



Islandmore Wind Farm

Environmental Impact Assessment
Report

Chapter 4: Population & Human
Health

Islandmore Wind Farm Limited

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4.1 INTRODUCTION

This chapter presents an assessment of the likely and significant effects of the project on population and human health. Human beings comprise a significant and important environmental factor which must be comprehensively assessed. This includes effects on the existence, activities and wellbeing of people, including the local population. While there is no specific definition of the meaning of the term 'Human Health', the European Commission *Guidance on the preparation of the Environmental Impact Assessment Report* (2017) states 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".

Many of the likely significant effects on population and human health are therefore addressed in the specific, relevant chapters of this EIAR including, for example, Water (**Chapter 7**), Air Quality (**Chapter 8**), Climate (**Chapter 9**), Landscape (**Chapter 10**), Noise & Vibration (**Chapter 12**), Shadow Flicker (**Chapter 13**) and Interactions between these environmental factors and population and human health (**Chapter 15**).

In accordance with Environmental Protection Agency (EPA) *Advice Notes on Current Practice in the preparation of Environmental Impact Statements* (2003), issues which are specifically examined in this chapter include *inter alia*:-

- 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 land use?;
- Land-uses – will there be severance, loss of rights of way or amenities, conflicts, or other changes likely to ultimately to alter the character and use of the surroundings?;
- Tourism – will the development affect the tourism profile of the area?; and,
- Health and Safety – will there be risks of death, risks to public health, disease, discomfort or nuisance?

Likely significant effects may occur as a result of direct interaction between the project and population and human health receptors, such as farming operations affected as a result of construction activities, or indirectly, such as employment created as a result of the local spending of wages earned by the construction workforce during the construction phase of the project.

4.1.1 STATEMENT OF AUTHORITY

This chapter was prepared by various members of the Galettech Energy Services (GES)

Planning & Environment Team. GES has substantial socio-economic/population and human health assessment experience having prepared Population & Human Health (Human Beings) chapters for multiple projects which have been subject to EIA, including those listed at **Section 1.8.1 (Chapter 1)**.

4.1.2 DESCRIPTION OF THE PROJECT

In summary, the project comprises the following main components as described in **Chapter 3:-**

- 10 no. wind turbines, 3 no. with an overall height of 185m and 7 no. with an overall height of 150m;
- All associated and ancillary site development, excavation, construction, landscaping and reinstatement works, including provision of site drainage infrastructure and forestry felling;
- Works to the public road network along the turbine component haul route; and,
- 110kV electricity substation and installation of c. 7km of underground electricity line to facilitate connection of the wind farm to the existing Tonroe 110kV electricity substation at Ballaghaderreen, County Roscommon.

The project is located in north County Roscommon; c. 2km north of Ballaghaderreen, c. 13km east of Charlestown (Co. Mayo) and c. 6km southwest of Gorteen (Co. Sligo); and is located in close proximity to the county boundaries between counties Roscommon, Sligo and Mayo.

It is envisaged that turbine components will be transported from the Port of Galway through the counties of Galway, Mayo and Roscommon to the project site utilising, predominately, motorway and national roads. Accordingly, it is assessed that there is no likelihood of significant effects on population and human health arising from the transport of turbine components and, therefore, these works have been scoped out from further assessment.

A full description of the project is presented in **Chapter 3**.

4.2 POLICY AND GUIDANCE

This section sets out the policy and guidance which is considered to be of relevance to an assessment of effects on population and human health for a project of this type i.e. Project Type 33 as described in the EPA's *Advice Notes on Current Practice in the preparation of Environmental Impact Statements (2003)*.

4.2.1 NATIONAL POLICY

4.2.1.1 Wind Energy Development Guidelines for Planning Authorities 2006

The *Wind Energy Development Guidelines for Planning Authorities 2006* ('the 2006 Guidelines') offer advice to planning authorities in determining planning applications for wind farm developments, including the likely significant effects on human health and population.

4.2.1.2 Draft Revised Wind Energy Development Guidelines (December 2019)

The *Draft Revised Wind Energy Development Guidelines* ('the Draft Guidelines') were published in December 2019. The Draft Guidelines include updates to several key

aspects of the 2006 Guidelines including in respect of matters which interrelate with population and human health effects; namely noise, visual amenity and shadow flicker.

4.2.2 REGIONAL POLICY

Regional policy, as it relates to population and human health, is derived from the Northern & Western Regional Assembly *Regional Spatial and Economic Strategy 2020–2032* (RSES). The RSES seeks to provide a framework through which national policies; including in relation to economic, environmental and quality of life factors; are implemented across the Northern & Western Regional Assembly, which includes County Roscommon.

4.2.3 LOCAL POLICY

4.2.3.1 Roscommon County Development Plan 2022-2028

The *Roscommon County Development Plan 2022-2028* ('the Roscommon CDP') includes a set of Strategic Objectives which also relate to population & human health, including as follows:-

- Plan for a population uplift of 6,387 persons/2,353 housing units during the Plan period. In doing so, ensure increased alignment between the location of population growth and employment growth;
- Direct a significant proportion of the county's assigned population growth to the Athlone West area of Athlone and to Roscommon town, thereby enabling the creation of a critical mass in those areas for the provision of increased services, facilities, and employment opportunities;
- Promote the highest quality living environment possible, in both urban and rural areas, for all inhabitants of County Roscommon to enjoy;
- Promote the regeneration and renewal of towns and villages throughout County Roscommon and create healthy place-making by improving the attractiveness, quality, design, viability and vibrancy of towns and villages;
- Promote the development of the towns and villages throughout County Roscommon to their full economic and social potential in order to support and enhance both the resident/hinterland community and economic and employment base and to enable towns and villages become self-sustaining, sustainable and balanced;
- Encourage and facilitate the provision of high-quality housing, at density levels appropriate to its setting, located in optimum locations and aligned with adequate infrastructure, services and amenities;
- Develop and promote the towns and villages of the county as attractive residential alternatives to single dwellings in the open countryside;
- Continue to recognise that County Roscommon is a predominantly rural county and plan to facilitate a balance between facilitating residential development in the open countryside and reinvigorating the towns and villages;
- Sustain rural communities by supporting agriculture, rural based economic activity, promoting balanced development of rural settlements and maintaining a stable population base;

- Protect and enhance the natural assets of County Roscommon, including clean water, biodiversity, landscape, green infrastructure, heritage and agricultural land;
- Foster the creation of an attractive and competitive business environment by supporting economic development, job creation, tourism and prosperity for all;
- Ensure that the county is served by adequate community facilities and amenities, which add to the quality of life of residents of the county;
- To protect, conserve and enhance the built and natural heritage and the landscape of County Roscommon for future generations; and reinforce the distinctive character of the county through ensuring that recognised sites and species of environmental importance are conserved and managed appropriately; and,
- Achieve a transition to a competitive, greener, low carbon, climate resilient and environmentally sustainable county, facilitated through reducing the need to travel, by integrating land use and sustainable modes of transport, by reducing the use of non- renewable resources and by promoting and facilitating renewal energy initiatives on a domestic and commercial scale.

4.2.4 GUIDANCE

4.2.4.1 EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports (2022)

The Environmental Protection Agency *Guidelines on the Information to be contained in Environmental Impact Assessment Reports (2022)* ('the EPA Guidelines') state that an EIAR does not generally require assessment of land-use planning, demographic issues or detailed socio-economic analysis unless the project gives rise to likely significant effects which affect economic or settlement patterns.

Whilst the project will not result in such development, it will give rise to the generation of employment during both the construction and operation phases as well as inward investment which may affect the local supply chain. On this basis, the EIAR baseline contains a brief summary of key socio-economic baseline data relating to the wider study area (see **Section 4.3.2** below) and the likely effects on this receiving environment are considered.

In relation to likely effects on human health, the EPA Guidelines highlight the importance of avoiding duplication of assessments (i.e. care should be taken to avoid 'double-counting' effects that are identified elsewhere in the corresponding chapter of the EIAR e.g. noise or air quality effects etc). As a result, likely effects on population and human health which may arise from these specific environmental factors are addressed in their respective chapters. The likely interactions of these effects, if any, are also addressed in **Chapter 15**.

The EPA Guidelines further state that assessments of other health and safety issues, as relevant, may be carried out under other EU Directives (e.g. reports prepared under the Integrated Pollution Prevention and Control frameworks or SEVESO Directive etc.). In keeping with the requirement of the EIA Directive, an EIAR should take account of the results of such assessments without duplicating them.

4.2.4.2 EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects

These guidelines ('the Fáilte Ireland Guidelines') recognise that the impact and interaction of tourism with the environment is complex and the assessment of environmental impacts is crucial to creating a sustainable tourism economy and protecting natural resources. It is also acknowledged that tourism can be affected both by direct and indirect effects of new developments as well as by interactions between new activities and tourism activities; for example, the effects of high volumes of heavy goods vehicles passing through hitherto quiet, scenic, rural areas.

The Fáilte Ireland Guidelines set out that the EIAR should indicate the location of sensitive nearby tourism resources that are likely to be directly affected, and other premises which may be the subject of secondary impacts such as alteration of traffic flows or increased urban development. The EIAR should indicate the numbers of premises and visitors likely to be affected, both directly and indirectly.

4.2.4.3 EMF & You: Information about Electric & Magnetic Fields and the electricity network in Ireland

The provision of electrical apparatus is common practice throughout Ireland and its installation does not give rise to any specific health concerns. The extremely low frequency (ELF) and electrical magnetic fields (EMF) associated with the operation of the electrical equipment will, as is required by legislation, comply fully with the international guidelines for ELF and EMF set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), a formal advisory agency to the World Health Organisation, as well as the EU guidelines for human exposure to EMF.

The document 'EMF & You' (ESB, 2017)¹ provides further practical information on EMF.

4.2.4.4 Supplementary Guidance & Information Sources

Other advice and guidance, reviewed as part of the baseline assessment and in developing the assessment methodology include:-

- *Code of Practice for Wind Energy Development in Ireland* (Department of Communications, Climate Action and Environment, 2016);
- *Best Practice Guidelines for the Irish Wind Energy Industry* (Irish Wind Energy Association, 2012);
- *Best Practice Principles in Community Engagement and Community Commitment* (Irish Wind Energy Association, 2013);
- *An Enterprising Wind: An economic analysis of the job creation potential of the wind sector in Ireland* (Irish Wind Energy Association, 2014);
- *Wind Turbine Experiences – 2012 Survey Results* (British Horse Society, 2013);
- *Wind Turbines and Horses - Guidance for Planners and Developers* (British Horse Society, 2015); and,
- *Electricity Transmission Studies: Evidence-Based Environmental Studies* (EirGrid, various).

Key socio-economic data for the baseline has been derived from:-

- Central Statistics Office (CSO);
- Roscommon County Development Plan 2022-2028;

¹ https://esb.ie/docs/default-source/default-document-library/emf-public-information_booklet_v9.pdf?sfvrsn=0

- *Sligo County Development Plan 2024-2030*;
- *Mayo County Development Plan 2022-2028*;
- Pobal Profiling GIS Data (<https://maps.pobal.ie/>);
- Fáilte Ireland data in conjunction with websites of relevant tourism sites and amenities in the area;
- Fáilte Ireland – *Key Tourism Facts 2024* (2025);
- Fáilte Ireland – *Visitor Attitudes on the Environment* (2026);
- *County Roscommon Tourism Strategy 2025-2030*;
- *County Sligo Tourism Strategy 2018-2023*;
- *Roscommon Outdoor Recreation Strategy 2023-2028*;
- *Roscommon County Local Economic and Community Plan 2023-2029*;
- *County Sligo Local Economic & Community Plan 2023-2030*;
- *Mayo Local Economic and Community Plan 2023-2029*; and,
- OSI mapping and aerial photography.

4.3 METHODOLOGY

4.3.1 DESK BASED RESEARCH

The majority of effects on population and human health receptors are likely to be experienced during the construction phase. These are likely to include potential beneficial effects on the local economy, including employment opportunities and increased spend on local services as well as potential adverse effects, such as restrictions on farming operations, neighbouring businesses or general disruption to the amenity of the local area, including in respect of road traffic, which may indirectly impact on its recreation or tourism value. Once operational, effects are likely to be primarily related to the visual impact and potential noise effects from the project.

In respect of human health, the chapter takes into consideration the results of other assessments in the EIAR which have relevance to health, namely soils; water; air quality; climate; noise; shadow flicker; and landscape. The findings of these assessments are cross referenced in this chapter, but the assessment will not be repeated to avoid duplication.

Employment effects and direct expenditure are quantified using data provided by the Developer and, where necessary, using standard industry data. Opportunities for local businesses and the local labour market to be involved in supply chain activities will be identified and where possible quantified.

4.3.2 STUDY AREA

The spatial focus of the assessment is undertaken at two levels. Firstly, effects on specific community, recreation and tourism receptors are assessed at a local level which is defined as 5km from the wind turbines and 500m from the route of the underground electricity line and is referred to as the 'Local Study Area' (LSA). The LSA includes a small area of northeastern County Mayo, to the northwest of the project site, and southern County Sligo, to the north of the project site.

Economic effects are assessed with regard to a wider study area that takes account

of a likely catchment for provision of domestically sourced goods and services relating to the construction and operation of the wind farm. This study area comprises the county within which the project is situated, i.e. County Roscommon, and is referred to as the 'Wider Study Area' (WSA). Whilst it is recognised that the project is located adjacent to counties Mayo and Sligo; given the rural characteristics and sparsely populated nature of the relevant areas of Mayo and Sligo; it is considered that that as County Roscommon is presented as a statistical unit in CSO Census data, and that the WSA is used as a measure of key population, labour market and economic statistics and trends, it is the most appropriate study area for assessment purposes.

Given the scale of the project, it is not considered necessary to assess effects at a national or international level.

Study Areas	Spatial Extent
Wider Study Area	County Roscommon
Local Study Area	5km from the wind turbines and 500m from the underground electricity line

Table 4.1: Study Area Details

A desk-based review of existing conditions in the area has been undertaken, covering the following themes:-

- Wider Study Area:-
 - Population;
 - Labour market, education and skills;
 - Business diversity and supply chain; and,
 - Visitor economy.
- Local Study Area:-
 - Recreational assets;
 - Visitor attractions; and,
 - Visitor accommodation and other businesses/services serving the tourism economy.

4.3.3 CONSULTATION

A range of statutory and non-statutory organisations have been consulted as part of the EIAR scoping process. The responses which are relevant to likely effects on population and human health are summarised in **Table 4.2** and provided at **Annex 1.4**.

Consultee	Comments	Reference within EIAR
Faillte Ireland	Supplied copy of <i>EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects</i> .	Incorporated into methodology.

Table 4.2: Scoping advice relating to Population & Human Health

Separately, the Developer has also engaged in a public consultation process during the design phase of the project. Door-to-door visits were undertaken with local residents, together with the distribution of information booklets, where members of the public were afforded the opportunity to discuss the project directly with the project

team. In addition, all local elected public representatives were contacted; while representatives of local community groups were also consulted with.

The public consultation process was managed by a dedicated Community Liaison Officer and structured to ensure clarity and consistency, and to maintain an objective and factual approach. A website was also established where members of the public concerned could view details of the project, receive updates on the project and to contact the Developer via email or phone number (www.projects.statkraft.ie/islandmore-wind-farm).

A comprehensive overview of the Developer's approach to public consultation is provided at **Annex 1.6**.

4.3.4 APPROACH TO ASSESSMENT OF EFFECTS

The approach to the assessment of effects assesses the likely construction, operational and decommissioning effects on:-

- the local economy (employment and economic output);
- the local population;
- opportunities for local involvement in the business supply chain and employment, i.e. how the key construction and operational activities will translate into investment;
- recreation and tourism assets; and,
- land use, through possible effects arising from improved access to the countryside.

Decommissioning phase effects are assessed as being largely similar to construction effects.

4.3.5 SENSITIVITY CRITERIA, MAGNITUDE AND SIGNIFICANCE THRESHOLDS

Likely effects will be assessed in line with the following parameters:-

- beneficial or adverse (or neutral);
- extent (the area over which the effect occurs);
- likelihood (i.e. likely or unlikely);
- duration (the time for which the effect is expected to last prior to recovery or replacement of the resource or feature);
- reversibility (permanent or temporary); and,
- timing and frequency.

4.3.6 SENSITIVITY CRITERIA

There are no published standards that define receptor sensitivity relating to population and human health assessments. As a general rule, the sensitivity of each receptor or receptor group is based on its importance or scale and the ability of the baseline to absorb or be influenced by the identified effects. In assigning receptor sensitivity, consideration is given to the following:-

- importance of the receptor e.g. local, regional, national, international;
- availability of comparable alternatives;

- ease at which the resource could be replaced;
- capacity of the resource to recover or adapt to identified effects over a period of time; and,
- level of usage and nature of users (e.g. sensitive groups such as people with disabilities).

Based upon competent expert judgement, four levels of sensitivity are used: High; Medium, Low and Negligible. Proposed sensitivity criteria are set out in **Table 4.3** below.

4.3.7 MAGNITUDE CRITERIA

The magnitude of impact is evaluated based on the change that occurs with respect to the baseline conditions. Four degrees of magnitude are used: High, Medium, Low and Negligible.

4.3.8 DEFINING SIGNIFICANT EFFECTS

The level of an effect is assessed by combining the magnitude of the impact and the sensitivity of the receptor as illustrated at **Table 4.3**. Five main levels of effect are used: Imperceptible, Slight, Moderate, Substantial and Profound; while further sub-levels are formed by amalgamating the main levels (e.g. Moderate-slight).

Where an effect is classified as 'Profound' or 'Substantial', this is considered to represent a 'significant effect' in terms of the EIA Directive. Where an effect is classified as Moderate, this may be considered to represent a 'significant effect' but is subject to competent expert judgement and interpretation, particularly where the sensitivity or impact magnitude levels are not clear or are borderline between categories or the impact is intermittent.

Magnitude	Sensitivity of Receptor				
	Very High	High	Medium	Low	Negligible
Very High	Profound	Profound-Substantial	Substantial	Moderate	Slight
High	Profound-Substantial	Substantial	Substantial - moderate	Moderate-slight	Not Significant
Medium	Substantial	Substantial moderate	Moderate	Slight	Imperceptible
Low	Moderate	Moderate-slight	Slight	Not Significant	Imperceptible
Negligible	Slight	Not Significant	Imperceptible	Imperceptible	Imperceptible

Table 4.3: Level of Significance Matrix

4.3.9 APPROACH TO MITIGATION

Mitigation measures, additional to those environmental measures embedded in the project design, are considered in order to mitigate any likely significant adverse effects that are identified through the assessment process.

4.3.10 CUMULATIVE EFFECTS

Consideration is given to the likely cumulative effect of the project in combination with other existing, permitted and proposed developments, including those listed in **Chapter 1**.

4.3.11 LIMITATIONS OF ASSESSMENT

Certain information, in particular information regarding capital expenditure and construction employment, will not be available until the normal pre-construction procurement processes have been completed. This assessment provides estimates, based on experience from other projects, of likely spend and employment during construction sufficient to allow assessment in this EIAR.

Information on interrelated effects is informed by the assessments undertaken on other environmental factors which are set out in the relevant chapters of this EIAR. Any assessment limitations are also set out in those chapters.

The status of certain individual receptors (e.g. accommodation businesses etc.) may be subject to change. Information reported in this chapter is based on the receiving environment survey work, as described in **Section 4.4**.

4.4 DESCRIPTION OF EXISTING ENVIRONMENT

4.4.1 WIDER STUDY AREA

4.4.1.1 Population

According to CSO Census 2022 data (CSO, 2022), the current population of County Roscommon stands at 70,259, which is less than 1.4% of Ireland's total population, as a whole, of 5.15 million.

4.4.1.2 Labour Market/Education and Skills

2022 Census data for County Roscommon², published in September 2023, indicates that there were 29,611 persons aged 15 years and over whose principal economic status was 'at work', whilst 844 were short term unemployed, 1,392 were long term unemployed and 475 were looking for their first regular job.

4.4.1.3 Business Diversity and Supply Chain

Data on an area's business population can be obtained from the CSO census data. This data source can be used to identify the structure of the local business base by sector. This is potentially useful in assessing the capacity of the local area to accommodate supply chain activity for infrastructure and other largescale construction projects, such as the subject project. **Table 4.4** provides the latest available (Census 2022) data on the structure of the local business base, both in absolute and relative terms.

Industry	Roscommon 2022	
Managers, Directors and Senior Officials	2,195	6.9%
Professional Occupations	5,732	17.9%
Associate Professional and Technical Occupations	3,368	10.6%
Administrative and Secretarial Occupations	3,093	9.7%
Skilled Trades Occupations	5,434	17.1%
Caring, Leisure and Other Service Occupations	2,635	8.3%

² <https://visual.cso.ie/?body=entity/ima/cop/2022&boundary=C03789V04537&guid=2ae19629-1497-13a3-e055-000000000001>

Industry	Roscommon 2022	
Sales and Customer Service Occupations	1,925	6.1%
Process, Plant and Machine Operatives	2,600	8.2%
Elementary Occupations	2,399	7.5%
Not stated	2,466	7.7%
Total	31,847	-

Table 4.4: Persons at work or unemployed by occupation

Source: CSO Census Data 2022

The data in **Table 4.4** shows that 'Professional Occupations', 'Skilled Trades Occupations', and 'Associate Professional and Technical Occupations' have the highest percentage of the work force; whilst 'Not Stated' comprises 7.7% of the workforce.

4.4.1.4 Visitor Economy

Fáilte Ireland combines counties together to form 7 no. different regions across Ireland for which tourism statistics are produced. County Roscommon forms part of the 'West' region along with counties Galway and Mayo.

The latest data for the West region indicates that:-

- there was a total of 1,226,000 overseas visitor trips to the region in 2024 generating approximately €847 million income;
- there was a total of 100,000 trips by residents from Northern Ireland to the region in 2024 generating approximately €30 million income; and,
- there was a total of 2,461,000 trips by Irish residents to the region in 2024 generating approximately €618 million income.

The policies and objectives contained within the Roscommon CDP are focussed on developing the county as a tourism destination; wherein it is set out that the county is strategically positioned as an inland county offering easy motorway access, serviced by a rail lane, and containing the geographic centre of Ireland. Within the county, there are also several notable rivers and lakelands; namely the River Shannon, Lough Ree and Lough Key. In addition, the Roscommon CDP also recognises that the county is located within *Ireland's Hidden Heartlands*, one of Fáilte Ireland's regional tourism brands. The Roscommon CDP seeks to further build upon this designation to create key visitor experiences and unique tourism offerings.

The Roscommon CDP also highlights that the implementation of the Shannon Master Plan and the Beara-Breifni Activation Plan will enhance Roscommon's appeal as a tourism destination, especially concerning the Shannon waterway and its related attractions. The policies and objectives in the CDP emphasise the promotion of tourism as an integral component of the county's economic profile and commits to the ongoing support for the *Roscommon Tourism Strategy 2017-2020*, along with any subsequent revisions.

Further amenity or tourism attractions located within County Roscommon include:-

- Arigna Mining Experience;
- Boyle Abbey;

- Lough Key Forest & Activity Park;
- King House;
- Strokestown Park House & Gardens;
- Rathcroghan Visitor Centre; and,
- Elphin Windmill;

4.4.2 LOCAL STUDY AREA

The following section describes the baseline environment for the LSA i.e. within 5km of the wind turbines. As set out at **Section 4.3.2**, this component of the baseline covers:-

- Community;
- Recreation;
- Visitor economy assets; and,
- Land use.

4.4.2.1 Community

The project is located in north County Roscommon; with the wind farm being located c. 2km north of Ballaghaderreen which is the only notable settlement located within the LSA. The Tonroe 110kV electricity substation, to which the wind farm will be connected via an underground electricity line, is located immediately to the northwest of the settlement.

The settlement of Ballaghaderreen is identified in the Roscommon CDP (Volume II) as a 'Self Sustaining Growth Town':-

"The Vision for Growth in Ballaghaderreen as identified in this Settlement Plan is to: Enable Ballaghaderreen to develop as a settlement dedicated to the growth of a vibrant and competitive creative sector and related industrial base, capable of providing opportunities for new and existing enterprises to support the local community and economy."

The Roscommon CDP sets out that the population of Ballaghaderreen, at the time of the 2022 census, was recorded as 1,800 with a projected population increase of 340 over the lifetime of the plan. Additionally, the town centre of Ballaghaderreen is one of 6 no. areas designated in the Roscommon CDP as an Architectural Conservation Area due to its "early nineteenth-century town planning origins".

4.4.2.2 Recreation

Given the rural nature of the LSA and the absence of a significant number of settlements, recreational facilities are quite limited and are mainly centred around the town of Ballaghaderreen.

Ballaghaderreen GAA Club

Ballaghaderreen GAA Club is located c. 1.5km southwest of the project (underground electricity line). The facilities include a playing field with associated changing facilities, spectator stand(s) and parking. The receptor is assessed to be of local value and therefore sensitivity is low for the purposes of this assessment.

Health Quarters Leisure Centre

Health Quarters Leisure Centre is located within Ballaghaderreen and c. 1km south of the project (underground electricity line). Facilities include a gymnasium, nutrition and wellness centre and private studios. The receptor is assessed to be of local value and therefore sensitivity is low for the purposes of this assessment.

Ballaghaderreen Community Garden and Park

Ballaghaderreen Community Garden is located c. 600m southwest of the project (underground electricity line). Facilities include raised garden beds, polytunnel, walkway and small gathering space. The receptor is assessed to be of local value and therefore sensitivity is low for the purposes of this assessment.

Ballaghaderreen Tennis Club

Ballaghaderreen Tennis Club is located c. 880m southwest of the project (underground electricity line). Facilities include tennis courts, changing facilities and associated parking. The receptor is assessed to be of local value and therefore sensitivity is low for the purposes of this assessment.

Walking Paths, Trails and Cycling

Sport Ireland Outdoors (formerly National Trails Office of Sport Ireland) is responsible for all waymarked trails. The Lung Lough Gara Way walking route is located within the LSA and passes through the project site. The receptor is assessed to be of regional value with a medium sensitivity for the purposes of this assessment.

4.4.2.3 Tourism

Accommodation

Three accommodation businesses, have been identified within the LSA; namely, Durkin's Guesthouse (c. 580m south), Spellman's Motel (c. 830m south) and Edmondstown House (c. 2km east). In addition, there are a small number of self-catering rental properties within the LSA which are marketed via third party marketing sites, such as Airbnb. The accommodation businesses identified are considered to be of local value and their sensitivity is therefore assessed as low.

Land Use

The project site, and the LSA, is predominately used for agricultural/forestry related purposes and, outside of those land uses described above, does not generally provide for notable recreational uses.

4.5 DESCRIPTION OF LIKELY EFFECTS

The following sections assess the effects which are likely to arise during the construction, operation and decommissioning phases of the project.

While the selected forestry replant lands may ultimately be located beyond the extent of the WSA and LSA; it is assessed that there is no likelihood of significant effects on population & human health arising at any point during planting activities or during the growth period. While the replanting of lands would result in a perceptible alteration to land use, the extent of replanting is likely to be undertaken within a relatively small, consolidated landholding and would not adversely affect population trends or human health at a local, regional or national scale. Similarly, it is assessed that there is

no likelihood of the replanting acting in combination with other developments to result in significant adverse effects on population & human health.

4.5.1 CONSTRUCTION PHASE

4.5.1.1 Effects on the WSA

Employment and Local Investment

During the 15-18 month construction phase of the project, there will be economic effects resulting from expenditure on site preparation, purchase and delivery of materials, plant, equipment and components. Information provided by the Developer and based on experience at other similar projects in Ireland, indicates that there is expected to be a peak on-site workforce of c. 100 no. workers. It is highly likely that a significant percentage of these workers will be recruited from the local labour market within the WSA, with the remainder being recruited from Ireland as a whole.

The most significant project infrastructure are the 10 no. wind turbines, the electricity substation and underground electricity line. The indicative investment sums have been set out in **Table 4.5** which provides a breakdown of the total development and capital expenditure required to develop and construct the project. Total investment comprises approximately €88 million for the project, including turbines, civil engineering works, electrical plant and grid connection.

Item	Description	Cost
Development Expenditure	Works undertaken up to the point of commencement of construction.	€6 million
Turbines & Ancillary Equipment	The activity by wind turbine manufacturers and suppliers, including nacelle/hub component manufacture and assembly and blade and tower manufacture. It includes transport, installation and commissioning but excludes the turbine service/maintenance agreement.	€50 million
Civil Works	The activity by civil contractors and their suppliers; including access tracks and drainage, crane hardstands, turbine foundations, cable trenches and buildings for electrical switch gear, and public road upgrade works.	€17 million
Electrical Works	The activity by electrical contractors and their suppliers, including cables, electrical switch gear, protection and control system.	€15 million
Total		€88 million

Table 4.5: Breakdown of Estimated Capital Investment

The procurement of goods and services is likely to have a significant positive effect on the local economy. Of the level of investment presented above, local contract spend (within the WSA) could be in the region of €22 million (c. 25%) over the development and construction period.

The types of supply chain companies that could benefit from this expenditure are wide ranging and are likely to include, but not limited to, the following:-

- haulage and transport services;

- traffic management;
- materials supply, e.g. stone aggregates and concrete;
- plant and equipment hire;
- vehicle servicing/tyres;
- fencing;
- fuel;
- security;
- waste management;
- building construction, electrical, plumbing, roofing, flooring, plastering and joinery services;
- signage and lighting;
- telecommunications;
- drainage;
- planting and landscaping;
- catering;
- professional services; and,
- accommodation.

The contractors appointed by the Developer will be actively encouraged to develop local supply chains throughout the WSA and work with local subcontractors and service providers.

In addition, local businesses and services are likely to experience indirect, short-term and slight benefits during the construction phase works as the workforce spend locally on general living costs whilst they are based in the area. These effects are further explored in the following section.

Tourism Economy

The construction period is anticipated to last for approximately 15-18 months and, as stated, is likely to benefit the local economy through expenditure on purchases of accommodation, food, fuel etc. which will be required to sustain the construction workforce. These beneficial effects would be experienced by businesses already operating within the tourism sector, as well as those that are partly dependent on tourism for their income, for example the retail sector.

Anecdotal evidence, based on other similar construction projects, demonstrates that local businesses such as accommodation providers welcome the enhanced level of occupancy that is achieved due to construction contractors using their accommodation on a year round basis, including periods of the year that are traditionally considered 'low season'. The benefits of increased business, although temporary, can allow businesses to invest in improvements that would not otherwise be affordable, leading to a longer term enhancement.

The positive effects arising during the construction period are assessed to more than offset any likely temporary negative effects to the tourism economy that may occur in the event that tourist visitors were unable to find local accommodation (for example, if accommodation was in use by construction workers) during the

construction phase.

Whilst overall effects on the tourism economy are assessed to be imperceptible and not significant (beneficial or adverse), the benefits to individual businesses is likely to be substantial and may indeed be significant. However, until such time as contracts are agreed by the Developer, it is not possible to quantify the precise level of benefit to individual businesses.

4.5.1.2 Effects on the LSA

Population Sustainability & Residential Amenity

Construction of the project is expected to have a duration of 15-18 months with works to occur between the hours of 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 hours on Saturday. Except for extended concrete pours during the construction of turbine foundations or any possible emergency works, construction activity is not expected to occur generally outside of these hours, or on Sundays or public holidays.

Construction works will generate noise; with **Chapter 12** concluding that noise levels at properties nearest to the project will be below prescribed limits. The assessment concludes that noise levels will be temporary in nature and will diminish with increased distance. Activities related to the installation of the underground electricity line will be undertaken in close proximity to residential dwellings along the proposed route. However, due to the transient nature of works and with the implementation of best practice construction methods and appropriate mitigation measures, the effect is not assessed as likely to be significant.

Chapter 14 (Transport & Access section) notes that the civil construction phase is estimated to generate 10,360 no. heavy goods vehicle (HGV) trips. It is also estimated that 30 no. light goods vehicle (LGV) trips will be generated daily as staff and personnel travel to and from the project site. Overall, the likely effects are not assessed to be significant and are assessed as ranging from moderate-to-slight, direct, indirect, negative, positive, short-term and long-term.

No likely significant effects on population sustainability are anticipated and likely effects on residential amenity are expected to be slight to moderate negative, of a temporary nature with the specific effects dictated by the proximity of individual residences to the project site.

Land Use

The project site comprises a mix of operational agricultural landholdings, commercial forestry and private cutover peat and includes land parcels which are owned by a number of private landowners. The Developer is in regular dialogue with each landowner and each has entered into a legal agreement to allow the Developer to use the land for the project. The legal agreements include a series of measures designed to minimise any likely land use effects including the clear identification of lands which may be subject to works; measures to ensure that disturbed lands are reinstated appropriately; and provision for the use of proposed access tracks by landowners during the operation phase of the project. Measures to facilitate the safe continuation of agricultural/forestry operations during the construction phase have also been developed.

Tourism and Recreation Assets

As the sensitivity of all but one of the tourism/recreational receptors within the LSA is

assessed to be low, and the magnitude of any adverse effects would also be low, the effect on receptors in the LSA would be imperceptible (adverse) and not likely to be significant. This effect would be further reduced, or may become beneficial overall, if businesses in this area generate additional revenue areas as a result of the project. It has been assessed that the Lung Lough Gara Way walking route has a medium level of sensitivity, due to its regional importance., However, given the temporary duration of the construction phase, the magnitude of adverse effect is assessed as being low and therefore the overall level of significance (of effect on this recreational asset) is assessed as being 'slight', in accordance with **Table 4.3** above.

The impact on businesses within the LSA, would be beneficial although, as the sensitivity is low, the level of beneficial effect is not expected to be more than imperceptible. Beneficial effects on individual businesses may be higher, particularly where they are regularly used by construction staff, as this affords them regular income that is not seasonally dependent. However, until contracts are agreed, and construction commences, it is not known which businesses would specifically benefit.

The detailed CEMP, to be prepared prior to the commencement of construction, will set out measures to ensure that local residents/businesses are informed of the construction work including the location and duration of temporary road closures and the identification of alternative routes during the construction works. Given the temporary nature of the construction works, the measures to be implemented and the low sensitivity of the receptors, the effect is assessed to be imperceptible and not likely to be significant.

Major Accidents or Natural Disasters

As set out within **Chapter 6** and **Chapter 7** of this EIAR, the project is not identified to be a likely source of pollution during either the construction or operation phases, predominately due to the limited volume of hydrocarbons stored on site and the bunding arrangements to ensure that spillages do not occur. In the event of an accident on site, mitigation measures set out in the above chapters will ensure that significant environmental effects are unlikely to occur.

There is limited likelihood for significant natural disasters to occur at the project site during the construction, operation or decommissioning phases. Ireland is a geologically stable country with a generally mild temperate climate. The potential natural disasters that may occur are therefore limited to ground instability, flooding and fire. The risk of ground instability is addressed at **Chapter 6** and risk of flooding is addressed in **Chapter 7**. It is assessed that the risk of significant fire occurring, affecting the project and causing it to have significant environmental effects, is limited. As discussed above, there are no significant sources of pollution from the project with the potential to cause environmental or health effects. Furthermore, one of the core 'mitigation by design' features of the project (maximising the distance to residential dwellings) further limits any likelihood of significant human health effects as a result of accidents or natural disasters.

Major industrial accidents involving dangerous substances pose a significant threat to human health and the environment. Such incidents can give rise to serious injury to local residents or result in damage to the environment, both within project sites and in the vicinity. However, the project site is not regulated by or connected/proximate to any site regulated under the Control of Major Accident Hazards Involving Dangerous Substances Regulations (COMAH/SEVESO Directive) and so there is no likelihood of a major accident during construction, operation or decommissioning or cumulative

effects or interactions with any such site.

4.5.1.3 Cumulative Effects

This assessment has taken into account the cumulative impact of the project including all elements i.e. wind farm and associated ancillary infrastructure, underground electricity line and upgrade works to the turbine component haul route.

However, there is potential for cumulative effects to arise in relation to the construction of other permitted or proposed developments should the construction phases overlap with the project. While there are a number of existing, permitted or currently proposed developments within the WSA and LSA, it is assessed that none of these projects are of a sufficient scale or nature to be likely to result in cumulative socio-economic, population or human health effects.

4.5.2 OPERATION PHASE

4.5.2.1 Effects on the WSA

Employment and Investment

When the project is operational, it will require a team of personnel to provide servicing, maintenance, repairs and other operational support. It is estimated that up to 5 no. engineers and technicians (full time equivalent) will be needed to provide operational support to the project. It is likely that these staff will be based within the WSA i.e. County Roscommon.

Further employment is anticipated to be supported directly and indirectly elsewhere in Ireland during the operation phase. Additional to the direct impacts on employment, there will also be indirect effects generated throughout the operation phase. Indirect effects arise from the placing of contracts with other businesses, both in the local area and elsewhere in Ireland, supplying services and materials to the project. Examples of such supply chain activity would include the procurement of:-

- site and building maintenance;
- waste management;
- civil engineering contractors for access track maintenance, ditching, crane hardstanding repairs, and weed control etc.;
- supply of consumable items (e.g. lubricants and oils, spare parts, office supplies, etc.); and,
- turbine inspections.

In addition to the above, local shops, cafes and accommodation providers often experience an increase in business during the operation phase e.g. personnel onsite for during wind farm maintenance and servicing.

The Developer will seek to secure positive benefits for the local economy by encouraging the use of local labour, manufacturers and suppliers where possible during the operation phase.

Tourist Economy

Chapter 10 of the EIAR assesses in detail the likely landscape and visual effects of the project. The chapter concludes that the significance of visual impact during the operation phase will range between 'Imperceptible' and 'Substantial-Moderate' for

visual receptors and that the project will not give rise to significant landscape and visual effects.

Notwithstanding these considerations, it is assessed that there is no evidence to suggest that an occasional view of the project might adversely affect the visitor appeal of the area. The project site is relatively remote and will be substantially screened from the local road network and visual receptors as a result of landscaping proposals (see **Chapters 3 and 10**). Accordingly, it is assessed that the project will not result in any significant effect on the tourism economy.

4.5.2.2 Effects on the LSA

Community Benefit Funds and Community Investment

The operation of the project will bring about a number of financial benefits to both the WSA and LSA. These benefits include investment opportunities, community benefit funds, payment of commercial business rates to the Planning Authority and rental income accrued by involved landowners. Each of these benefits are discussed below.

The Developer is committed to operating a community benefit fund in accordance with Wind Energy Ireland (WEI) best practice and it will be available to the community at a rate of €2 per megawatt hour (MWh) produced, should the project qualify for the *Renewable Energy Support Scheme (RESS)*. Therefore, an investment of approximately €296,000 (or c. €29,600 per turbine) per year for up to 15-years, is committed to by the Developer. There will also be a community investment element available where there will be an opportunity for all local residents to participate, should they wish to do so. The structure for the investment scheme will form part of the RESS design.

The community benefit fund will be administered by a committee set up by the Developer and will comprise members from the local community. This will allow the local community to prioritise the fund and target the projects which they consider are of local importance. Local community groups will be invited to submit funding requests to the committee and preference will be given to local projects, thereby contributing to the vitality of the local population, and to projects which are considered to represent an environmental/social benefit or incorporate a renewable energy element/aspect.

Based on current rates, the project would provide an annual business rates payment of €854,000 to the Planning Authority. These annual payments will have significant benefits across the entirety of the county, including within the LSA.

Additionally, it should also be noted that, over the operational lifetime of the project, a substantial investment will be made to involved landowners. It is highly likely that these landowners will reinvest a significant proportion of this sum into the local economy and supply chains which will, in turn, result in further community gains. Benefits will accrue in the LSA as a result of this overall spend/investment and, depending on the choices made, will likely have positive social and economic effects.

The long-term, secure nature of the investment would allow the community to plan ahead; to draw in other sources of match funding to maximise the benefits; and to design investment projects to target local priorities. Given the annual contributions, the magnitude of impact is assessed to be 'High'. This would result in a likely positive effect of moderate or major importance on the LSA.

Property Values

The largest study of the impact of wind farms on property values to date has been carried out in the United States of America. The study, titled *The Impact of Wind Power Projects on Residential Property Values in the United States: A multi-Site Hedonic Analysis* and undertaken by Hoen et al. (2009), was carried out for the U.S Department of Energy. The study collected and examined data from in excess of 7,000 sales of single-family homes situated within 10-miles (c. 16km) of 24 no. existing wind farms in 9 no. States over an approximate period of 10- years. In addition to an examination of sales data, fieldwork was undertaken to verify and understand the degree to which wind energy development was visible.

The study concludes that:-

"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."

A further study was undertaken and the results published in a paper titled *A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States* by Hoen et al. (2013). The 2013 study evaluated in excess of 50,000 residential property sales completed in the vicinity of almost 70 no. wind farms across 9 no. States. The study was undertaken on the basis of a substantially greater sample and assessed properties at varying distances from wind energy developments; with all properties located within 10-miles (c. 16km) of the wind farm, c. 1,100 were located within 1-mile (c. 1.6km) and c. 330 located within 0.5-mile (0.8km).

The 2013 study 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."

Each of the above studies highlight the fact that the findings do not confirm that there will never be an adverse effect on the values of individual properties as a consequence of a wind energy development; but, instead, that such cases are assessed to be statistically insignificant. Therefore, while claims regarding significant property value depreciation are regularly made by local residents and communities, the evidence of the studies carried out in the United States of America do not support these claims.

In the United Kingdom, a study was carried out by the Centre for Economics and Business Research (CEBR) in March 2014 on behalf of Renewable UK and found that:-

- The status of the county-wide property market is the primary driver behind local house prices; and,
- The construction of wind farms at the 5 no. sites evaluated in England and Wales has perceptibly affected house price growth within a 5km radius of the sites.

In Scotland, a study published in October 2016 titled *Impact of wind Turbines on House*

Prices in Scotland (Heblich et al) sets out the main findings of a study assessing the effect on house prices from wind farm developments. The study is based on an extremely large sample size of in excess of 500,000 property sales in Scotland between the years of 1990 and 2014. The key findings of the study include:-

- No evidence of a consistent adverse effect on house prices. The analyses do not find evidence of a consistent adverse effect of wind energy development when averaging across the entire sample. In most cases, the results demonstrate either no significant negative effect on property prices within 2km or 3km or find a positive effect; and,
- Results vary across Scotland. The results demonstrated notable variances across differing regions of the country; however, the data is insufficient to assess the underlying reasons for the variances.
- Based on multiple long-term international assessments of property prices as described above, it is evident that wind energy developments have not impacted property values.

In Ireland, the University of Galway published a study in 2023 titled *Wind Turbines and House Prices Along the West of Ireland: A Hedonic Pricing Approach* (Gillispie et. al. 2023) which focusses on the effect of wind energy developments on property values on the western seaboard of Ireland. The study collected data from counties Donegal, Leitrim, Sligo, Mayo, Galway, Kerry and Cork; and assesses housing data taken from www.daft.ie and reviewed data from almost 65,000 no. property listings within 15km of a wind turbine between the years of 2016 and 2021.

The study concludes that:-

"It is clear from the analysis that turbines can incur a discount on nearby properties. However, there is evidence to suggest that the price effect is not persistent and can be minimised through siting decisions.

As renewable policies progress, the west and south of Ireland will likely continue to see disproportionately greater numbers of wind energy developments compared to the rest of the country. Therefore, the results outlined in this paper have important implications for policy, especially in terms of siting locations for wind turbine development.

While it is important to reach climate targets through growth in renewable electricity production, it is necessary do so at a minimal cost to the public by focusing developments to remote areas with limited urban influence."

Although this study gives an insight into effects in a specific geographical location over a specific timeframe, international studies have demonstrated that property prices achieved over a longer period of time based on a larger sample size provides a more robust and accurate quantitative dataset when assessing the probable influence of wind turbines on that price.

It is assessed, therefore, based on national and international studies, that the development of the project is not likely to have a significant effect on property values.

Other effects within the LSA

Based on a review of the findings of the assessment in **Chapter 14**, no significant effects are likely as a result of maintenance vehicles accessing the site as this would be on an occasional basis only and would not significantly increase vehicular movements in the local area.

There would also be some likely minor beneficial effects on local businesses within the LSA, probably most likely around Ballaghaderreen arising from expenditure on goods and services by staff and suppliers employed at the project site. This is expected to benefit local shops and food and drink businesses. Although the expenditure would be intermittent, and is therefore difficult to quantify, the benefit would be enhanced by the fact that workers visiting the project would do so all year round, unlike tourism expenditure which tends to be seasonal.

Visual effects on recreational receptors are assessed in **Chapter 10** and the findings have been taken into account in the assessment above, although it is important to note that a significant landscape and visual effect does not necessarily result in a significant effect on population & human health. In assessing effects, there is not a straightforward relationship between users experiencing views of turbines from a point or along a route (for example a passing cyclist) and impacts on usage. Some people may be encouraged/discouraged from using the receptor due to the presence of turbines, but for others there may be no effect, or even a positive effect.

The assessment of landscape and visual effects finds that the greater effects will be contained within a relatively limited area around the site, and the magnitude of likely effects will dissipate with distance. It is assessed that these visual effects will not result in any significant adverse effects on any receptors.

4.5.2.3 Human Health

Noise

During the construction and operation phase of the project, noise levels sufficient to cause nuisance or sleep disturbance are not assessed as likely to occur. The full results of this assessment are presented in **Chapter 12**.

Lightning Protection

Appropriate lightning protection measures are incorporated in modern wind turbines to ensure that lightning is conducted harmlessly past the sensitive parts of the nacelle and down into the earth. The rotor blades of the wind turbines are similarly equipped with lightning receptors mounted in the blade. The turbine is grounded and shielded to protect against lightning. In the event of a lightning strike, or an abnormal increase in voltage (overvoltage), the entire electrical and electronic equipment is protected by built-in energy absorbing components with surge protection in the electrical components.

Lightning protection is also incorporated into the design of the electricity substation.

Based on the above, it is assessed that the overall sensitivity of the project to lightning strike is low, and the magnitude of impact is assessed as negligible. The overall significance of impact is therefore assessed as being imperceptible.

Ice Fall

In extremely cold climates or at high altitude, ice can potentially build up on blades or other parts of the turbines. Ice can potentially fall off and cause injury although there is no experience of any such incident occurring in Ireland. Most modern turbines are fitted with anti-vibration sensors, which will detect any imbalance caused by the icing of the blades. The sensors will cause the turbine to wait until the blades have been de-iced prior to beginning operation. All occupied/habitable properties in the vicinity of the wind turbines are located sufficiently distant from a wind turbine and

therefore there is no likely impact in respect of ice throw.

Based on the above, it is assessed that the overall sensitivity of the project to ice fall is low, and the magnitude of impact is assessed as negligible. The overall significance of impact is therefore assessed as being imperceptible.

Electromagnetic (EMF) Interference

All electricity, both natural and man-made, produces two types of fields – electric fields and magnetic fields. The on-site electricity cables, electricity substation and grid connection electricity line will, as is required by law, comply with the international guidelines for ELF-EMF set by the International Commission on Non-Ionizing Radiation Protection (ICNRP), which is an advisory agency to the World Health Organisation. The cables will also comply with EU guidelines for human exposure to EMF. In addition, all electricity lines/cable will be located below-ground, thus avoiding any likelihood of significant adverse EMF effects. The substation will similarly comply with ICNRP and EU guidelines relating to exposure to EMF.

Based on the above, it is assessed that the overall sensitivity of the project to EMF interference is low, and the magnitude of impact is assessed as negligible. The overall significance of impact is therefore assessed as being imperceptible.

Shadow Flicker

Shadow flicker is assessed in detail in **Chapter 13**. While, in the absence of mitigation measures, shadow flicker is predicted to be experienced at dwellings; the Developer has committed to the implementation of technological measures such that no dwelling will experience shadow flicker effects, as set out in the *Draft Revised Wind Energy Development Guidelines 2019*. This commitment can be achieved by automatically switching off the wind turbines, if the sun is shining, at predetermined times when shadow flicker is predicted to occur at any particular dwelling. This process can be completed by software installed within the turbine's computer system. Accordingly, the assessment concludes that there will be no likely significant shadow flicker effects arising from the project.

4.5.2.4 Cumulative Effects

While there are a number of existing, permitted or currently proposed developments within the WSA and LSA, it is assessed that none of these projects are of a sufficient scale or nature to have the likelihood to result in in-combination population and human health effects during the operation phase of the project.

4.5.3 DECOMMISSIONING PHASE

These effects are assessed to be the same as the construction phase effects described above.

4.6 MITIGATION & MONITORING

4.6.1 CONSTRUCTION PHASE

Allowing for the implementation of embedded mitigation set out elsewhere within this EIAR, no likely significant adverse effects have been identified in respect of socio-economic receptors arising from construction of the project and therefore no mitigation measures are required to reduce or remedy any adverse effect. In terms of beneficial effects, individual businesses or receptors may experience substantial

positive effects during the construction phase of the project.

As identified above, a series of measures has been agreed with involved landowners regarding the management of agricultural/forestry activities during the construction phase. These measures have been incorporated into signed legal agreements with the landowners and will be implemented in full.

4.6.2 OPERATION PHASE

No likely significant adverse effects have been identified in respect of socio-economic receptors arising from the operation of the project and therefore no mitigation measures are required to reduce or remedy any adverse effect.

Mitigation measures proposed elsewhere in this EIAR; including in respect of water protection, noise minimisation and the avoidance of shadow flicker will ensure that significant population or human health effects are unlikely to occur.

4.6.3 DECOMMISSIONING PHASE

No likely significant adverse effects have been identified in respect of socio-economic receptors arising from the decommissioning of the project and therefore no mitigation measures are required to reduce or remedy any adverse effect.

4.7 RESIDUAL EFFECTS

4.7.1 CONSTRUCTION PHASE

No significant residual adverse construction effects are assessed as likely to occur.

4.7.2 OPERATION PHASE

No significant residual adverse operation phase effects are assessed as likely to occur.

4.7.3 DECOMMISSIONING PHASE

No significant residual adverse decommissioning effects are assessed as likely to occur.

4.8 SUMMARY

The assessment undertaken in this chapter has evaluated data from a range of sources, including the findings and conclusions of other assessments within this EIAR, to determine the likely effects of the project on population and human health. In order to avoid 'double-counting', the assessment focuses on those factors which might result in economic, social and health and safety effects. Other specific assessments on population and human health, including, for example, in respect of noise, visual impact and air quality, are undertaken separately elsewhere in this EIAR.

It is assessed that the construction phase of the project will bring about likely beneficial effects on employment and local investment, on the tourism economy and, to a greater extent, local businesses including tourism businesses operating within the WSA. The operation phase of the project will have a positive effect on employment and investment, including community benefits, as well as a minor beneficial effect on local businesses. The overall assessment of this chapter is that the project will have no likely significant adverse effects on population and human health. No specific mitigation measures, other than full adherence to all best practice measures and health and safety guidance, have therefore been identified as being required.

