

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED CROAGHAUN WIND FARM, CO. CARLOW

VOLUME 2 – MAIN EIAR

CHAPTER 11 – POPULATION, HUMAN HEALTH & MATERIAL ASSETS

Prepared for: Coillte



Date: December 2020

Core House, Pouladuff Road, Cork
T12 D773, Ireland

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

CORK | DUBLIN | CARLOW

www.fehilytimoney.ie

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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 Croaghaun Wind Farm on Population, 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 headings:

- Population;
- Employment and Economic Activity;
- Land Use;
- Recreation, Amenity and Tourism;
- Human Health and Safety; and
- Renewable Resources, Non-renewable Resources and Utility Infrastructure.

There are a number of sources of effects from the project with potential to impact on the various aspects of population, human health and material assets, as listed above. These include noise, visuals, shadow flicker, air quality and transportation. The potential effects on population, human health and material assets with respect to 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. The findings of these chapters in terms of the potential and residual impacts on population and human health are presented in this chapter.

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 presented in this chapter.

Throughout this chapter the 'proposed development' 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 and works involving the Turbine Delivery Route (TDR). The 'project' refers all elements including the proposed development, grid route connection and replant lands. The assessment of the replant lands element of the project is presented in Appendix 3.3 and Appendix 3.4 of Volume 3 of this EIAR.

For assessment purposes the proposed project is separated into three distinct elements. The wind farm site will be referred to as the 'Main Wind Farm Site'. The area of the proposed grid route cable infrastructure will be referred to as the 'grid connection' and the area of the Turbine Delivery Route will be referred to as the 'TDR'. These three areas combined make up the 'Study Area'.



11.2 Methodology

This chapter of the EIAR which assesses potential effects on population, human health and material assets has been prepared following a review of the National Planning Framework, The Regional Spatial and Economic Strategy for the Southern Region, and the Carlow County Development Plan 2015-2021.

This chapter of the EIAR has been completed in accordance with the guidance set out by the Environmental Protection Agency (EPA), in particular, the Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (EPA, August 2017), 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 Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (EPA, August 2017).

Demographic data has been sourced from the Central Statistics Office (CSO)'s Census of Ireland (2016) records. Demographic information relating to the State, County Carlow, 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 ('Main Wind Farm Site') lies within the EDs of Myshall and Cranemore.
- The grid connection element of the project ('Grid Connection') including the proposed off-site substation at Kellistown is located in the EDs of Myshall, Shangarry, Rathrush, Templepeter and Kellistown.
- The turbine delivery route ('TDR') is contained with the EDs of Cranemore, Newtownbarry, Castledockrell, Marchalstown, Enniscorthy Rural and Tinnacross before the TDR meets the M11 motorway at Junction 25.

The Study Area including the Main Wind Farm Site, Grid Connection and TDR are identified in Figure 11-1.

Eircode data (2020), Geodirectory data, and planning application lists sourced from Carlow 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 October 2020. Eircode and Geodirectory data pinpoint registered addresses. This information was ground-proofed with a house survey where a surveyor travelled the Main 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.



A socio-economic profile of the existing environment was established using live register data 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 in the area was examined to determine potential impacts on existing land use patterns which may arise as a result of the proposed development. Corine Land Cover data (2018) was studied and observation was 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, Carlow County Council Planning Department requested that potential impact to land use be considered in the EIAR.

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, as recommended by Fáilte Ireland, during consultation for the preparation of this EIAR (as discussed in Chapter 5: EIA Scoping, Consultation, and Key Issues) and is referred to in Section 11.6 of this chapter specifically. 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.

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.

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.

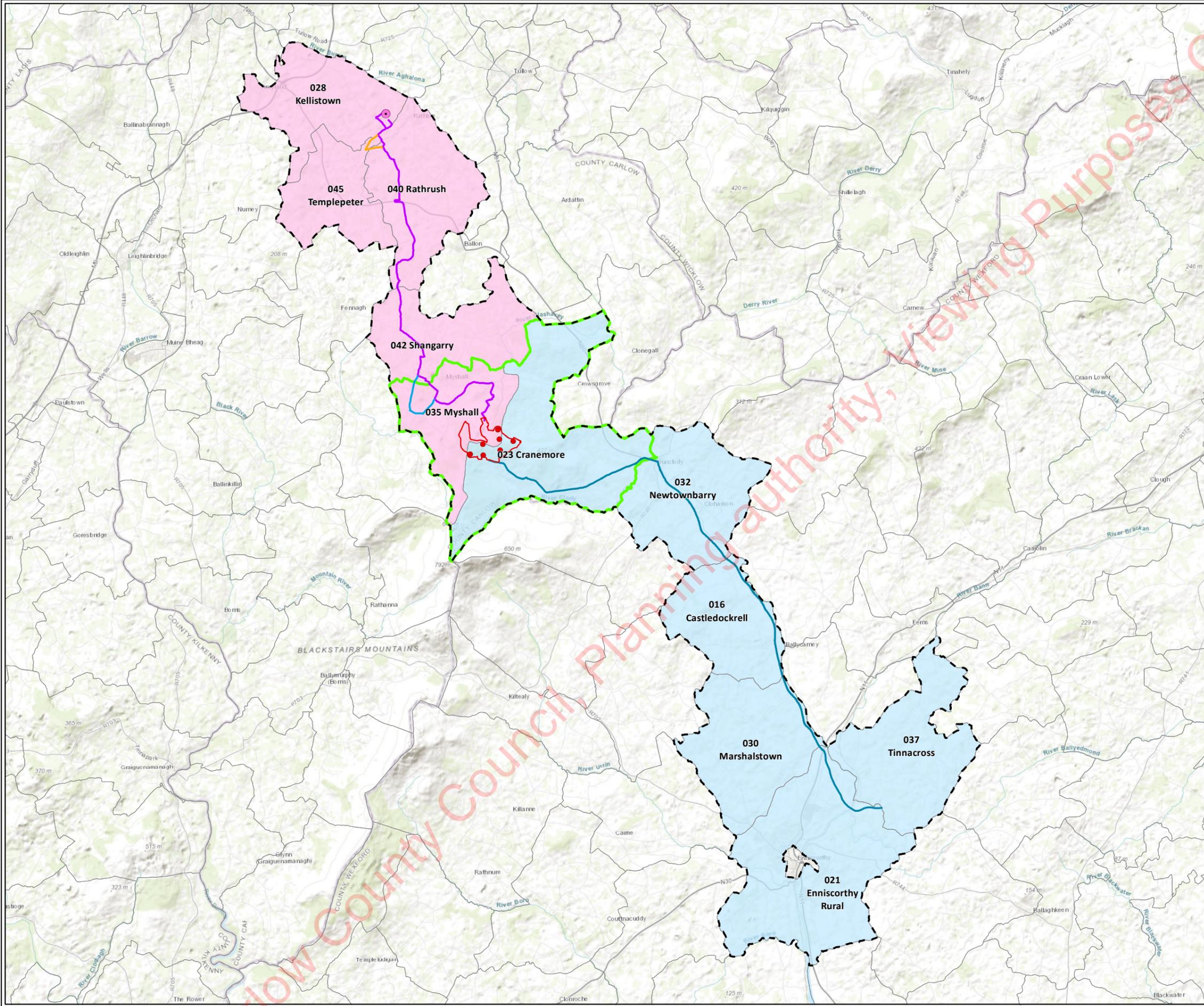
As outlined in Chapter 5: EIA Scoping, Consultation, and Key Issues, prior to preparing the EIAR, statutory authorities and other relevant bodies were consulted. Key items of relevance to Population, Human Health and Material Assets, as raised by these parties have been addressed and referenced within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



Consultation responses of relevance to the population, human health and material assets assessment were received from Fáilte Ireland, Carlow County Council Planning Department 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.

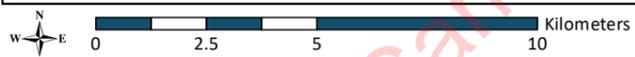
In relation to cumulative impacts for Population, Human Health, and Material Assets, the potential effect of the proposed project 'in combination' with other projects, constructed, proposed or permitted has been assessed. The cumulative impact assessment provides a baseline from which a full environmental assessment of the potential effects arising from the project in combination with other plans and projects can be considered comprehensively. A search was conducted within 15km of the proposed project as this was considered a reasonable zone of influence for the purpose of assessing potential in-combination impacts on population, human health and material assets. Monthly planning searches were carried out to identify proposed development in proximity to the Main Wind Farm Site, Grid Connection 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. Where potential significant effects has been identified, mitigation measures have been proposed. Residual impact is then considered which details potential impacts following implementation of mitigation measures.

Carlow County Council, Planning Authority, Viewing Purposes Only



- Proposed Turbine Layout
- Kellistown Substation
- Study Area
- Proposed Development Boundary
- Proposed Grid Connection Route
- Grid Connection Route Variant 1
- Grid Connection Route Variant 2
- Proposed Turbine Delivery Route
- Electoral Divisions
- Main Wind Farm Site
- Grid Route
- TDR

TITLE:		Study Area	
PROJECT:		Croaghaun Wind Farm	
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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 Carlow and the State between the Census years of 2006 and 2016 in order 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 project is 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		
Main Wind Farm Site	TDR	Grid Connection
Myshall	Cranemore	Myshall
Cranemore	Newtownbarry	Shangarry
	Castledockrell	Rathrush
	Marchalstown	Templepeter
	Enniscorthy Rural	Kellistown
	Tinnacross	

11.3.1 Existing Environment - Population

Population Growth

The proposed project is located in east County Carlow on the northern slopes of the Backstairs Mountains in proximity to the Wexford County Boarder. The area is predominantly rural in character consisting of one-off houses. Nearby settlements include Myshall, Kildavin and Bunclody.

According to Eircode data 2020, there are 46 no. residential dwellings within 1.5km of the turbine locations¹. Of these 46 dwellings, 14 no. are also registered as commercial (farmsteads). Furthermore, 1 no. consented dwelling has been identified within 1.5km of the turbine locations. This consented dwelling is yet to be constructed. Figure 11-2 illustrates the receptors within the vicinity of the Main Wind Farm Site according to Eircode (2020) and Geodirectory data. This information is supported by the ground proofing survey and planning application search. Furthermore, there are approximately 137 no. one-off houses along the 23.2 km grid route.

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

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



Table 11-2: Population Statistics 2006-2016

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%
Carlow County	50,349	54,612	56,932	8.5%	4.2%	13%
Main Wind Farm Site	1,358	1,673	1,696	23.2%	1.4%	24.9%
TDR	13,889	15,397	15,872	10.8%	3.1%	14.3
Grid Route	3,364	3,667	3,609	9%	-1.6%	7.3%

The data presented in Table 11-2 demonstrates that the population within the Main Wind Farm Site rapidly increased in population between 2006 and 2011 in comparison to the State and County-wide average. However, this growth slowed down significantly between 2011 and 2016 with a lower average in comparison to the State and County. The TDR and Grid Connections showed similar growth to the state and County, however, a noticeable decline in population occurred in the Grid Connection between 2011 and 2016.

Population Density

The population density recorded within the State, County Carlow, the Main Wind Farm Site, Grid Connection and TDR during the 2006, 2011 and 2016 Census are set out hereunder in table 11-3. The population density of the Main Wind Farm Site has increased from 25.1 persons per square kilometre in 2006 to 31.4 persons per square kilometre in 2016, representing an overall increase in population density of 25% over a ten year period. It should be noted that between 2011 and 2016, the population density increased by 1.3%. The population of the Main Wind Farm Site has consistently been lower than that of the State and County Carlow, indicating that the Main Wind Farm Site is more sparsely populated.

The TDR has a significantly higher population density due to its proximity to urban areas. This represents a population density 36% higher than the state average and 193% higher than the Main Wind Farm Site according to the 2016 Census. The population of the Grid Connection shows similarities to the Main Wind Farm Site due to its rural nature. The population density of the Grid Connection is significantly lower than that of the State and County Carlow. The population density of the Grid Connection fell by 0.6 person per square kilometre between 2011 and 2016. The population density of the Main Wind Farm Site, TDR and Grid Connection for the 2016 Census year is illustrated in Figure 11-3.



Table 11-3: Population Density between 2006 – 2016

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
Carlow County	56.1	60.9	63.5
Main Wind Farm Site	25.1	31	31.4
TDR	80.5	89.2	92
Grid Connection	35	38.2	37.6

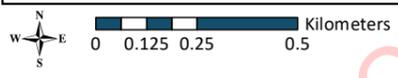
Population - Existing Environment

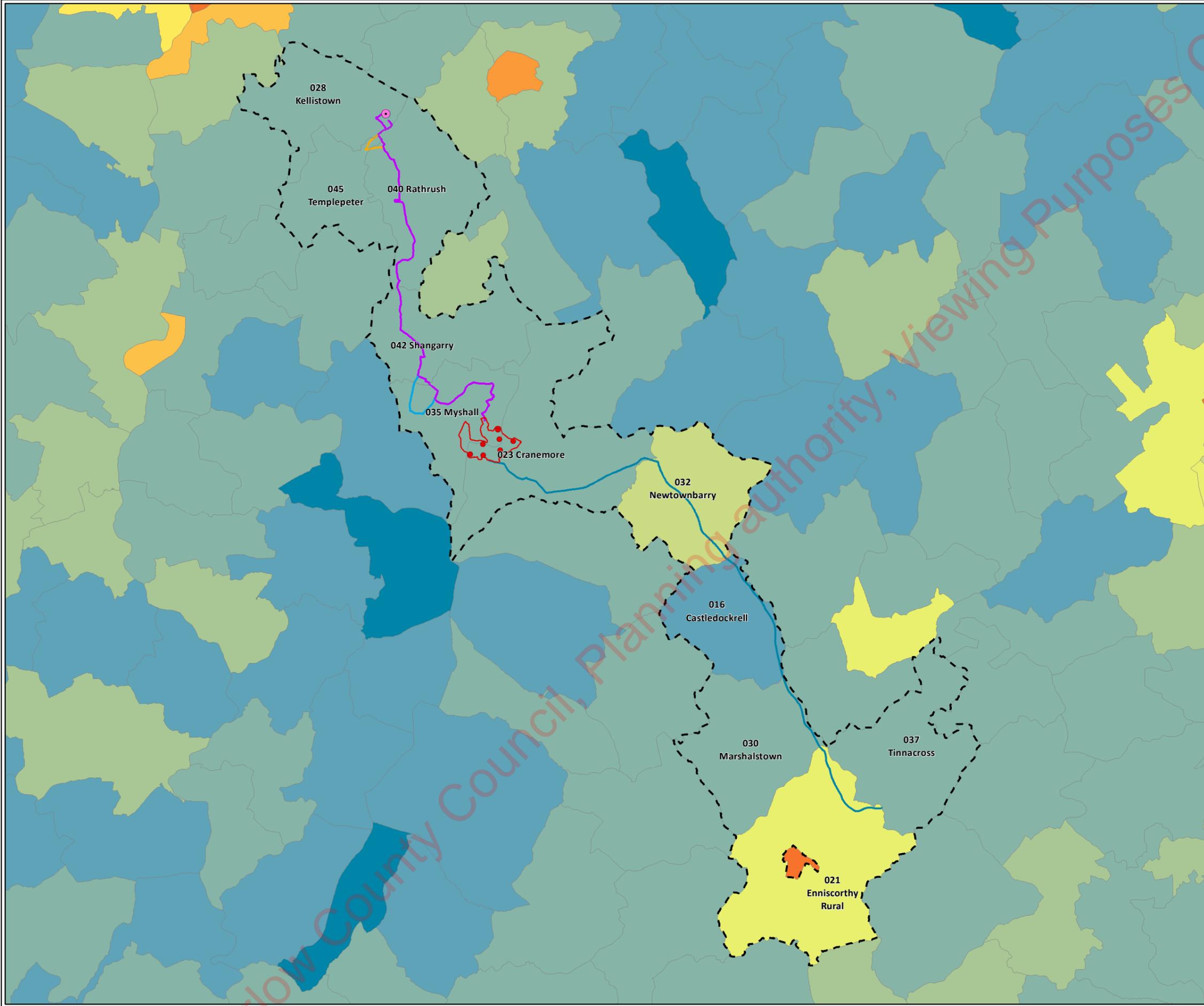
As demonstrated above, the Main Wind Farm Site of the proposed Croaghaun Wind Farm Project is a rural area, with low population numbers and low population density when compared to the averages of the State and County Carlow. There was significant population growth in the Main Wind Farm Site between the 2006 and 2011 census, but this greatly reduced between 2011 and 2016. The TDR has a much greater population than the Main Wind Farm Site due to its proximity to built-up areas. This is demonstrated by its population density which is approximately 36% greater than the state average and 193% greater than the Main Wind Farm Site (Census 2016). The Grid Connection shows similarities to the Main Wind Farm Site with a low population density in comparison to the state and County Carlow averages. Overall, the Main Wind Farm Site and Grid Connection have a low population density associated with their rural nature, whereas the TDR has a higher population density associated with its proximity to built-up areas.



- Residential
- Commercial
- Residential and Commercial
- Proposed Turbine Layout
- 750m Buffer of Turbine Layout
- 1.5km Buffer of Turbine Layout
- Proposed Development Boundary
- ▲ Existing 80m Met Mast
- ▲ Proposed Permanent 100m Met Mast
- Proposed Grid Connection Route
- Grid Connection Route Variant 1
- Proposed Croaghaun Loop
- Proposed Existing Road Upgrade
- Proposed New Road
- Proposed Turning Heads and Passing Bays
- Proposed Turbine Hardstanding
- Proposed Borrow Pit
- Proposed Temporary Compound
- Proposed Substation Compound

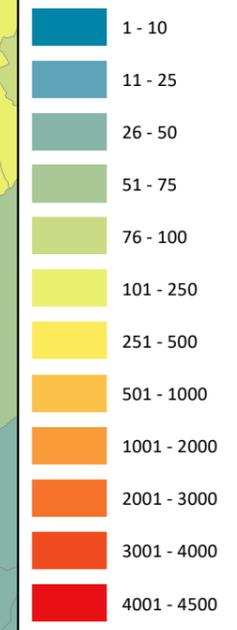
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Nearby Residential Receptors	
PROJECT:	
Croaghaun Wind Farm	
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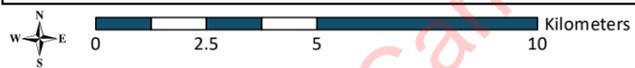


- Proposed Turbine Layout
- Kellistown Substation
- Study Area
- Electoral Divisions
- Proposed Development Boundary
- Proposed Grid Connection Route
- Grid Connection Route Variant 1
- Grid Connection Route Variant 2
- Proposed Turbine Delivery Route

Population Density 2016 by ED



TITLE: Population Density of Study Area (2016)	
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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 towns.

This will give rise to short-term/temporary population growth in the Main 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 46 and 62 jobs. These employment projections are set out in section 11.4.2.

The population of the Main Wind Farm Site recorded in the 2016 Census was 1,696 persons. An estimate of between 46 and 62 jobs associated with the construction works has potential to increase the population of the Main Wind Farm Site by between 2.7% and 3.7%. However, this increase is associated with daily construction works and therefore the population of the Main Wind Farm Site will increase daily during construction hours and return back to normal outside of working hours. As construction work is temporary, it is unlikely that workers will take up residence in the Main Wind Farm Site, however, it is likely that some workers will stay in accommodation within the Main Wind Farm Site or at nearby towns. Overall, this will result in a slight, temporary increase in population resulting in a slight temporary 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 a 10-month period. Population of the Grid Connection 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 and temporary impact on the population of the Grid Connection.

Similarly, the temporary accommodation works associated with the TDR route are limited to 5 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 these accommodation works, however, as the works are limited, this temporary increase in population is considered insignificant and temporary.

It is unlikely that permanent impact to population in the Main 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 11 and 15 long term jobs (with an installed capacity of approximately 38.5MW). 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 Main Wind Farm Site, the operational phase will give rise to temporary, slight population increase in the Main 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 Croaghaun 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 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 Main 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 Main Wind Farm Site, however, it is likely that some workers will stay in accommodation within the Main 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 Main 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 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 Impact – 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 Croaghaun Wind Farm.



This is likely to result in a temporary slight population increase in the Main Wind Farm Site during working hours. As per the assessment of operational impacts, any impact to the population of the Main 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 Main Wind Farm Site, TDR, Grid Connection, together with County Carlow 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 Croaghaun Wind Farm Project, excluding the replanting lands which are assessed separately in Appendix 3.3 and Appendix 3.4 of Volume 3 of this EIAR.

11.4.1 Existing Environment – Socio-economics, 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 has seen 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 Carlow.

Table 11-4: Live Register Data for County Carlow and the State 2017 – 2020

	Sept 2017	Sept 2018	Sept 2019	Sept 2020
State	244,319	205,730	183,783	212,910 ²
County Carlow	3,938	3,537	3,184	3,646

Between 2017 and 2019 unemployment trends in County Carlow and the State as a whole experienced a significant reduction, where numbers recorded on the live register dropped by 25% throughout the State and 19% in County Carlow. However, due to the negative economic impact associated with COVID-19, numbers of people on the live register has increased from 2019 figures across the state by 16%, and by 15% across County Carlow.

Taking account of 2016 Census population figures as detailed in section 11.3.1, this represents an unemployment rate of 4.5% across the state, and an unemployment rate of 6.4% across County Carlow, indicating a greater average unemployment within the County.

² Totals for 2020 do not include persons in receipt of the Pandemic Unemployment Payment (PUP)



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 15-64 who are employed. Table 11.5 below 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.

Table 11-5: Economic Status of the Total Population Ages 15+ in 2016

	Status	State	County Carlow	Main Wind Farm Site	TDR	Grid Connection
% of Population aged 15+ which are:	At Work	53%	50%	54%	47%	54%
	First time job seeker	1%	1%	1%	1.5%	0.5%
	Unemployed	7%	9%	7%	11%	5%
	Student	11%	11%	6.5%	9%	12%
	Home duties	8%	9%	11%	10%	11%
	Retired	15%	14%	17%	15%	13%
	Unable to work	4%	5.5%	3%	6%	4%
	Other	0%	0.5%	0.5%	0.5%	0.5%

As set out in Table 11-5, overall, the principal employment status in 2016 across the State, County Carlow, Main Wind Farm Site, TDR and Grid Connection is “at work” with the Main Wind Farm Site and Grid Connection having the greatest average of at work persons and the TDR having the lowest average at 47%. Similarly, average unemployment rates recorded in the 2016 Census show that the Grid Connection has the lowest average unemployment (5%) followed close behind by the Main Wind Farm Site and the State at 7%. The Main Wind Farm Site has both the lowest average of persons unable to work and a higher average percentage of retired persons in comparison to the State, County, TDR and Grid Connection.

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 Commerce & Trade and Professional Services being the two most common employment sectors across all areas. The Main Wind Farm Site has the highest average percentage of persons employed in Agricultural, Forestry & Fisheries at 12% and the lowest average percentage of persons employed in Public Administration.



Table 11-6: Industry Distribution by Area

Persons at Work by Industry	State	County Carlow	Main Wind Farm Site	TDR	Grid Connection
Agriculture forestry & fishing	4%	7%	12%	6%	10%
Building & construction	5%	6%	8%	8%	7%
Manufacturing industries	11%	14%	13%	16%	14%
Commerce and trade	24%	23%	22%	22%	23%
Transport and communications	9%	5%	5%	5%	5%
Public administration	5%	5%	3%	4%	5%
Professional services	24%	22%	21%	22%	24%
Other	18%	18%	16%	17%	12%

Overall, the economic profile of the Main 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. Of note is that the average unemployment rate is highest along the TDR (11%) and lowest along the Grid Connection (5%). The Main Wind Farm Site has both the highest average percentage of retired persons (17%) and the highest average percentage of persons working in the primary economic activity sector (12%) when compared to the State, County, TDR and Grid Connection.

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

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

According to Institute for Sustainable Futures document (2015), 3.2 job years are created per MW of wind energy development during the construction and installation phase. Based on this employment estimate and an approximate two-year construction phase, approximately 62 jobs could be created during the construction phase (for an installed capacity of approximately 38.5MW).



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. Using this figure, a projection of approximately 46 jobs could be created as a result of the construction of the proposed development (for an installed capacity of approximately 38.5MW).

Therefore, it is considered that between approximately 46 and 62 staff/contractors could be employed during the construction phase of the project. The employment of tradespeople, labourers, and specialised contractors for the construction phase will have a direct short-term, positive impact on the local economy, bringing benefits to local service providers and businesses with a direct and indirect financial benefit to the local community.

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

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

11.4.3.1 *Economic Value & Employment Potential*

The proposed project will contribute to achieving Ireland's energy targets as set out in the Climate Action Plan 2019, which has a target of 70% of electricity generated from renewable sources by 2030. With a target increase in onshore wind of 8.2GW by 2030, the Croaghaun Wind Farm has the potential to contribute to 0.5% of this total.

The Sustainable Energy Authority of Ireland (SEAI) Renewable Energy in Ireland Report 2020 Update states that wind energy provided Ireland with 28% of its electricity in 2018. The use of renewables in electricity generation reduced CO₂ emissions by 4.9 million tonnes in 2018, displacing 1.3 million tonnes of fossil fuels, avoiding approximately €623 million in fossil fuel imports for that year. It is estimated that wind energy alone resulted in the avoidance of €432 million in fossil fuel imports (SEAI, 2020). These savings will continue to rise with the installation of further renewable energy developments.

Once the proposed Croaghaun 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. Based on this estimate, the proposed development (with an installed capacity of approximately 38.5MW) could be expected to contribute to between 11 and 15 long-term direct and indirect jobs.



Although only a small proportion of these jobs are likely to be directly based in the Main 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 benefit to the economy of County Carlow. 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 a slight positive indirect impact on employment in the Study Area, County Carlow and nearby towns.

Rates and development contributions paid by the developer will contribute significant funds to Carlow County Council which will likely be used to improve the services available to the people of the County. The Carlow County Council Development Contribution Scheme 2017-2021 indicates a charge of €3,070 per wind turbine installed. This suggests that a Development Contribution of up to €21,490 will be made payable by the applicant prior to construction (with up to 7 no wind turbines). 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. The payment of rates and development contributions is likely to have a significant benefitting impact on service provision in the County Carlow Area.

The terms of the Renewable Energy Support Scheme 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.

11.4.3.2 Community Benefit Fund

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 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 will be published by the Minister 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.

Coillte aim to develop long-life assets in such a way to ensure long-term benefits to the local community and economy are created and sustained. Coillte expects 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 and €1 per MWh for the remaining lifetime of the wind farm. If this commitment is improved upon in upcoming Government Policy, the figures will be adjusted accordingly.

Assuming that the export capacity of the proposed development will be approximately 38.5MW and is contracted under the RESS, it is anticipated that the community benefit fund for the proposed Croaghaun Wind Farm has potential to deliver up to €200,000 per year to the local community for the first 15 years of operations following the commissioning of the project, and €100,000 per year for the remaining lifetime of the project.



The provision of the Community Benefit Fund will have a significant positive impact on the socio-economic 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 economic benefits.

11.4.4 Property Value

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 RenewableUK 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), we do not find a consistent negative effect of wind turbines or wind farms when averaging across the entire sample of Scottish wind turbines and their surrounding houses. Most results either show no significant effect on the change in price of properties within 2km or 3km or find the effect to be positive.
- Results vary across areas: The results vary across different regions of Scotland. Our data does not provide sufficient information to enable us to rigorously measure and test the underlying causes of these differences, which may be interconnected and complex.

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.

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 in the Main Wind Farm Site and outlying areas. The influx of construction workers to the Main Wind Farm Site will have an indirect 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 slight, positive temporary impact to socio-economics, employment and economic activity in the Main 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 impacts 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 impact of the development with respect to socio-economics is considered to be slight positive impact 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 slight positive economic impact from income spent by construction and operations 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 long-term significant positive impact to the Main 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 Carlow and in the local area. This is considered a significant positive residual impact.

A slight long-term positive impact 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, resulting in a slight long-term positive impact for electricity users throughout the country.

Overall, the residual impact associated with socio-economics, employment and economic activity as a result of the proposed development is considered significantly 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 in line with Carlow County Council Planning Department's scoping response, as detailed in Chapter 5 of this EIAR.

11.5.1 Existing Environmental – Land Use

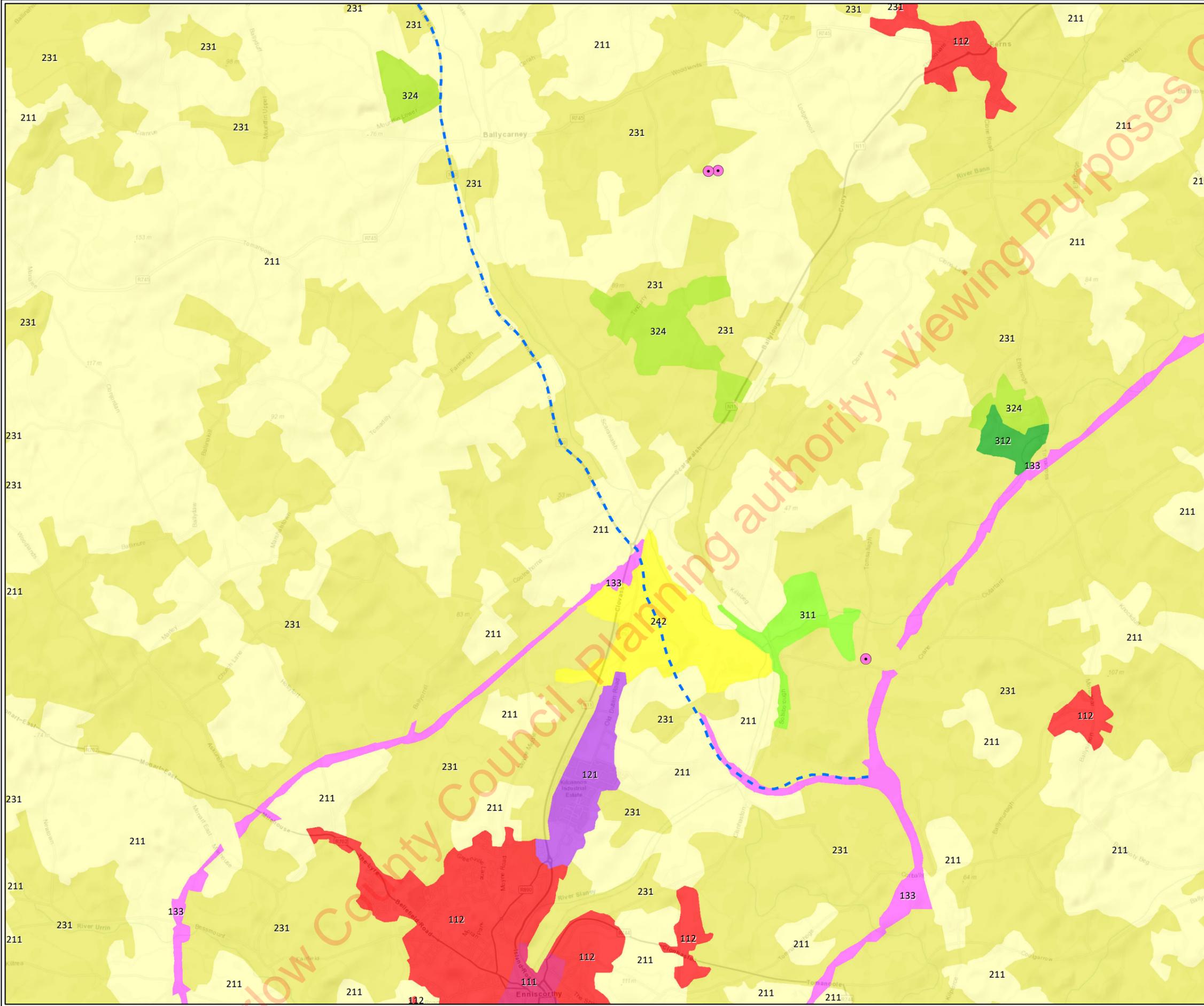
The proposed Croaghaun Wind Farm site is located in an area of coniferous forestry managed by Coillte and a small area of third party agricultural lands at the south west and east of the wind farm site. The forestry on-site has an ongoing maintenance, felling and replanting schedule which has a program to continue for the foreseeable future. The wind farm site also consists of a series of walking trails contained on existing Coillte tracks. These are used for recreational activity. An associate carparking area and signage is also present to the south of the site near the primary access route of the proposed development.

According to the Corine Landcover Database (2018) and site investigation surveys carried out during environmental assessment, the site is also located on a section of peat bog and a section of agricultural land which continues to the south of the site. Agricultural activity on these lands is primarily grazing and pasture. There is 1 no. wind farm in the immediate vicinity of the proposed development, Greenoge Wind Farm, which is located directly east of the proposed wind farm site. Greenoge Wind Farm consists of 5 no. wind turbines including Nordex N90s and Nordex N60s.

The land use of the greater area surrounding the site is predominantly agricultural lands. The Blackstairs Mountains are located south of the proposed development and consist of commercial forestry and recreational walking trails. Settlement in the area is made up of one-off rural housing and farmyards generally located along the road network of the area (Linear settlement pattern). There are 28 no. residential dwellings within 1.38km of the turbine locations. This distance represents 10 no. rotor diameters from the proposed turbine locations. The closest dwelling is located approx. 980m from the nearest turbine. Clusters of dwellings are focused on the local villages of Myshall and Kildavin, and the district town of Bunclody.

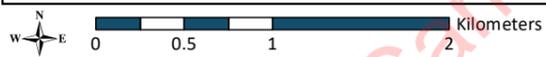
The Grid Connection is rural in nature. The route follows the public road, avoiding built up areas such as the town of Myshall to the north of the development.

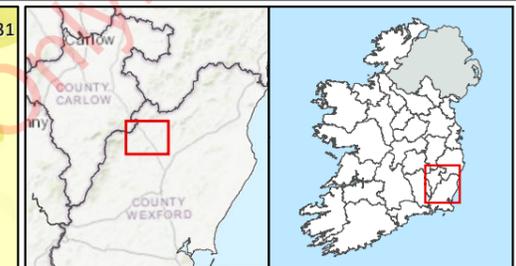
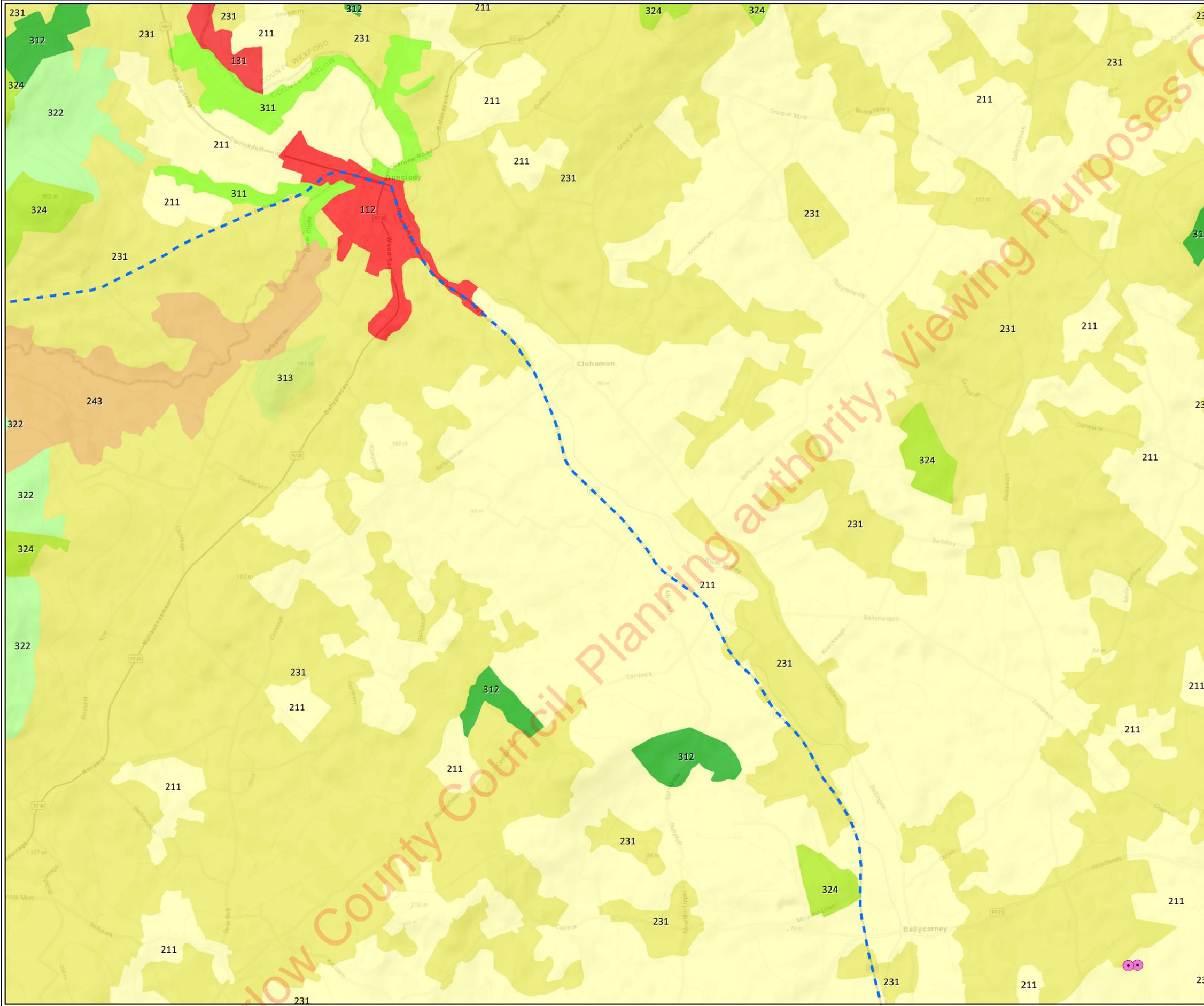
The route continues north https://uss.ftco.ie/DMS/view_document.aspx?ID=625705&Latest=true



- Kellistown Substation
 - Turbine Delivery Route
- CORINE Land Cover 2018**
- 111 Continuous urban fabric
 - 112 Discontinuous urban fabric
 - 121 Industrial or commercial units
 - 133 Construction sites
 - 211 Non-irrigated land
 - 231 Pastures
 - 242 Complex cultivation patterns
 - 311 Broad-leaved forest
 - 312 Coniferous forest
 - 324 Transitional woodland scrub

TITLE:	CORINE Land Cover 1/4	
PROJECT:	Croaghaun Wind Farm	
FIGURE NO:	11.4	
CLIENT:	Coillte	
SCALE:	1:40000	REVISION: 0
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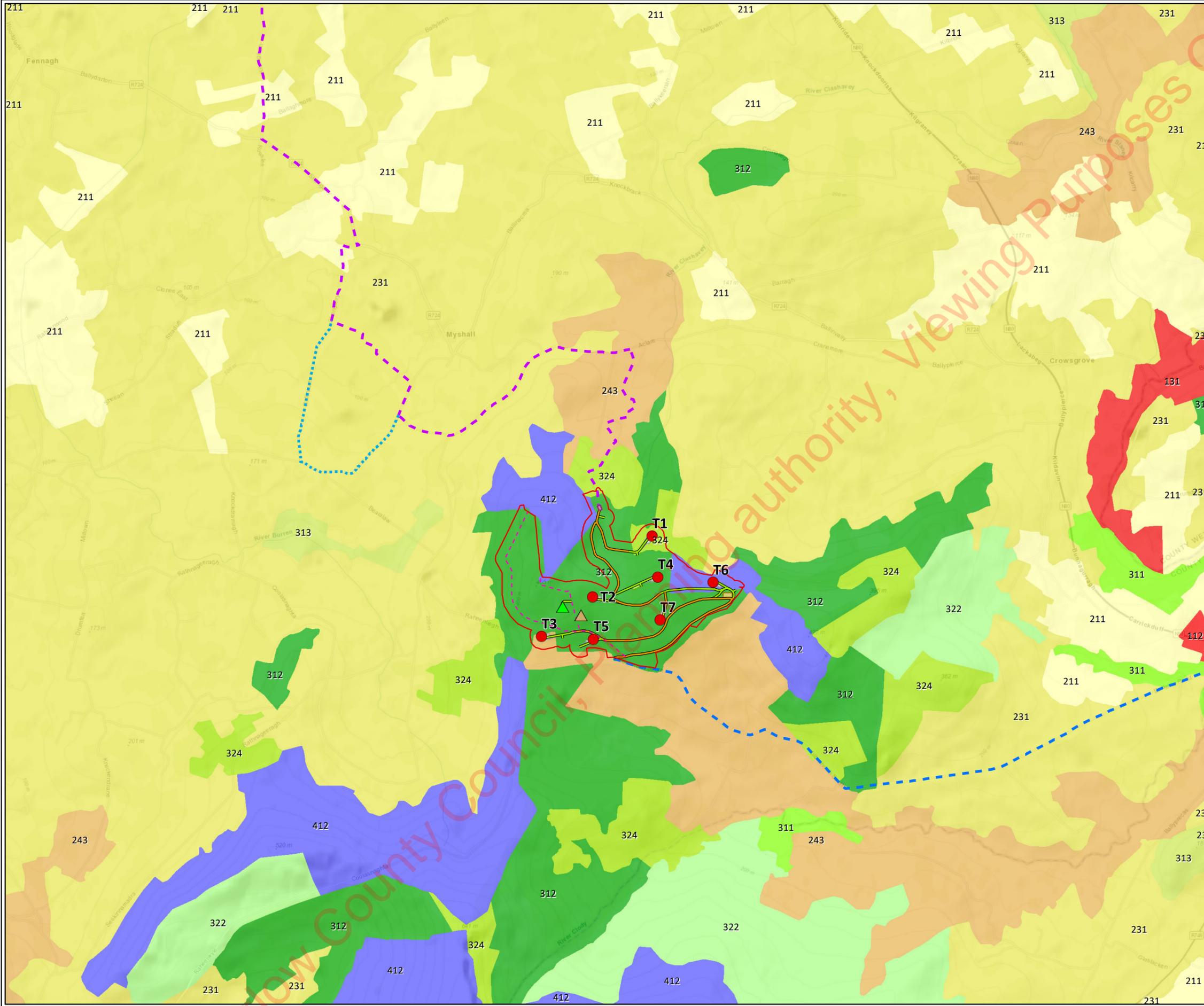




- Kellistown Substation
 - - - Turbine Delivery Route
- CORINE Land Cover 2018**
- 112 Discontinuous urban fabric
 - 131 Mineral extraction sites
 - 211 Non-irrigated land
 - 231 Pastures
 - 243 Land principally occupied by agriculture with areas of natural vegetation
 - 311 Broad-leaved forest
 - 312 Coniferous forest
 - 313 Mixed forest
 - 322 Moors and heaths
 - 324 Transitional woodland scrub

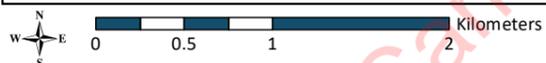
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PROJECT:	Croaghaun Wind Farm		
FIGURE NO:	11.4		
CLIENT:	Coillte		
SCALE:	1:40000	REVISION:	0
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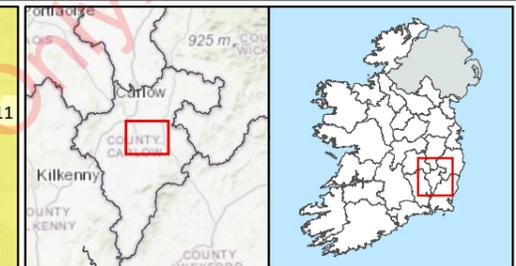
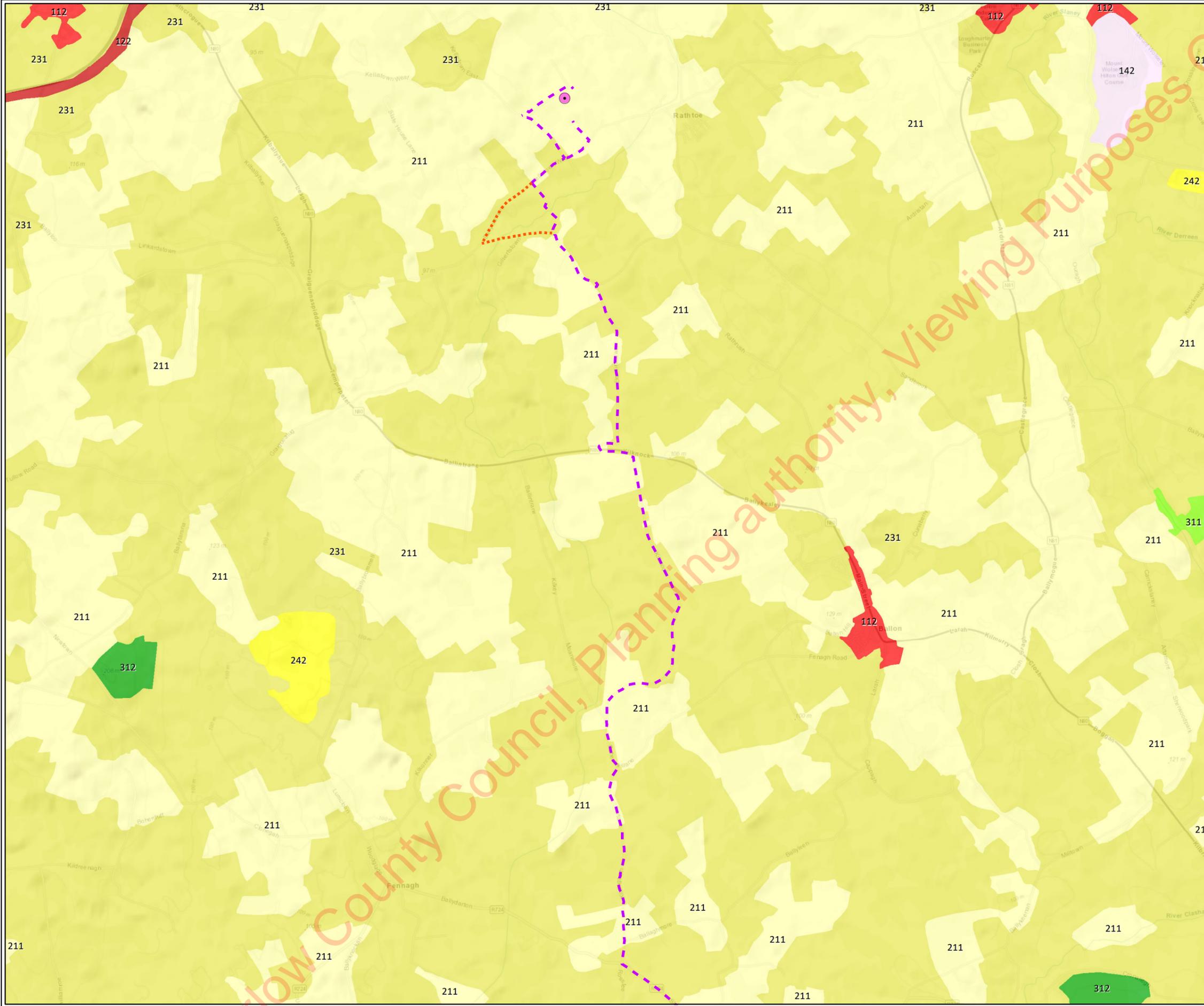




- Proposed Turbine Layout
 - Proposed Development Boundary
 - ▲ Existing 80m Met Mast
 - ▲ Proposed Permanent 100m Met Mast
 - Proposed Grid Connection Route
 - Grid Connection Route Variant 1
 - Proposed Croaghau Loop
 - Proposed Existing Road Upgrade
 - Proposed New Road
 - Turbine Delivery Route
 - Proposed Turbine Hardstanding
 - Proposed Borrow Pit
 - Proposed Temporary Compound
 - Proposed Substation Compound
- CORINE Land Cover 2018**
- 112 Discontinuous urban fabric
 - 131 Mineral extraction sites
 - 211 Non-irrigated land
 - 231 Pastures
 - 243 Land principally occupied by agriculture with areas of natural vegetation
 - 311 Broad-leaved forest
 - 312 Coniferous forest
 - 313 Mixed forest
 - 322 Moors and heaths
 - 324 Transitional woodland scrub
 - 412 Peat bogs

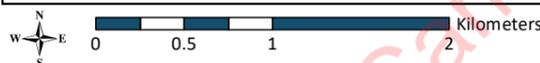
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PROJECT:	Croaghau Wind Farm	
FIGURE NO:	11.4	
CLIENT:	Coillte	
SCALE:	1:40000	REVISION: 0
DATE:	19/11/2020	PAGE SIZE: A3





- Kellistown Substation
 - Proposed Grid Connection Route
 - Grid Connection Route Variant 2
- CORINE Land Cover 2018**
- 112 Discontinuous urban fabric
 - 122 Road and rail networks
 - 142 Sport and leisure facilities
 - 211 Non-irrigated land
 - 231 Pastures
 - 242 Complex cultivation patterns
 - 311 Broad-leaved forest
 - 312 Coniferous forest

TITLE:	CORINE Land Cover 4/4	
PROJECT:	Croaghaun Wind Farm	
FIGURE NO:	11.4	
CLIENT:	Coillte	
SCALE:	1:40000	REVISION: 0
DATE:	19/11/2020	PAGE SIZE: A3



Carlow County Council, Planning Authority, Viewing Purposes





11.5.2 Potential Impacts – Land Use – Construction

The existing land-uses in proximity to the proposed Croaghaun 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 of the proposed development. This will occur on the forestry lands where the majority of the construction work will take place and to a smaller extent on agricultural lands where there is a single turbine located (T3) and a section of heath and scrubland where another single turbine is located (T6).

5no. proposed turbines, the proposed on-site substation, met mast, borrow pit and construction compound are located within forestry and consequently tree felling will be required as part of the project. Felling of approximately 24.4 hectares of coniferous forestry 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 moderate, permanent impact to forestry in the area. As part of the project, replant lands have been identified at Sroove, Co. Sligo and Crag, Co. Limerick. This is a requirement as part of the felling licence. Forestry activity at the site will cease during the construction phase resulting in a temporary slight negative impact to existing land use at the wind farm site.

Access to the Kilbrannish Wood recreation trail will be temporarily disrupted during the construction phase of the proposed development. Access will be limited to the site and the works will be required at the western carparking area to accommodate turbine delivery. The closure of the site area to recreational use during the construction phase will have a short-term significant negative impact on recreational land use at the site for the duration of 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 partially on agricultural lands, with the majority to be installed within the public road corridor. This may temporarily affect access to agricultural lands. Similarly, potential slight and temporary negative effects may occur to residential land use as a result of grid connection installation works along the grid route. This impact is likely to be slight, temporary as the installation works for cable trenching will be completed quickly and in sections. 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. The proposed off-site substation will be located adjacent the existing Kellistown Substation. This will be positioned in an adjacent agricultural field and will result in a permanent impact to agricultural land use at this location. Due to the limited extent of the proposed off-site substation, this impact is expected to be non-significant.

TDR node upgrade activity has potential for non-significant, temporary impacts to town centre activities in the Settlement of Bunclody as accommodation works will be required at a number of points within the town. This is likely to have non-significant impact due to the small extent of the works and may cause temporary inconvenience with respect to traffic and parking in the town centre and potential brief effects to the supply of electricity and telecommunications to homes and businesses as a result of temporary removal of services. Turbine delivery may impact on land use temporarily due to the transportation of oversized loads on the public road. This is likely to have a slight temporary negative impact on residential land-use due to noise nuisance as a result of machinery. The impact of noise is further considered in Chapter 7 – Noise and Vibration.

11.5.3 Potential Impacts – Land Use – Operational

Given that the footprint of the proposed development will occupy a small proportion of the development site area when operational, as illustrated in figure 11-4, it is anticipated that there will be minimal impact on existing land uses arising from the operational phase.



The operational phase of the Croaghaun 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 majority of the lands impacted are currently in use for commercial forestry. The removal of approximately 24.4 hectares of commercial forestry lands will have a slight negative long-term effect on the existing forestry land use, however, the remaining forested area will continue its ongoing commercial maintenance, felling and replanting schedule throughout the operational life of the proposed project.

The project will consist of replant lands as detailed in section 3.5.19 of this EIAR. This will act to offset the loss of forested lands and will also result in the change in land use of existing scrub land to commercial forestry at the location of the proposed replant lands. An assessment of the replant lands are included in Appendix 3.3 and Appendix 3.4 of Volume 3 of this EIAR.

There will be 1 no. turbine located on agricultural lands (T3). This will result in the change of use of an area of approximately 0.6 hectares from agricultural pasture land to wind farm use. This will have a slight, negative impact on agricultural land use due to the removal of grazing lands for the duration of the project. There will be 1 no. turbine located on scrub/heath land (T6). This will result in the change of use of an area of approximately 0.7 hectares of scrub/heath to wind farm use. This will have a non-significant impact on land use due to the lack of activity on the scrub/heath land.

The operational phase of the Croaghaun 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). This includes the adjacent Greenoge Wind Farm which operates adjacent agricultural practice. Existing land-use, such as grazing livestock or crops can continue on the site as normal. As such, there will be no significant impact to agricultural practice as a result of the proposed development.

The operational phase of the Croaghaun Wind Farm will provide additional recreation infrastructure at the wind farm site. The proposed works as described in section 3.5.21 will include the upgrade of 2.74km of existing forestry tracks and paths as recreational amenity trails to include trail signage and way markers. This will create an additional walking trail at the wind farm site. The inclusion of these elements in the project will have a long-term significant positive impact on recreation land use at the site and will maintain the existing recreational land use at the site.

The proposed upgrades have been selected to compliment a recreation development concept which is being developed for the Kilbrannish Forest and Croaghaun Mountain area. This concept plan is being sponsored by Coillte and developed in consultation with Carlow County Council and the local community. The map shown in Figure 11-5 illustrates the overall strategic concept for Kilbrannish Forest and Croaghaun Mountain. The above proposal is being prepared with particular consideration to the County Carlow Tourism Plan, The County Carlow 2021 Local Economic and Community Plan, Borris Our Vision and Bunclody Tourism as well as other community and special interest strategies and consultation.

Only the sections of trail upgrades and associated signage and way-markers described in Section 3.5.1 which are located within the Main Wind Farm Site development boundary are included as part of the Croaghaun Wind Farm Project. A subsequent community benefit fund associated with the Croaghaun Wind Farm project may lead to further development in Kilbrannish forest as well as in Kilbrannish South, Nine Stones, Mount Leinster and the Blackstairs Mountains if desired by the community.

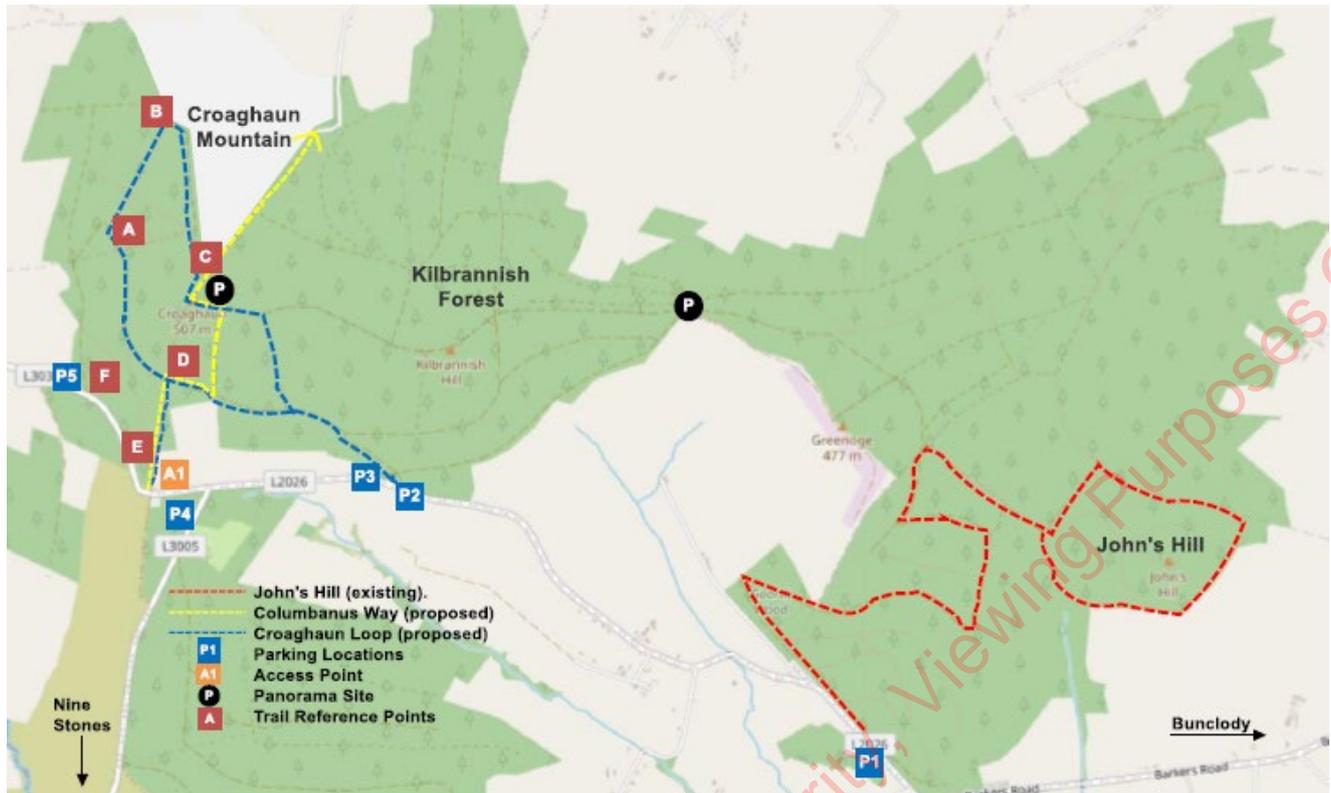


Figure 11-4: Proposed Recreation Infrastructure Development

Activity is not expected at the Grid Connection and TDR during the operational phase of the proposed project. There is potential for repair works along the grid connection 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. There is also potential for temporary restrictions to recreational trail use if this were to take place at the site during the operational life of the proposed development.

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 as they are primarily used for forestry and recreation activities.

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 practices. During decommissioning works forestry access tracks may be in use by construction crews which may temporarily prohibit access to certain areas of forestry. Impact is expected to be slight and temporary.



Similarly, during decommissioning, the works will result in the temporary closure of tracks for recreation activities. This will have a temporary slight negative impact on recreation activity in the area.

Following decommissioning, areas of the site cleared of forestry may be replanted if suitable. Forestry practices and recreation activity will also benefit from the upgraded access tracks left in situ throughout the site resulting in a 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 at the decommissioning phase.

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 in order to minimise the construction of new tracks and roads and minimise the removal of forested areas. Where new access tracks 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 will provide 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 effect 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 practices as a result of the upgrading of access tracks throughout the site will cause a moderate, positive impact for forestry at this location. Similarly, the provision of new and upgraded recreation walking trails will have a long-term significant positive impact on recreation land use at the site.

Other infrastructure that will remain in situ includes turbine foundations and hardstands which will be covered over and vegetated. The on-site substation and the off-site substation at Kellistown will be taken in charge by Eirgrid or ESB. The grid route cable will remain in situ and form part of the national grid. These elements will result in a slight, imperceptible residual impact on land use.



The loss of 24.4 hectares of commercial forestry will have a slight negative residual impact on forestry land use in the area of the proposed wind farm, however, the provision of replant lands located at Sroove, Co. Sligo and Crag, Co. Limerick, consisting of a total area approximately 24.4 hectares of replanted forestry will result in a neutral residual impact on forestry land use at a national scale.

11.6 Recreation, Amenity and Tourism

This section provides a comprehensive overview of the recreation, amenity and tourism value for the study area, County Carlow and the State in order to assess the potential effects arising from the proposed development. As 2020 has 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. This section had regard to Fáilte Ireland’s ‘Guidelines on the Treatment of Tourism in an Environmental Impact Statement’ in line with the recommendations of the scoping response received from the prescribed body. 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 is one of the major contributors to the national economy and is a significant source of full time and seasonal employment. Tourism statistics for 2019 as published by Fáilte Ireland (August 2020) state that overseas tourism grew by 0.9% on 2018 figures with over 9.6 million visitors. Expenditure from overseas tourism was estimated to be down by -0.9% remaining strong at €5.1 billion. Fáilte Ireland’s 2019 survey results indicate that the most popular recreation activity for tourists was hiking and cross country walking.

Regional tourism performance figures for 2018 have been made available to the public by Fáilte Ireland. As demonstrated in Table 11-7 below, tourist numbers for the South-Eastern region totalled 1,028,000 overseas visitors in 2018. Tourist revenue accounted for €261 million for overseas tourists. Northern Ireland tourist figures totalled 22,000 tourists in 2018 with €8 million in revenue generated from Northern Ireland visitors.

Table 11-7: South East Regional Performance (Tourists in 2018)

Region	Item	Britain	Mainland Europe	North America	Other Areas	All Overseas	Northern Ireland	Domestic Trips
South East	Tourists (000s)	296	358	296	78	1,028	22	1,683
	Tourist Revenue (€mn)	83	86	70	22	261	8	304

Policy surrounding Tourism, Recreation and Amenity is set out in Chapter Eight of the Carlow County Development Plan 2015 – 2021 (CDP). This chapter outlines objectives to encourage and facilitate the development of sustainable tourism as a pillar of economic growth. Key national walking routes are highlighted as an asset as well as various golfing facilities, the Carlow Garden Trail and the Rivers Barrow and Slaney for the passive and active water enthusiast.



The Blackstairs Mountains are also noted as one of the most important natural attractions in the county and the “Nine Stones” vantage point is noted for its views. The CDP also notes Coillte’s “open forest” policy which allows the visitor to access and enjoy woodland areas including Kilbrannish Woods. The CDP states that Carlow County Council will seek to improve access to the excellent walking product in the county, through the development of looped walks in co-operation with relevant stakeholders.

The Kilbrannish forest recreation area adjoins the proposed wind farm site and is made up of two looped walks, the 3km ‘Windfarm Loop’ and the 5km ‘Kilbrannish Forest loop’. It includes a carpark of 10-spaces, picnic area and detailed map board. A section of the South Leinster Way passes through these looped walks. This is a 104km long-distance walking trail from Kildavin, near Bunclody, to Carrick-on-Suir. It is a National Waymarked Trail which opened in 1984. A 2010 review of National Waymarked Trails by the National Trails Office indicated that the use of the route for multiday use is low, while sections of the route have medium to high day usage.

The Columban Way is a cultural walking route being developed across Europe which begins in the Backstairs Mountains. A section of the route passes through the proposed wind farm site.

The County Carlow Outdoor Recreation Strategic Plan (2020) aims to provide opportunities to benefit from quality outdoor experiences in support of wellbeing, health and local economy, with an overall vision of providing Sustainable, Local, Inclusive outdoor recreation. The strategy identifies the existing outdoor recreation assets of County Carlow which includes a concentration of sites in proximity to the proposed Croaghaun Wind Farm Site. These sites include Hillwalking and Walking Trails. An extract from the strategy, ‘Figure 3: existing outdoor recreation sites’, is included in Figure 11-6 below.

The strategy places the Blackstairs Mountains as a cornerstone of natural outdoor recreation resources in County Carlow for hillwalking, mountain-biking and paragliding/hang-gliding activities. Furthermore, the strategy sets out actions for the Myshall Area which includes provision of additional connecting trails, trailhead and mountain links at Myshall, development of the Columban Way and continued engagement with Coillte regarding the provision of further outdoor recreation opportunities at Kilbrannish Hill and Kilbrannish South.

The Mount Leinster Heritage Drive is a 75km looped scenic drive that includes heritage features, scenic walks, stately homes, and viewing points, passing through the towns of Bagninastown, Borris, Myshall and Bunclody. A section of this route passes directly south of the site on the L2026.

Hang-gliding and paragliding activities take place around the Mount Leinster area. The Irish Hang Gliding & Paragliding Association (IHPA) identify four locations in Co. Carlow for flying as set out in the IHPA Site Guide Issues 4 (July 2015). The four locations and their associated assembly points are illustrated in Figure 11-7 and are considered further in Section 11.6.3. The four locations include the following:

- Westerly Car Park Mt Leinster
- Black Banks Mt Leinster
- Slievebawn Mt Leinster
- Mast Mt Leinster

Other recreation and tourism amenities located in the wider area of the Croaghaun Wind Farm Site include:

- Rathnageeragh Castle, located ca. 4km west
- Southern County Fishing and Wildlife Park, located ca. 5km west



- River Slaney, located ca. 5km east
- Mount Leinster, located ca. 5km south
- Bunclody Golf Course, located ca. 6km east
- Blackstairs Eco-centre, located ca. 8km south west
- Holy Year Cross, located ca. 8km south
- Huntington Castle & Gardens, located ca. 8km north east
- Altamont Gardens, located ca. 8km north
- Borris Golf Club, located ca. 13km south west
- River Barrow, located ca. 13km west.

Overall, the most significant recreation activity at the proposed Croaghaun Wind Farm site is trail walking and hiking.

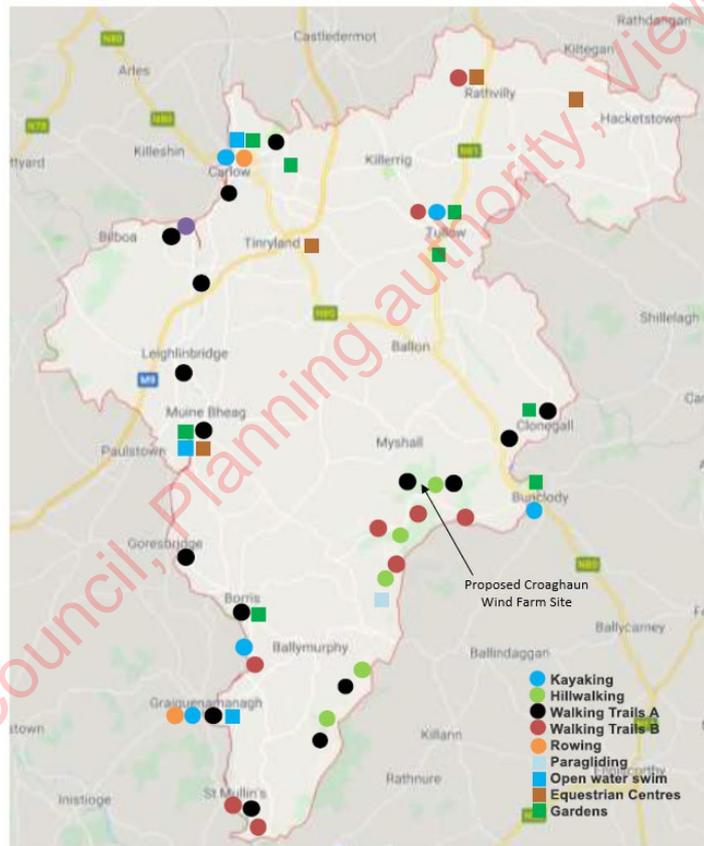


Figure 11-5: Existing outdoor recreation sites (extract from County Carlow Outdoor Recreation Strategic Plan)



Community Facilities

Community facilities in proximity to the Main Wind Farm Site including schools, clubs, health centres and religious establishments are focused in the surrounding settlements of Myshall and Bunclody.

There are a number of schools in the area of the wind farm. Myshall National School is located approx. 2.3km north west of the Wind Farm Site. Kildavin National School is located approximately 5km north east of the wind farm site and Carrigduff and Our Lady of Lourdes National Schools are located in Bunclody, approximately 6km to the east of the site. FCJ secondary school is also located in Bunclody and a vocational college is also located in the town.

Myshall is the most proximate settlement to the wind farm site, located approx. 2km to the north west. This settlement has a number of community facilities including a community centre, Naomh Eoin GAA Club, 2 no. churches and town centre services such as a post office, health centre and convenience shops.

Bunclody, approx. 6km to the east of the site is located along the proposed TDR. This is a larger town by comparison to Myshall and has a larger range of facilities including Bunclody GAA Club, swimming pool, two medical centres, a clinic, fire station, library, 2 no. churches, town square and town centre services including supermarkets, shops and restaurants and bars. The town is serviced by 3 no. regional bus services.

There are no significant community facilities located along the proposed grid route element of the project. Ballon GAA club is located approximately 0.5km east of the route.

11.6.2 Potential Impacts - Recreation, Amenity and Tourism - Construction

During the construction phase of the proposed Croaghaun Wind Farm, construction works have potential to cause impacts on recreation, amenity and tourism activities within the vicinity of the site. This is likely to occur in close proximity to the construction site and has potential to impact on the existing Kilbrannish Wood Amenity trail, a two-loop trail throughout Coillte lands. This will also impact on a 1.5km section of the Leinster Way walking trail which passes through the site. This section of trail will be closed to the public during the 12-18 month construction phase as the upgrade works will be carried out on these paths which will also be used by vehicles and machinery for access. The trail will be diverted onto the public road to bypass the closed section of trail during the construction period.

Other forestry trails within the proposed wind farm site used by hikers and walkers under Coillte's Open Forest Policy will also be closed to the public during the construction phase for safety reasons. The closure of these trails and tracks will result in a significant temporary negative impact on recreation activity at the wind farm site. This section of trails and tracks is expected to remain closed for duration of the construction phase of 12-18 months. However, trails adjacent to the site such as Deerpark Old will remain accessible for the duration of the construction works. The Columban Way walking route which is currently being developed by the Local Authority and Local Groups will pass through the wind farm site; however, the route will be diverted to the public road during construction of the proposed wind farm.

Activities associated with the nearby attractions including the "Nine Stones" vantage point and Mount Leinster may experience indirect impact due to construction activities as a result of nuisance in the form of increased traffic and noise. This may have a slight temporary negative impact on activities associated with these nearby amenities.



Detail in relation to potential traffic impacts as a result of the construction of the Croaghaun Wind Farm is provided in Chapter 13: Traffic and Transportation. Detail of potential visual impacts during the construction phase is dealt with in Chapter 15: Landscape and Visual, and potential effects of construction noise and vibration is discussed in Chapter 7: Noise & Vibration.

No significant recreation, amenity or tourism facilities have been identified along the TDR or grid route and as such, it is unlikely that these elements of the project will have a negative impact on recreation and tourism. The TDR route passes through Bunclody Town Centre. There is potential for the TDR node upgrades to cause non-significant, temporary impacts to town centre activities due to limited construction works. Furthermore, the delivery of turbines through the town may impact on town centre activities and community facilities. However, it is likely that turbine component delivery will be carried out off-peak to avoid significant impact on town centre services, facilities and activities.

In relation to tourist performance of the County and South East Region, it is unlikely that the construction phase of the proposed development will have a significant negative temporary impact on tourism performance as the footprint of the proposed development is relatively small and therefore it is unlikely that the impact associated with the construction phase will be far reaching.

11.6.3 Potential Impacts - Recreation, Amenity and Tourism – Operational

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 work 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.’



Further research has been undertaken in Scotland in 2011 by Visit Scotland who have produced a Wind Farm Consumer Research report which showed that 83% of those surveyed said a wind farm would not affect their decision about where to stay when on a holiday or short break in Scotland. Also, against a backdrop of increased wind farm deployment, Visit Scotland's statistics showed the number of visits to Scotland last year and the amount of spending by visitors both increased while their 'Scotland National Visitor Survey 2011' made no mention of the issue of wind farms affecting tourism in Scotland.

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 Croaghaun Wind Farm is described in Chapter 15 – Landscape and Visual

The operational phase of the Croaghaun Wind Farm will provide an upgrade of 2.74km of existing forest track for the purpose of recreation and amenity. A section of these upgraded tracks form part of the existing Kilbrannish Wood recreation trail as well as a section of the South Leinster Way. The inclusion of this element of the project will maintain and improve recreation activity at the site, provide a long-term significant positive impact on recreation, amenity and tourism.

Links to cultural heritage are also considered at the site. A standing stone sited c.560m to the west of the proposed location of Turbine 2 (as detailed in Chapter 14: Archaeology, Architectural and Cultural Heritage). It is proposed to provide signage at the site linking the proposed walking trail to the standing stone to enhance the cultural heritage offering of the proposed amenity trail.

The development of further recreation facilities at the Croaghaun Wind Farm site will help achieve County Development Plan objectives by improving the 'walking product' in the County, through the improvement of existing trails and the development of a new looped walking trail as well as capitalising on the most popular tourist activity in Ireland of 2019 (Fáilte Ireland, 2020), as detailed in section 11.6.1. The provision of upgraded and additional walking trails will also aid in achieving the aims of the County Carlow Outdoor Recreation Strategic Plan (2020), in accommodating a section of the Columban Way, providing additional connecting trails and provision of further outdoor recreation opportunities at Kilbrannish Hill. Overall, the proposed recreation trail will promote sustainable active outdoor activity for locals and visitors in line with the County Carlow Outdoor Recreation Strategic Plan.

As detailed in Chapter 15: Landscape and Visual, the magnitude of the landscape impact is deemed to be Medium within the Central Study Area, whereas, beyond 5km from the site, the magnitude of landscape impact is deemed to reduce to Low and Negligible at increasing distances as the wind farm becomes a proportionately smaller component of the overall landscape fabric. Considering this, it is unlikely that the proposed operational development will detract from the recreation, tourism and amenity offerings of the site and surrounding area.

Overall, it is expected that the operational phase of the proposed development will have a long-term significant positive impact on recreation, amenity and tourism in the area by providing new and upgraded recreation trails at the site, contributing to aims and objectives of the County Development Plan and the County Carlow Outdoor Recreation Strategic Plan (2020).

There is however potential for a moderate negative impact on hang gliding and paragliding activities currently taking place in the area. The Mount Leinster area of Co. Carlow is known to be popular for Hang Gliding. Hang Gliding and Paragliding in Ireland is not regulated and the area in question is not designated for such activities. However, the IAA recommends that those considering in engaging in this activity contact the Irish Hang Gliding & Paragliding Association (IHPA)



The IHPA Site Guide Issue 4 (Irish Hang Gliding and Paragliding Association Limited, 2015) identifies four locations in Co. Carlow for flying, listed in Table 11-8. These locations are illustrated in Figure 11-7 along with the main assembly points indicated in red.

Table 11-8: Hang-gliding and Paragliding Sites in Co. Carlow (Extract from the IHPA Site Guide 2015)

Site	County	Wind Direction	Skill Level
Westerly Car Park, Mt Leinster	Co. Carlow/Co.Wexford	W	Intermediate to Advanced
Black Banks, Mt Leinster	Co. Carlow/Co.Wexford	NW-N	Intermediate to Advanced
Slievebawn, Mt Leinster	Co. Carlow/Co.Wexford	N-NE	Intermediate to Advanced
Mast, Mt Leinster	Co. Carlow/Co.Wexford	SE-WSW	Advanced

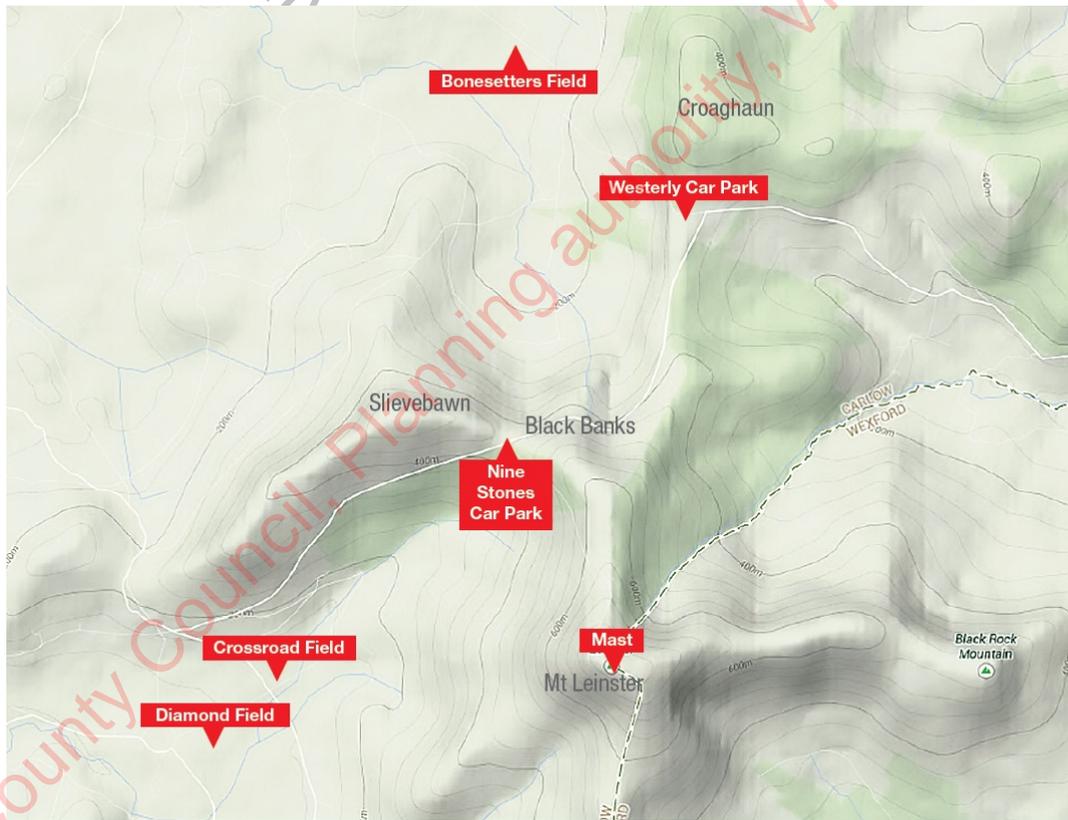


Figure 11-6: Hang-gliding & Paragliding Sites in Co. Carlow

The Nine Stones car park shown in the map below is identified as the main assembly point for pilots. As noted in the table above, the Westerly car park which is proximate to the wind farm site is identified as the best place to take off from, when winds are from a westerly direction. Slievebawn is identified as a good take off point for, N – NE winds while Black Banks is identified as suitable for NW-N winds. Mast is identified as suitable for a wide range of wind directions (SE,WSW) but is only suitable for more advanced pilots.



Coillte have been consulting with the IHPA and will continue to consult in order to seek to minimise potential impacts on hang gliding activities in the area. However, for the purpose of this EIAR the worst case scenario is that the Westerly Car Park will become unusable for hang-gliding and paragliding. In such circumstances this will have a moderate negative impact however, the wind farm will not create an overall significant impact on this activity in the wider area as it will not negatively impact on the other locations for hang-gliding and paragliding activity in the area.

As part of ongoing engagement, Coillte have discussed the possibility of locating IHPA wind monitoring equipment on Croaghaun Wind Farm's permanent meteorological mast to allow IHPA to assess real time wind conditions prior to travelling to site.

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.

Decommissioning works will include removal of above ground structures including the turbines, mountings and fencing. During the works, forestry tracks and amenity trails in proximity to the site will be closed to the public to assure public safety. Similar to the construction phase, this is expected to have a moderate temporary impact on recreational trail walking and hiking at the Croaghaun Wind Farm site.

Furthermore, the increased traffic associated with decommissioning works has the potential to create an indirect impact on the nearby amenities as a result of nuisance in the form of increased traffic and noise. This may have a slight temporary negative impact on activities associated with these nearby amenities.

Due to the temporary nature of both the construction and decommissioning phases, the overall development of the Croaghaun Wind Farm 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 Croaghaun 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 Croaghaun 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.

The most significant potential for tourism and recreation activity in the site area was identified as trail walking and hiking. The development of the proposed Croaghaun Wind Farm has the potential to increase the amenity value of the area by improving recreation facilities, providing both new and improved trails in and around the site which can be used for walking and hiking. This provision is in keeping with the character of recreational activities popular in the area.

In providing for public safety, appropriate signage and safety measures will be put in place where forestry tracks will be closed to the public due to construction and decommissioning activities.



During the construction phase a diversion will be put in place for the section of the South Leinster Way and Columban Way which pass through the wind farm site. This will direct walkers to the public road in order to bypass the construction site. Appropriate signage will be put in place to direct walkers. Notification of this diversion will be provided to Sport Ireland, Fáilte Ireland and Carlow County Council in order to provide online information for walkers and hikers in advance of their recreation activity.

Chapter 13 – Traffic and Transportation sets out mitigation measures for affects associated with increased traffic volumes associated with the construction and decommissioning 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

While there is potential for a slight, temporary impact to recreation, amenity and tourism due to the closure of existing forestry tracks during the construction and decommissioning phases of the proposed development, 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 Croaghaun Wind Farm. Under worst case scenario, a moderate negative impact to hang-gliding and paragliding activity will occur in close proximity to the site due to the presence of the proposed wind turbines, however, much of this activity is concentrated to the south of the site around Mount Leinster and can continue during the operational phase.

A residual long-term significant positive impact on recreation, amenity and tourism is expected as a result of the provision of new and improved recreation facilities at the site which will remain after decommissioning of the wind farm development.

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 of 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 Croaghaun 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 (2016) has published a report entitled 'Health in Ireland, Key Trends 2016' which provides statistics relating to human health in Ireland over the last 10 years. Generally speaking, Ireland's population has a high level of good health as demonstrated in self-evaluation statistics included in Census data (see Table 11.9 below).

From analysis of the health statistics below, the general health of the Main Wind Farm Site, TDR and Grid Connection is very good or good, in line with State and County-wide averages. The Main Wind Farm Site and Grid Connection have approximately the same averages, with 89% of respondents of the 2016 Census indicating that their health was 'good' or 'very good' and 1% indicating their health was 'bad'. Less than 0.5% of respondents indicated their health was 'very bad' for these areas.



The TDR has slightly lower averages of respondents in ‘very good health’ with 5% less than the Main Wind Farm Site Area and the Grid Connection, but overall, the averages match that of the County and State. Overall, the Census data indicates that the population of the Main Wind Farm Site, TDR and Grid Connection are generally in good health.

Table 11-9: Population by General Health (Census, 2016)

General Health (Census 2016)	State	County Carlow	Main Wind Farm Site	TDR	Grid Connection
Very Good	59%	58%	63%	58%	63%
Good	29%	28%	26%	29%	26%
Fair	8%	9%	8%	9%	8%
Bad	1%	2%	1%	2%	1%
Very Bad	0%	0%	0%	0%	0%
Not Stated	3%	3%	2%	2%	2%

With respect to health and safety, the Health and Safety Authority of Ireland monitor fatal workplace injuries throughout Ireland. In relation to construction activities, in the past 10 years (2010 to 2019) an average of 8.1 fatal workplace injuries have occurred throughout Ireland. This is above average in relation to other economic sectors. The average number of fatal workplace injuries throughout all economic sectors for the past 10 years in Ireland has been 4.5 fatal workplace injuries per year. This indicates the above average danger levels which workers are exposed to on construction sites.

With regard to the control of major accident hazards involving dangerous substances, on examination of upper and lower tier Seveso Establishments in the surrounding region of the proposed development, no Seveso Establishments were identified in proximity to the site.

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 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 with electricity during commissioning;
- Working at heights;
- Working in confined spaces;
- Ground conditions and soil stability;



- Substation construction involving high voltage electricity;
- 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.

The works proposed as part of the Croaghaun 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 if proper construction and safety protocols are not followed.

At the time of preparation of this chapter, the COVID-19 virus represents a significant risk to human health. Similar to any construction site, potential for spread of the virus during the construction phase of the proposed development may occur due to potential transmission from worker to worker due to construction activities and potential for close quarter working conditions. Up to date HSE guidance will be consulted regularly in line with HSA recommendations and all reasonable on-site and travel precautions will be taken if COVID-19 remains a significant health issue during the construction phase.

Potential health and safety hazards may occur on public roads and adjacent land uses including agricultural lands and forestry lands and associated recreation uses (forestry tracks). As detailed in section 3.6.1, the proposed wind farm site is used for recreation activity. A key risk to public safety associated with the construction of the proposed development involves the potential for recreation users accidentally entering the wind farm construction site. If unmitigated, this has potential for temporary significant negative impact on human safety. To mitigate against this, the wind farm site and associated walking trails will be closed to the public during the construction phase, as detailed in Section 11.7.5. Furthermore, potential impact to public safety may occur as a result of the closure of forestry tracks used for recreation activity which may cause confusion or disorientation for recreation users.

Construction 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 and forestry lands creating a potential hazard. This may cause a potential moderate, temporary impact to public safety.

The delivery of turbines will require transport of heavy/bulk goods from Dublin Port to the wind farm site via the Dublin Port Tunnel, M50, N11, M11 and from Junction 25 of the M11 to the 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 manoeuvring points. This has potential for significant impacts to human safety 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 distance between the nearest receptor and source of emissions at the wind farm site, the 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 short term, temporary and slight. Therefore, the construction phase of the Croaghaun 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 slight and temporary 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 significant temporary impact at nearby dwellings, however, given the nature of the grid connection works, construction activities will not occur over an extended period 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 slopes have been considered stable at the wind farm site. Considering the mitigation measures as set out in Chapter 9: Land, Soils and Geology, the impact on human health during construction works is expected to be negligible.

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 no 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 negligible and these flows are further reduced with the proposed drainage system.

Overall, if unmitigated, the construction phase of the proposed development has potential for significant 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

11.7.3 Potential Impacts - Human Health & Safety – Operational

11.7.3.1 Site Access and Usability of Lands

The proposed Croaghaun Wind Farm is designed to last up to 35 years. During the operational period, there is potential impacts 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.

Under normal conditions, operational wind turbines do not pose a threat to public safety or the safety of animals.



With respect to safety aspects, Section 5.7 of the Wind Energy Development Guidelines (2006) state 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.”

Throughout the operational phase of the proposed development, trails within Coillte lands will be open for recreational walking and hiking. Many of these tracks will be upgraded during the construction phase improving amenity for walkers. The trails will not come in proximity to electrical infrastructure. The off-road trails will provide a safe area for children and adults to exercise in the countryside. No likely significant negative impacts to public safety will occur due to the use of forest trails.

The use of forest trails will provide opportunities for health gain through encouragement of exercise. This has potential to provide a long-term moderate positive impact to human health in the locality.

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.

11.7.3.2 Health and Safety Standards and Procedures

As part of the human health assessment of the proposed Croaghaun 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 has generally 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 Syndrome – An independent review of the state of knowledge about the alleged health condition’, Expert Panel on behalf of Renewable UK, July 2010.
- ‘Wind Turbine Sound and Health Effects - An Expert Panel Review’, American Wind Energy Association and Canadian Wind Energy Association, December, 2009.
- ‘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, there will be no exceedances to the guideline limits as set out in the Wind Energy Development Guidelines (2006). In terms of noise, operational wind farm noise levels meet the derived night and daytime noise limits at all residential properties surrounding the Croaghaun Wind Farm.

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. 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 policy-makers establish guidelines for ELF-EMF exposure for both the general 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 11-10: 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 0.13 μT directly above ground (ESB, 2017), 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 Croaghaun Wind Farm and the Kellistown 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 Croaghaun 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 Croaghaun Wind Farm.

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 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 Croaghaun 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 Croaghaun 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 Croaghaun 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; and
- Landslides.

Flooding

In the event of extreme weather conditions there is potential for the proposed development to impact on human health and the surrounding environment due to increased surface water runoff as a result of additional impermeable surfaces such as wind turbine hardstands. This has potential to add to flood risk which may 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 proposed development does not have a negative impact on flood risk in the surrounding area and therefore the increased risk of flooding as a result of the proposed development is negligible. In the event of extreme weather conditions, the proposed surface water drainage will manage storm water avoiding significant impact on the project's infrastructure. Therefore, the proposed development will not result in increased flood risk and will not result in effects on human safety (including traffic), water quality, biodiversity, soil stability, material assets and archaeological or architectural heritage, as a result of increased flood risk.

Mitigation measures are set out in Chapter 10: Hydrology and Water Quality to avoid potential 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 impact for the Croaghaun Wind Farm, in particular, given that the majority of the site is adjacent to forestry. It should be noted that a significant number of wind farms are built within forestry in Ireland. An internal Coillte fire and security management plan is 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 a fire at the Croaghaun Wind Farm, there is potential for 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, 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 CGEP will have an effect on noise and vibration and telecommunication and aviation.

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

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.



These impacts can have a significant to profound impact 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 Croaghaun Wind Farm site to investigate 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. The investigation identified a thin layer of peat deposit which was classed as a highly organic topsoil with 'peat appearance'. As such, potential peat stability issues were ruled out at the proposed infrastructure locations.

Mitigation by design has been incorporated to the project to avoid potential effects from landslides. Mitigation measures for potential landslide/slope failure is 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 to natural disaster of the proposed Croaghaun Wind Farm is negligible.

11.7.4 Potential Impacts - Human Health & Safety – Decommissioning

The decommissioning phase of the proposed development is 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 impact on human health and safety is expected to be low and temporary.

During the decommissioning works there is potential for 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 moderate and temporary. 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 impact to public health and safety. Once good practice is followed, the potential for impact on public health and safety is expected to be temporary and non-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. Furthermore, a Construction and Environmental Management Plan is included in appendix 3.2, 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.

Up to date HSE guidance will be consulted regularly in line with HSA recommendations and all reasonable on-site precautions will be taken to reduce the spread of COVID-19 on construction sites.

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.

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 and associated recreation trails 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.

Where recreational trails are closed to the public during construction and decommissioning, signage will be provided indicating alternative routes for walkers which avoid the construction site. This aims to avoid potential confusion and disorientation to recreation users as well as maintaining public safety in proximity to the construction site.



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

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 fulfil compliance to 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 risks posed to humans are 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 with the use of swales as described in Chapter 10 – Hydrology and Water Quality. Coillte fire plans are reviewed and updated on a regular basis.

A nominated competent person shall carry out checks and routine maintenance work to ensure the reliability and safe operation of 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 Croaghaun 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 EAIR will prevent any potential significant impacts on human health during the construction and decommissioning phases.

Long-term positive residual impacts will occur due to the provision of clean, renewable electricity. The operation of the Croaghaun Wind Farm will result in the net displacement of c. 53,118 tonnes of CO₂ per annum which would otherwise be emitted through the burning of fossil fuels.

The use of upgraded forest tracks and provision of a new looped walking trail for recreational activity will provide opportunities for health gain through encouragement of exercise. This has potential to provide a long-term moderate positive impact to human health in the locality.



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. The Geological Survey of Ireland in their scoping response for the Croaghaun Wind Farm project highlighted potential impact on the extractive industry and mineral resources in the area of the site as a result of the development. This has been considered with respect to non-renewable resources in this section. Transport Infrastructure Ireland, in their scoping response requested that the project should take cognisance to safeguard the national roads network. This has been considered in the design of the project and is detailed 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 a number of active and historic quarries and mineral occurrences surrounding the Main Wind Farm Site. These consist of rock quarries, a sand and gravel quarry and recorded mineral occurrences, none of which are located within the site boundary. The GSI Aggregates database indicates that there is a very low to low potential for crushed rock or granular aggregate across much of the windfarm site.

Other non-renewable resources within the site area includes peat boglands located north of the east of the site and another area of peat bog to the north west of the site. Another section of peat bog is located south west of the site, as indicated in figure 11-4: Corine Land Cover. Site investigation at areas of proposed infrastructure revealed no presence of peat, only a peaty topsoil.

Renewable resources at the site include a significant plantation of commercial forestry which is subject to an ongoing maintenance, felling and replanting schedule. This plantation covers the majority of the proposed wind farm site. Further commercial forestry is present in the wider landscape to the south and east of the site. Wind resource is above 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 5 and 8 m/s at 100 m above ground level.

No significant renewable and non-renewable resources have been identified along the Grid Connection. Sections of commercial forestry have been identified adjacent the proposed TDR route.

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. No major utility infrastructure was identified at the proposed wind farm site or along the proposed grid route.

Some minor elements of utility infrastructure and elements of public and private property were identified along the TDR route which will require alteration or removal. This includes temporary removal of street furniture, road signage and overhead utilities and application of a load bearing surfaces to an existing roundabout. These elements are identified in section 3.5.6.1 of this EIAR and further detailed in Chapter 13: Traffic and Transportation. In line with recommendations from TII, horizontal directional drilling will be utilised to install the underground cable for the grid route connection beneath the N80 national primary route in order to safeguard the national roads network and avoid potential significant impact by way of traffic disturbance.



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

11.8.2.1 *Non-renewable Resources*

The construction of the Croaghaun Wind Farm will impact on natural resources such as aggregates which will be sourced from batching plants, quarries and pits within the area of the site. The quarries identified in proximity to the site are located at:

- Clonmelsh, Co. Carlow. Located 24km from Croaghaun.
- Millford, Co Carlow. Located 25km from Croaghaun.

The proposed borrow pit located at the wind farm site has potential to provide up to 15,000m³ of site won general fill as detailed in Chapter 9: Land Soils and Geology. Existing tracks have been used where possible and the layout was designed to minimise the length of new track required in order to reduce the requirement for such stone material. In addition, it is likely that a small amount of granular material may be required to maintain access tracks during operation which could impact the source quarry. The use of site-won and imported material will have a slight, permanent impact on non-renewable resources of the area. This is not considered to be significant.

Peat excavation will occur in areas where infrastructure will be installed. The existing peat identified at the site is limited in extent and thin in thicknesses, occurring in topsoil. Any peat removed will be used for reinstatement purposes around turbine bases, hardstands and borrow pit within the wind farm site.

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.

It is considered that the proposed development will have an overall positive impact in terms of carbon reduction and climate change. It will assist Ireland in meeting its target of producing 70% of electricity from renewable sources by 2030 as set out in the Climate Action Plan 2019.

Trees felled for development purposes will be replanted at another unplanted location as set out in Irish Forest Service Guidelines. The proposed development will require the felling of forestry within and around the infrastructure to accommodate the construction of turbine foundations, hard stands, crane pads, access tracks, site compounds, borrow pit and substation. The estimated area of tree clearing required for the proposed development will be approximately 24.4 ha. A felling licence will be sought from the Forest Service prior to any tree felling and will include the provision of relevant replant lands. The overall effect of the proposed development on renewable timber resources will be neutral. Replant lands have been identified at Sroove, Co. Sligo and Crag, Co. Limerick. The total area for replanting is approximately 24.4 ha.

11.8.2.3 *Utilities Infrastructure*

As detailed in the Turbine Delivery Route Survey Report, overhead utilities, poles, lampposts, bollards and signage will require temporary or permanent relocation and road widening, tree removal and wall removal will be required at certain points along the route to accommodate the delivery of wind turbine components. This has the potential to cause a non-significant temporary impact on nearby dwellings and commercial/industrial activities in the town of Bunclody where the majority of the temporary accommodating works will be required.



This potential impact is likely to be imperceptible. The Turbine Delivery Route Survey Report is included in Appendix 13-1 and 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 effects on telecommunications are discussed in Chapter 16: Telecommunications and Aviation. As set out in Chapter 16, the proposed development will have no impact on the telecommunications signals during the construction of the project, due to the absence of telecommunications links in the area.

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 slight, negative temporary impact on the roads concerned during construction, with some roads likely to require re-surfacing.

Importation of materials and equipment for the Croaghaun 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 is assessed in Chapter 13: Traffic and Transportation.

As recommended by Transport Infrastructure Ireland, the proposed grid route will avoid impact on national roads in order to safeguard the national road network. As a result, horizontal directional drilling will be used to install the underground cable beneath the N80 national route, to avoid construction works on the route and avoid potential traffic impacts.

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 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 compound during construction.

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. – where possible will be used as suitable fill elsewhere on site for the new site tracks, the hardstanding areas and embankments where possible.

provision of receptacles 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 an appropriate facility. 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 Croaghaun 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 imperceptible.

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 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 impact on existing telecommunications signals during the operational phase of the project due to the absence of telecommunication links in the area.

Waste is not expected to be produced during the operation phase of the proposed development. In the event that 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 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 mast. Turbine foundations and access tracks will be left in situ. The proposed on-site substation building and off-site substation building at Kellistown will be taken in charge of by Eirgrid / ESB which will have a 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 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 slight negative impact on the road network due to increased traffic.

Waste will be produced as a result of the decommissioning activities. A CEMP will be followed 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. As a result, the waste produced as a result of the decommissioning phase will have an imperceptible impact on the receiving environment.

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

Existing services along the proposed 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 stone and fill will be sourced locally and will be excavated from on-site borrow pit insofar as possible to minimise transportation distances, reducing CO2 emissions.



The 24.4 hectares of commercial forestry which will be felled at the proposed Croaghaun Wind Farm site will be replanted at alternative lands under a felling licence. The proposed replant lands are located at Sroove, Co. Sligo and Crag, Co. Limerick. The total area of commercial forestry replanting is approximately 24.4 ha.

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.

A comprehensive turbine delivery plan will be implemented between Dublin Port and the wind farm site which will include safety procedures and Garda escort. The comprehensive turbine delivery procedure will avoid impact on the roads involved with the TDR including the Dublin Port Tunnel, the M50, the M11, the N11 and the TDR route leading from Junction 25 of the M11 to the wind farm site. It is likely that this activity will take place outside of regular travelling/commuting hours in order to avoid potential traffic impacts on major routes.

A Construction Waste Management Plan has been prepared for the proposed Croaghaun 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 Eastern-Midlands 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. The Waste Management Plan will be read in conjunction with the EIAR.

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 an imperceptible residual impact on non-renewable resources.

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

Residual waste from the construction and decommissioning phases will be disposed of in a licenced waste facility. This will result in a slight 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 Croaghaun Wind Farm does not proceed, the existing land use on the site will continue in its present form consisting largely of commercial forestry and a small portion of agricultural land for the foreseeable future. The existing recreational walking loops will remain unchanged and the additional recreation potential for the site will not be realised.

In the absence of renewable energy development, it is possible that there will be a continuance of excessive greenhouse gas emissions and consumption of fossil fuels.



The opportunity to harness the wind energy capacity of County Carlow would be lost, further constraining the State from achieving its renewable energy targets of 70% by 2030. The net displacement of c. 53,118 tonnes of CO₂ per annum as a result of the proposed development will not be achieved.

Overall renewable energy supply was 11% of gross final consumption in Ireland in 2018 (SEAI, 2020). The remaining 89% 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.

It is also envisaged that if the Croaghaun 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 Carlow Area. Development contributions and considerable commercial rates would not be made payable to Carlow 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 in-combination impacts on the receiving environment. Projects and proposed developments within 15km of the study area were considered for the purpose of this assessment. 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 which in-combination impacts were not identified were discounted from the impact assessment as detailed below.

A number of developments in the planning system 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 with respect to population, human health and material assets.

There are a number of wind farms within 20km of the proposed development. The most proximate is the Greenoge Wind Farm, located approximately 500m east of the proposed development. The proposed development in combination with the Greenoge wind farm will have a cumulative impact on land use in the area, introducing additional renewable energy land use to an established forested area, reducing the overall forestry resource by approximately 24.4 hectares. Due to the relatively small land take of the proposed development and the provision of replant lands consisting of approximately 24.4 ha at Sroove, Co. Sligo and Crag, Co. Limerick, the cumulative impact on land use is expected to be slight and long-term.

The cumulative impact of the proposed development in combination with the Greenoge Wind Farm on Landscape and Visuals is detailed in Chapter 15: Landscape and Visual. The in-combination visual impact of the proposed development and Greenoge Wind Farm is expected to be medium to low. The significant setback distance between the proposed turbines and existing dwellings will reduce potential cumulative visual impact between the proposed the proposed wind farm and the existing Greenoge Wind Farm with respect to residential amenity at nearby dwellings.



Cumulative noise impacts have been assessed for the proposed wind farm project in-combination with the existing Greenoge Wind Farm in relation to residential amenity. The cumulative predicted noise levels comply with the daytime and night-time at the majority of noise sensitive locations, with the exception of one dwelling location. Mitigation measures have been set out in Chapter 7: Noise and Vibration, in order to avoid in-combination impacts on residential amenity.

The presence of the Greenoge Wind Farm, in combination with the proposed wind farm will have a negative impact on hang-gliding and paragliding recreation activity at the northern slopes of the Blackstairs Mountains due to restricted movements as a result of the presence of wind turbines. This is considered to be a moderate impact as it is consistent with emerging baselines trends at the site in relation to the presence of the adjacent Greenoge Wind Farm. These recreational activities can continue to the south of the site around Mount Leinster. The cumulative effect will not significantly impact on these activities in the greater area to the south of the site.

A 100MW battery storage facility is planned approximately 50m south east of the Kellistown substation. The proposed off-site substation element of the proposed project will be located directly to the east of the existing substation. Should the battery storage facility be constructed at the same time as the off-site substation and the grid route connection works, there is potential for temporary cumulative impact on human health in proximity to the Kellistown substation as a result of construction works which may cause cumulative noise, vibration and dust at nearby dwellings, causing a negative impact on residential amenity. Due to the sparse population in proximity to the Kellistown substation, the small footprint of the proposed and consented developments and the use of best practice construction methods, any cumulative impact on human health and residential amenity will be temporary and non-significant.

Potential cumulative impact of the proposed off-site substantial at Kellistown and the permitted battery storage facility will result in negative in-combination effects on traffic due to potential for both projects to be constructed at the same time, resulting in additional HGV journeys to and from the area which may have an in-combination effect on residential amenity. As detailed in Chapter 13: Traffic and Transportation, this potential impact is expected to be temporary in duration and slight in significance.

Cumulative impact on residential amenity as a result of noise from the existing Kellistown Substation, consented battery storage facility and proposed off-site substation at Kellistown, in-combination is expected to be negligible as set out in Chapter 7: Noise and Vibration. As detailed in Chapter 15: Landscape and Visual, the proposed substation will appear as an extension to the existing substation as opposed to a new and unfamiliar feature and will not produce a significant in-combination visual impact when viewed from nearby receptors.

There are three solar farm developments planned in proximity to the Kellistown Substation which were considered as part of the cumulative assessment on Population, Human Health and material Assets:

1. Johnstown & Bennekerry, Co Carlow
2. Friarsown & Killerig, Co Carlow and
3. Garreenleen, Bendinstown, Tinnaclash & Ardabearn, Co. Carlow.

Of these solar farm developments, there is one (no. 3) which proposes to connect to the Kellistown Substation via underground cable. There is potential that this development could be constructed at the same time as the proposed Croaghaun Wind Farm. There is potential for slight cumulative impacts to human health and residential amenity for dwellings in close proximity to the Kellistown Substation if the cable route connection works for the solar development overlaps with the construction of the consented battery storage facility at Kellistown and the proposed off-site substation and grid connection of the Croaghaun Wind Farm Project.



This potential impact on residential amenity due to in-combination impacts of noise, dust and traffic associated with the construction works. This potential in-combination impact associated with the construction phase is expected to be temporary in duration and slight in significance. There are no potential negative in-combination operational impacts on Population, Human Health and material Assets associated with the Solar Farm Developments listed above and the proposed Croaghaun Wind Farm.

The electricity generating capacity of the three solar farm developments listed above, in combination with the generating capacity of the proposed wind farm, considered cumulatively would have a significant positive cumulative impact on utility infrastructure and renewable energy resource in the area and would have a positive impact on national renewable energy resources as well as reduction in requirements for the use of non-renewable fossil fuels.

There is potential for a moderate positive cumulative impact on recreation and amenity at the proposed Croaghaun Wind Farm site as a result of the proposed amenity trail, 'The Croaghaun Wind Farm Trail' which will work in combination with the existing looped trails at the site, the South Leinster Way and the Columban Way to improve the recreation offering at the site. This has potential to further improve health gain in the area and encourage use of the site for exercise.

11.11 Conclusion

The assessment of Population, Human Health and Material Assets has established the existing environmental conditions of the study area, including the Main Wind Farm Site, the Grid Connection, 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 Main Wind Farm Site and Grid Connection were found to be of low density and dispersed when compared to averages of County Carlow as a whole and the State. The TDR was found to have a higher density due to its proximity to built-up areas. The construction and decommissioning of the project will likely result in a short-term/temporary population growth in the Main 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 development of the Croaghaun Wind Farm due to the temporary nature of the construction works.

The economic profile of the Main 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. Of note is that the average unemployment rate is highest along the TDR (11%) and lowest along the Grid Connection (5%).



The Main Wind Farm Site has both the highest average percentage of retired persons (17%) and the highest average percentage of persons working in the primary economic activity sector (12%) when compared to the State, County, TDR and Grid Connections.

Positive direct and indirect benefits to economic activity were identified during the construction and decommissioning phases due to the creation of construction jobs based in the area which may provide employment for those living in the study area and surrounding areas of County Carlow. 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 Croaghaun 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 Main Wind Farm Site is primarily commercial forestry, agriculture and recreation in the form of walking trails. An existing wind farm is located directly to the east of the site. The grid connection is primarily agriculture and the TDR is a mix of agriculture, forestry and town centre and commercial premises. Slight, temporary impacts to the existing land use along the Grid Connection and TDR is expected during the construction phase. At the wind farm site, 24.4 hectares of commercial forestry will be removed to allow for the proposed development. It is proposed to replant approximately 24.4 hectares of forestry on alternative lands at Sroove, Co. Sligo and Crag, Co. Limerick. The recreation land use of the site will also be temporarily negatively affected during the construction phase due to the closure of the site for construction purposes. This is required to maintain public safety during the construction phase. The operational phase is not expected to have a significant impact on land use in the area of the proposed wind farm.

With respect to Recreation, Amenity and Tourism, trail walking and hiking was identified as the main tourism and recreation potential for the Wind Farm Area with existing looped trails at the site as well as the South Leinster Way, the Columban Way and nearby Mount Leinster. Sections of trail at the wind farm site will be temporarily closed to the public including the Kilbrannish Wood Amenity trail and a short section of the South Leinster Way and Columban Way. Users will be appropriately notified and diverted to an alternative route along the public road. The operational phase will see the upgrade of 2.74km of existing walking track as well as the addition of a new walking trail the 'Croaghaun Wind Farm Trail'. The inclusion of these elements in the project will maintain and improve recreation activity at the site and will have a long-term significant positive impact on recreation and amenity. This element of the project will also contribute to the aims and objectives of the Carlow County Development Plan (2015) and the County Carlow Outdoor Recreation Strategic Plan (2020). There is potential for a moderate negative impact to hang-gliding and paragliding activity at the proposed wind farm site due to the presence of wind turbines. This activity will continue south of the site around the Mount Leinster Area and will not be significantly affected.

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 Croaghaun 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 Croaghaun Wind Farm's potential susceptibility to natural disaster is negligible.



It is anticipated that the proposed Croaghaun 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 and reducing CO2 emissions. Replant lands will be provided to replace forestry lands required for the development of the windfarm. The Croaghaun 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 due to the absence of telecommunication links in the area.

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 Croaghaun Wind Farm.

11.12 References

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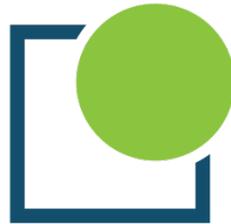
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Cork, T12 D773,
Ireland
+353 21 496 4133

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 XA00,
Ireland
+353 59 972 3800

