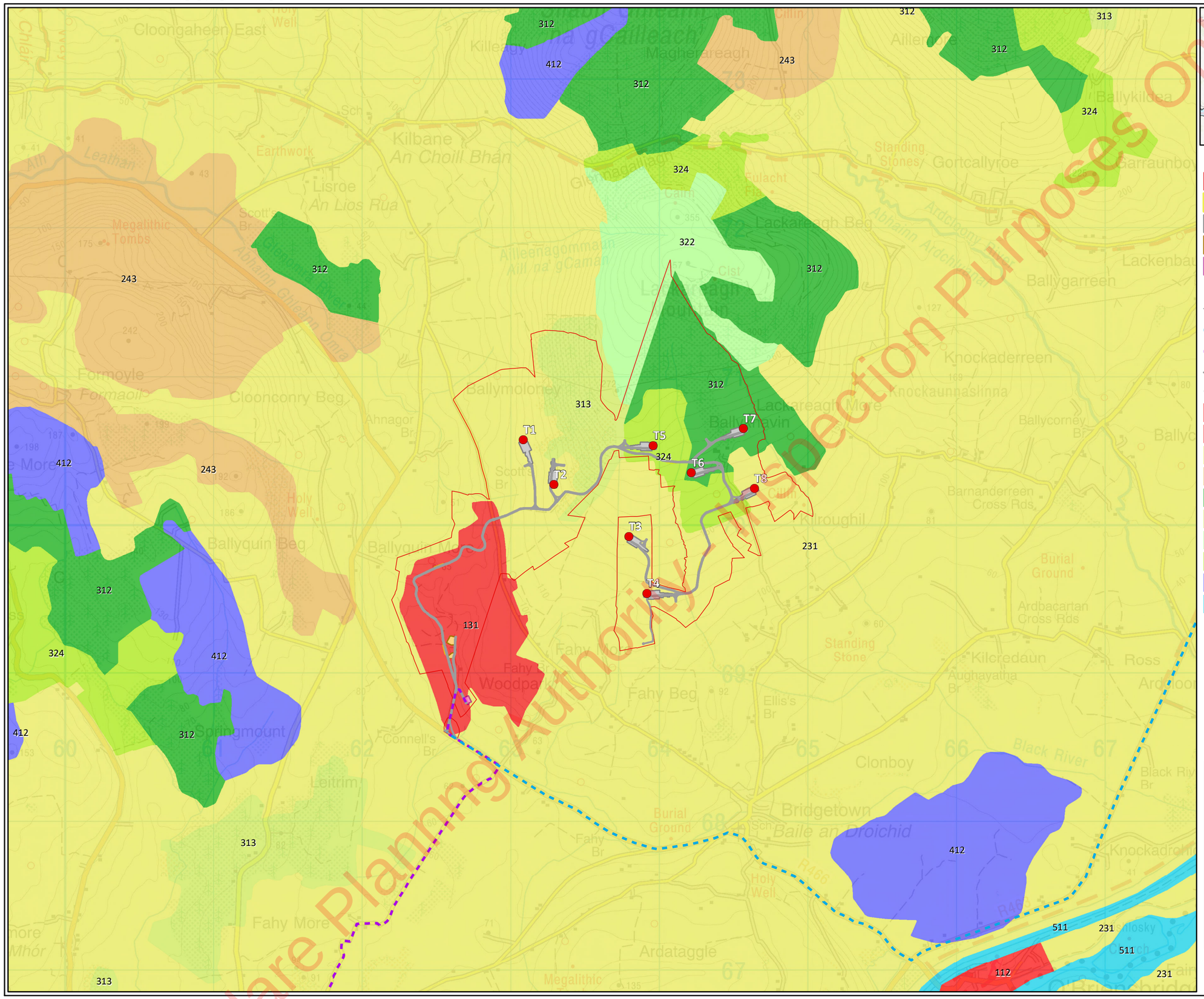
No recorded archaeological monuments are located within the subject lands. The desktop-based archaeological assessment prepared by JCA, see accompanying report, indicated no archaeological exclusions were required. An un-recorded feature was noted and further survey during project design together with site testing is recommended prior to construction.

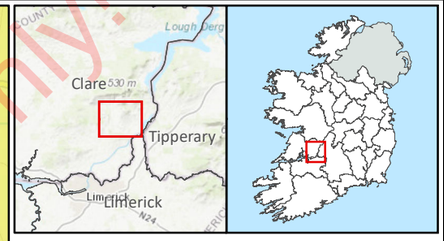
From a desktop assessment, there are no gas lines or significant water mains running through the lands.

The study area and associated existing environment associated with the TDR shall be confined to the public road corridor associated with the above roads with the exception of locations where temporary accommodation works will be required to facilitate the delivery of oversized loads. These accommodation works include hedge or tree cutting, relocation of powerlines/poles, lampposts, signage and local road widening. For these locations, private lands have been identified and assessed in the EIAR. The TDR and location of temporary accommodation works are described in detail in Section 3.5, Chapter 3 and presented in Figure 3-3, Chapter 3.

The Corine Landcover mapping for the Wind Farm Site is illustrated in Figure 11-3.

Path: R:\Map Production\2020\P20-003\Workspace\EIAR\P20-003_GIS_Fig11-3_CorineLandCover_A3.mxd





Legend

- Wind Farm Site Boundary
- Passing Bays
- Turbine Hardstanding Area
- Construction Compound
- Substation Compound
- Proposed Turbine Layout
- Met Mast Access Track
- Turbine Delivery Route
- Grid Connection Route
- Onsite Access Roads

CORINE Land Cover 2018

- 112 Discontinuous urban fabric
- 131 Mineral extraction sites
- 231 Pastures
- 243 Agriculture (mainly) with natural vegetation areas
- 312 Coniferous forest
- 313 Mixed forest
- 322 Moors and heaths
- 324 Transitional woodland scrub
- 412 Peat bogs
- 511 Stream courses

TITLE:	Corine Land Cover		
PROJECT:	Fahy Beg Wind Farm, Co. Clare		
FIGURE NO:	11.3		
CLIENT:	RWE Renewables Ireland Ltd.		
SCALE:	1:25000	**REVISION:**	0
DATE:	16/11/2022	**PAGE SIZE:**	A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

N W E S

0 0.5 1 2 Kilometers

11.5.2 Potential Impacts – Land Use - Construction

The existing land-uses in proximity to the proposed Fahy Beg Wind Farm will remain broadly unchanged during the construction phase of the project, however, some land use in close proximity to the site will be temporarily disrupted during the construction phase. This will occur on the forestry lands and the agricultural lands where turbines and associated infrastructure are proposed.

There are 3 no. proposed wind turbines located within commercial forestry areas and 5 no. proposed turbines located on pasture lands. Existing access tracks will be utilized and upgraded where possible and new tracks will be required in both forested lands and agricultural lands. This will result in temporary interruption to these lands during the construction phase.

Felling is required within and around the wind farm infrastructure to accommodate the construction of the turbines, hardstands and crane pads, access tracks, on-site substation and construction compound. This will result in a long-term moderate, negative impact to forestry in the area.

Inline with the Forest Service's published policy on granting felling licenses for wind farm developments, areas permanently cleared of forestry for turbine bases, access roads, and any other wind farm related uses will have to be replaced by the planting of forestry at an alternative locations. The Forest Service policy requires replacement on a hectare for hectare basis.

It should be noted that the clear felling of trees in the State requires a felling licence. The associated afforestation of alternative lands equivalent in area to those lands being permanently clearfelled is also subject to licencing ('afforestation licencing'). The Forest Service of the Department of Agriculture, Food & the Marine is Ireland's national forest authority and is responsible for all forest licencing. In light of the foregoing and for the purposes of this project, the developer commits that the location of any replanting (alternative afforestation) associated with the project will be greater than 10km from the wind farm site and also outside any potential hydrological pathways of connectivity i.e., outside the catchment within which the proposed project is located. On this basis, it is reasonable to conclude that there will be no more than imperceptible indirect, or in-combination effects associated with this replanting. In addition, the developer commits to not commencing the project until both felling, and afforestation licences are in place, and this ensures the afforested lands are identified, assessed and licenced appropriately by the relevant consenting authority. Forestry activity at the site will cease during the construction phase resulting in a short-term slight, negative impact to existing land use at the wind farm site, however, activity in adjacent areas of forestry can continue during the construction phase.

Temporary effects on land use will arise as a result of the installation of the grid connection along the grid route which will be constructed within the public road corridor. Full road closures will be put in place to facilitate cabling works in combination with lane closures, partial road closures and stop/go systems. This will allow for the works to be completed efficiently and minimise disruption time for residents.

This will result in temporary slight, negative impact to residential and agricultural land use where access may be temporarily restricted. Traffic management measures will be put in place as detailed in Chapter 13 of this EIAR, resulting in limited disruption to land use along the grid route.

TDR node upgrade activity has potential for slight, brief to temporary impacts to land use in proximity to each node. Most works have potential to cause non-significant brief impacts where street furniture and wall removal, temporary load bearing surfaces and vegetation trimming is required. Brief impact may also occur to the supply of electricity and telecommunications to homes and businesses as a result of temporary removal of services to accommodate turbine delivery. Turbine delivery will impact on land use temporarily due to the transportation of oversized loads on the public road.

This is likely to have a temporary slight, negative impact on residential land-use due to noise nuisance because of machinery. The impact of noise is further considered in Chapter 7 – Noise and Vibration.

11.5.3 Potential Impacts – Land Use - Operation

Given that the footprint of the proposed development will occupy a small proportion of the development site area when operational, as illustrated in Figure 11-3, it is anticipated that there will be minimal impact on existing land uses arising from the operational phase.

The operational phase of the Fahy Beg Wind Farm will result in a change of land use in areas where access tracks, wind turbine bases, hardstanding areas, met mast, substation, recreation trail and associated drainage infrastructure will be located. The lands affected are currently in use for commercial forestry and agriculture. The removal of commercial forestry lands will have a long-term slight, negative impact on the existing forestry land use, however, the remaining forested area will continue its ongoing commercial maintenance.

There will be 5 no. turbines located on or partly on agricultural lands. This will result in the change of use from agricultural pastures to wind farm use. This will have a long-term slight, negative impact on agricultural land use due to the removal of grazing lands for the duration of the project.

The operational phase of the Fahy Beg Wind Farm will not negatively impact on agricultural practices on lands adjacent to the site. There are no peer reviewed studies which indicate that wind energy development has a negative impact on the health of livestock. There are numerous examples of renewable energy developments throughout the country and internationally where livestock coexist and routinely graze in the same fields as wind turbines (AWEA, 2019). Existing land-use, such as grazing livestock or crops can continue on the site as normal. As such, there will be no likely significant negative impact to agricultural practice as a result of the proposed development.

It is proposed to upgrade existing agricultural and forestry tracks where possible to avoid additional land take from roads. Where this is not possible, new access tracks have been proposed. These access tracks will be used throughout the operational phase for operation and maintenance of the proposed wind farm. The tracks will also be used for forestry and agricultural practice, providing a long-term slight, positive impact to these land uses through provision of upgraded and new roads infrastructure throughout the site.

Activity is not expected at the Grid Connection Route and TDR during the operational phase of the proposed project. There is potential for repair works along the Grid Connection Route to take place, however, these will likely be brief or temporary and insignificant. It is unlikely that the TDR route will be required during the operational phase of the project, unless in the unlikely event a turbine component requires to be transported for replacement or repair. In this case, there is potential for slight temporary negative impact on residential land-use due to noise nuisance as a result of machinery.

Biodiversity enhancement measures will be incorporated into the site. Higher value habitats will be actively managed to maintain and improve their value and lower value habitats will see specific interventions designed to improve their attractiveness for a wide range of species. Inputs (e.g., fertiliser, herbicide) will be controlled and appropriate planting will increase the available feeding, roosting and nesting cover for wildlife. Certain measures (e.g., control of stocking density) will be universal across the management lands. Other measures (e.g., planting of wild bird cover and native deciduous woodland) will be entirely site specific. The measures proposed take into account the habitats present and their current condition and importance in the local landscape. This will have a positive impact on land-use by enhancing the biodiversity of the area. A Biodiversity Enhancement Management Plan for Fahy Beg Wind Farm can be found in Appendix 3.4.

11.5.4 Potential Impacts – Land Use – Decommissioning

The decommissioning phase of the proposed development is described in Section 3.8 of this EIAR and provides for the removal of turbines and associated infrastructure from the site. The potential impacts associated with the decommissioning phase in relation to land use will be similar to those associated with construction phase but of a reduced magnitude.

Decommissioning works will include removal of all above ground structures including the turbines and met mast. The on-site substation will be taken in charge by Eirgrid / ESB and therefore will remain in situ. The turbine foundations will be covered over and allowed to re-vegetate naturally and access tracks will be left in situ to continue to be used for agricultural, forestry and recreation land uses.

The decommissioning works will require a construction crew on-site and may cause temporary disruption to surrounding land uses. Removal of infrastructure from the site may temporarily impact on forestry and agricultural practices. During decommissioning works forestry and agricultural access tracks within the wind farm site may be in use by construction crews which may temporarily prohibit access to certain areas of forestry or hinder access to areas of agricultural pasture. Impact to these land uses during the decommissioning phase is expected to be temporary to short-term slight, negative.

Forestry practices and recreation activity will also benefit from the upgraded access tracks left in situ throughout the site resulting in a long-term moderate, positive impact on the forestry industry and recreation activity at the site.

The underground grid connection will remain in situ following decommissioning and form part of the national grid. Therefore, impact to land use along the grid route is unlikely during the decommissioning phase.

The BEMP lands are contracted for the duration of the project, thereafter their full control will revert back to the landowner.

11.5.5 Mitigation Measures – Land Use

Mitigation measures for land use are primarily related to preliminary design stage, which has allowed for the prevention of unnecessary or inappropriate ground works or land use alterations to occur. The construction and operational footprint of the proposed development has been kept to the minimum necessary to avoid impact on existing land uses as so far as possible.

Existing forestry tracks have been incorporated into the design to minimize the construction of new tracks and roads and minimize the removal of forested areas. Where new access tacks are required, these have been sensitively designed in order to minimise impact on forestry. Electricity cables will be installed underground in or alongside access tracks to avoid impact on forestry practices.

The construction and decommissioning works will be planned and controlled by a Construction and Environmental Management Plan (CEMP). The CEMP for the construction phase is included in Appendix 3.1 of Volume 3 of this EIAR. This provides details on day to day works and methodologies. As part of these works, the public and other stakeholders will be provided with updates on construction activities which will affect access to lands. This will be communicated to members of the public through a community liaison officer employed for the duration of the construction period.

Prior to the grid connection installation works within public roads, it is proposed that all access points (domestic, business, farm) are considered when finalising the temporary road closures and diversions, in order to maintain local access as much as possible and avoid impacts on various land uses. All proposed works and deliveries along the TDR route will also be controlled by a Construction and Environmental Management Plan to avoid undue impact to adjacent land uses.

11.5.6 Residual Impacts – Land Use

Once mitigation measures are in place and the appropriate design measures are incorporated, as proposed, there will be no significant adverse negative residual effects arising from the project on land use. Benefits to forestry and agricultural practices as a result of the upgrading of access tracks throughout the site will cause a moderate, positive impact for forestry and agriculture at this location. Lands associated with the proposed BEMP are all contained within the proposed wind farm site boundary. A detailed description of the existing environment at each of the proposed BEMP land sites is provided in Appendix 3-4 of Chapter 3 Description of Proposed Development. The creation of biodiversity enhancement will have a long-term positive impact.

Other infrastructure that will remain in situ includes turbine foundations and hardstands which will be covered over and vegetated. The on-site substation will be taken in charge by Eirgrid or ESB. The grid route cable will remain in situ and form part of the national grid. The residual impact on land use as a result of the in-situ hardstands, foundations, substation and grid connection following decommissioning is likely to be permanent, imperceptible and neutral due to the small extent of land affected.

4 no. turbines are located within forestry and thus tree will be required as part of the project. The felling area proposed is the minimum necessary to construct the proposed project and also to comply with any environmental mitigation (bats in particular. Thus, the felling will be the subject of a Felling Licence Application to the Forest Service prior to construction as per the Forest Service's policy on granting felling licenses for wind farm developments.

11.6 Recreation, Amenity and Tourism

This section provides a comprehensive overview of the recreation, amenity and tourism value for the study area, County Clare and the State in order to assess the potential effects arising from the proposed development. Tourism is one of the major contributors to the national economy and is a significant source of full time and seasonal employment. As 2020 and 2021 have experienced an unprecedented negative impact on international tourism due to the COVID-19 epidemic, this section focuses on statistics from 2018 and 2019 as a reasonable scenario for tourism potential for the County. The preparation of this section had regard to Fáilte Ireland's 'Guidelines on the Treatment of Tourism in an Environmental Impact Statement'. Consultation has taken place with local recreation groups, as detailed in Chapter 5 of this EIAR, in order to thoroughly understand potential affects to recreation activity in the area.

11.6.1 Existing Environment – Recreation, Amenity and Tourism

Tourism statistics for 2019 as published by Fáilte Ireland (March 2021) state that overseas tourism grew by 0.7% on 2018 figures with over 9.7 million visitors. Expenditure from overseas tourism was estimated to be down by -0.8% remaining strong at €5.1 billion.

Fáilte Ireland's 2019 survey results indicate the top 5 most popular recreation activity for tourists in Ireland:

1. Hiking and cross country walking;
2. Cycling;
3. Golf;
4. Equestrian;
5. Angling.

Fáilte Ireland's Regional Tourism performance figures for 2018 and 2019 are set out in Table 11-8 and 11-9 for the Mid-West Region which includes both Counties Clare and Tipperary. As demonstrated in the tables, tourism numbers for the Mid-West Region contribute a significant tourism revenue of €683 million and €697 million in 2018 and 2019 respectively.

Table 11-8: Mid- West Regional Performance (Tourists in 2018)

Region		Britain	Mainland Europe	North America	Other Areas	All Overseas	Northern Ireland	Domestic Trips
Mid West	Tourists (000s)	368	481	565	83	1,497	13	1,090
Mid-West	Tourist Revenue (€mn)	109	144	217	41	511	5	167

Table 11-9: Mid-West Regional Performance (Tourists in 2019)

Region		Britain	Mainland Europe	North America	Other Areas	All Overseas	Northern Ireland	Domestic Trips
Mid-West	Tourists (000s)	378	456	522	75	1,432	23	1,197
Mid-West	Tourist Revenue (€mn)	107	122	212	31	472	8	217

Thus, with the above figures in mind, tourism is considered an important industry for County Clare. Chapter 9: Tourism, of the Clare County Development Plan (2017), identifies that:

> *'County Clare has an abundance of tourism resources, including natural and cultural attractions, vibrant towns and villages and contrasting landscapes, all of which are easily accessible to both national and international visitors. The tourism industry makes a significant contribution to the vitality and sustainability of a wide variety of local enterprises, particularly in rural areas. Tourism promotes an enhanced awareness and positive appreciation of local traditions and ways of life. While County Clare is one of the leading tourist counties in Ireland, a stronger year-round product must be developed. There is also a need to ensure that tourism growth is spread beyond established resorts and larger towns to rural areas'.*

Furthermore, Chapter 9: Tourism, of the Draft Clare County Development Plan (2021), identifies Clare as a:

> *"A county in which tourism growth continues to play a major role in its future development. A county which is the gateway to the west, delivering tourism experiences which reflect our strong commitment to sustainability, connectivity, innovation and new approaches to doing business. A place that is globally recognized as a sustainable destination and where the benefits of tourism are spread across the county throughout the seasons."*

Top attractions in the Clare area in 2019, listed by Fáilte Ireland, include Lough Derg, Inis Cealtra (Holy Island), Burren, Cliffs of Moher the Wild Atlantic Way and Loop Head which are located approx. 6.2km, 14.5km, 53km, 62.6km, 97.1km, 63km and 97.1km respectively from the proposed wind farm site.

Other recreation and tourism amenities located in the area of the proposed wind farm include:

- McNamara's Lake, ca. 2.3km from the wind farm site.
- O'Briensbridge Riverside Walk, ca. 3.2km from the wind farm site.
- St. Michael's Rowing Club, ca. 3.15km from the wind farm site.
- Feenlea Mountain trail ca. 5.37km from the wind farm site.
- Clonlara GAA Club, ca. 6.05km from the wind farm site.
- Broadford GAA Club, ca. 6.5km from the wind farm site.
- West Lake Aqua Park Killaloe ca. 6.65km from the wind farm site.
- Moylussa Summit, ca. 6.8km from the wind farm site.
- Pollagh Trail, ca. 7.08km from the wind farm site.
- Lough Derg Equestrian Centre, ca. 7.22km from the wind farm site.
- Clarisford Park, ca. 7.3km from the wind farm site.
- Lough Derg FC, ca.7.45km from the wind farm site.
- Ballina Killaloe RFC, ca. 7.5km from the wind farm site.
- Gortacullin Bog NHA, ca. 7.5km from the wind farm site
- Ballina Playground, ca. 7.6km from the wind farm site.
- Landscape House Golf and Leisure, ca. 7.77km from the wind farm site.
- Doon Wood, ca. 7.88km from the wind farm site.
- Lough Derg Equestrian Centre, ca. 8km from the wind farm site.
- Ballina Riverside Park, ca. 8.07km from the wind farm site.
- Brian Boru's Fort, ca. 8.15km from the wind farm site.
- Doon Lough (Natural Heritage Area), ca. 8.16km from the wind farm site.
- Ballina Riverside Park, ca. 8.07km from the wind farm site.
- Ballina Riverside Pool, ca. 8.3km from the wind farm site.
- Ballina GAA Club, ca. 8.66km from the wind farm site.
- Seanchaill Sports Complex, ca. 9.32km from the wind farm site.
- Ogonnellow GAA Club, ca. 9.6km from the wind farm site.
- St. Coelan's Holy Well, ca.10.4km from the wind farm site.

- Graves of the Leinstermen, ca. 11.3km from the wind farm site.
- UL Sports Facilities, ca. 11.3km from the wind farm site.
- 12 O'Clock Hills, ca.11.7km from the wind farm site.
- Millenium Cross, ca. 12.1km from the wind farm site.
- Woodcock Hill, ca. 12.6km from the wind farm site
- Clare Glens Loop, ca. 13.68km from the wind farm site.

Overall, the most significant recreation activity/attractions in proximity to the Fahy Beg Wind Farm site is trail walking, mountain biking, equestrian activity and sports grounds.

There are seven recorded archaeological sites located within the boundary of the wind farm site while there are a further eighteen examples located within the surrounding 1km study area. The majority of these archaeological sites are either completely levelled, partially extant or extant and are all located within private lands which are not accessible to the public and have no discernible existing tourist or amenity attributes. Three National Monuments in State Care are located within 6km of the site in the Killaloe area.

Community Facilities & Services

Community facilities and services in proximity to the proposed Wind Farm Site are centred on towns and villages in the area. The closest settlement to the wind farm site is the village of Bridgetown, located 1.5km to the southeast. Facilities and services within the village include food places, public houses, a national school and a church. The village of O'Briensbridge is located approx. 3.5km south east of the wind farm site. Facilities and services here include a range of village retail, accommodation, public houses, rowing club, a preschool, a playground and a church.

The most proximate town to the wind farm site is Killaloe, ca. 7km northeast of the site. The TDR passes through the southern extremities of the town. Community facilities and services within the town include a range of town centre retail, supermarkets, food places and public houses, pre-school, primary and secondary schools, further education centre, guest houses, hotels, church, garda station, sports grounds, care centres, medical centres, post office and park and playground.

The TDR also passes through the town of Ballina, ca. 7.5km northeast of the site. The TDR passes through the southern extremities of the town . Community facilities and services within the town include a range of town centre retail, food places, public houses, a preschool, guesthouses, sports grounds, marina, playground, a greenway, riverside pool, hotels, equestrian centre, a church and a primary school.

The TDR also passes through the periphery of the village of O'Briensbridge, ca. 3.5km southeast of the site. These villages have services including convenience stores, guest houses, sports clubs, a greenway, public houses, food places food places, church and sports grounds.

The proposed GCR does not pass by any significant community facilities.

11.6.2 Potential Impacts – Recreation, Amenity and Tourism - Construction

There are no significant tourism attractions located in proximity to the proposed Fahy Beg Wind Farm site, grid route and TDR, and as such, the construction phase of the proposed development is not expected to impact on major tourism attractions, tourism numbers or tourism revenue.

The proposed works associated with the wind farm site and GCR will avoid negative impact on nearby community facilities, town centre services and amenities due to lack of proximity. The proposed works, including the construction haul routes do not interact with nearby recreation and tourism amenities as listed in section 11.6.1 and therefore there are no expected direct impacts on these features.

The TDR passes through the villages of Bridgetown and O'Briensbridge, County Clare and south of the town of Killaloe, County Clare. During turbine delivery there is potential for indirect impact to town/village centre services due to the transportation of large and bulky loads through the settlements. This will likely be as a result of traffic calming measures during the escorting of the turbine components. Temporary accommodation works will not be required in these settlements and therefore impact is likely to be temporary to brief, negative and not significant.

Mitigation is set out in Chapter 13: Traffic and Transportation in order to avoid indirect impact so far as possible on town and village centre facilities and services during turbine delivery.

11.6.3 Potential Impacts – Recreation, Amenity and Tourism - Operation

In relation to tourism and wind energy development, the Wind Energy Development Guidelines for Planning Authorities (2006) states the following:

> "*Wind Energy developments are not incompatible with tourism and leisure interests, but care needs to be taken to ensure that insensitively sited wind energy developments do not impact negatively on tourism potential. The results of survey work indicate that tourism and wind energy can co-exist happily*"

The Draft Revised Wind Energy Development Guidelines (2019) also maintain that wind energy development "can co-exist happily" with tourism and go on to detail the survey works as also cited in the 2006 guidelines.

The survey work referred to in the guidelines is Sustainable Energy Ireland's (SEI's) Attitudes towards the Development of Wind Farms in Ireland (2003). The SEI (now SEAI) report found that the overall attitude towards wind farms is positive.

> "*The overall attitude to wind farms is very positive, with 84% of respondents rating it positively or very positively (Chart 2.6). Only 1% rate it negatively ('fairly bad'), with 14% not having an opinion either way, and no one rating wind farms 'very negatively'. Interestingly, this time it is those from Dublin who are most positively disposed; this could arise from the fact that Dubliners are less likely than others to have a wind farm built in their locality."*

Where negative attitudes were voiced towards wind farms, the visual impact of the turbines on the landscape was the strongest influence. The report also notes however that the findings obtained within wind farm catchment areas showed that impact on the landscape is not a major concern for those living near an existing wind farm (SEI, 2003).

With regard to the economic and environmental impacts of wind farm development, the national survey reveals that attitudes towards wind energy are influenced by a perception that wind is an attractive source of energy:

> "*Over 8 in 10 recognise wind as a non-polluting source of energy, while a similar number believe it can make a significant contribution to Ireland's energy requirements. People therefore seem to have little difficulty with the concept of wind energy*".

This report concludes that based on the detailed study of attitudes, it is clear that there is "*widespread goodwill towards wind farm developments*".

Recent independent research conducted by BiGGAR Economics in 2016 entitled 'Wind Farms and Tourism Trends in Scotland', assessed the relationship between wind farm developments and the tourist industry in Scotland. An analysis was carried out on eight local authorities which had witnessed a higher increase in wind energy developments than the Scottish average. Of the eight local authorities, five also witnessed a greater increase in sustainable tourism employment than that of the National Average with just three witnessing less growth than the Scottish average. The research concluded that at local authority level, no detrimental impact occurred on the tourism sector as a result of wind energy development, rather that, in the majority of cases, sustainable tourism employment performed better than other areas.

Fáilte Ireland conducted research titled "Visitor Attitudes on the Environment", which was first published in 2008 and updated in 2012. The research surveyed both domestic (25%) and overseas (75%) holidaymakers to Ireland to determine their attitudes to wind farms. The survey results indicate the following:

- Most visitors are broadly positive towards the idea of building more wind farms on the island of Ireland. A minority (one in seven) were negative towards wind farms in any context.
- Despite the fact that almost half of the tourists interviewed had seen at least one wind farm on their holiday, most felt that their presence did not detract from the quality of their sightseeing.
- The largest proportion (45%) said that the presence of the wind farm had a positive impact on their enjoyment of sightseeing, with 15% claiming that they had a negative impact.
- Almost three quarters of respondents claimed that potentially greater numbers of wind farms would either have no impact on their likelihood to visit or would have a positive impact on future visits to the island of Ireland.

The updated survey, 2012, found that over half of tourists surveyed had seen a wind turbine while travelling the country. The survey results were as follows:

- 32% said that the wind turbines enhanced the surrounding landscape.
- 47% said that it made no difference to the landscape.
- 21% claimed wind turbines had a negative impact on the landscape.
- 71% of respondents claimed that potentially greater numbers of wind farms would either have no impact on their likelihood to visit or have a positive impact on future visits to the island of Ireland.

In 2011, Fáilte Ireland's guidelines on tourism and environmental impacts stated in Chapter 4 titled 'Project factors affecting tourism' that 'some types of new or improved large scale infrastructure – such as roads – can improve the visitor experience – by increasing safety and comfort or can convey a sense of environmental responsibility – such as wind turbines.'

From a review of literature as detailed above, it is concluded that the majority of tourists surveyed had a generally positive view on wind energy development in the landscape. Further analysis of the potential visual impact of the proposed Fahy Beg Wind Farm is described in Chapter 15 – Landscape and Visual.

The most proximate major tourist attraction to the Fahy Beg Wind Farm Site is Lough Derg and Inis Cealtra (Holy Island).

The Zone of Theoretical Visibility (ZTV) map included in Chapter 15 – Landscape and Visual carried out over a 20km study area of all or some of the proposed turbines shows that there is extensive visibility to the south with the plains of limerick and Tipperary, clear visibility to the south west with Limerick City and a high degree of visibility to the southwest to southeast up to the Slieve Felim Mountains which features patchy visibility across the varied upland areas. However, the ZTV map does not account for foliage or structures and therefore it is likely that the proposed turbines will not be visible from the park. Visual impact as outlined in Chapter 15 is therefore likely to be imperceptible and long-term.

11.6.4 Potential Impacts – Recreation, Amenity and Tourism - Decommissioning

The decommissioning phase of the proposed development is described in Section 3.8 of this EIAR and provides for the removal of turbines and associated infrastructure from the site. The potential impacts associated with the decommissioning phase in relation to recreation, amenity and tourism will be similar to those associated with construction phase but will likely be of a reduced magnitude.

Due to the temporary nature of the decommissioning phases of the Fahy Beg Wind Farm, it is expected to have an insignificant and temporary impact on recreation, amenity and tourism.

11.6.5 Mitigation Measures – Recreation, Amenity and Tourism

Mitigation measures for recreation, amenity and tourism are primarily related to the preliminary design stage of the Fahy Beg Wind Farm, which has allowed for the prevention of unnecessary or inappropriate development to occur that would significantly affect any recreational or tourist amenity. In designing the Fahy Beg Wind Farm, careful consideration was given to the potential impact on landscape amenity. The magnitude of visual impact on the landscape is assessed in Chapter 15 – Landscape and Visual.

Chapter 13: Traffic and Transportation sets out mitigation measures for potential effects associated with increased traffic volumes of the construction and decommissioning phases of the proposed development which may have an indirect impact on recreation and amenity in the area of the wind farm site.

11.6.6 Residual Impacts – Recreation, Amenity and Tourism

There are no expected significant, adverse impacts to recreation, amenity and tourism in the surrounding area as a result of the development of the proposed Fahy Beg Wind Farm due to the distance from major tourism attractions and the short-term/temporary nature of the works.

The community benefits gained during the operational phase due to the capital investment in the area are expected to last beyond the decommissioning phase resulting in a residual permanent significant, positive impact on the amenities of the area.

11.7 Human Health & Safety

This section provides a comprehensive overview of the health profile of the receiving environment and the State, in order to provide for the assessment of potential impacts that the proposed development may have on human health. An assessment of peer reviewed literature has been carried out to provide a sound, scientific basis for the potential impacts arising from the proposed Fahy Beg Wind Farm.

11.7.1 Existing Environment – Human Health & Safety

Human health in relation to this assessment refers to the nature and possibility for adverse health effects on humans. In the context of existing human health, The Department of Health (2019) has published a report entitled 'Health in Ireland, Key Trends 2019' which provides statistics relating to human health in Ireland over the last 10 years (2009 to 2019). Generally speaking, Ireland's population has a high level of good health as demonstrated in self-evaluation statistics included in Census data (see Table 11.10 below). Human health in relation to this assessment refers to the nature and possibility for adverse health effects on humans.

From analysis of the health statistics below, the general health of the Study Area is recorded as very good or good. This is in line with State and County-wide averages. The averages fluctuate with the percentages of those in Not stated, Very Bad, Bad and Fair health status in the Study Area having approximately the same averages. However, both County Clare and the County Tipperary have lower percentages of those indicating they are in 'good' health in comparison to State and ED Averages. Figures from all jurisdictions all around 1% indicate their health was 'bad'. Less than 1% of respondents indicated their health was 'very bad' for these areas with the EDS located in the Grid Connection Route indicating the highest percentage in the 'very bad' category. This shows a slightly greater percentage of persons of 'very good' general health when compared to the State which has 2 percentage points lower than that of the Study Area. The census data indicates that the population of the Study Area is in slightly better health when compared to the state and county average.

Table 11-10: Population by General Health (Census, 2016)

General Health (Census 2016)	State	County Clare	County Tipperary	Wind Farm Site	GCR	TDR
Very Good	59.4%	58.3%	57.5%	62.7%	61.3%	61.8%
Good	27.6%	28.9%	29.3%	25.9%	26.7%	26.5%
Fair	8%	8.3%	9.2%	8.3%	7.2%	6.9%
Bad	1.3%	1.3%	1.5%	1.3%	1.5%	1.3%
Very Bad	0.3%	0.3%	0.3%	0.6%	1.1%	0.4%
Not Stated	3.3%	2.8%	2.3%	1.6%	2.3%	3.1%

From a review of the GSI Landslide Susceptibility database, the proposed development and proposed infrastructure locations are located within areas of 'Low' susceptibility. No historical records of landslide activity have been identified within or close to the site, according to the GSI database. According to the OPW (floodinfo.ie), no major flood incidents are recorded at the wind farm site or grid route. Flood events have been recorded along or adjacent to sections of the TDR, however, no flood events have been recorded at the TDR node upgrades where works are required.

There is no record of wildfires at the proposed Wind Farm Site, Grid Route or TDR.

11.7.2 Potential Impacts – Human Health & Safety - Construction

The construction phase of the proposed development has potential to create health and safety hazards for both construction workers and the general public. This is as a result of construction activities and the associated impacts including increased traffic, transport of heavy or bulky materials, noise emissions, dust emissions, construction activities on public roads, excavation and general site-safety.

Aspects of the construction works that may present health and safety issues, are as follows:

- General construction site safety (e.g., slip/trip, moving vehicles etc.);
- Lifting of heavy loads overhead using cranes;
- Working at heights;
- Working in confined spaces;
- Ground conditions and soil stability;
- Road safety due to increased traffic numbers and transport of oversized loads to the site along turbine delivery routes and proposed haul routes;
- Pedestrian and recreation user safety;
- Installation of electrical cables on-site and in the public road corridor;
- Potential emissions impacting air quality and noise;
- Substation construction involving high voltage electricity;
- Working with electricity during commissioning.

The works proposed as part of the Fahy Beg Wind Farm will pose a risk to construction workers on-site especially during adverse weather conditions. This has potential to cause significant impact on human health in the short term during the 12-18 month construction period throughout the construction site, if proper construction and safety protocols are not followed.

Construction and accommodating works taking place on the public road and the delivery of heavy/bulky goods (TDR) and machinery on narrow roads may lead to temporary limited access to farmlands, forestry lands and residential properties creating a potential hazard. This may cause a potential temporary moderate, negative impact to public safety along the TDR route and grid route during the construction phase.

The delivery of turbines will require transport of heavy/bulk goods from Foynes Port in County Limerick via the N69, N18, M7, R494 before entering the local roads R463 and R466 on approach to the proposed wind farm site. Due to the abnormality of the turbine components, there is potential human safety risks associated with their delivery including traffic safety and pedestrian safety at special maneuvering points. This has potential for temporary significant, negative impacts to human safety during the delivery of turbine components if unmitigated.

Potential impacts on air quality has the potential to affect human health. This has been assessed in Chapter 6: Air and Climate Change. No significant impacts on air quality have been identified with regard to the emissions of construction related traffic. The impact on air quality due to emissions from construction works (construction machinery) has been identified as imperceptible. Due to the distance between the nearest receptor and source of emissions at the wind farm site, the temporary negative impact on air quality at nearby dwellings will be imperceptible.

Construction works associated with the grid connection have potential to impact on nearby dwellings with regard to air quality. Due to the nature of construction along the proposed grid route, which works as a "rolling" construction site, meaning that these works will not be concentrated in any one area of the route, these effects are considered to be brief to temporary slight, negative. Therefore, the construction phase of the Fahy Beg Wind Farm will not have a significant impact on air quality.

The potential impacts from noise during the construction phase at the Wind Farm site and TDR is expected to have a temporary slight, negative impact on nearby residential receptors. The works will remain below the construction noise limit of 65dB as detailed in Chapter 7: Noise and Vibration. Vibration is not expected to be perceived at nearby residences. Impacts from noise along the grid route during the construction phase has potential to cause temporary significant, negative impact at nearby dwellings, however, given the nature of the grid connection works, construction activities will not occur over an extended period (which is typically greater than 3 days at any particular receptor) at any one location.

Potential impacts on human health associated with land, soils and geology during the construction phase relate to potential contamination of ground water which can be caused by hydrocarbon spills, siltation and landslide. Furthermore, landslides have the potential to cause injury and fatality. A slope stability assessment has been carried out and proposed development and proposed infrastructure locations are generally located within areas of 'Low' to 'Moderate High' susceptibility, with localised areas classified as 'High' (northernmost extent of the site). Furthermore, stable in the long-term drained conditions at the wind farm site. Climate change would have an effect on groundwater in limiting the amount of water to replenish groundwater. Thus, less water will infiltrate through soil, there will be less deep percolation and hence groundwater recharge. Considering the mitigation measures as set out in Chapter 9: Land, Soils and Geology, the impact on human health during construction works over an 12-18 month period is expected to be temporary, negligible and imperceptible.

Potential impacts on human health associated with hydrology during the construction period relate to standing water caused by blocked drains, water collecting in excavated areas or diverted water resting in an undrained area. This has potential to cause drowning with particular risk to on-site staff. There is also potential for blockage of roadside drains causing potential hazard to traffic. A flood risk assessment has been carried out and a drainage design has been incorporated into the proposed development as detailed in Chapter 10: Hydrology and Water Quality. As a result, the proposed development is expected to have a negligible impact on flood risk in the surrounding area of the wind farm site or along the grid route and TDR. The increased surface water runoff due to development is not significant and these flows are further reduced with the proposed drainage system. The likely impact of flooding on human health and safety as a result of construction activities is therefore temporary and imperceptible.

Overall, if unmitigated, the construction phase of the proposed development has potential for temporary significant, negative impact to human health and safety for construction workers and members of the public in proximity to the site, if proper construction safety protocols and traffic management are not applied. Mitigation measures to prevent potential impact to human health and safety are set out in section 11.7.5. Once mitigation is put in place, impacts to human health and safety during the 12-18 month construction period are unlikely.

11.7.3 Potential Impacts – Human Health - Operation

11.7.3.1 Site access and usability of lands

During the operation phase of the proposed development, there is potential for impact to human health and safety if appropriate mitigation measures are not put in place.

Potential human safety issues can occur due to the falling ice as a result of the icing of turbine blades in cold weather conditions. This is unlikely to present safety problems as wind turbines are fitted with anti-vibration sensors. These sensors detect any imbalance caused by the icing of the blades. The sensors will cause the turbine to shut down until the blades are de-iced prior to beginning operation again.

Potential impacts to the safety of operation and maintenance staff are associated with working at heights, working at steep gradients or uneven ground, moving vehicles and machinery and working with high-voltage electricity. Properly qualified staff will be employed at the wind farm site and safety protocol will be followed at all times. Therefore, impact to the safety of operation and maintenance staff is unlikely.

Under normal conditions, operational wind turbines do not pose a threat to public safety or the safety of animals. Section 5.7 of the Wind Energy Development Guidelines (2006) states the following:

> *"There are no specific safety considerations in relation to the operation of wind turbines. Fencing or other restrictions are not necessary for safety considerations. People or animals can safely walk up to the base of the turbines. There is a very remote possibility of injury to people or animals from flying fragments of ice or from a damaged blade."*

There are no expected works to take place along the grid route or TDR during the operational phase of the proposed development. If maintenance works are required in these areas or bulk equipment is required to be delivered, proper safety protocols will be put in place in line with the mitigation measures set out in section 11.7.5. Therefore, impact to human safety on public roads during the operation phase is unlikely.

11.7.3.2 Health and Safety Standards and Procedures

As part of the human health assessment of the proposed Fahy Beg Wind Farm, an analysis of peer-reviewed literature on potential health impacts arising from wind energy projects was undertaken. Anecdotal reports were identified of negative health impacts in people living in close proximity to wind turbines, however, the literature review demonstrates that peer-reviewed research generally does not support these statements.

The review of literature did not find any published, credible scientific sources that link wind turbines to adverse health effects. The key documents that have been taken into consideration with respect of potential effects on human health are as follows:

- 'Wind Turbine Sound and Health Effects - An Expert Panel Review', American Wind Energy Association and Canadian Wind Energy Association, December, 2009.
- 'Wind Turbine Syndrome – An independent review of the state of knowledge about the alleged health condition', Expert Panel on behalf of Renewable UK, July 2010.
- 'A Rapid Review of the Evidence', Australian Government National Health and Medical Research Council (NHMRC) Wind Turbines & Health, July 2010.
- 'Position Statement on Health and Wind Turbines', Climate and Health Alliance, February 2012.
- 'Wind Turbine Health Impact Study - Report of Independent Expert Panel' – Massachusetts Departments of Environmental Protection and Public Health, 2012.
- 'Wind Turbines and Health, A Critical Review of the Scientific Literature Massachusetts Institute of Technology', Journal of Occupational and Environmental Medicine, Vol. 56, Number 11, November 2014.

- 'Wind Turbine Noise and Health Study', Health Canada, 2014.
- 'Wind Turbines and Human Health', Front Public Health, 2014.
- 'Position paper on wind turbines and public health', Health Service Executive, February 2017.
- 'Environmental Noise Guidelines for the European Region', World Health Organisation, 2018.

'Infrasound' has been cited as a cause of potential health impacts as a result of wind turbine development. This is discussed in detail in Chapter 7: Noise and Vibration, Section 7.2.4. It states that infrasound is noise occurring at frequencies below that at which sound is normally audible, that is, less than about 20 Hz, due to the significantly reduced sensitivity of the ear at such frequencies. In this frequency range, for sound to be perceptible, it must be at very high amplitude, and it is generally considered that when such sounds are perceptible then they can cause considerable annoyance. However, wind turbines do not produce infrasound at amplitudes capable of causing annoyance as outlined in the following paragraphs.

The UK Department of Trade and Industry study, 'The Measurement of Low Frequency Noise at Three UK Windfarms' (2006), concluded that:

> "*Infrasound noise emissions from wind turbines are significantly below the recognised threshold of perception for acoustic energy within this frequency range. Even assuming that the most sensitive members of the population have a hearing threshold which is 12 dB lower than the median hearing threshold, measured infrasound levels are well below this criterion.* "

It goes on to state that, based on information from the World Health Organisation, '*there is no reliable evidence that infrasound below the hearing threshold produce physiological or psychological effects'* and that '*it may therefore be concluded that infrasound associated with modern wind turbines is not a source which may be injurious to the health of a wind farm neighbour'*.

In terms of perceived effects from shadow flicker and noise, a shadow flicker assessment has been conducted and is included in Chapter 12 of this EIAR and a Noise assessment is included in Chapter 7.

In relation to shadow flicker, the developer commits to zero shadow flicker through the installation of shadow flicker monitoring and software management measures. In terms of noise, operational wind farm noise levels meet the derived night and daytime noise limits at all residential properties surrounding the proposed Fahy Beg Wind Farm. However, for some receptors a new source of noise will be introduced into the soundscape, and it is expected that there will be a slight to moderate significance of impact, with dwellings closest to the project with a long-term moderate significance of impact.

Following a review of literature regarding the potential impact of operational wind farms on human health, it is concluded that there is no scientific consensus to support an association between negative health impacts and responsible wind turbine development. The operational phase will therefore likely have a long-term, imperceptible, neutral impact on human health in proximity to the wind farm site.

With respect to safety, only trained and licenced employees will be permitted to access the turbines. Appropriate training will be provided for potential emergencies; therefore, the operational phase of the proposed development will have a negligible impact on public health and safety.

11.7.3.3 Potential Health and Safety Impacts from Proposed Cables and Electromagnetic Interference

Wind turbines, like all electrical equipment, produce electro-magnetic radiation. The provision of underground electricity cables similar to the proposed capacity is however commonplace throughout Ireland and the installation to the required specification does not give rise to health concerns. The following research outlines the potential for health impacts caused by electromagnetic interference.

The EirGrid document 'EMF & You: Information about Electric & Magnetic Fields and the electricity transmission system in Ireland' (EirGrid, 2014) provides information on studies which have been carried out on the health impact of electromagnetic fields (EMF). This report notes that since 1979, many scientific studies have been carried out on the possible effects of EMF on people. Agencies include the World Health Organisation (2006), the National Radiological Protection Board of Great Britain (2004), and the International Agency for Research on Cancer (IARC) (2002).

In 2009 the International Commission on Non-Ionising Radiation Protection (ICNIRP) issued guidelines for exposure for members of the public to DC magnetic fields. Other more recent reviews have been performed for the UK's Health Protection Agency (2012) and the European Union's Scientific Committee on Emerging and Newly Identified Health Risks (2015). The Eirgrid (2014) report notes that:

> "*These agencies concluded that exposure to only very strong DC magnetic fields can cause biological effects. The exposures required to produce such effects, however, are extraordinarily high relative to levels of DC magnetic fields produced by common sources*."

The Eirgrid (2014) report concludes that exposure to extremely low frequency (ELF)-EMF from power lines or other electrical sources is not a cause of any long-term adverse effects on human, plant, or animal health. A 2019 Eirgrid report titled 'The Electricity Grid and Your Health' states that:

> "*The consensus from health and regulatory authorities is that extremely low frequency EMFs do not present a health risk*."

To ensure such adverse effects do not occur, the WHO (World Health Organisation) monograph recommended that policymakers establish guidelines for ELF-EMF exposure for both the public and workers, and that the best source of guidance is the ICNIRP guidelines.

In 2010, ICNIRP issued updated guidelines, which reviewed the research since the 1998 report and replaced previous recommendations given by ICNIRP for this frequency range. The revised range is detailed in table 11.10. The underground cable to be installed complies with these ICNIRP guidelines:

- ICNIRP Guidelines for limiting exposure to time varying electric and magnetic fields (1Hz–100kHz) Health Physics 99(6):818-836; 2010.

Magnetic flux densities for Alternating Current (AC) magnetic fields are reported using units of microtesla (µt) and electric fields in kilovolts per metre (Kv/m). The ICNIRP guidelines formed the basis of the EU guidelines for human exposure to EMF (EU, 1999) and the EU Directive 2013/35/EU on the minimum health and safety requirements regarding the exposure of workers to the risks from EMFs.

Table 11-11: ICNIRP Guidelines

Exposure Characteristics	Electric Field Strength (kV/m)	Magnetic Flux Density (μT)
ICNIRP 2010 General Public Reference Level	5	100

The magnetic fields associated with underground cables decrease rapidly with distance. For underground cables, the fields decrease with the square of distance. The electric field emissions from underground cables are negligible as the ground absorbs the field.

As the proposed cable does not pass under housing, the exposure levels will be extremely low. Most homes have average magnetic field levels in the range 0.2 μT to greater than 0.4 μT. These magnetic fields are attributable to low voltage sources such as wiring, appliances, and distribution circuits (Mastanyi et al, 2007). In dwellings and other properties with electricity, the levels will not exceed the ICNIRP guidelines by a significant margin.

Based on the details of the proposed development, there will be no impact on residential properties at any distance from the proposed development as the ICNIRP guidelines are not exceeded at all relevant distances including directly above the cables. The magnetic field associated with an underground 110kV cable is 2.32 μT directly above ground and 0.15 μT at 10 meters from the cable (EirGrid, 2019), significantly below the ICNIRP Guidelines levels of 100 μT. The ESB state that exposure to electrical fields associated with underground cables are considered negligible (ESB, 2017).

The HSE, in their 2017 report 'Position paper on wind turbines and public health' state the following with regard to Electromagnetic radiation:

> "*There is no direct evidence from which to draw any conclusions on an association between electromagnetic radiation produced by wind farms and health effects. Extremely low-frequency electromagnetic radiation is the only potentially important electromagnetic emission from wind farms that might be relevant to health. Limited evidence suggests that the level of extremely low-frequency electromagnetic radiation close to wind farms is less than average levels measured inside and outside suburban homes*."

In the case of the proposed grid connection between the Fahy Beg Wind Farm and the Ardnacrusha substation, the electric and magnetic fields expected to be associated with the operation of the proposed cable fully complies with the ICNIRP and EU guidelines on exposure of the general public to ELF EMF. Therefore, the potential impact to human health as a result of electromagnetic interference associated with the operational phase of the Fahy Beg Wind Farm will be negligible and imperceptible.

EU Directive 2013/35/EU on the minimum health and safety requirements regarding the exposure of workers to the risks from EMFs was transposed into Irish law on 1st July 2016 by the Safety, Health and Welfare at Work (Electromagnetic Fields) Regulations 2016 (S.I. No. 337 of 2016). The regulations impose a number of duties on employers to maintain safety during work procedures. This includes the carrying out of risk assessment, avoiding and reducing risk, employee information, training and consultation and health surveillance where appropriate. The proposed development will comply with both EU and Irish law and will result in a negligible impact to human health on employees at the Fahy Beg Wind Farm during the operational phase.

11.7.3.4 Vulnerability of the Project to Major accidents and Natural Disasters

EU Directive 2014/52/EU which amends Directive 2011/92/EU states the following in relation to vulnerability of a project to major accidents and natural disaster:

> '*In order to ensure a high level of protection of the environment, precautionary actions need to be taken for certain projects which, because of their vulnerability to major accidents, and/or natural disasters (such as flooding, sea level rise, or earthquakes) are likely to have significant adverse effects on the environment.*
>
> *For such projects, it is important to consider their vulnerability (exposure and resilience) to major accidents and/or disasters, the risk of those accidents and/or disasters occurring and the implications for the likelihood of significant adverse effects on the environment*'.

The following section considers the proposed project's vulnerability to major accidents and natural disasters, potential adverse impacts on human health and the environment, the magnitude of potential impacts, the likelihood of potential impacts and considers the preparedness of the project in case of accident, disaster or emergency.

Should a major accident or natural disaster occur, the potential sources of pollution onsite during the construction and operational phases of the Fahy Beg Wind Farm are limited. The primary sources with the potential to cause significant environmental pollution and associated negative impacts on human health and the environment include the bulk storage of hydrocarbons, chemicals and wastes. In the case of the proposed Fahy Beg Wind Farm development site, the storage of chemicals of this kind are strictly limited.

There is limited potential for significant natural disasters to occur at the Fahy Beg Wind Farm as Ireland does not suffer from extreme temperatures like that of many countries at a similar latitude due to the dominant influence of the Gulf Stream. This provides Ireland with a mild temperate climate. Potential natural disasters that may occur are therefore limited to:

- Flooding;
- Fire;
- Major incidents involving dangerous substances;
- Catastrophic events; and
- Landslides.

Flooding

In the event of extreme weather conditions there is potential for the proposed development to negatively impact on human health and safety and the surrounding environment due to increased surface water runoff as a result of additional impermeable surfaces such as wind turbine hardstands and new access tracks. This has potential to add to flood risk which may negatively impact on human safety (including traffic), water quality, biodiversity, soil stability, material assets and archaeological or architectural heritage. It is unlikely that potential increase in flood risk will impact on noise and vibration, air and climate, landscape and visual and telecommunication and aviation. The magnitude of these consequences has potential to be significant, resulting in potential injury or fatality, property damage, infrastructure damage and damage to ecosystems.

The risk of flooding is addressed in Chapter 10: Hydrology and Water Quality, which concludes that the wind farm site is unlikely to be susceptible to flooding and will have a negligible impact on flood risk in the surrounding area, as a result of the proposed development. Furthermore, there is no expected increase to flood risk along the grid route or TDR.

In the event of extreme weather conditions, the proposed surface water drainage will manage storm water avoiding significant negative impact on the project's infrastructure. Therefore, the proposed development will not likely result in increased flood risk, which will not likely result in effects on human safety (including traffic), water quality, biodiversity, soil stability, material assets and archaeological or architectural heritage, as the increased flood risk is considered negligible.

Mitigation measures are set out in Chapter 10: Hydrology and Water Quality to avoid potential negative impacts during the construction stage with respect to flood risk.

Fire

In respect of fire, in May 2017 a major gorse/ground vegetation fire incident took place in proximity to the 169MW Galway Wind Park. This incident highlights fire as a potential significant negative impact for the Fahy Beg Wind Farm as part of the project is located within forestry. It should be noted however that a substantial number of wind farms are built within forestry in Ireland. In order to avoid negative impact from potential forest fires management plans are in place to control the potential spread of forest fires. This is achieved through the implementation of fire breaks within the lands and the training of staff in firefighting. Fire plans are reviewed and updated and provisions for firefighting are checked annually. The proposed infrastructure including turbines, met mast and substation are set back from the surrounding treelines in order to maintain a fire break.

In the event of electrical equipment catching fire at the proposed Fahy Beg Wind Farm, there is potential for negative impact on human health and safety, air quality, water quality, biodiversity, soils, material assets, archaeological or architectural heritage and landscape and visuals. The magnitude of these consequences has potential to be significant and negative, resulting in potential injury or fatality, property damage, infrastructure damage, loss of forested lands and damage to ecosystems. It is unlikely that potential fire at the Fahy Beg Wind Farm will have an effect on noise and vibration and telecommunication and aviation.

The potential for fire at the proposed Fahy Beg Wind Farm is mitigated against by design. Furthermore, the wind farm will be remotely monitored, and potential accidents will be quickly identified and reported.

In line with WEI Health and Safety Guidelines for the Onshore Wind Industry (2011), Emergency Response Plans will include emergency response procedures for initial actions in the event of a fire. Records will be kept for testing of fire alarms and drills and maintenance/inspection of fixed and portable firefighting equipment. Information will be provided to employees on fire safety and fire prevention, including risks of and control measures to prevent fire outbreak, evacuation procedures and those responsible for their implementation, and the use of firefighting equipment, in line with HSA guidance.

During the construction phase of the proposed development, an emergency response plan will be in place as set out in Section 6 of the CEMP, included in Appendix 3.1 of Volume 3 of this EIAR.

Major Incidents Involving Dangerous Substances

Major industrial accidents involving dangerous substances pose a significant risk to human health and to the environment both on and off the site of an accident. The Health and Safety Authority (HSA) of Ireland list all upper and lower tier SEVESO establishments throughout Ireland.

The proposed Fahy Beg Wind Farm site is not in proximity to any site regulated under the Control of Major Accident Hazards Involving Dangerous Substances Regulations i.e., SEVESO site, that would fall within the consultation radius distance from a SEVESO site as per County Development Plan Policy Objective ZU 5-2. The most proximate SEVESO site located 16km south west of the proposed wind farm site is Grassland Agro, Dock Road Limerick City (lower tier Seveso Site).

Given the nature of the proposed development, coupled with the lack of proximity to established Seveso sites, there is a negligible potential risk of negative impact to the proposed development and its receiving environment, as set out throughout this EIAR, arising from the occurrence of such a potential accident.

Catastrophic Events

According to the Health and Safety Authority (HSA), operational wind farms are still considered a workplace (albeit not permanently occupied). All persons who have control to any extent over the wind farm have duties to ensure, so far as reasonably practicable, that the wind farm does not pose a risk to those working there or to anyone not employed there but who may be affected by activities on the wind farm.

Each wind turbine, incorporating the tower, blades, gearbox and ancillary equipment in the tower and nacelle are considered to be machines under the European Machinery Directive [2006/42/EC]. The duties on designers and manufacturers of machinery are set out in the Machinery Directive, which has been transposed into national law by the 2008 European Communities (Machinery) Regulations [S.I.No.407/2008]. All wind turbines will be CE marked, which is in effect, a mark of assurance that the wind-turbine complies with the essential health and safety requirements (EHSRs) of EU supply law.

In all cases, the manufacturer or the manufacturer's authorised representative must compile information in a technical file confirming how the machine complies with these requirements. The maintenance of turbines and ancillaries must only be carried out by competent, trained and qualified personnel. The system of work for operation and maintenance must be planned, organised, maintained and revised to ensure safety of personnel.

Potential catastrophic events associated with operational wind turbines and battery energy storage systems include:

- Wind turbine toppling (due to foundation or tower failure);
- Wind turbine rotational failure in extreme wind conditions (due to control system or rotor break failure); and
- Fire.

The primary mitigation against a catastrophic event that may endanger the health and safety of the public has been implemented at design stage through adequate siting of wind turbines which provide sufficient set back distances from occupied buildings and other infrastructure to avoid the risk of negative impact in the event of wind turbine collapse.

The tip height for wind turbines at the Fahy Beg Wind Farm will range between 169m and 176.5m. No turbines have been located within 2 x tip height of the proposed on-site substations in accordance with EirGrid general functional specifications. A setback distance is applied between wind turbines and existing HV overhead lines.

Turbines have been sited with consideration for existing ground conditions to minimise the risk of turbine foundation failure, toppling and landslide.

Intrusive site investigations have been carried out to confirm ground conditions at turbine locations as well as slope stability analysis for turbines located on sloped ground. Other design mitigation measures employed for the siting of wind turbines include the following:

- Areas mapped by GSI as having a high susceptibility to landslides have been avoided;
- Turbine locations have been assessed by site investigation and visually by geotechnical engineers prior to confirmation of final siting;
- If turbines are located on sloped ground, particular care has been taken in design of road and hard standing alignments, cutting and filling and drainage;
- Peat probing has been carried out at turbine locations. Locating turbines in peat has been carried out in accordance with best practice guidelines and standards as set out in Chapter 9 Land, Soil, Hydrogeology & Geology.

Wind turbines are fitted with sophisticated remote monitoring and control systems to manage rotational speed. Turbines also have the capability to shut down in storm conditions through adjustment of blade pitch. Turbines are also fitted with emergency power supply (EPS) units to provide backup power in the event of a loss of mains power supply that could impact the control system.

Wind turbines shall be fitted with fire suppression systems and will have emergency escape procedures in place for operational staff in the event of fire in a wind turbine. An emergency response plan is contained in the CEMP included in Appendix 3.1 of Volume 3 of this EIAR.

Landslides

Landslides pose a risk to a range of environmental receptors including human safety (including traffic), hydrology and water quality, biodiversity, land, soil, geology and hydrogeology, material assets and archaeological and cultural heritage. The negative impacts associated with landslides can have a significant to profound effect on environmental sensitivities, depending on the scale of the landslide and the receiving environment.

As detailed in Chapter 9: Land, Soils and Geology, a slope stability assessment was carried out at the Fahy Beg Wind Farm site to investigate the lands for potential slope failure. Safety ratios for potential slope failures indicates that the slopes are considered stable in the long-term drainage conditions. Site investigation was conducted to investigate the presence of peat on site, there is no evidence of peat on site. No evidence of slope instability was observed at the site and there are no historical records of landslide activity within 1km of the site on the GSI database.

Mitigation by design has been incorporated into the project to avoid potential effects from landslides. Mitigation measures for potential landslide/slope failure are set out in Chapter 9: Land, Soils and Geology. Mitigation measures relating to flood risk which could have a bearing on potential landslides are detailed in Chapter 10: Hydrology and Water Quality.

During the construction phase of the proposed development, an emergency response plan will be in place as set out in Section 6 of the CEMP in the unlikely event of a landslide/slope failure.

In relation to potential vulnerability of the project to major accidents and natural disasters it is concluded that the potential susceptibility of the project to major accidents and or natural disaster of the proposed Fahy Beg Wind Farm is negligible.

11.7.4 Potential Impacts – Human Health – Decommissioning

The decommissioning phase of the proposed development, as described in Section 3.8 of this EIAR, provides for the removal of turbines and associated infrastructure from the site. The potential impacts associated with decommissioning phase in relation to human health will be similar to those associated with construction phase as detailed in Section 11.7.2.

Decommissioning works will include removal of above ground structures including the turbines, mountings, and fencing. The proposed on-site substation will be taken in charge by EirGrid or ESB following decommissioning. During the decommissioning works there is potential for significant impact to human health and safety for construction workers on site. These impacts are similar to those set out in section 11.7.2. Potential impacts to human health and safety on-site will be prevented through best practice methods as per the construction phase CEMP and will include staff training and knowledge of the site-specific decommissioning plan. Once mitigation measures and best practice construction site methods are followed, potential negative impact on human health and safety is expected to be imperceptible and temporary.

During the decommissioning works there is potential for negative impact on health and safety of the public. Similar to Section 11.7.2, impacts are associated with the presence of a construction crew, increased traffic, presence of heavy goods vehicles and machinery, potential obstructions on the public road and potential obstruction to recreation and amenity trails. Potential impact to public health and safety during the decommissioning phase is considered temporary moderate and negative.

However, a Construction and Environmental Management Plan for decommissioning works will be followed, clear signage will be utilized on public roads and walkways and the community will be informed of works prior to commencement to avoid any potential negative impact to public health and safety. Once good practice is followed, the potential for negative impact on public health and safety is expected to be temporary and not significant.

11.7.5 Mitigation Measures – Human Health & Safety

11.7.5.1 Mitigation Measures – Construction & Decommissioning

To maintain safety and avoid health impacts on construction workers and the general public, best practice site safety and environmental management will be maintained. The proposed development will be designed, constructed, operated and decommissioned in accordance with the following:

- Safety, Health & Welfare at Work (Construction) Regulations 2013;
- Safety, Health & Welfare at Work Act 2005;
- Safety, Health & Welfare at Work (General Applications) Regulations 2007.

All construction staff will be adequately trained in health and safety and will be informed and aware of potential hazards. A Construction and Environmental Management Plan is included in Appendix 3.1, will be circulated to all construction workers which will detail safety protocol and methodology. Furthermore, site investigation has been completed and mitigation has been proposed as detailed in Chapter 9: Lands, Soils and Geology and Chapter 10: Hydrology and Water Quality.

All hazards will be identified, and risks assessed. Where elimination of the risk is not feasible, appropriate mitigation and/or control measures will be established. The contractor will be obliged under the construction contract and current health and safety legislation to adequately provide for all hazards and risks associated with the construction phase of the project.

FÁS Safe Pass registration cards are required for all construction, delivery and security staff. Construction operatives will hold a valid Construction Skills Certificate Scheme card where required.

The developer is required to ensure a competent contractor is appointed to carry out the construction works. The contractor will be responsible for the implementation of procedures outlined in the Safety & Health Management Plan.

Once mitigation measures and health and safety measures are followed, the potential for impact on human health on the construction site during construction and decommissioning is expected to be not significant and temporary to short-term.

Public safety will be addressed by restricting access to the public in the vicinity of the site works during the construction and decommissioning stage. The construction site will be closed to the public for the 12-18 month construction period as well as the decommissioning period. This measure aims to avoid potential injury to members of the public as a result of construction activities.

Appropriate warning signage will be posted at the construction site entrance, directing all visitors to the site manager. Appropriate signage will be provided on public roads approaching site entrances and along haul routes.

In relation to the TDR, extra safety measures will be employed when large loads are being transported, for instance, Garda escort will be requested for turbine delivery and a comprehensive turbine delivery plan will be utilised to avoid potential impact to human safety for road users and pedestrians. A traffic and transport assessment has been completed and is detailed in Chapter 13: Traffic and Transportation.

For the installation of the grid connection cable in the public road, a detailed traffic management plan will be developed in discussion with locals who will be directly impacted by the works, and in agreement with the Local Authority. Public consultation will be conducted along the grid cable route to inform local residents ahead of construction and decommissioning works.

Once mitigation measures and health and safety measures are implemented and followed, the potential for impact on human health for members of the public during construction and decommissioning of the proposed project is expected to be not significant and temporary to short-term.

11.7.5.2 Mitigation Measures - Operational

For operation and maintenance staff working at the proposed wind farm, appropriate site safety measures will be utilised during the operational phase by all permitted employees. All personnel undertaking works in or around the turbines will be fully trained and will use appropriate Personal Protective Equipment (PPE) to prevent injury.

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

All electrical elements of the proposed development are designed to ensure compliance with EMF standards for human safety.

All on-site electrical connections are carried by underground cable and will be marked out above ground where they extend beyond the track or hardstanding surface. Details of cables installed in the public road will be available from ESBN.

Lightning conductors will be installed on each turbine as all structures standing tall in the sky require this protection. Turbines specifically require this to prevent power surges to electrical components.

Turbines will be fitted with ice detection systems which will stop the turbine from rotating if ice is forming on a turbine blade. This aims to prevent ice throw which can cause injury.

Rigorous statutory and engineering safety checks imposed on the turbines during design, construction, commissioning and operation will ensure the risk posed to humans is negligible. 24-hour remote monitoring and fault notifications are included as standard in the Turbine Operations and Maintenance Contracts.

In addition to scheduled maintenance, the maintenance contracts will allow for call out of local engineers to resolve any issues as soon as they are picked up on the remote monitoring system.

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

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

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

The design of the proposed wind farm has considered the susceptibility to natural disasters. The proposed site drainage will mitigate against any potential flooding risk with the use of swales as described in Chapter 10 – Hydrology and Water Quality.

A nominated competent person shall carry out checks and routine maintenance work to ensure the reliability and safe operation of fire-fighting equipment and installed systems such as fire alarms and emergency lighting. A record of the work carried out on such equipment and systems will be kept on site at all times.

Shadow flicker detection systems will be installed on all turbines in order to reduce potential occurrence of shadow flicker on nearby receptors. This is further detailed in Chapter 12: Shadow Flicker.

In order to ensure the proposed wind farm is compliant with the noise limits, some of the turbines may need to be operated in noise reduced modes of operation in order to protect residential amenity. Details of these mitigation measures are set out in Chapter 7: Noise and Vibration.

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

11.7.6 Residual Impacts – Human Health

Through various aspects of the design process for the Fahy Beg Wind Farm, negative residual impact on human health is expected to be imperceptible. This is due to the significant setback distance from nearby dwellings, the reduction of potential occurrence of shadow flicker on neighbouring dwellings through the use of shadow flicker detection systems, and noise control measures to reduce potential noise impacts on nearby receptors. Furthermore, the mitigation measures as set out throughout the EIAR will prevent any potential significant negative impacts on human health during the construction and decommissioning phases.

Long-term positive imperceptible residual impacts will occur due to the provision of clean, renewable electricity. The operation of the Fahy Beg Wind Farm will result in the net displacement of c. 52,980 tonnes of CO2 per annum which would otherwise be emitted through the burning of fossil fuels.

11.8 Renewable, Non-Renewable Resources and Utility Infrastructure

This section provides a comprehensive overview of the material assets (renewable and non-renewable resources, and utility infrastructure) of the receiving environment in order to provide an understanding of the potential effects which the proposed development may have on renewable and non-renewable resources, and utility infrastructure. The waste produced as a result of the proposed development is also considered in this section.

11.8.1 Existing Environment – Renewable, Non-Renewable Resources and Utility Infrastructure

The GSI Online Minerals Database accessed via the Public Data Viewer shows no metallic occurrences within the site. A lead deposit has been recorded to reside in the Broadford Gravels approximately 1.4km north of the site. The quarry Ballyquin Pit operated by Roadstone Ltd. is located within the site boundary. The main product from Ballyquin Pit is sand and gravel for concrete and earthworks use.

The GSI Aggregates database indicates that there is low to very high potential for crushed rock or granular aggregate across the Wind Farm Site, as shown in Figures 9.8 and 9.9 OF Chapter 9 Land, Soils & Geology.

Wind resource is average at the site location. The 2013 Sustainable Energy Authority of Ireland (SEAI) Wind Speed Atlas identifies the site as having an average wind speed of between 7.3 m/s and 8.5 m/s at 100m above ground level.

No significant renewable and non-renewable resources have been identified along the GCR or in proximity to TDR node upgrades.

As part of the scoping and consultation process for the proposed project, searches of existing utility services were carried out to identify areas where major assets exist such as high voltage electricity cables or gas mains. Private utility and telecommunications companies were also consulted during this period. A 400KV overhead line passing through the northern section of the site was identified at the proposed wind farm site.

11.8.2 Potential Impacts – Renewable, Non-Renewable Resources and Utility Infrastructure - Construction

11.8.2.1 Non-renewable Resources

The construction of the proposed Fahy Beg Wind Farm will impact on natural resources such as aggregates which will be sourced from batching plants and quarries in proximity to the site. Fahy Beg Wind Farm shall involve the use of 2 no. existing quarry and agricultural entrances as access points with the public road.

Ballyquin Pit Quarry

Existing tracks have been used where possible and the layout was designed to minimise the length of new track required in order to reduce the requirement for stone material. The use of imported materiel will have a slight, permanent negative impact on non-renewable stone resources of the source quarry. This impact is considered to be imperceptible in the long-term.

11.8.2.2 Renewable Resources

The proposed development is intended to capture the renewable wind resource at the site. There will be no negative effects on the renewable energy resource of the receiving environment as this project represents a net provider.

It is considered that the proposed development will have an overall long-term positive impact in terms of carbon reduction and climate change. It will assist Ireland in meeting its target of producing 80% of electricity from renewable sources by 2030 as set out in the Climate Action Plan 2021

11.8.2.3 Utilities Infrastructure

Major utility infrastructure within the wind farm site includes a 400KV overhead line which passes through the northern section of the site. The construction phase of the proposed development is not expected to affect the existing overhead line as construction will not take place in the vicinity of the line.

Appendix 13.2 of this EIAR includes the Turbine Delivery Route Survey Report. This report details where overhead utilities, poles, lighting columns, bollards and signage will require temporary removal and sets out where tree removal and wall removal will be required at certain points along the route to accommodate the delivery of wind turbine components.

The removal of overhead utility infrastructure has the potential to cause a brief to temporary non-significant negative impact on nearby dwellings and commercial/industrial activities along the route.

Lighting columns will require temporary removal at various points along the TDR. This is expected to have a temporary non-significant negative impact on utility infrastructure. The TDR Report details the locations and extent of the accommodation works required.

There is potential for turbine delivery to negatively impact on major road infrastructure if unmitigated. Turbine delivery could potentially cause traffic disturbance and damage to road infrastructure if not properly planned and assessed. Potential impact on road infrastructure is detailed in Chapter 13: Traffic & Transportation.

Potential effects on telecommunications are discussed in Chapter 16: Telecommunications and Aviation. As set out in Chapter 16, the grid connection is not expected to impact on telecommunications during the operational phase. Impacts on overhead lines as a result of turbine delivery is only associated with the construction process. There is potential that overhead lines may require brief disruption in the unlikely event that a turbine component requires replacement - in this case the turbine delivery route is required to be used during the operational phase. The effects on overhead telecommunications services would be similar to those described in Section 16.4.2.1. This would result in a brief slight negative impact to telecommunications services along the TDR.

Desktop research and consultation with utilities providers did not identify any significant services along the grid route. The construction of the cable trenches along public roads will have a temporary, slight, negative impact on the roads concerned during construction, with some roads likely to require re-surfacing.

Importation of materials and equipment for the Fahy Beg Wind Farm will also increase shipping traffic at the ports being used and increase freight on the motorway, national primary routes and regional road network. This impact is assessed in Chapter 13: Traffic and Transportation.

11.8.2.4 Waste

During the construction phase of the proposed development, waste will be generated due to the various construction activities and materials required for the installation of infrastructure at the wind farm site, grid route and TDR.

In line with the National Waste Management Guidelines for the circular economy and European Waste Management Hierarchy, the developer and appointed contractor will aim to prevent, reduce, reuse and recover as much of the waste generated on site as practicable and to ensure the appropriate transport and disposal of residual waste off site.

Any waste generated during the development construction phase will be collected, source separated and stored in dedicated receptacles at the temporary construction compounds.

It is envisaged that the following categories of waste will be generated during the construction of the project:

- municipal solid waste (MSW) from the office and canteen;
- construction and demolition waste;
- waste oil/hydrocarbons;
- paper/cardboard;
- timber;
- steel.

A fully authorised waste management contractor will be appointed prior to construction works commencing. This contractor will provide appropriate receptacles for the collection of the various waste streams and will ensure the regular emptying/and or collection of these receptacles.

Waste will be reused onsite for other suitable purposes where possible.

For example:

- re-use of shuttering etc. where it is safe to do so;
- re-use of rebar cut-offs where suitable;
- re-use of excavate materials for screening, berms etc.;
- re-use of excavated material etc. – will be used as suitable fill elsewhere on site for the new site tracks, the hardstanding areas and embankments where possible.

Receptacles will be provided for the separation and collection of dry recyclables (paper, cardboard, plastics etc.), biological waste (canteen waste) and residual waste. Receptacles will be clearly labelled, signposted and stored in dedicated areas. The following sourced segregated materials container will be made available on site at a suitable location:

- timber;
- ferrous metals;
- aluminium;
- dry mixed recyclables;
- packaging waste;
- food waste.

Residual waste generated on-site may require disposal. This waste will be deposited in dedicated receptacles and collected by the licensed waste management contractor and transported to a licenced facility by the licenced contractor. Licenced facilities in the area are identified in Chapter 3. All waste movements will be recorded, of which records will be held by the waste manager on-site.

Any contaminated soils will be handled, removed and disposed of in accordance with statutory requirements for the handling, transportation and disposal of waste.

Waste management during the construction stage is set out in the CEMP included in Appendix 3.1 of Volume 3 of this EIAR. Once these best practice measures are put in place, waste produced during the construction stage will have an imperceptible impact on the receiving environment.

11.8.3 Potential Impacts – Renewable, Non-Renewable Resources and Utility Infrastructure - Operational

Once the Fahy Beg Wind Farm is operational, the potential for negative effects on material assets is minimal. Maintenance of access tracks and infrastructure may require small amounts of imported fill, however, the impact of this is likely to be slight/imperceptible.

A setback distance has been imposed between the proposed wind turbines and the existing 400kV overhead lines. No impact on existing major utility infrastructure is expected at the wind farm site during the operational phase. There is potential for brief disconnection of overhead lines during the decommissioning phase if large turbine components are required to be removed from the wind farm site. This has potential to cause a brief slight negative impact to telecommunication services where overhead lines require disconnection. There is also potential for broadcasting to be affected at receivers close to the wind farm site during the operational phase, i.e. nearby dwellings.

Mitigation by design has achieved a setback of over 800m between the proposed turbines and the nearest dwelling which will reduce potential effects on receivers. A protocol will be signed with 2RN which will ensure remedial measures will be implemented should they be required as a result of potential negative effects on 2RN's network. Mitigation includes supplying dwellings with optimised roof-top antennas or satellite reception if required.

Furthermore, the potential for electromagnetic interference from wind turbines occurs only during the commissioning and operational phase of the project. There are no potential electromagnetic interference effects associated with the construction phase of the proposed project on telecommunications and broadcasting in the area.

The direct effect of electricity generated by the proposed development will give rise to a reduction in the quantity of fossil fuels required for electricity generation across the State. This will give rise to a long-term slight positive impact on renewable energy resource and will contribute to reducing Ireland's dependency on imported fuel resources.

As set out in Chapter 16, the proposed development will have no significant impact on existing telecommunications signals during the operational phase of the project. The grid connection is not expected to impact on telecommunications during the operational phase. Impacts on overhead lines as a result of turbine delivery is only associated with the construction phase. There is potential that setback may require brief disruption in the unlikely event that a turbine component requires replacement - in this case the turbine delivery route is required to be used during the operational phase. The effects on overhead telecommunications services would be similar to those described in Section 16.4.2.1 of Chapter 16 Telecommunications and Aviation. This would result in a brief slight negative impact to telecommunications services along the TDR.

Significant volumes of waste are not expected to be produced during the operation phase of the proposed development. If maintenance works are required at the wind farm site, grid route or TDR during the operational phase, a CEMP will be in place, and waste management procedures as set out in section 11.8.2.4 will be followed. Any waste produced during the operational phase of the wind farm will have an imperceptible impact on the receiving environment.

11.8.4 Potential Impacts – Renewable, Non-Renewable Resources and Utility Infrastructure – Decommissioning

The potential impacts associated with decommissioning phase will be similar to those associated with construction but of a reduced magnitude.

Decommissioning works will include removal of above ground structures including the turbines and met masts. Turbine foundations and access tracks will be left in situ. The proposed on-site substation building will be taken in charge of by Eirgrid / ESB which will have a long-term slight positive impact on electricity infrastructure provision in the area. Similarly, the underground grid cable will remain in situ and will become a part of the national grid resulting in a long-term slight positive impact on electricity infrastructure provision in the area.

There will be no significant negative impacts on renewable and non-renewable resources during the decommissioning phase. No likely negative impacts on utility infrastructure are expected during the decommissioning phase.

Increased traffic numbers on the local, regional and national roads will have a temporary slight negative impact on the road network due to increased traffic.

Waste will be produced as a result of the decommissioning activities.

The CEMP in Appendix 3.1 will be implemented during the decommissioning phase and waste management procedures as set out in section 11.8.2.4 will be followed. Decommissioned turbine components will be reused and recycled where possible and all non-reusable or recyclable materials will be disposed of in a licenced waste facility.

Licenced waste facilities have been identified in Section 3.4.7 of Chapter 3 of the EIAR, however, decommissioning is expected to take place 35-years from commissioning of the proposed wind farm and therefore it is uncertain if the identified facilities will remain operational at this time. Through the use of a waste management plan, similar to that as detailed in the CEMP contained in Appendix 3.1, waste produced during the decommissioning phase will have an imperceptible impact on the receiving environment. Waste produced during the decommissioning phase will likely have a slight negative impact on the capacity of the licenced waste facilities used at the time of decommissioning.

11.8.5 Mitigation Measures – Renewable, Non-Renewable Resources and Utility Infrastructure

Existing services along the proposed grid connection cable route have been predicted through a desktop study and will be confirmed in the pre-construction surveys prior to construction. This will minimise the impact in terms of disruption or damage to existing utilities. It is not intended to divert existing services but instead, where possible, the cable will be laid above or below existing services. Communication with service providers will be maintained for the duration of the construction works where required.

Non-renewable resources of general construction fill will be sourced locally and will be excavated from on-site borrow pits insofar as possible to minimise transportation distances, reducing CO2 emissions.

Where services and street furniture are required to be removed temporarily to accommodate turbine delivery, residents and business in proximity to the works will be informed in advance.

The comprehensive turbine delivery procedure which will be implemented between Foynes Port and the wind farm site will include safety procedures and Garda escort in accordance with the Traffic Management Plan contained in Appendix 3.1.
The procedure will avoid impact on the roads involved with the TDR including the N69, M7, R466, R494, R463, and unidentified local roads leading to the site. It is likely that turbine delivery will take place outside of regular travelling/commuting hours in order to avoid potential traffic impacts on major routes.

A Construction Waste Management Plan (Appendix 3.1) has been prepared for the proposed Fahy Beg Wind Farm in line with the "Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects" (2006) as published by the Department of the Environment, Community and Local Government and supported by the Southern Region Waste Management Plan 2015-2021.

The Waste Management Plan will be finalised in accordance with the CEMP following the appointment of the contractor for the main construction works and will take cognisance of any newly published waste management policy.

11.8.6 Residual Impacts – Renewable, Non-Renewable Resources and Utility Infrastructure

Non-renewable resources such as aggregates and cement are required onsite during the construction phase. This will result in a permanent negative imperceptible residual impact on non-renewable resources.

The proposed development will result in a long-term slight positive residual impact on non-renewable resources by offsetting the use of fossil fuels in electricity generation over the lifetime of the project.

The proposed on-site substation and underground grid route cable will be taken in charge of by Eirgrid or ESB following decommissioning, providing a long-term slight positive residual impact on electricity infrastructure in the area.

Residual waste from the construction, operation and decommissioning phases will be disposed of in a licensed waste facility. This will result in a permanent slight negative impact to capacity of licenced waste facilities in the area of the proposed development.

11.9 Do-Nothing Scenario

In the event that the proposed Fahy Beg Wind Farm does not proceed, the existing land use on the site will continue in its present form consisting of commercial forestry and agricultural land for the foreseeable future.

In the absence of renewable energy development, it is possible that there will likely be a continuance of excessive greenhouse gas emissions and consumption of fossil fuels. The opportunity to harness the wind energy capacity of the site would be lost, further constraining the State from achieving its renewable energy targets of 80% by 2030. The net displacement of c. between 132,414 and 148,125 tonnes of CO2 per annum as a result of the operational phase of the proposed development will not be achieved.

Overall renewable energy supply was 13.5% of gross final consumption in Ireland in 2020 (SEAI, 2021). The remaining 86.5% of energy came from fossil fuels indicating Ireland's heavy dependency on the importation of fossil fuels to meet its energy needs in transport, heat and electricity. This dependency on energy imports leaves Irish consumers exposed to fluctuating international oil and gas prices. Harvesting renewable, indigenous resources such as wind will help diversify the Irish generation portfolio and reduce Ireland's dependency on imported fuel resources. In the do-nothing scenario, the proposed 31.2-38.4 MW wind farm will not contribute to reducing fossil fuel dependency.

It is also envisaged that if the Fahy Beg Wind Farm Project does not proceed, opportunity for employment relating to the construction, operation and decommissioning of the proposed development will be lost, resulting in a lost opportunity for potential economic activity in the County Clare Area. Development contributions and considerable commercial rates would not be made payable to Clare County Council by the developer, and no Community Benefit Fund Scheme will be put in place in the locality resulting in a lost opportunity for benefit to community infrastructure.

11.10 Cumulative Impacts

As part of the cumulative impact assessment included throughout this EIAR, planned, proposed, consented and existing developments/projects in the area of the wind farm site, grid route and TDR were considered for potential cumulative impacts on the receiving environment. As set out in section 11.2 above projects and proposed developments within 20km of the wind farm site were considered for the purpose of this assessment. Projects and proposed developments were also identified within the Grid Route and TDR corridor which falls within the wind farm 20km radius.

The list of all projects considered for the cumulative assessment are included in Appendix 1.2 of Volume 3 of this EIAR. Each of the projects listed in Appendix 1.2 were considered with respect to potential cumulative impacts on Population, Human Health and Material Assets. Projects where cumulative impacts were not likely to occur were discounted from the impact assessment as detailed below.

Development in the planning system as listed in Appendix 1.2 within the vicinity of the wind farm site, grid connection and TDR consisting of housing and agricultural developments were identified for potential cumulative assessment, however, these developments are small in scale and will have an imperceptible cumulative impact with the construction and operation of the proposed wind farm, in relation to population, human health and material assets due to the lack of interaction Developments in the planning system within the vicinity of the wind farm site, GCR and TDR consisting of one-off housing and agricultural developments were identified for potential cumulative assessment, however, these developments are small in scale and will have an imperceptible cumulative impact with the construction and operation of the proposed wind farm, in relation to population, human health and material assets.

This is due to the significant setback of the proposed wind farm from nearby planned, proposed and existing projects and the brief to temporary nature of the proposed construction works associated with the GCR and TDR. Therefore, potential cumulative impacts associated with small scale development were considered to be imperceptible.

The electricity generating capacity of the proposed development, in combination with the consented solar farms and existing wind farms in proximity to the Annagh site, will have a long-term significant positive cumulative impact on utility infrastructure and renewable energy resource in the greater area and will have a positive impact on national renewable energy resources as well as reduction in requirements for the use of non-renewable fossil fuels. This will increase national savings on fossil fuel imports.

The proposed Killaloe Bypass/Shannon Bridge Crossing/R494 Upgrade has been examined for potential in-combination effects with the proposed Fahy Beg Wind Farm Project. The route options presented show two potential routes and there is potential for short-term positive socio-economic benefits to the study area and greater area as a result of the construction phase of both the Fahy Beg Farm and the Killaloe Bypass/Shannon Bridge Crossing/R494 Upgrade project due to employment opportunities associated with the construction of the proposed projects.

There is also likely to be indirect cumulative impacts in terms of demands placed on local quarries for aggregate and concrete required during the construction phase of the proposed development in combination with the Killaloe Bypass/Shannon Bridge Crossing/R494 Upgrade. This is likely to be a moderate negative impact on non-renewable stone resources.

11.11 Conclusion

The assessment of Population, Human Health and Material Assets has established the existing environmental conditions of the study area, including the Wind Farm Site, the Grid Connection and the Turbine Delivery Route (TDR) Area. Potential impacts were considered for the construction, operational and decommissioning phases of the proposed development as well as potential residual and cumulative impacts. Mitigation measures have been proposed where relevant.

The Population, Human Health and Material Assets Chapter has been subdivided into the following topics for the purpose of the assessment:

- Population Trends;
- Socio-Economics, Employment and Economic Activity;
- Land Use;
- Recreation, Amenity and Tourism;
- Human Health and Safety;
- Renewable, Non-Renewable Resources and Utilities Infrastructure.

The population of the Wind Farm Site and Grid Connection were found to be of low density and dispersed when compared to averages of County Clare as a whole and the State. The GCR was found to have a higher population density due to its proximity to the built-up areas of Ballina and Killaloe.

The construction and decommissioning of the project will likely result in a short-term/temporary population growth in the Wind Farm Site, Grid Connection and TDR during working hours due to the influx of construction workers during the construction and decommissioning phases. However, permanent impact on the population of the study area is considered unlikely as a result of the proposed development of the Fahy Beg Wind Farm due to the temporary nature of the construction works.

The economic profile of the Wind Farm Site, TDR and Grid Connection does not show any major disparities when compared to the National and County-wide average socio-economic statistics. In general, the baseline conditions of the study area shows healthy socio-economic characteristics.

Positive direct and indirect benefits to economic activity are identified during the construction and decommissioning phases due to the creation of construction jobs based in the area which are likely to provide employment opportunities for those living in the study area and surrounding areas of County Clare. The construction and decommissioning phases are likely to have a temporary positive economic impact on local businesses and services.

The operational phase of the proposed development has been identified as having a positive economic and social impact on the Wind Farm Area with the provision of a Community Benefit Fund which will contribute to social infrastructure in the area and financially benefit those in closest proximity to the proposed wind farm. Other positive economic benefits as a result of the operational phase of the proposed Fahy Beg Wind Farm includes reducing the State's reliance on fossil fuels which will reduce electricity prices, economically benefiting the consumer in the long-term throughout the State. Rates and development contributions will also benefit the local authority.

The land use of the Wind Farm Site consists of agriculture and forestry. The land use in proximity to the proposed grid connection is primarily agriculture and one-off housing and the land use along the TDR is agriculture and town centre/village centre including commercial, residential and industrial premises. Slight, temporary impacts to the existing land use along the GCR and TDR is expected during the construction phase.

With respect to Recreation, Amenity and Tourism, trail walking, mountain biking, equestrian activity and sports grounds are the main activities and attractions in the greater area of the proposed wind farm site. There are no major tourist attractions in proximity to the site. It is expected that the construction, operational and decommissioning phases of the proposed development will have a non-significant neutral impact on recreation and tourism in the area due to the distance of the proposed turbines from significant features.

The provision of the community benefit fund will likely have a moderate positive long-term impact on the amenities of nearby villages.

Potential impacts on human health and safety have been identified for both construction workers and the general public as a result of the construction and decommissioning of the Fahy Beg Wind Farm. Best practice construction methods and improved safety measures on public roads have been identified as measures to prevent potential accidents during the construction and decommissioning works. Potential health impacts from noise and electromagnetic fields during the operational phase are considered negligible.

Furthermore, the proposed Fahy Beg Wind Farm's potential susceptibility to major accidents and natural disaster is considered negligible.

It is anticipated that the proposed Fahy Beg Wind Farm will avoid significant negative impact on renewable and non-renewable resources by sourcing local building materials where possible and providing site-won materials, therefore reducing the requirement of transport, reducing CO2 emissions. The proposed Fahy Beg Wind Farm was found to have an overall positive impact on utility infrastructure providing clean energy to the national grid and reducing dependency on fossil fuels. Furthermore, the proposed development will have no impact on existing telecommunications signals during the operational phase of the project as confirmed through consultation with telecommunications providers.

Cumulative impacts have also been considered in relation to proposed, consented and constructed projects located nearby the wind farm site, grid route and TDR. No significant in-combination impacts were identified in relation to population, human health and materiel assets.

In conclusion, once mitigation measures set out throughout this EIAR are implemented, it is unlikely that significant negative impacts to population, human health and material assets will occur as a result of development of the proposed Fahy Beg Wind Farm.

11.12 References

American Wind Energy Association (AWEA) (2019), Wind 101, Benefits of Wind, Wind in my Community, Agriculture. Available at:
https://www.awea.org/wind-101/benefits-of-wind/wind-in-my-community/agriculture

American Wind Energy Association and Canadian Wind Energy Association (2009). Wind Turbine Sound and Health Effects - An Expert Panel Review, available at:
http://canwea.ca/pdf/talkwind/Wind_Turbine_Sound_and_Health_Effects.pdf

An Bord Pleanála (2021), Case Search (online). Available at: http://www.pleanala.ie/

Australian Government National Health and Medical Research Council (NHMRC) (2010), Wind Turbines & Health, July 2010.

Baringa (2019), Wind for a Euro - Cost-benefit analysis of wind energy in Ireland 2000-2020. Available at:
https://www.iwea.com/images/files/baringa-wind-for-a-euro-report-january-2019.pdf

BiGGAR Economics (2017), Wind Farms and Tourism Trends in Scotland. Available at:
https://biggareconomics.co.uk/wp-content/uploads/2020/01/Wind-farms-and-tourism-trends-in-Scotland.pdf

Clare County Council (2017), Clare County Development Plan 2017-2023. Available at:
https://www.clarecoco.ie

Central Statistics Office (2016), Small Area Population Statistics. Available from:
https://www.cso.ie/en/census/census2016reports/census2016smallareapopulationstatistics/

Central Statistics Office (2021), Live Register Data. Available from:
https://statbank.cso.ie/

Central Statistics Office, Census 2006, 2011, 2016.

Central Statistics Office (2021), Detailed COVID-19 Income Support and Live Register Tables. Available from:
https://www.cso.ie/

Climate and Health Alliance (2012), Position Statement on Health and Wind Turbines. February 2012.

Deloitte, Irish Wind Energy Association (2009), Jobs and Investment in Irish Wind Energy. Available at:
https://www.iwea.com/images/files/9660bd5e72bcac538f47d1b02cc6658c97d41f.pdf

Department of Communications, Climate Action & Environment (2019), Climate Action Plan 2019. Available at:
https://www.dccae.gov.ie/en-ie/climate-action/publications/Documents/16/Climate_Action_Plan_2019.pdf

Department of Communications, Climate Action and Environment (2018), Renewable Energy Support Scheme – High Level Design Paper. Available at:
https://www.dccae.gov.ie/documents/RESS%20Design%20Paper.pdf

Department of Communications, Climate Action and Environment (2020), Terms and Conditions for the First Competition Under the Renewable Energy Support Scheme – RESS 1: 2020. Available at: https://www.dccae.gov.ie/documents/RESS_1_Terms_and_Conditions.pdf

Department of the Environment, Heritage and Local Government (2006), Wind Energy Development Guidelines for Planning Authorities

Department of Health (2019), Health in Ireland – Key Trends 2019. Available at: https://www.gov.ie

Department of Housing, Local Government and Heritage (2021), EIA Portal (Online). Available at: https://gov.ie/

Department of Housing, Planning and Local Government (2018), Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment. Available at: https://www.housing.gov.ie/sites/default/files/publications/files/guidelines_for_planning_authorities_and_an_bord_pleanala_on_carrying_out_eia_-_august_2018.pdf

Department of Housing, Planning and Local Government (2019), Draft Revised Wind Energy Development Guidelines. Available at: https://www.housing.gov.ie/sites/default/files/public-consultation/files/draft_revised_wind_energy_development_guidelines_december_2019.pdf

Department of Trade and Industry (UK) (2006), The Measurement of Low Frequency Noise at Three UK Windfarms. W/45/00656/00/00.

EirGrid (2014), EMF & You: Information about Electric & Magnetic Fields and the electricity transmission system in Ireland

Eirgrid (2019), The Electricity Grid and Your Health

Environmental Protection Agency (2017), Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. Available at: https://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf

ESB (2017), EMF and You: Information about Electric & Magnetic Fields and the electricity network in Ireland, April 2017. Available at: https://esb.ie/docs/default-source/default-document-library/emf-public-information_booklet_v9.pdf?sfvrsn=0

European Union (2011), DIRECTIVE 2011/92/EU. Official Journal of the European Union L 26/1.

European Union (2014), DIRECTIVE 2014/52/EU. Official Journal of the European Union L 124/1

European Union (2017), Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report. Available at: https://ec.europa.eu/environment/eia/pdf/EIA_guidance_EIA_report_final.pdf

European Wind Energy Association (EWEA) (2009), Wind at Work, - Wind Energy and Job Creation in the EU available at: http://www.ewea.org/fileadmin/files/library/publications/reports/Wind_at_work.pdf

Fáilte Ireland (2008, 2012), Wind Farms – Visitor Attitudes on the Environment, National Tourism Development Authority, 2012/No.1

Fáilte Ireland (2011), Guidelines on the Treatment of Tourism in an Environmental Impact Statement

Fáilte Ireland (2019), Key Tourism Facts 2018. Available from: https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/Key-Tourism-Facts-2018.pdf?ext=.pdf

Fáilte Ireland (2021), Preliminary Key Tourism Facts 2019. Available from: https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/4_Visitor_Insights/KeyTourismFacts_2019.pdf?ext=.pdf

Front Public Health (2014), Wind Turbines and Human Health. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4063257/

Health and Safety Authority (2021), Fatal Workplace Injuries by Economic Sector 2021 (NACE Revision 2). Available at: https://www.hsa.ie/eng/Topics/Statistics/Fatal_Injury/

Health Canada (2014), Wind Turbine Noise and Health Study: Summary of Results.

Health Service Executive (2017), Position paper on wind turbines and public health.

Heblich, et al, (2016) Impact of wind Turbines on House Prices in Scotland. Climate Exchange. University of Sheffield 2016.

Hoen, et al. (2009), The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis. Journal of Real Estate Research, Vol. 33, 2009.

Hoen, et al. (2013), A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States. Office of Energy Efficiency and Renewable Energy (Wind and Water Power Technologies Office) of the U.S. Department of Energy

Institute of Sustainable Futures (2015), Calculating Global Energy Sector Jobs. Available at: https://opus.lib.uts.edu.au/bitstream/10453/43718/1/Rutovitzetal2015Calculatingglobalenergysectorjobsmethodology.pdf

International Commission on Non-Ionising Radiation Protection (ICNIRP) (2010), Guidelines for limiting exposure to time varying electric and magnetic fields (1Hz–100kHz) Health Physics 99(6):818-836; 2010. Available at: https://www.icnirp.org/cms/upload/publications/ICNIRPLFgdl.pdf

Irish Wind Energy Association (2012). Best Practice Guidelines for the Irish Wind Energy Industry. Available at: https://www.iwea.com/images/files/9660bdfb5a4f1d276f41ae9ab54e991bb600b7.pdf

Knopper and Ollson (2011). Health effects and wind turbines: A review of the literature.

Marshall Day Acoustics (2014). Summary of research of noise effects on animals.

Massachusetts Departments of Environmental Protection and Public Health (2012). Wind Turbine Health Impact Study - Report of Independent Expert Panel. available at:

http://www.mass.gov/eea/docs/dep/energy/wind/turbine-impact-study.pdf

Massachusetts Institute of Technology (2014). Wind Turbines and Health, A Critical Review of the Scientific Literature. Journal of Occupational and Environmental Medicine, Vol. 56, Number 11, November 2014.

National Trails Office (2010), Setting New Directions – A Review of National Waymarked Ways in Ireland. Available at: https://www.sportireland.ie/sites/default/files/2019-10/setting_new_directions.pdf

Renewable UK (2010). Wind Turbine Syndrome – An Independent review of the state of knowledge about the alleged health condition. Available at: http://www.burnley.gov.uk/attachments/APP20130381_013%200381%20Renewable%20Energy%20Paper%20on%20Wind%20Turbine%20Syndrome.pdf

Renewable UK & Cebr (2014), The Effect of Wind Farms on House Prices

Rutovitz, J. and Harris, S. (2015). Calculating Global Energy Sector Jobs: 2015 Methodology Update. Prepared for Greenpeace International by the Institute for Sustainable Futures, University of Technology, Sydney.

Safety, Health & Welfare at Work (Construction) Regulations 2013.

Safety, Health & Welfare at Work (Construction) Regulations 2013.

Safety, Health & Welfare at Work (General Applications) Regulations 2007.

Safety, Health & Welfare at Work (General Applications) Regulations 2007.

Safety, Health & Welfare at Work Act 2005.

Safety, Health & Welfare at Work Act 2005.

Scientific Committee on Emerging and Newly Identified Health Risks (2015), Opinion on Potential health effects of exposure to electromagnetic fields (EMF)

Siemens & IWEA (2014), An Enterprising Wind – An economic analysis of the job creation potential of the wind sector in Ireland. Available at: https://www.esri.ie/publications/an-enterprising-wind-an-economic-analysis-of-the-job-creation-potential-of-the-wind-sector-in-ireland

Sustainable Energy Authority Ireland (SEAI) (2013), Wind Atlas. Available at: https://www.seai.ie/

Sustainable Energy Authority Ireland (SEAI) (2015), A Macroeconomic Analysis of Onshore Wind Deployment to 2020. Available at: https://www.seai.ie/publications/A-Macroeconomic-Analysis-of-Onshore-Wind-Deployment-to-2020.pdf

Sustainable Energy Authority Ireland (SEAI) (2017). Energy in Ireland 1990-2016: 2017 Report. Available at: https://www.seai.ie/publications/Energy-in-Ireland-1990-2016-Full-report.pdf

Sustainable Energy Authority Ireland (SEAI) (2019), Renewable Energy in Ireland – 2019 Report. Available at: https://www.seai.ie/publications/Renewable-Energy-in-Ireland-2019.pdf

Sustainable Energy Authority of Ireland (SEAI) (2020), Renewable Energy in Ireland – 2020 Update. Available at: https://www.seai.ie/publications/2020-Renewable-Energy-in-Ireland-Report.pdf

Sustainable Energy Authority of Ireland (SEAI) (2020), Energy-Related CO_2 Emissions in Ireland 2005 – 2018 – 2020 Report. Available at: https://www.seai.ie/publications/Energy-Emissions-Report-2020.pdf

Sustainable Energy Authority Ireland (SEAI) (2020), Energy in Ireland 2020 Report. Available at: https://www.seai.ie/publications/Energy-in-Ireland-2020.pdf

Sustainable Energy Ireland (SEI) (2003), Attitudes towards the Development of Wind Farms in Ireland. Available at: https://mosart.ie/wp-content/uploads/2016/02/Attitudes-Towards-Wind-Farm-Development-Ireland.pdf

UK Department of Trade and Industry (2006). The Measurement of Low Frequency Noise at Three UK Windfarms, Department of Trade and Industry, W/45/00656/00/00

UK Health Protection Agency (2012). WHO International EMF Project IAC Meeting

Visit Scotland, Insight Department (2012), Wind Farm Consumer Research Topic Paper, August 2012

Visit Scotland, Insight Department (2012), Scotland Visitor Survey 2011 & 2012, Summary of 2011 Results, January 2012.

World Health Organisation (2018), Environmental Noise Guidelines for the European Region.

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

www.fehilytimoney.ie

CORK OFFICE
Core House
Pouladuff Road,
Cork, T12 D773,
Ireland
+353 21 496 4133

Dublin Office
J5 Plaza,
North Park Business Park,
North Road, Dublin 11, D11 PXT0,
Ireland
+353 1 658 3500

Carlow Office
Unit 6, Bagenalstown Industrial Park, Royal Oak Road,
Muine Bheag,
Co. Carlow, R21 XW81,
Ireland
+353 59 972 3800