5 POPULATION AND HUMAN HEALTH

5.1 INTRODUCTION

This chapter considers the potential effects on population and human health arising from the proposed Drumnahough Wind Farm, a 12 turbine wind energy development in Co. Donegal. A full description of the proposed development, development lands and all associated project elements is provided in Chapter 2 of this EIAR. The nature and probability of effects on population and human health arising from the overall project has been assessed of which the proposed development forms part. The assessment comprises:

- a review of the existing receiving environment;
- prediction and characterisation of likely impacts;
- evaluation of effects significance;
- consideration of mitigation measures, where appropriate.

5.1.1 Scope of assessment

5.1.1.1 *Topic Areas included for Assessment*

The following EPA publications were consulted as part of the scoping of topics for this assessment.

- *Guidelines on Information to be contained in environmental impact statements (2002),*
- *Draft Guidelines on Information to be contained in environmental impact assessment reports(2017),*
- *Advice Notes on Current Practice (in the preparation of Environmental Impact Statement) (2003),* and
- *Draft Advice Notes for the Preparation Environmental Impact Statements (2015)* were also consulted.
- European Commission's Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU) (2017),

Table 5-1 outlines the issues which these EPA guidance documents suggest may be examined as part of the human environment study.

Table 5-1 Issues relevant to the Human Environment

Topic Area	Potential Issues
Economic Activity	- *will the development stimulate additional development and/or reduce economic activity, and if either, what type, how much and where?*
Social Consideration	- *will the development change patterns and types of activity and landuse?*
Land-use	- *will there be severance, loss of rights of way or amenities, conflicts, or other changes likely to ultimately alter the character and use of the surroundings?*
Tourism	- *will the development affect the tourism profile of the area?*
Health and Safety	- *vectors through which human health impacts could be caused e.g. will there be risks of death, disease, discomfort or nuisance?*

Accordingly, the scope of this assessment is made with respect to these topic areas and considers the effects of the construction, operation and decommissioning of the proposed development in terms of how the proposal could affect population and settlement, economic activity, employment, land use, amenities and tourism, and health and safety.

5.1.1.2 *Tourism and Amenities*

Tourism and amenity impacts are interrelated with effects on landscape and visual amenity, archaeology and heritage interests, and transport. Each of these effects are addressed in other chapters of this Environmental Impact Assessment Report (EIAR) and reference should therefore be made to Chapter 12 Landscape and Visual, Chapter 13 Cultural Heritage and Chapter 15 Material Assets.

While reference is made to these effects where relevant, this chapter does not re-evaluate these assessments. The focus of this assessment is primarily on physical disruption, severance or exclusion of users' ability to continue existing activities or deterrence of additional further development of amenities and tourism potential.

5.1.1.3 *Human Health*

The European Commission document 'Guidance on the preparation of the Environmental Impact Assessment Report, 2017; provides that: *"Human health is a very broad factor that would be highly Project dependent. The notion of human health should be considered in the context of the other factors in Article 3(1) of the EIA Directive and thus environmentally related health issues (such as health effects caused by the release of toxic substances to the environment, health risks arising from major hazards associated with the Project, effects caused by changes in disease vectors caused by the Project, changes in living conditions, effects on vulnerable groups, exposure to traffic noise or air pollutants) are obvious aspects to study. In addition, these would concern the commissioning, operation, and decommissioning of a Project in relation to workers on the Project and surrounding population".*

Similarly, the EPA Draft Guidelines on the information to be contained in environmental impact assessment reports (2017), states that '*in an EIAR, the assessment of impacts on population & human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in the EIAR e.g. under the environmental factors of air, water, soil etc'.*

The EPA (2017) guidance also advises that '*The evaluation of effects on these pathways is carried out by reference to accepted standards of safety in dose, exposure and risk. These standards are in turn based upon medical and scientific investigation of direct effects on health of the individual substances, effect or risk.* ***This practice of reliance upon limits doses and thresholds for environmental pathways such as air water or soil provides a robust and reliable health protection criteria for analysis relating to the environment'***.

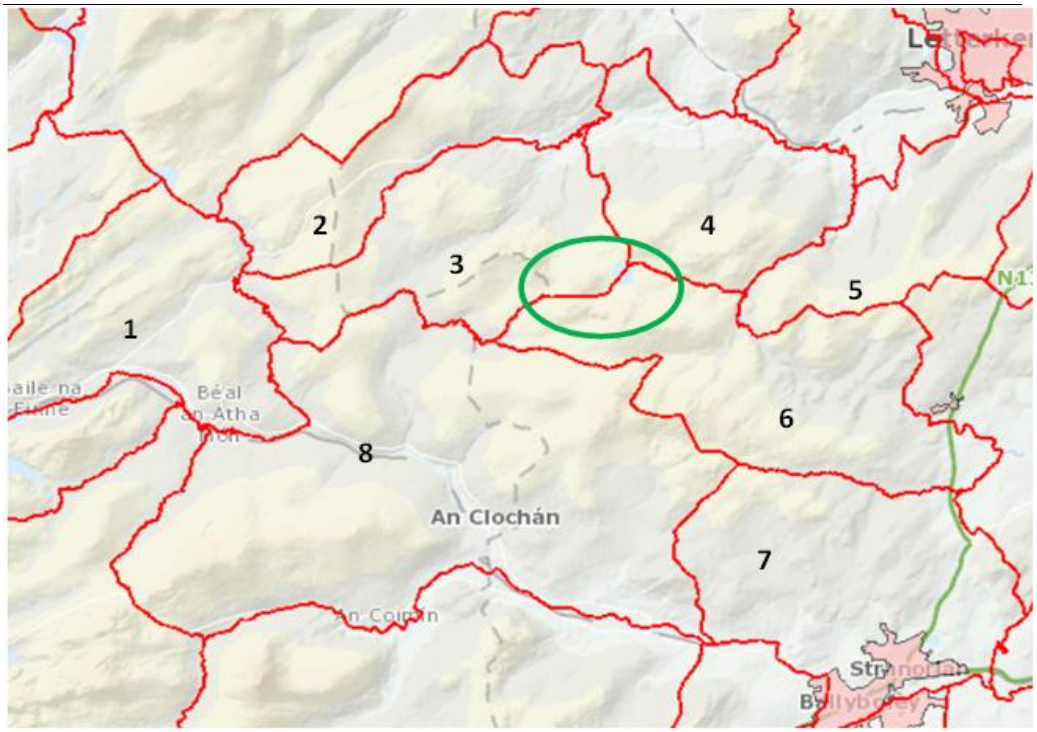
Human health, in this chapter of the EIAR, is therefore considered in relation to health effects/issues and environmental hazards arising from the other environmental factors and the assessment is made with regard to the established international health-based guidelines limit value necessary to protect the public.

5.1.2 Study Area

The Study Area for the purpose of this assessment on Population and Human Health primarily focuses on the local receiving human environment in the vicinity of the proposed development. These include those who reside, work, visit, or use the local road networks in the general area. Electoral Divisions (EDs) are the smallest legally defined administrative areas in the State for which Small Area Population Statistics (SAPS) are published from the Census. Therefore in order to discuss the receiving human environment and other statistics in the vicinity of the proposed development site, the Study Area for this assessment has regard to Electoral Divisions (EDs) within or located close to the proposed development site. The extent of the EDs and SAPS considered for the purposes of this assessment are shown in **Figures 5-1** and **5-2** and set out in **Tables 5-2** and **5-3**.

Although, this chapter predominately describes the human environment in the vicinity of the proposed development, sensitive human receptors in the broader human environment are considered in the other specialised environmental topics including the following;

- Landscape and Visual Assessment;
- Cultural Heritage Assessment; and
- Material Assets (including Traffic and Transportation; telecommunications and aviation).

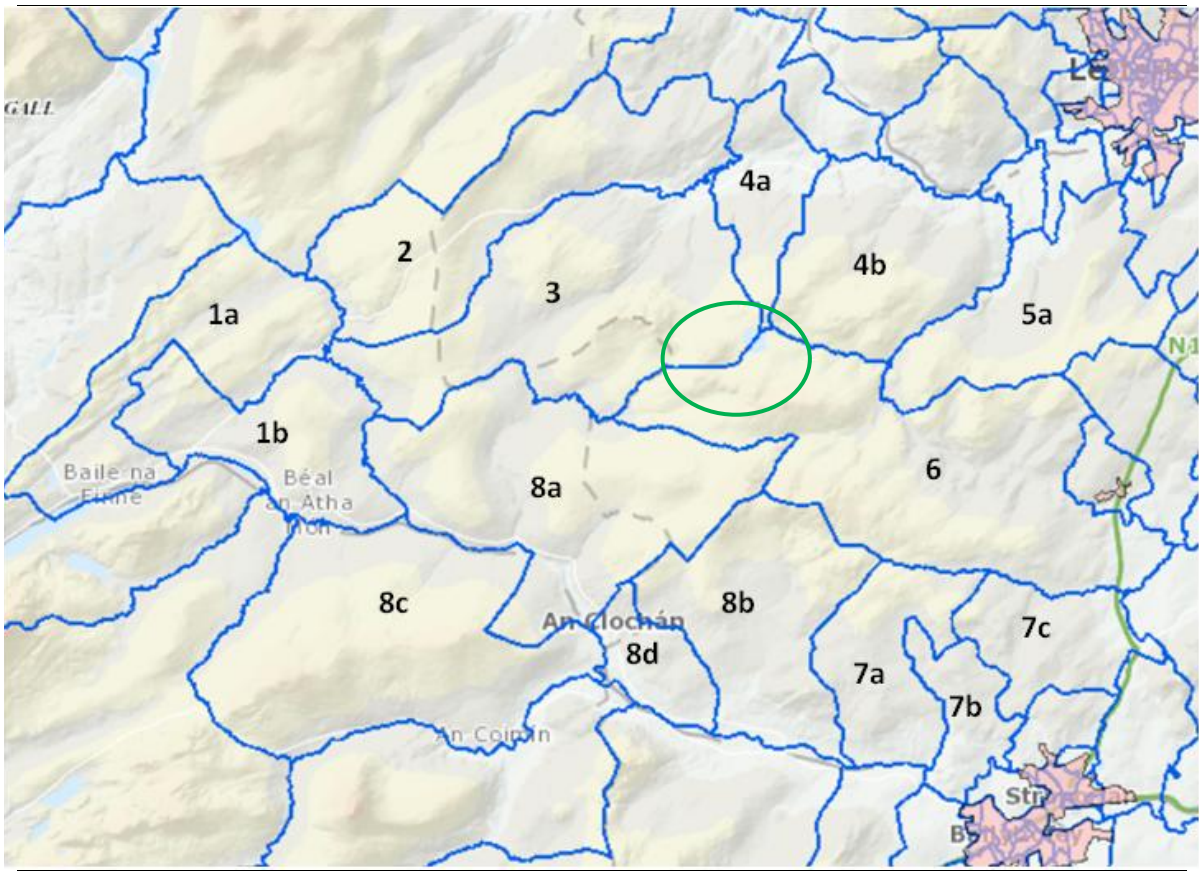


Key	
	Electoral Divisions (EDs)
	Location of Proposed Wind Farm Development lands

Figure 5-1 Study Area Electoral Divisions (EDs)
Source: Adapted from CSO SAPMAPS

Table 5-2 Study Area Electoral Divisions (EDs)

Area Ref	Electoral Division
1	**Baile na Finne**
2	**Suí Corr**
3	**Mín Charraigeach**
4	**Killymasny**
5	**Corravaddy**
6	**Lettermore**
7	**Stranorlar**
8	**An Clochán**



	Small Area Population Districts (SAPs)
	Location of Proposed Wind Farm Development lands

Figure 5-2 Study Area Small Area Population Districts
Source: Adapted from CSO SAPMAPS

Table 5-3 Study Area Small Areas and Electoral Divisions

Area Ref	CSO SMALL AREA	Electoral Division
1a	057068001	Baile na Finne
1b	057068002	
2	057134001	Suí Corr
3	057120001	Mín Charraigeach
4a	057099001	Killymasny
4b	057099002	
5a	057041002	Corravaddy
6	057109001	Lettermore
7a	057137001	Stranorlar
7b	057137003	
7c	057137005	
8a	057034001	An Clochán
8b	057034002	
8c	057034003	
8d	057034004	

5.1.3 Replacement Forestry Lands

There is a requirement to replant land taken out of forestry. The total replanting requirement for the proposed project is 37.2hectares (Ha). Four potential replanting areas have been identified namely lands at sites in Co. Cork, Co. Limerick, Co. Galway and Co. Clare as outlined in **Chapter 2**. These proposed replanting lands have been assessed as part of the Afforestation Approval process and have obtained Technical Approval for Afforestation from the Forest Service. Consideration of the replacement forestry lands in this chapter is made in the context of land-use only.

5.1.4 Methodology

The methodology used for this study included desk based research of published information and site visits to assemble information on the local receiving environment. The desk study included the following activities:

- Review of the most recent Census of Ireland data to establish settlement demographics and economic context of the study area.
- Review of Ordnance Survey Mapping and aerial photography to establish existing land use and settlement patterns within the study area.
- Review of local and regional development plans and planning policy in order to identify future development and identify any planning allocations within the study area.
- Review of Donegal County Council's Planning Register to identify relevant development proposals currently under consideration by the Council.
- Review of planning policy and strategies to identify, way marked walking and cycling routes and other Rights of Ways within the study area.
- Review of tourism data including, Tourism Ireland, Failte Ireland, Go Visit Donegal and local websites to identify tourism data and visitor attractions within the study area.

The desk based research also had regard to published information on public health and wind turbines including:

- Irish Health Service Executive (HSE) Position paper on wind turbines and public health (2017).
- World Health Organization (WHO) Regional Office for Europe, Night noise guidelines for Europe,(2009)
- Health Impacts of Wind Turbine Noise. The Public Health Wales Position Statement (2013).
- Australian Government National Health and Medical Research Council (NHMRC) Statement: Evidence on Wind farms and Human Health (2015)
- The Potential Health Impact of Wind Turbines. Chief Medical Officer of Health (CMOH) Report (Ontario) (2010).
- Wind Turbine Health Impact Study: Report of Independent Expert Panel. Prepared for: Massachusetts Department of Environmental Protection, Massachusetts Department of Public Health (January 2012).
- WHO Environmental Noise Guidelines for the European Region (2018).
- ESB EMF and You Information about Electric and Magnetic Fields and the electricity network in Ireland (April 2017)
- European Commission Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) Opinion on Potential health effects of exposure to electromagnetic fields (EMF) (2015)

5.1.5 Assessment Criteria

Determination of the significance of an effect will be made in accordance with the terminology outlined in EPA *Draft Guidelines on Information to be contained in environmental impact assessment reports(2017)* as set out in **Table 5-4** below.

Table 5-4 *Impact Assessment Criteria*

Quality of Effects	Positive	A change which improves the quality of the environment
	Neutral	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error
	Negative /adverse	A change which reduces the quality of the environment
Significance of Effects	Imperceptible	An effect capable of measurement but without significant consequence
	Not significant	An effect which causes noticeable changes in the character of the environment but without significant consequences
	Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
	Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends
	Significant	An effect which, by its character, magnitude duration or intensity alters a sensitive aspect of the environment
	Very Significant	An effect which, by its character, magnitude duration or intensity alters most of a sensitive aspect of the environment
	Profound	An impact which obliterates sensitive characteristics
Duration of Effect	Momentary	Effects lasting from seconds to minutes
	Brief	Effects lasting less than a day
	Temporary	Effects lasting less than a year
	Short-term	Effects lasting one to seven years
	Medium-term	Effects lasting seven to fifteen years
	Long-term	Effects lasting fifteen to sixty years
	Permanent	Effects lasting over sixty years
	Reversible	Effects than can be undone e.g. through remediation or restoration
	Frequency	How often the effect will occur. (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually)
Types of Effects	Indirect	Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway
	Cumulative	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effect
	'Do Nothing'	The environment as it would be in the future should the subject project not be carried out.
	'Worst case'	The effects arising from a project in the case where mitigation measures substantially fail.
	Indeterminable	When the full consequences of a change in the environment cannot be described
	Irreversible	When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
	Residual	The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic	Where the resultant effect is of greater significance than the sum of its constituents, (e.g. combination of SOx and NOx to produce smog).

Source: EPA *Draft Guidelines on Information to be contained in environmental impact assessment reports (2017)*

5.2 EXISTING RECEIVING ENVIRONMENT

5.2.1 Development Location

Situated in the rural central upland area of Donegal, the site of the proposed wind farm development is located on the southwestern slopes of Cronaglack, Crockalough and Cark Mountain. Lands in the portion of the Project Area proposed for wind turbine development occupy parts of the townlands of Tooslenagh, Treankeel, Meenadaura, Carrickalangan and Cark. The grid connection to the permitted Lenalea 110kv substation also includes the townland of Killymasny while the section of the existing access track through Meentycat wind farm traverse parts of Meentycat, Meenalabbin and Aughkeely townlands.

5.2.2 Settlement Patterns

Settlement patterns in the greater region range from very large urban centres, to small community settlements, to relatively isolated farmsteads.

Letterkenny (population 19,274, CSO 2016) approximately 12.5km to the northeast, and the twin towns of Ballybofey/Stranorlar (population 4,852, CSO 2016) approximately 11km to the southeast are the largest urban centres relative to the site of the proposed development and are the major service and employment centres in the region. Smaller population centres in the general locality are the towns of Convoy and Raphoe and the villages of Drumkeen and An Clochán. These towns and small villages provide a range of local community facilities, including primary schools, sporting clubs, churches, general shops and post offices.

The nearest urban settlements to the site of the proposed development are the villages of An Clochán approximately 4.7 km to the south and Drumkeen approximately 9 km to the southeast. See **Figure 5-3.**

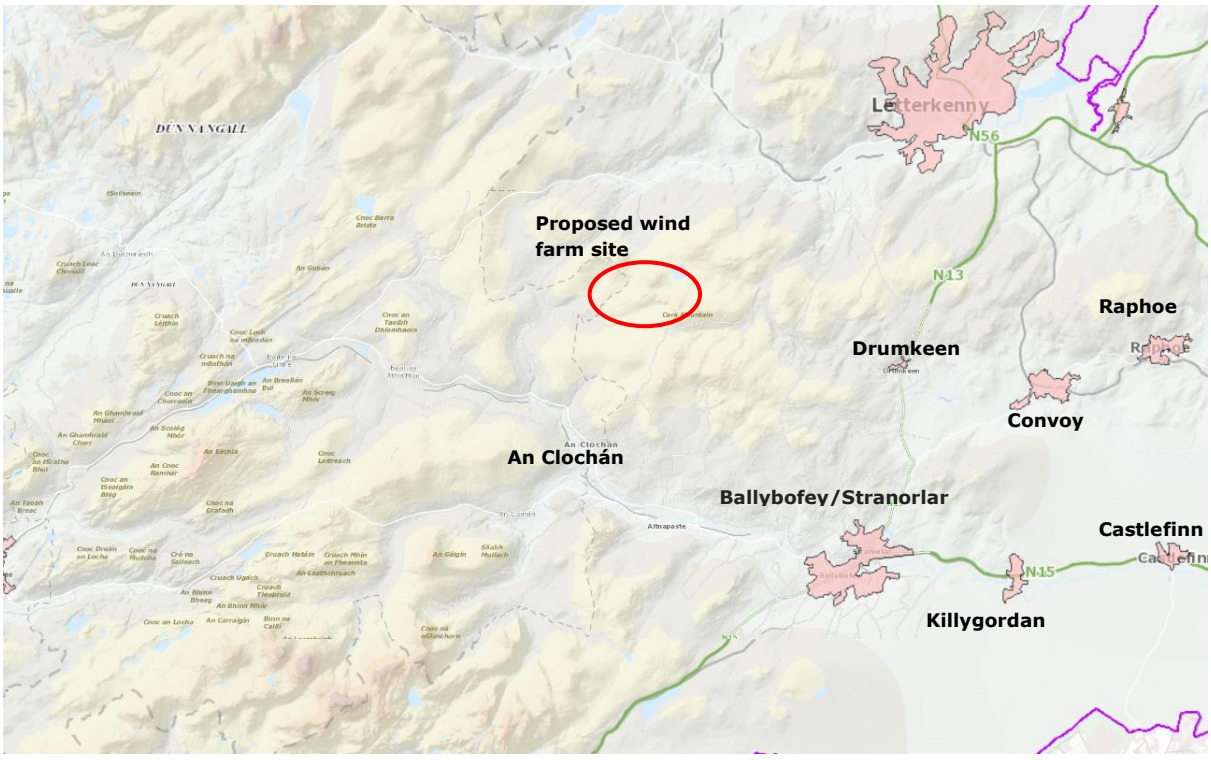


Figure 5-3 Principal Towns/villages in the Area
Source: Adapted from CSO SAPMAPS

The Project Area for the wind turbine development is located in a rural, lightly populated area. Settlement patterns typically comprise farmsteads and one-off residential dwellings, distributed along the local and regional road networks that encompass the site and serve the area. Housing and settlement located in the vicinity of the proposed development lands is shown in **Figure 5-4**. The greatest density of settlement occurs along the local road networks in clustered and ribbon development to the north and south west of the development site.

There are no residential dwellings within the proposed development site boundary. There is one unoccupied and derelict dwelling within less than 1km of the nearest proximal wind turbine (approximately 690m from T11). There are approximately 4 residential dwellings approximately 1km from the site and 10 residences within 1-2km from the site. A review of the Donegal County Council planning data base shows that there is planning permission for a new residential dwelling approximately 2.2km east of T1.

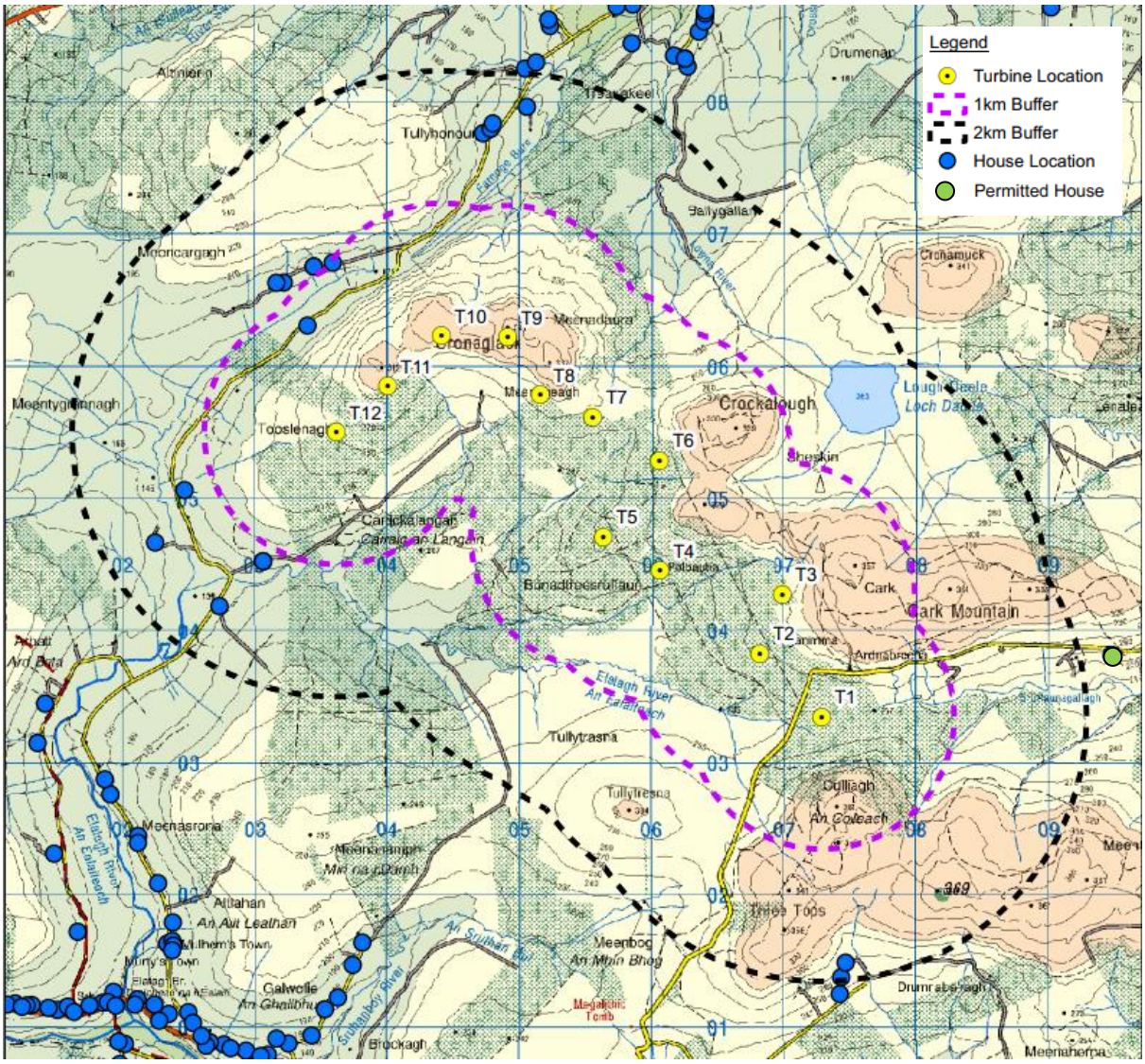


Figure 5-4 Residential Dwellings within 1-2km of the wind farm development lands

5.2.3 Population Density

The 2016 census of population provides population statistics for small geographical areas and electoral divisions. A review of this data shows that while the recorded population density across the Study Area varies between the electoral divisions, the overall region is moderately populated. Population densities outside of the main urban centres and larger towns in the area range from approximately 6 persons per km^2 to 34 persons per km^2.

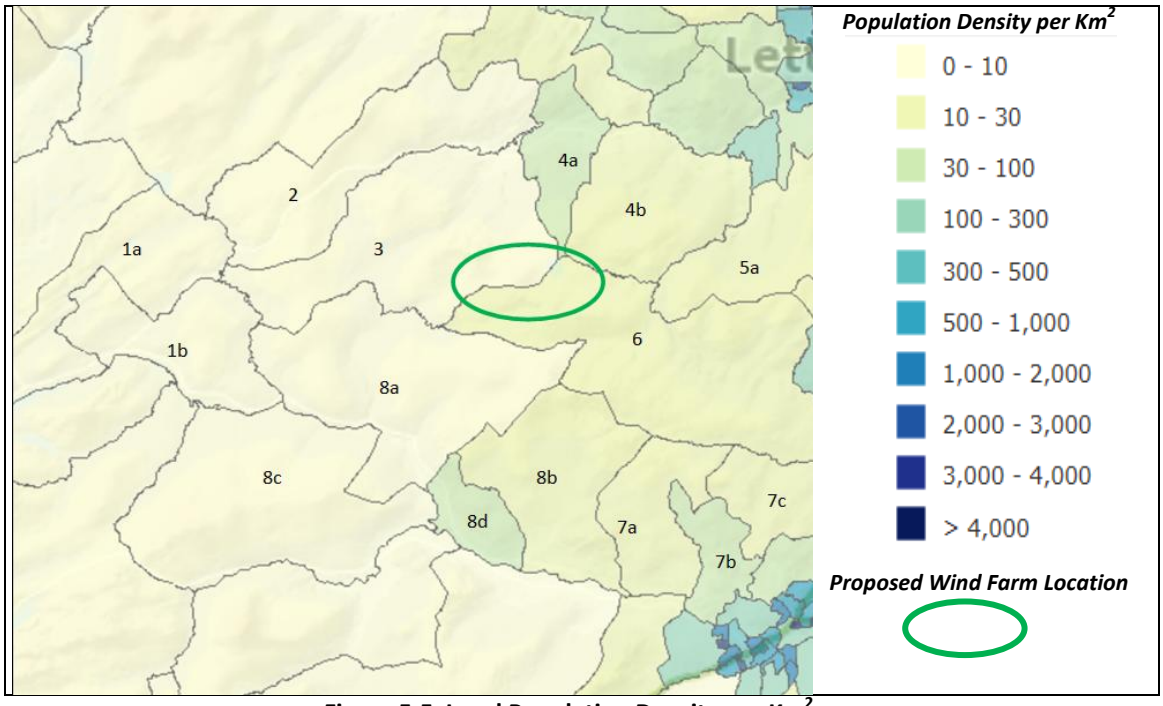


Figure 5-5 Local Population Density per Km^2

Source: ***Adapted from CSO SAPMAPS*** *http://airomaps.nuim.ie/id/Census2016/*

Table 5-5 Small Area Population Statistics

Area Ref	CSO SMALL AREA	Electoral Division	Total population	Population Density per km^2
1a	057068001	Baile na Finne	150	8.37
1b	057068002		130	8.58
2	057134001	Suí Corr	94	3.91
3	057120001	Mín Charraigeach	127	4.14
4a	057099001	Killymasny	232	30.3
4b	057099002		289	15.8
5a	057041002	Corravaddy	243	14.6
6	057109001	Lettermore	414	10.5
7a	057137001	Stranorlar	218	18.9
7b	057137003		242	41.7
7c	057137005		265	28.7
8a	057034001	An Clochán	211	6.6
8b	057034002		275	14.1
8c	057034003		246	7.1
8d	057034004		193	35.7

Source: Census of Population 2016 - Small Area Population Statistics (SAPS)

5.2.4 Population Trends

The available data on population trends indicates that while most Electoral Divisions are experiencing increases in population numbers, other areas are experiencing a population decline. **Table 5-6** below shows that almost all areas experienced a rise in population in the period 2006-2011 with the exception of Baile na Finne ED, which had a population decline of -0.9%. For the period 2011-2016 the data shows that Baile na Finne ED continues to have a population decrease.

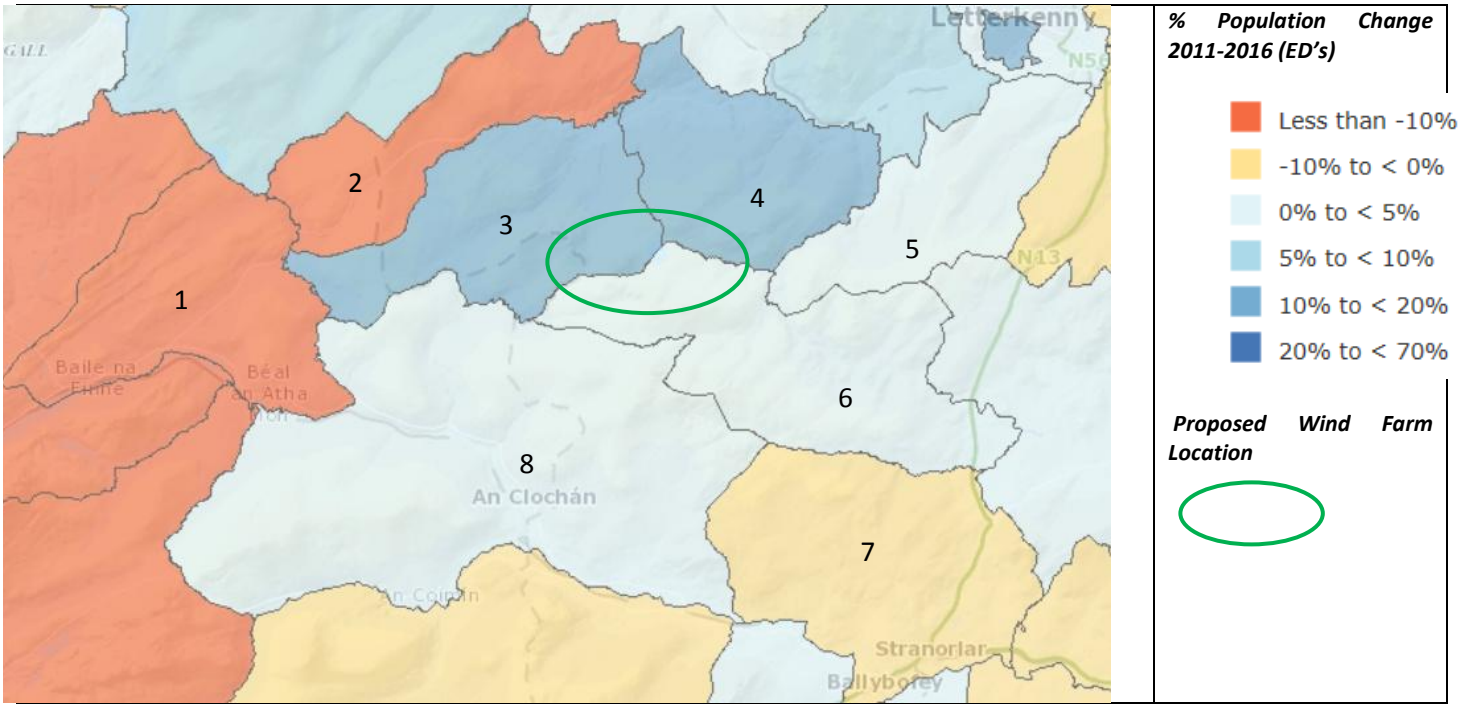


Figure 5-6 % Population Change 2011-2016 (ED's)

Source: ***Adapted from AIRO Census Mapping http://airomaps.nuim.ie/id/Census2016/***

Table 5-6 Population Trends

Area Ref	Electoral Division	% Change in Population 2006 - 2011	% Change in Population 2011-2016
1	**Baile na Finne**	**-0.90%**	**-10.54%**
2	**Suí Corr**	**11.5%**	**-11.32%**
3	**Mín Charraigeach**	**23.3%**	**14.41%**
4	**Killymasny**	**13.4%**	**10.5%**
5	**Corravaddy**	**35.5%**	**4.17%**
6	**Lettermore**	**11.6%**	**0.49%**
7	**Stranorlar**	**9.3%**	**-0.26%**
8	**An Clochán**	**5%**	**3.35%**

Source: Census of Population 2016 and 2011 - Small Area Population Statistics (SAPS)

5.2.5 Irish Language and the Gaeltacht

The term 'Gaeltacht' is used for areas in Ireland where the Irish language is, or was until the recent past, the main language spoken by the majority of the local population. The Donegal Gaeltacht covers extensive parts of County Donegal and comprises a geographical area of approximately 1,502 km^2 (580 sq mi). The Donegal Gaeltacht has a population of **23,346**, (Census 2016) and

represents 14% of the total population of Donegal. The 2016 census data provides that approximately 70% of the population within the Gaeltacht, aged 3 years and over, speak Irish.

The proximity of the Donegal Gaeltacht area to the proposed development lands can be seen in **Figure 5-7**

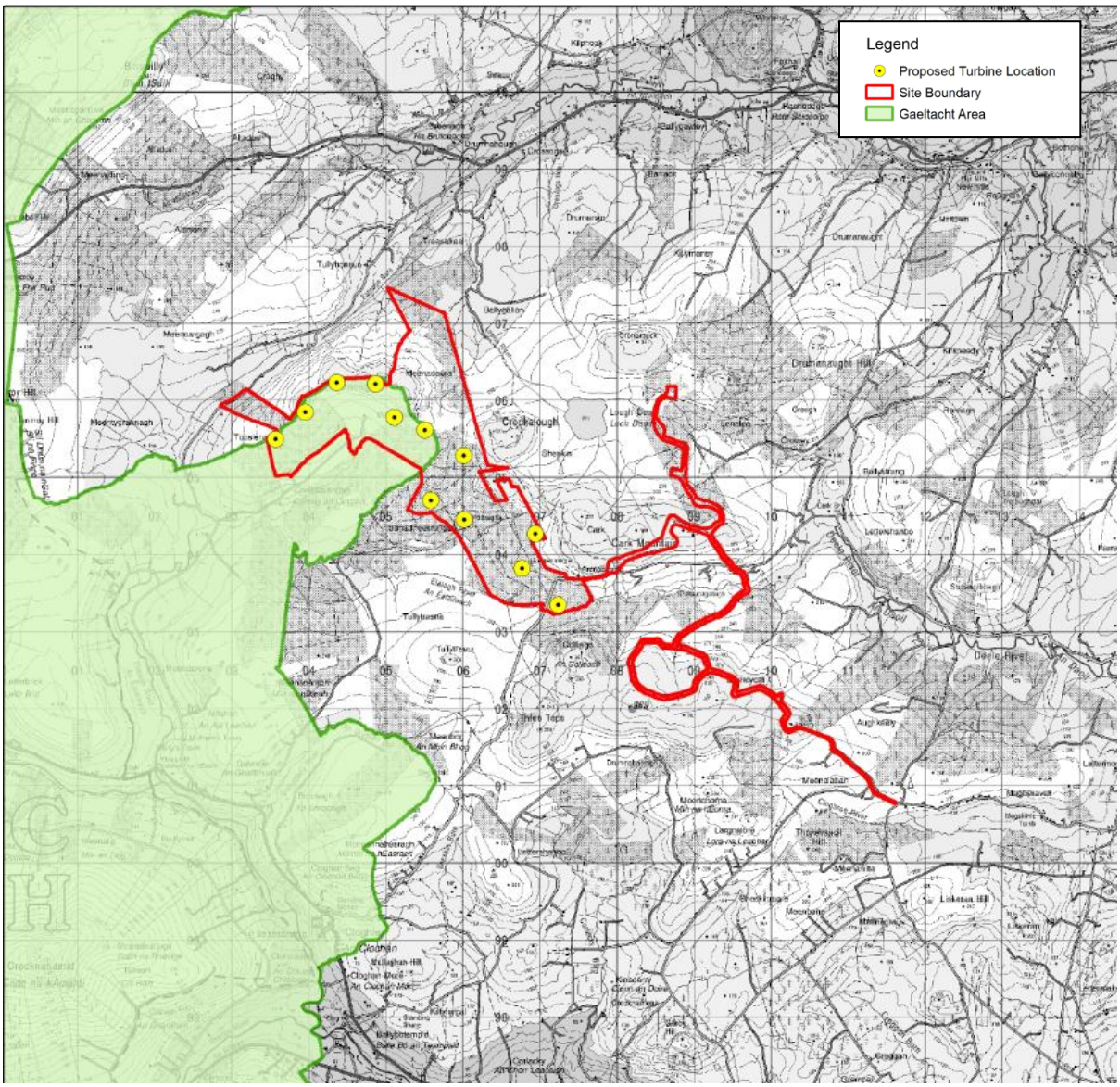


Figure 5-7 Proximity of Development site to the Donegal Gaeltacht

5.2.6 Economic Activity

According to the 2016 census of population employment statistics for the region, the work force is employed in a diverse range of industries. The statistics show that the highest level of employment is within the Public administration /Professional services category with approximately 35% of the workforce within the Study Area employed in this category. Other key employment sectors include Commerce and Trade (25%), Agricultural (12.5%) and Transport and Communication (10%).

A review of the 2016 commuter flow data suggests that while the majority of the workforce works outside of the area in which they live, there is a high level of employment in the locality with approximately 47% of commuters' flow travelling into the area to work.

The larger urban centres are the principal employment centres for the area. These towns provide employment in the retail, services and professional sectors.

Table 5-7 Small Area Population Employment Statistics - % Persons at Work by Industry 2016

CSO SMALL AREA CODE		Electoral Division	% of Workers					
			Agriculture, forestry, fishing	Building and construction	Manufacturing industries	Commerce and trade	Transport / Communication	Public admin/ Professional Services
1a	057068001	Baile na Finne	7.8	11.8	11.8	13.7	9.8	23.5
1b	057068002		18.2	5.5	10.9	18.2	5.5	23.6
2	057134001	Suí Corr	15.9	6.8	6.8	11.4	2.3	27.3
3	057120001	Mín Charraigeach	3.9	3.9	7.8	19.6	13.7	31.4
4a	057099001	Killymasny	3.2	5.3	5.3	24.5	10.6	34.0
4b	057099002		13.2	4.7	8.5	32.1	2.8	31.1
5a	057041002	Corravaddy	10.9	6.9	5.9	24.8	7.9	25.7
6	057109001	Lettermore	13.7	4.4	9.7	19.4	8.0	25.7
7a	057137001	Stranorlar	9.3	8.1	2.3	18.6	5.8	27.9
7b	057137003		4.3	5.2	3.1	22.9	8.3	34.4
7c	057137005		10.3	8.0	4.6	18.4	9.2	33.3
8a	057034001	An Clochán	12.7	8.9	6.3	16.5	5.1	29.1
8b	057034002		18.8	7.1	7.1	17.0	7.1	24.1
8c	057034003		12.5	4.9	9.9	9.9	7.4	28.4
8d	057034004		12.3	6.3	4.7	20.3	9.4	20.3

Source: Census of Population 2016 - Small Area Population Statistics (SAPS)

Table 5-8 Electoral Division Statistics - % Commuter Flows

Electoral Division	COMMUTER FLOWS (No's of Persons)		
	Inward Commuters	Outward Commuters	Net Flow
Baile na Finne	53	53	0
Suí Corr	3	29	-26
Mín Charraigeach	10	37	-27
Killymasny	49	144	-95
Corravaddy	26	574	-548
Lettermore	18	113	-95
Stranorlar	1309	564	+745
An Clochán	53	179	-126

Source: Census of Population 2016 - Small Area Population Statistics (SAPS)

5.2.7 Land Uses

The lands to be developed as part of the proposed development are predominantly peat bogs, transitional woodland scrub and commercial conifer plantations. Agricultural activities were noted south of proposed turbine T9 and T11 by the presence of sheep fencing. The nature of the agriculture activity in the surrounding environment is marginal in nature given the upland nature of the area. Evidence of turf cutting in the locality was noted during site visits.

There are currently no defined recreational land-uses within or associated with the proposed development lands.

The surrounding land includes some pastures and lands principally occupied by agriculture with significant areas of natural vegetation.

Wind energy is another key land-use surrounding the proposed site with long established neighbouring operational wind farms of Cark (1997), Meentycat (2004), Culliagh (2000 and 2012) and Cark Extension (2012).

5.2.8 Tourism and Amenities

The tourism and hospitality industry in Ireland is one of the major contributors to the national economy and makes a significant contribution to the vitality and sustainability of a wide variety of local enterprises, particularly in rural areas. In 2018, the most current available data from Tourism Ireland shows that, this industry generated approximately €5.2 billion in revenue and supported over 300,000 jobs (Tourism Ireland Visitor Fact and Figures 2018).

County Donegal is one of the leading tourist counties in Ireland and has an abundance of tourism resources, including natural and cultural attractions. It is evident from a review of various tourism websites that Donegal has a substantial tourism offering including activity tourism, specialised tourism, traditional music and cultural heritage.

The most prominent tourism attractions in the county are principally located along the coastal regions. Refer to **Figures 5-8** and **5-9** below.

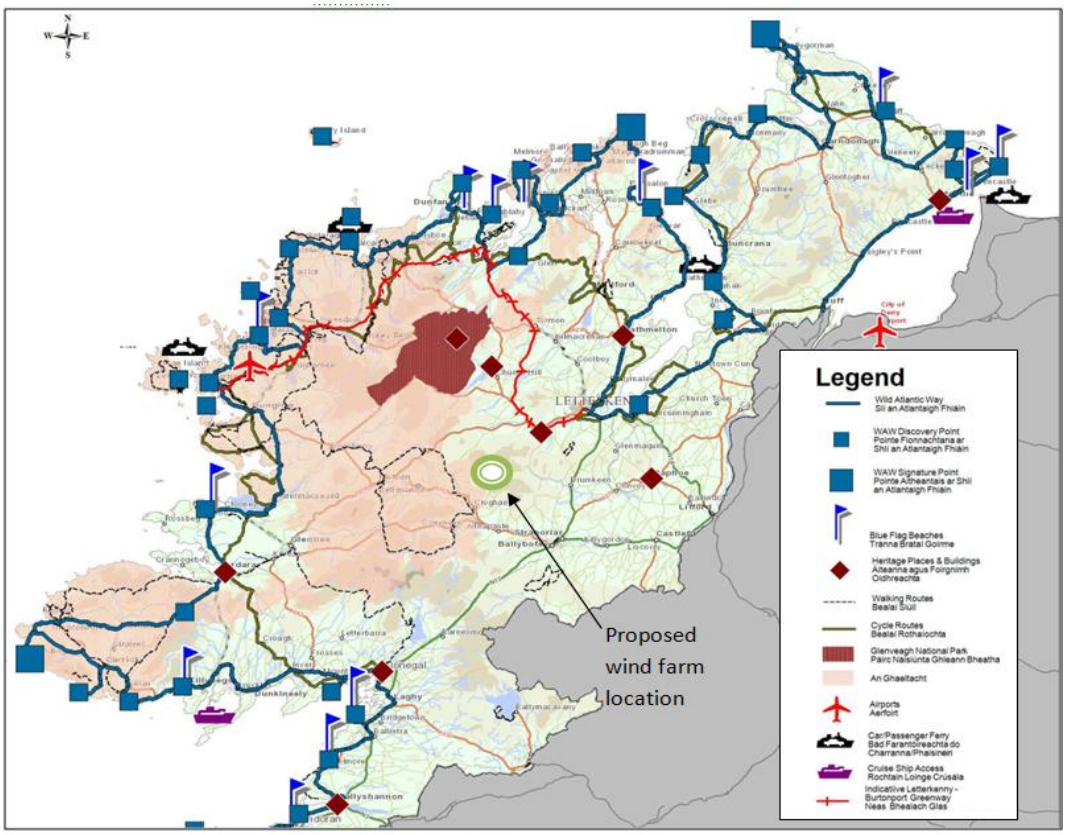


Figure 5-8 Key Tourism /Recreational Amenities in County Donegal
Source: Adapted from Map 9.1 Tourism Donegal County Development Plan 2018-2024

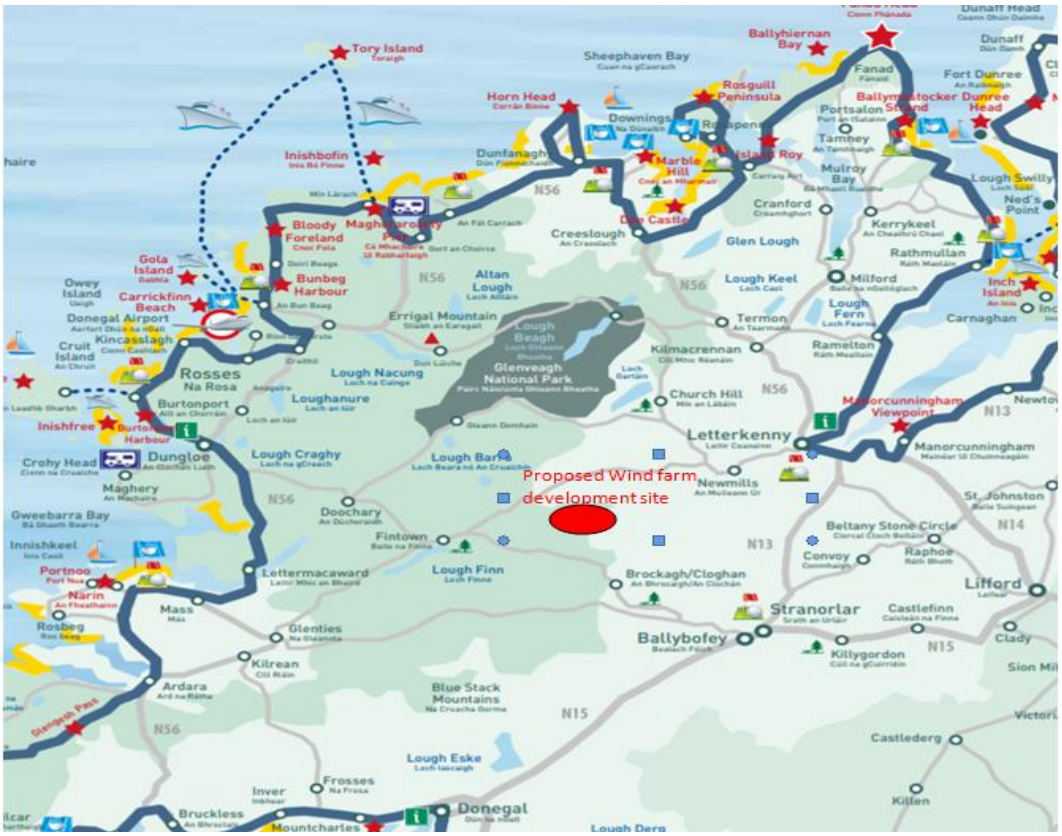


Figure 5-9 Key Tourism /Recreational Amenities in County Donegal

Source: adapted from Donegal Tourism Map 2019 https://www.govisitdonegal.com/getmedia/e538307c-aa55-414e-bd07-5e9685af0eb6/%c2%a9Donegal_Tourism_Map2019.pdf.aspx?ext=.pdf

While there are no tourist attractions pertaining specifically to the site of the proposed development, there are a number of recreational and cultural amenities in the vicinity of the site, and in the wider area including:

- Walking trails and Forest Walks
- Cycling
- Golf
- Angling
- Equestrian activities

Cloghan village is located approximately 4.8km southwest of the proposed development and is popular for both Salmon and Sea Trout fishing.

The Drumboe Woods trail in Ballybofey/Stranorlar lies approximately 10km to the southeast of the proposed development and represents the nearest forestry land offering general public recreational amenities.

Slí Dhún na nGall/Sli na Finne is a long distance (51km) way-marked trail, travelling on many minor roads as well as off-road. The trail is, at its closest point, approximately 3.5 kilometres west of the nearest proposed turbine.

The Bluestack Mountains, circa 15km to the southwest of the site, contains a 65km walking route with scenic views to the surrounding countryside.

There is also an annual community walk through the operational Meentycat Wind Farm, south of the proposed development, which in September 2019 attracted over 1,200 community members.

The Northwest Cycle Trail is a long distance cycle trail (326km) which runs from Sligo Town to Lifford. It passes closest to the proposed turbines just south of Ballybofey, approximately 11 kilometres to the southeast.

Ballybofey and Stranorlar Golf Club is a significant recreation and tourism amenity asset in the area.

Glenveagh National Park, approximately 10 kilometres northwest of the proposed development site, is the only designated National park in Co. Donegal. It is well known for its high scenic qualities, its castle and setting on Lough Beagh. It is also designated an area of Especially High Scenic Amenity (EHSA) under the County Development Plan. Several trails exist within the park, namely:

- Derrylahan & Lakeside Walks
- Lough Inshagh Walk
- View Point Walk
- Upper Glen Walk
- Castle Garden Trail

As well as visitor attractions and resources which support outdoor recreational activity there are a range of services which cater to tourists and visitors such as hotels, bed & breakfasts and caravan parks. Such facilities are present in many of the settlements in the surrounding area.

5.2.9 Public Health

The 2016 Census also provided information on the general health profile of the population for each small area. The statistic show that overall the local population has good health with only between 1-3% of the proportion of the population in the Study Area reporting to have 'bad' or 'very bad' health. See **Table 5-9** below

Table 5-9 Health Statistics 2016 - %Population Bad or Very Bad – Health

CSO SMALL AREA CODE		Electoral Division	Total population	% Bad Health	% Very Bad Health
1a	057068001	Baile na Finne	150	1.3	0
1b	057068002		130	0.8	0.8
2	057134001	Suí Corr	94	1.1	0
3	057120001	Mín Charraigeach	127	1.6	0
4a	057099001	Killymasny	232	0.4	0
4b	057099002		289	0.7	0.7
5a	057041002	Corravaddy	243	0.4	0
6	057109001	Lettermore	414	2.2	0.2
7a	057137001	Stranorlar	218	0.5	0
7b	057137003		242	1.2	0
7c	057137005		265	1.1	0
8a	057034001	An Clochán	211	0.5	0
8b	057034002		275	0.4	1.1
8c	057034003		246	0.4	0.4
8d	057034004		193	1.0	0

Source: Census of Population 2016 ***AIRO Census Mapping http://airomaps.nuim.ie/id/Census2016/***

5.2.10 Replacement Forestry Lands

To allow for replacement of forestry to be permanently felled to accommodate the proposed development, potential replanting areas have been identified at sites in Co. Cork, Co. Limerick, Co. Galway and Co. Clare as outlined in **Chapter 2.** The proposed replanting lands predominantly comprise of semi-natural and improved grassland, wet grassland and agricultural grasslands.

The overall level of residential development within a kilometre of these sites is low, with intermittent farms and some houses located along the local roads. There are no community facilities or amenities located within or close to the proposed replanting site. There are no tourist attractions pertaining specifically to the proposed replanting site.

5.3 LIKELY SIGNIFICANT EFFECTS

5.3.1 Population and Settlement

The proposed development is unlikely to have a significant effect on population numbers of the area. There will be no loss of residential dwellings and therefore there will be no displacement of the existing population. There will be no mass in-migration associated with the proposed development.

It is estimated that the construction phase will create approximately 60 full time equivalent (FTE) roles. It is expected that the majority of construction personnel will primarily be local to the region. A minor number of key employees involved in the construction, may decide however to temporarily re-locate to the area in the short-medium term. During the operational phase of the wind farm, it is envisaged that operators and maintenance personnel will be sourced locally. Overall, throughout construction, operation, and decommissioning, it is expected that the development will have a neutral impact on population numbers.

During operation, the proposed development would however bring added benefit to the local community through the provision of a community benefit fund. See section 5.3.7 below. This fund would assist local communities to enhance and/or maintain a range of amenities and services for residents in the local towns, villages and surrounding hinterland, which in turn would help sustain existing population levels in the area. Therefore, it is likely that the proposed development would indirectly have a positive long term effect on population and settlement in the region.

Additionally, annual rates payments from the project will contribute substantial funds to Donegal County Council over its lifespan, which will be redirected to the provision of public services within Co. Donegal. These services include provisions such as road upkeep, fire services, environmental protection, street lighting, footpath maintenance etc. along with other community and cultural support initiatives.

5.3.2 Economic Activity

It is not likely that the proposed development would directly or indirectly result in any negative effect or reduction in existing economic activity of the area during any phase of the development. Similarly, there is no known specific direct or indirect economic development likely to result from the proposed development.

However, during the construction phase aggregates and concrete supply for road construction and foundations will be obtained from local quarries and suppliers, supporting the local economy. There are also potential economic opportunities for local companies and businesses to provide a range of services including catering, accommodation and plant hire. Therefore the proposed development would have a positive direct short term effect on the local economy. During operation, the proposed development has potential to have a positive direct long term effect on the local economy from monetary contributions associated with the community fund and annual rates.

5.3.3 Employment

In the construction phase, it is envisioned that resources and labour will be sourced in the region where possible. It is estimated that the construction phase will take approximately 14 months and may create approximately 60 full time equivalent (FTE) roles, which will have a positive, if short-term, impact on employment. In the long-term, the development is expected to generate full-time employment for two persons during its operational phase.

5.3.4 Land-use

All new development proposals have the potential to affect the local area character and human environment by introducing a new incompatible land use activity which could result in physical disruption, severance or exclusion of users' ability to continue existing activities or the sterilisation of lands thus preventing any additional further land-use potential.

During construction there may be a level of effect on existing land-uses within the proposed development site. Existing forestry activities and harvesting within the plantation would cease for the duration of the wind farm construction works.

Outside of the proposed development footprint, it is not envisioned that land use activities would be adversely impacted.

Once operational, conventional felling and forestry activities will resume and continue to take place at the site independent of the proposed development. Only a relatively small area of commercial forestry, approximately 37.2ha of the forestry resource in the area locally, will be permanently displaced in the footprint of the wind farm infrastructure. This loss of land use would not be significant.

During operation it is considered that the proposed development would not constitute significant negative impacts in terms of land-use considerations for the following reasons:

- The proposed development does not conflict with any planning policies or zoning provisions for this area.

- The proposed future landuse is consistent with current wind farm developments on adjoining and nearby lands.
- The proposed development will not introduce any activities or features which are otherwise currently unusual to the area. There are therefore no changes to the patterns and types of activity in the area as a result of the proposed project.
- There will there be no severance, loss of rights of way or amenities as a result of the proposed development. All works will be undertaken on private lands.
- In terms of impacts to neighbouring lands and land-uses it is considered that the proposed development does not pose a significant risk to either existing or future land-uses. All existing land-use practices can co-exist with the development.

Overall, it is considered that during the construction phase there is likely to be a slight to moderate negative impact on land use within the development lands. Similarly, during decommissioning there is likely to be temporary disruptions to land-uses and access. Impacts would be temporary and not significant. During operation it is considered that the proposed development would have a neutral impact on land-uses.

The requirement to replant land taken out of forestry would be an indirect impact of the proposed development. The total replanting requirement for the proposed development is 37.2hectares (Ha). Each of the proposed replanting sites are located within a rural, working landscape in which agriculture and forestry form the primary land-uses. The proposed replanting sites are in private ownership and there will be no severance, loss of rights of way or public amenities due to afforestation of these lands.

5.3.5 Tourism and Amenities

While tourism has become a major economic driver in Donegal, no significant economic benefits of this industry are directly associated with the proposed development lands. The proposed development site is not currently used as a recreation site. There are no picnic facilities near the site or any direct tourist attractions or services at the site.

Given that there are currently no tourism attractions specifically pertaining to the proposed development site there are no direct impacts associated with the construction phase of the proposed development.

The location of the proposed development away from major tourist attractions will ensure that visitors are not directly impeded from the larger area during the operational phase. However, a range of attractions are present in the wider area from which the proposed development may be visible. This includes sites of historical, cultural or natural interest as well as sites or linear routes which support a diverse range of outdoor recreational activities including walking, cycling and fishing.

Chapter 12 describes the assessment of landscape and visual impacts. The assessment considered the visual effects from key tourism and recreational locations in the area including **Glenveagh National Park** (Viewpoint 1)**,** Scenic Viewpoint in **Fintown (**Viewpoint 10) **and Sli Dun ns nGall** (Viewpoint 13).

Overall this assessment concluded that the proposed development will have a slight to moderate visual effect. While visual perception is largely subjective, it is considered based on that assessment in terms of both the overall impact on landscape character and the nature and extent of visual effects that the proposed development would be unlikely to have a significant, negative impact on the existing or future tourism potential of the area.

There are no tourist facilities or attractions located on or in the immediate vicinity of the proposed replanting lands. Therefore there is no potential for a significant impact on tourism or recreation land uses.

5.3.6 Irish Language and the Gaeltacht

The Donegal County Development Plan includes objectives to protect and strengthen the linguistic base and socio-economic vibrancy of Gaeltacht areas. Considering the nature of the proposed project, no significant negative effects upon the status of Irish as a community language or the socio-economic vibrancy of the Gaeltacht will occur.

Policy CCG-P-19 of the Donegal County Development Plan states: *It is a policy of the Council to facilitate developments which would strengthen the socioeconomic vibrancy of Gaeltacht towns and villages in accordance with the related policies of this Plan.*

The community benefit fund (Section 5.3.7) would provide funding in area which could be used to support this objective.

5.3.7 Community Fund

SSER and Coillte strongly believe in playing a part locally by contributing to the social, environmental and economic well-being of communities surrounding our wind farms. Traditionally funding has been allocated to a range of measures with a focus on energy efficiency, education, sustainability and safety.

If consented, a Community Benefit Fund for Drumnahough Wind Farm will be operated to ensure the project provides tangible long-term benefits to the community throughout the lifetime of the project. The Community Benefit Fund will be designed and developed on the basis of community involvement and consultation. SSE and Coillte will work with the local community to develop appropriate governance arrangements and decision-making structures. The Fund will be operated in line with the terms and conditions of the Renewable Electricity Support Scheme, if applicable, and the requirements of the revised Wind Energy Development Guidelines.

5.3.8 Health and Safety

5.3.8.1 *Safety*

While there is the potential for construction related hazards, serious risks to human health and safety are not envisioned. During construction and decommissioning the site will be managed in accordance with the following safety and health regulations and guidelines which will ensure a high standard of safety both for workers on site and the general public.

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

- Safety, Health & Welfare at Work (General Applications) Regulations 2007 to 2016; and
- Irish Wind Energy Association Best Practice Guidelines.

If blasting is required it will be undertaken in accordance with a site specific blasting plan. Pre-notification signs and warnings to any potentially affected landowners will be undertaken.

A Safety and Health Plan covering all aspects of the construction process will be prepared in advance of construction and will comprehensively deal with safety and health related issues.

The rigorous safety checks imposed on the turbines during design, construction, commissioning and operation ensures the risks to humans are negligible.

During the operational phase, potential electrical risks are associated with turbine transformers, switches and cabling. It is not envisioned that these will however pose any significant risk as these will fully meet health and safety regulations relating to high voltages and be enclosed in the sub-station site with secure fencing (2.4m steel palisade fence) and appropriate signage.

Access to the turbines and the substation will be controlled during operation to ensure the public are restricted for their safety.

Blades can potentially fail through damage sustained in severe weather mainly through lightning strike or due to inadequate upkeep and maintenance. This is extremely rare and the developer undertakes to operate and maintain all plant safely and in good working order on the site. Modern wind turbine design incorporates a fail-safe mechanism that comes into play under extreme weather conditions. This mechanism causes the turbines to automatically shut down in periods of excessively high wind-speeds. The separation distances of turbines from public roads and residences are well beyond fall over distances that would present a risk of significant accidents.

Overall, the project will have a net benefit on human health in the long term by contributing to the production of clean renewable energy.

5.3.8.2 *Health and Well Being*

Construction works and new development not only can pose safety risks but can also give rise to potential impacts on general amenity affecting health and well being. General amenity is to do with the pleasant, amenable qualities of a place as it is used and perceived by the people who reside, frequent or view it. There are a number of general elements that contribute to, or detract from, the amenity of an area. Nuisances such as noise, dust and traffic are potential factors for the devaluation of amenity.

The potential negative well being and nuisance effects of the proposed development on the local human environment have been identified as follows:

- Dust emissions from construction and decommissioning activities
- Noise emissions during construction activities and operation
- Visual impacts during operation
- Shadow flicker during operation
- Traffic nuisance during construction

Each of these issues has been fully assessed and is documented in other chapters of the EIAR as set out in **Table 5-10**. These assessments were reviewed to inform this study and it is concluded having regard to these environmental factors, under which human health effects might occur, there will be no significant effects on human health as a result of the project.

Table 5-10 Nuisances issues and relevant assessment

Development Phase	Potential Nuisance / Health & Safety Issue	Addressed In EIAR Chapter
Construction Phase	Noise emissions and vibration	Chapter 11
	Dust emissions	Chapter 8
	Traffic nuisance	Chapter 15
Operational Phase	Noise emissions and vibration	Chapter 11
	Visual impacts	Chapter 12
	Air quality impacts	Chapter 8
	Shadow Flicker nuisance	Chapter 14
Decommissioning	Traffic nuisance	Chapter 15
	Noise emissions and vibration	Chapter 11

Traffic and road usage

Potential impacts on the surrounding road network will arise principally during the construction phase. Peak daily construction traffic is predicted to be 180 HGVs with the predicted highest peak hourly HGV traffic volumes to be approximately 24 per hour. Peak construction traffic would principally occur during turbine base pours and therefore arise on twelve occasions.

Traffic studies carried out for the proposed development indicate that while the increased traffic volume on the local road network during the construction phase would be substantial, this increase will be well within the carrying capacity of the local road network. However, the existence of additional traffic, especially heavy goods vehicle traffic, associated with the construction phase has the potential for local residents and users of these roadways to experience minor disturbances and/or be inconvenienced on encountering site related traffic.

Noise:

The HSE position paper 2017 states that "There is no direct evidence that exposure to wind farm noise affects physical or mental health". There is no direct evidence that considered possible effects on health of infrasound or low-frequency noise from wind farms. The WHO (1995) states that "There is no reliable evidence that infrasound below the hearing threshold produce physiological or psychological effects".

While there is no reliable published scientific evidence that demonstrate a direct causal link between people living in proximity to modern wind turbines, the noise they emit and resulting physiological health effects, wind turbine noise can be a source of annoyance for some people.

Chapter 11 of this EIAR considers the effects of noise emitted for the scheme against national guidelines.

The wind farm construction phase has the potential to generate noise emissions which could cause disturbance to local noise sensitive areas. The results of the construction noise predictions indicate

that noise generated during the construction phase will not exceed the acceptable construction noise limit at any dwelling location, for the duration of the construction phase. The noise assessment makes recommendations regarding measures to reduce the amount of noise emissions during construction. Overall construction activities will have a temporary negligible effect and noise generated from construction traffic will have a temporary slight negative effect. Therefore, overall construction related activities will have a temporary slight negative effect.

Noise levels from operation of the turbines have been predicted for those locations around the site most likely to be affected by noise. The study concluded that operational noise levels from the proposed development will be within levels deemed, by national guidance, to be acceptable for wind energy schemes.

Therefore considering the separation distance between the proposed development and nearest residential receptors and with adherence to the national guide limits, the local population is unlikely to experience significant negative effects from noise.

Decommissioning is likely to result in less noise than during construction of the proposed development. The overall construction phase has been considered to have slight negative effects, therefore decommissioning will, in the worst case, also have slight negative effects.

Shadow Flicker

Shadow flicker is defined as the alternating light intensity produced by a wind turbine as the rotating blade casts shadows on the ground and stationary objects, such as the window of a residence.

The HSE position paper (2017) states that, "There is insufficient direct evidence to draw any conclusions on an association between shadow flicker produced by wind farms and health effects. Flashing lights can trigger seizures among people with a rare form of epilepsy called photosensitive epilepsy. The risk of shadow flicker from wind farms triggering a seizure among people with this condition is estimated to be extremely low".

The proposed development has the potential to give rise to shadow flicker impacts on surrounding dwellings. The modelling undertaken, assumes a worst case scenario, and has determined that 5 No. properties could theoretically experience potential shadow flicker exceeding threshold values greater than the 30 hours per year or 30 minutes per day guideline limit set out in the current 2006 Wind Energy Development Guidelines. Where meteorological conditions and the presence of screening are taken into consideration, the model concludes that the guideline limits will not be exceeded. With the implementation of additional turbine management measures to shut-down operations at critical times the proposed development would have zero shadow flicker effect on residential dwellings. Therefore the proposed development will not have significant negative effects on nearby dwellings as a result of shadow flicker (Refer to Chapter 14 Shadow Flicker for further details).

Electromagnetic Radiation

Emissions, such as electromagnetic fields (EMF) are related to the unwanted generation of electromagnetic energy. The European Commission opinion on EMF states that '*The results of*

current scientific research show that there are no evident adverse health effects if exposure remains below the levels recommended by the EU legislation[1].

The HSE position paper (2017) states that, '*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'*.

The proposed wind turbines are located at substantial distances from residential receptors and thus would have no possible EMF impact. The distance from any wind turbine to the nearest residence is 690m. This residence is currently unoccupied. All other residential receptors are at or greater than 1km from the nearest proximal wind turbine.

The proposed grid connections will be at one of two proposed locations, well away from any residence with no possible EMF impact. The distance from the nearest sensitive receptor to the permitted Lenalea Substation is in excess of 2.6km. The distance from the nearest sensitive receptor to the alternative grid connection point, which includes a substation, battery storage facility and loop in infrastructure (2 No. new end masts and associated overhead power lines to/from the existing 110kV line to/from the new proposed substation) is in excess of 830m.

Air Quality

It is generally accepted that the proposed development will make a positive contribution to air quality once operational. Notwithstanding this, there is the potential for short-term negative impacts in terms of dust emissions during the construction phase of the development.

Vehicle and fugitive dust emissions would occur primarily during project construction. Dust generated during the construction phase is not likely to significantly affect the local air quality. Given the distances to the nearest sensitive receptors, dust levels are not likely to exceed the recommended TA Luft 350mg/m3/day guide-limit. There is, however, the possibility of nuisance dust occurring in the vicinity of the site entrances and along the local public road which could affect road users. This is considered to result in temporary slight negative effects and mitigation will be needed.

With the effective implementation of standard dust management measures to control and reduce dust no significant negative effects, in terms of a community nuisance is likely to occur.

Visual Impacts

Given the size of the turbine structures and their proposed position along an open upland area, a visual impact is unavoidable. The extent of intrusion will vary in degree and significance according to viewing distance, the numbers and parts of turbines visible, the number of viewers affected and of course public perception.

[1] https://ec.europa.eu/health/scientific_committees/consultations/public_consultations/scenihr_consultation_19_en

A landscape and visual impact assessment was carried out in relation to the proposed development (Refer to Chapter 12 of this EIAR). A total of 17 viewpoints were used to determine the visual presence of the proposed development. From these viewpoints photomontages were prepared and a Landscape and Visual Impact Assessment completed.

The assessment of the 17 viewpoint locations shows that the visual effects range from those with No visual effect (3 No. viewpoint locations), to Moderate effect (3 No. viewpoint locations). Two Viewpoints were considered Imperceptible, three were considered Not significant, and six were considered Slight negative.

5.3.9 Cumulative Effects

Construction of the proposed development will result in increased traffic on the local road network, noise emissions from construction vehicles and equipment and from fugitive dust resulting from ground-disturbance activities. Any cumulative effect with existing development is catered for in the background receiving environment studies.

In considering cumulative effects with other planned or approved projects, construction effects will have a cumulative impact on the receiving environment, only if other reasonably foreseeable proposals are constructed in close vicinity to the proposed development construction and at the same time.

Therefore, cumulative noise, traffic and air quality impacts have the potential to arise locally when construction activities associated with the proposed development take place at the same time as other developments in a specific location. Most of the proposed development's construction activity is associated with installation of access roads and wind turbines within the Project site, with shorter duration and more limited activities associated with the construction of the underground connection to the permitted Lenalea Substation or, if progressed, the installation of the substation associated with the alternative grid connection option. Therefore there is limited potential for cumulative noise and air quality effects with other planned or approved projects. Any cumulative traffic effects/impacts on the local road networks due to construction works associated with possible developments would be temporary and short-term. Overall, it is considered unlikely that any cumulative effects with other projects due to construction works would result in long term significant impacts on Population and Human Health.

The noise impact from existing developments is catered for in the background noise surveys. No other additional approved projects have been identified in the study area that might produce cumulative noise and vibration impacts to sensitive receptors. Overall, no significant cumulative operational noise effects have been determined.

Shadow Flicker Control Measures will ensure no shadow flicker resulting from the proposed development. Therefore there is no potential for cumulative shadow flicker effects with existing or approved neighbouring wind farm developments.

Operation of the proposed development will not result in any signification air emissions. The proposed development along with other renewable energy developments will however contribute to cumulative long-term beneficial greenhouse gas and climate change effects.

5.4 MITIGATION

The potential for significant impacts on the human environment will principally arise during the proposed development's construction phases from traffic, noise and dust, and during the wind farm operational phase from noise and shadow flicker and will need to be addressed. Mitigation in relation to these issues are outlined in their respective Chapters of this EIAR (refer to Chapter 15 Material Assets Section 15.4; Chapter 8 Air and Climate Section 8.4; Chapter 11 Noise and Vibration Section 11.4; Chapter 14 Shadow Flicker Section 14.4). No additional mitigation is proposed here.

All Forest Service guidelines and Health and Safety legislation will be adhered to during all forestry-related activities at the proposed replanting lands. The potential for significant negative effects on worker and public health and safety is therefore minimal. No additional mitigation is proposed here.

5.5 RESIDUAL EFFECTS

- With the implementation of mitigation measures, noise nuisances will be kept to a minimum and within acceptable noise limits.
- With the implementation of mitigation measures, there will be zero potential for shadow flicker effects.
- With the implementation of standard traffic management measures, traffic nuisances will be kept to a minimum.
- With the implementation of mitigation measures, significant health and safety implications are not envisioned.
- With the implementation of standard best management construction activities, dust levels will remain within recommended acceptable guide-limits.

Overall there will be no significant negative residual effects on population and human health as a result of the proposed development.

5.6 CONCLUSION

As with any development, the construction activities can cause a nuisance to the local community and are likely to pose temporary minor disturbances locally. The most notable of these disturbances relates to the generation of additional traffic on the local networks. Here noise and safety implications are also a concern. However, disturbances associated with the additional volumes of traffic will principally be confined to the construction phase and will cease on completion of works. The construction phase will be managed to minimise the impact on the human environment and the local residents. With the mitigation measures in place, no significant negative effects on the local human environment are expected.

There are no predicted adverse operational impacts associated with the proposed development which would result in significant negative effects on local society. The project will produce electricity in an environmentally-friendly manner thereby avoiding the risk of air pollution and thus benefit human health.

In terms of impacts to neighbouring lands and land-uses it is considered that the proposed development does not pose a significant risk to either existing or future land-uses. All existing land-use practices can co-exist with the proposed development. There will be no severance, loss of rights of way or amenities as a result of the proposed development.

Noise effects are not considered to be significant. The noise assessment shows that the proposed development will operate within the recommended noise limit criteria in the wind energy planning guidelines 2006 for all third-party properties and thus will not adversely impact on the quality of life of local residents and the existing relatively tranquil environment in which they live.

The shadow flicker assessment shows that while there is potential for a number of dwellings within 1.4 km of the turbines to experience shadow flicker effects, the operational mitigation measures proposed (i.e. turbines will be programmed to shut down during periods when shadow flicker is predicted to occur) ensures that zero shadow flicker will occur at all residential receptors.

The operational phase will be managed to minimise the impact on the human environment and the local residents. Should it be required, turbines will be operated in a noise reduced mode at specific wind speeds to ensure that specified limits are met at all locations or shut down for periods. With the mitigation measures in place, no significant negative effects on the local human environment are expected.

The visual factor of the development is perhaps the most intrusive aspect. Given the size of the turbine structures and their proposed position along an open upland area, a visual effect is unavoidable. The extent of intrusion will vary in degree and significance according to viewing distance, the numbers and parts of turbines visible, the number of viewers affected and of course public perception. The landscape assessment demonstrates that the proposed development would not have a significant negative visual effect in terms of local population or key tourism and recreational amenities.

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