# Environmental Impact Assessment Report (EIAR)

## Seskin Wind Farm, Co. Carlow

Chapter 3 – Reasonable Alternatives

# Table of Contents

# 3. SITE SELECTION AND REASONABLE ALTERNATIVES

## 3.1 Introduction

Article 5(1)(d) of Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (codification) as amended by Directive 2014/52/EU (the EIA Directive) requires that the Environmental Impact Assessment Report (EIAR) prepared by the developer contains *"a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment."*

Article 5(1)(f) of the EIA Directive requires that the EIAR contains *"any additional information specified in Annex IV relevant to the specific characteristics of a particular project or type of project and to the environmental features likely to be affected."*

Annex IV of the EIA Directive states that the information provided in an EIAR should include a *"description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects."*

As detailed in Section 1.1.1 in Chapter 1, for the purposes of this EIAR, the various project components are described using the following references: 'Proposed Project', 'the site', 'the Proposed Wind Farm' and 'the Proposed Grid Connection Route'. This section of the EIAR contains a description of the reasonable alternatives that were studied by the developer, which are relevant to the Proposed Project and its specific characteristics, in terms of site location and other renewable energy technologies as well as site layout incorporating size and scale of the Proposed Project, connection to the national grid and transport route options to the site. This section also outlines the design considerations in relation to the Proposed Wind Farm and the Proposed Grid Connection Route. It provides an indication of the main reasons for selecting the chosen route, including a comparison of the environmental effects. The consideration of alternatives is an effective means of avoiding environmental impacts. As set out in the '*Guidelines on The Information to be Contained in Environmental Impact Assessment Reports' (Environmental Protection Agency, 2022),* the presentation and consideration of reasonable alternatives investigated is an important part of the overall EIA process.

### Hierarchy

EIA is concerned with projects. The Environmental Protection Agency (EPA) guidelines state that in some instances neither the applicant nor the competent authority can be realistically expected to examine options that have already been previously determined by a higher authority, such as a national plan or regional programme for infrastructure.

### Non-environmental Factors

EIA is confined to the environmental effects that influence consideration of alternatives. However, other non-environmental factors may have equal or overriding importance to the developer of a project, for example project economics, land availability, engineering feasibility or planning policy.

### Site-specific Issues

The EPA guidelines state that the consideration of alternatives also needs to be set within the parameters of the availability of the land, i.e., the site may be the only suitable land available to the developer, or the need for the project to accommodate demands or opportunities that are site specific. Such considerations should be on the basis of alternatives within a site, for example design and layout.

## 3.2 Consideration of Reasonable Alternatives

### 3.2.1 Methodology

The EU Guidance Document (EU, 2017) on the preparation of EIAR outlines the requirements of the EIA Directive and states that, in order to address the assessment of reasonable alternatives, the Developer needs to provide the following:

- A description of the reasonable alternatives studied; and
- An indication of the main reasons for selecting the chosen option with regards to their environmental impacts.

There is limited European and National guidance on what constitutes a 'reasonable alternative' however the EU Guidance Document (EU, 2017) states that reasonable alternatives "*must be relevant to the proposed project and its specific characteristics, and resources should only be spent assessing these alternatives".*

The guidance also acknowledges that "*the selection of alternatives is limited in terms of feasibility. On the one hand, an alternative should not be ruled out simply because it would cause inconvenience or cost to the Developer. At the same time, if an alternative is very expensive or technically or legally difficult, it would be unreasonable to consider it to be a feasible alternative."*

The EPA Guidelines (EPA, 2022) state that "*It is generally sufficient to provide a broad description of each main alternative and the key issues associated with each, showing how environmental considerations were taken into account is deciding on the selected option. A detailed assessment (or 'mini-EIA') of each alternative is not required."*

Consequently, taking consideration of the legislative and guidance requirements into account, this chapter addresses alternatives under the following headings:

- 'Do Nothing' Alternative
- Alternative Site Locations
- Alternative Renewable Energy Technologies
- Alternative Turbine Numbers and Model;
- Alternative Turbine Layout and Development Design;
- Alternative Design of Ancillary Structures
- Alternative Grid Connection Route Options;
- Alternative Transport Route and Site Access; and
- Alternative Mitigation Measures.

Each of these is addressed in the following sections.

When considering the Proposed Project, given the intrinsic link between layout and design, the two will be considered together in this chapter.

### 3.2.2 'Do-Nothing' Alternative

Annex IV, Part 3 of the EIA Directive states that the description of reasonable alternatives studied by the developer should include *"an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge."* This is referred to as the "do nothing" alternative. EU guidance (EU, 2017) states that this should involve the assessment of *"an outline of what is likely to happen to the environment should the Project not be implemented – the so-called 'do-nothing' scenario."*

An alternative land-use option to developing a renewable energy project at the Proposed Project site would be to leave the site as it is, with no changes made to the current land-use practices of low intensity agriculture and forestry on the Proposed Wind Farm, and public road corridor, public open space, agricultural land with significant areas of natural vegetation, and transitional woodland shrub along the Proposed Grid Connection Route. In doing so, the environmental effects in terms of emissions are likely to be neutral however, the opportunity to capture the available renewable energy resource would be lost, as would the opportunity to contribute to meeting Government and EU targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions. The opportunity to generate local employment and investment would also be lost. It is likely that the trends of population decline that have been recorded within the Population Study Area would continue in the absence of investment, as discussed in Chapter 5 of this EIAR on Population and Human Health. Overall, the potential impact of this is considered to be long term, negative and slight.

The existing land uses can and will continue in conjunction with the Proposed Project. A comparison of the potential environmental effects of the 'Do-Nothing' Alternative when compared against the chosen option of developing a renewable energy project at this site are presented in Table 3-1 below.

*Table 3-1 Comparison of environmental effects when compared against the chosen option of developing a renewable energy project*

| Environmental Consideration | Do Nothing Alternative | Chosen option of developing a renewable energy project |
|---|---|---|
| **Population & Human Health** | No increase in local employment and no long-term financial contributions towards the local community.<br><br>No potential for shadow flicker and noise to affect sensitive receptors. | Up to approximately 80-100 jobs could be created during the construction, operation, and maintenance phases of the Proposed Project.<br><br>Based on the assessment detailed in Chapter 5 and the mitigation measures proposed, there will be no significant effects related to shadow flicker and noise from the Proposed Wind Farm. |
| **Biodiversity (including Birds)** | No habitat loss.<br><br>No potential for collision risk for birds and bats. | As detailed in Chapter 6, the development has been designed to avoid or mitigate impacts on biodiversity.<br><br>As detailed in the Bat Report in Appendix 6-2 of this EIAR, there is unlikely to be any significant increase in collision risk to bats from the Proposed Wind Farm. |

| | | |
|---|---|---|
| | | As detailed in Chapter 7, the Collision Risk Assessment (CRA) indicates that the impact of the Proposed Wind Farm on birds corresponds to a **Low - Very Low** effect significance. |
| **Land, Soils & Geology** | Neutral | As detailed in the assessment in Chapter 8, there is no loss of topsoil, subsoil or bedrock as a result of the Proposed Project. Topsoil and subsoil will be relocated within the site. |
| **Water** | Neutral | As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur. |
| **Air Quality** | Will not provide the opportunity for an overall increase in air quality. | As detailed in the assessment of Chapter 10, there will be a moderate positive effect on air quality due to the operation of the Proposed Project. |
| **Climate** | Will not provide the opportunity for an overall reduction in greenhouse gases or assist in achieving the renewable energy targets set out in the Climate Action Plan. | As detailed in the assessment in Chapter 11, over the proposed thirty-five-year lifetime of the Proposed Wind Farm, 1,305,920 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. |
| **Noise & Vibration** | No potential for noise impacts on nearby sensitive receptors. | Based on the assessment detailed in Chapter 12 and the mitigation measures proposed, there will be no significant effects on sensitive receptors due to an increase in noise levels from the Proposed Project during the construction and operational phase. |
| **Cultural Heritage & Archaeology** | No potential for impacts on unrecorded, subsurface archaeology. | As detailed in the assessment in Chapter 13, the significance of direct effects will be imperceptible - moderate and no significant effects will occur. There will be no significant direct or indirect impacts on Cultural Heritage. |
| **Landscape & Visual** | No potential for landscape and visual impacts on nearby sensitive receptors. | As detailed in the assessment in Chapter 14, there are no 'Significant' landscape effects; no significant visual effects are deemed to arise from residential visual amenity in the landscape surrounding site and 'Moderate' residual visual effects will only occur for a relatively small number of properties in the area. |

| | | |
|---|---|---|
| **Material Assets** | Neutral | As detailed in Chapter 15, there will be temporary negative imperceptible to slight impact on traffic volumes during the construction phase of the Proposed Project. A detailed Traffic Management Plan incorporating all the mitigation measures will be agreed with the roads authority prior to construction works commencing on site. |
| **Major Accidents and Natural Disasters** | No potential for impacts resulting in major accidents.<br><br>Neutral impact in relation to natural disasters. | As detailed in Chapter 16 the risk of a major accident and/or disaster during the construction of the Proposed Project is considered 'low'. The highest risk scenarios to the Proposed Project (i.e., contamination and fire/explosion) are considered to be unlikely to occur at any phase of the Proposed Project.<br><br>A detailed risk assessment on potential risks relating to major accidents and natural disasters is provided in Section 16.4 of Chapter 16 of this EIAR. |

For the reasons set out above, the proposal for a wind energy development at the Proposed Wind Farm was progressed over a Do-Nothing Scenario despite the potential environmental effects. By progressing the Proposed Wind Farm there is an opportunity to enhance employment and investment in the local area and to capture the available renewable energy resource within County Carlow, thus contributing to meeting national and international climate targets. Please refer to Chapter 5 through to Chapter 16 of this EIAR for further details on the impact associated with the progression of the Proposed Project.

## 3.2.3 Alternative Site Locations

The process of identifying a suitable location for a development such as the Proposed Project site is influenced by a number of factors. While wind speeds, the area of suitable or available land, proximity to a grid connection point and planning policy are all very important, a wind farm project must be commercially viable/competitive, as otherwise it will never attract the necessary project finance required to see it built. The Irish Government has outlined the 2030 energy targets for both onshore and offshore wind projects in the 2024 Climate Action Plan (CAP 2024). CAP 2024 states that the target for both onshore and offshore wind energy is 9 Gigawatts (GW) and 5GW respectively. However, at the beginning of the site selection process for the Proposed Project, the planning legislation and regulations surrounding offshore wind energy was limited whilst the legislation and regulations relating to onshore wind energy is well developed and established. The certainty behind the onshore wind planning policies attracted the developers to select an onshore project due to the numerous unknowns regarding offshore wind planning policies, legislation, and regulations. At the time of writing, the Minister for the Environment, Climate and Communications had issued 'Maritime Area Consents' to the first phase of seven offshore wind energy developments on 23rd December 2022, highlighting the infancy of the offshore wind planning policy area in Ireland.

### 3.2.3.1 Strategic Site Selection

As the cost of building each megawatt of electricity-generating capacity in a wind farm is in the region of €1.5 million, it is critical that the most suitable site for the Proposed Project is chosen.

As set out in Section 1.3 of this EIAR the applicant company, EDF Renewables Ireland (EDF) is part of one of the world's largest electricity companies. EDF Renewables Ireland's team has a wealth of experience in bringing complex development projects to fruition, across onshore and offshore wind, solar PV and battery storage technology, and is supported by more than 400 colleagues in the UK. MKO, on behalf of EDF, undertook a detailed site identification process, through Geographical Information Spatial (GIS) software, within multiple counties which has led to a number of sites which EDF wishes to bring forward to planning, including the Proposed Project site and further sites in Co. Clare and Co. Kilkenny.

The detailed site identification process undertaken by MKO considered multiple criteria over a two-phase process to identify possible sites, within numerous counties, with the potential to accommodate a wind energy development. The GIS database drew upon a wide array of key spatial datasets such as, house location data, transport, existing wind energy and grid infrastructure data, land use data and environmental data such as ecological designations, landscape designations and wind energy strategy designations available at the time.

The following is a summary of the methodology used in the screening process. The screening process included the following phases:

- Phase 1 - Proximity to National Grid
- Phase 2 - Screening

#### 3.2.3.1.1 Phase 1 – Proximity to National Grid

As part of the site selection process, it was necessary to consider the potential for grid connection, including in terms of distance to potential connection nodes and the grid capacity at the nodes, in the local area, to accommodate the connection.

#### 3.2.3.1.2 Phase 2 –Screening

In order to identify sites which were not likely to result in significant adverse effects, this stage in the selection process discounted lands that were not available for development under a number of criteria, as follows:

- Residential Dwelling Locations plus 720m buffer
- Transport corridors
- 110kV/220kV/400kV Electricity Transmission Corridors
- Watercourses/Waterbodies plus 50m buffer
- Designated Sites
- Existing wind farms developments and lands committed to permitted/proposed developments.

#### 3.2.3.1.3 Results of the Screening Process

The application of the above criteria to identify a site relevant to the project and its specific characteristics, resulted in the selection of a candidate site located in north-west Co. Carlow near the village of Oldleighlin, as a candidate site to be brought forward for more detailed analysis. The site is now known as Seskin Wind Farm.

Other sites that also emerged from the screening process, outlined above, for which EDF are in the process of preparing separate planning applications are located in Co. Clare and Co. Kilkenny.

EDF intend to bring forward all these sites for wind energy development as all were considered to be viable sites for a wind energy development. Each are projects in their own right, which will be subject to EIA. As such a description of the reasonable alternatives studied which are relevant to each project and its specific characteristics, together with an indication of the main reasons for selecting the chosen

options with regards to their environmental impacts will be provided in the EIAR accompanying the applications for the same.

The alternative would be to bring forward a site that did not pass one or all of the above phases of the screening process. In that instance, there would be the potential for the construction and operation of a wind energy development to have an adverse effect on ecologically designated or sensitive areas and visually sensitive (scenic) or amenity areas. There would also be the potential for greater shadow flicker, noise and traffic impacts if the candidate site was located in an area with a higher number of residential dwellings.

### 3.2.3.2 Suitability of the Candidate Site

The Proposed Project, as a candidate site, was further examined under the following headings in order to confirm its suitability for wind energy development:

- Wind Speeds
- Designated Sites
- Available Set Back from Sensitive Receptors
- Residential Density
- Landscape Setting
- Planning Policy

#### 3.2.3.2.1 *Wind Speeds*

The Irish Wind Atlas produced by Sustainable Energy Authority of Ireland shows average wind speeds for the country. A suitable wind regime and consistent wind speeds are required for the development of a wind energy project. Wind speeds in the southeast of the country are typically between 4 – 8 m/s. While the wind resource of Ireland's southeast is lower than that of coastal and elevated regions, it is still very good in comparison with many parts of Europe. On-site monitoring of the wind resource, which is ongoing, will further verify that with a sufficient turbine height and blade diameter, the wind resource of the site is commercially viable.

#### 3.2.3.2.2 *Designated Sites*

The Proposed Project site is not located within any area designated for ecological protection.

The nearest Natura 2000 site to the Proposed Project, i.e., Special Area of Conservation (SAC) or Special Protection Area (SPA) is the River Barrow and River Nore SAC. The Proposed Grid Connection Route runs adjacent to the River Barrow and River Nore SAC, while watercourses within the Proposed Wind Farm site have a direct hydrological link to the River Barrow and River Nore SAC.

The nearest national designated site to the Proposed Project, i.e., Natural Heritage Area (NHA) or proposed Natural Heritage Area (pNHA) is Mothel Church, Coolcullen, which is located approximately 1.1 kilometres to the northwest of the Proposed Grid Connection Route, which is located within the public road corridor.

#### 3.2.3.2.3 *Residential Density*

The Applicant sought to identify an area with a relatively low population density. Having reviewed the settlement patterns in the vicinity, the study area has emerged as suitable to accommodate the Proposed Project. The population density of the electoral divisions in which the Proposed Wind Farm is located, Ridge and Rathornan, i.e., the Population Study Area, is 19.70 persons per square kilometre, as described in Chapter 5: Population and Human Health of this EIAR. This is significantly lower than the average national population density of 73.27 persons per square kilometre.

Furthermore, the closest dwelling to the Proposed Wind Farm is located 724m northeast of the nearest turbine (T03). This meets the requirements as set out in the DoEHLG's '*Draft Revised Wind Energy Development Guidelines'* released in December 2019 (hereafter referred to as Draft DoEHLG 2019 Guidelines) for a setback distance from occupied dwellings of 4 x tip height from a turbine (i.e., 720m in this case). There are 43 inhabitable dwellings located within 1 kilometre of the proposed turbine locations with 10 of those properties belonging to the landowners who form part of the Proposed Project.



#### 3.2.3.2.4 Landscape

As part of an upland, remote landscape, the Proposed Project site was strategically selected as a landscape highly suitable for accommodating wind energy development. Through the iterative project design process, various best practice tools used for assessing the landscape and visual impact of a wind farm development were used to bring forward the optimum design for the Proposed Project with respect to landscape and visual factors.

As further detailed in Chapter 14 Landscape of this EIAR, upland landscapes are typically suited for developments such as wind energy. One key rationale for siting turbines in upland areas is to maximise the use of the wind resource. There are also several other key attributes and factors which make upland landscapes highly suitable for accommodating wind energy developments from a Landscape and Visual Impact Assessment (LVIA) perspective, for example:

- Upland landscapes are typically of a large scale where commercial scale wind farms can be effectively absorbed.
- Marginal areas of upland landscapes (e.g. The Proposed Project site) regularly comprise environments that are highly modified by commercial activities such as forestry, these are large unpopulated areas of relatively low landscape sensitivity (e.g. degradation from historic human intervention) which are proven to be very suitable for accommodating all of the physical infrastructure required for a wind energy development (compared with other upland environments such as pristine peatland).
- Upland landscapes are typically areas of low population density (see Section 3.2.3.2.3 above) with open expanses of unsettled land which provide adequate space for wind farms enabling appropriate set back (e.g. 4 x tip height in Draft DoEHLG 2019 Guidelines) from residential receptors and large population centres.

Strategic geographic siting of turbines in relation to well defined landforms and topographical features existent within upland landscapes can substantially reduce the visual exposure of a wind farm development in its wider landscape setting and therefore eliminate visual effects on larger number of receptors.

#### 3.2.3.2.5 Planning Policy

A Planning Policy Rationale report has been prepared in support of the Proposed Project and this report accompanies this planning application. The objective of this document is to present a planning policy rationale for the Proposed Project. Despite favourable site characteristics, the Proposed Wind Farm is currently zoned '*not normally permissible*' in the Carlow County Renewable Energy Strategy, which is included in the Carlow County Development Plan 2022-2028. However, a robust analysis of wind energy constraints in Co. Carlow has indicated that sites such as the Proposed Project, do have development potential and can contribute towards the wind energy targets set out in international national and local policy. This report includes an assessment of the relevant international, national, regional, and local planning and renewable energy policy that applies to the Proposed Project (Chapter 2) which highlights the differences existing between local policy and international / national / regional policy.

This report notes that the Proposed Development adheres to the recommendations and guidance outlined in the '*Draft Revised Wind Energy Development Guidelines - December 2019'* (hereafter

referred to as 'Draft DoEHLG 2019 Guidelines') and the '*Best Practice Guidelines for the Irish Wind Energy Industry'* (Irish Wind Energy Association, 2012). The report concludes that the Proposed Project is considered to be in the overriding public interest, as it will contribute to achieving the objectives of the REPowerEU plan, both in relation to the transition to clean renewable energy and energy security for the both the State and the European Union.

The Planning Policy Rationale Report analyses the planning policy against which the Proposed Wind Farm will be assessed, the main findings of the report are as follows:

- The Proposed Project is strongly supported by climate and energy policy and law at an EU, national and regional level.
- The Proposed Wind Farm is supported by local policy LA. P7 of the Carlow County Development Plan 2022-2028 which facilitates developments, such as wind farms, on elevated sites, where residual adverse visual impacts are minimised or mitigated.
- The Killeshin Hills, in which the Proposed Wind Farm is located, is identified as having a 'moderate capacity' to accommodate wind farm development.
- Policy WE. P4 of the Carlow County Development Plan 2022-2028 contradicts other policies, namely those policies mentioned above.
- The Carlow Renewable Energy Strategy fails to identify any areas where the principle of wind energy is acceptable or favourably considered. The 'Not Normally Permissible' zoning designation is solely based on a landscape designation and does not consider the available areas identified for wind energy in the county.
- The 'Not Normally Permissible' wind energy set out by the Carlow Renewable Energy Strategy limits County Carlow's ability to adequately contribute to the national wind energy target of 9GW.

The report concludes that the Proposed Wind Farm site is suitable for wind energy development and the Proposed Project is in accordance with the proposed planning and sustainable development of the area and County Carlow as a whole.

#### 3.2.3.2.6 *Summary*

From the review of the criteria set out above, which is heavily weighted towards minimising any potential negative environmental impacts, the Proposed Project site was identified as a suitable location for the provision of a renewable energy development of the scale proposed. The Proposed Wind Farm is located on agricultural land and existing commercial forestry which allows the site to take advantage of existing access roads (which will be upgraded) and highlights the suitability of the Proposed Project as it can make sustainable use of these established items of infrastructure. The candidate site does not overlap with any environmental designations and is accessible in terms of connection to the national grid and is also located in an area appropriate for wind energy development with a relatively low population density and appropriate annual wind speeds.

Once the current candidate site emerged as a suitable location, the Applicant approached the landowners in order to assemble Proposed Project site. Arising from the site assembly discussions the current site layout was identified and brought forward as being capable of accommodating a cohesive viable area of sufficient size to cater for the Proposed Project.

The design of the Proposed Wind Farm has been an informed and collaborative process from the outset, involving the project designers, engineers, environmental, ecological, ornithological, hydrological, geotechnical, traffic consultants and archaeological specialists. The design process has also taken into account recommendations and comments of the relevant statutory and non-statutory organisations, the local community and the local authority where relevant.

Throughout the design process, the layout of the Proposed Wind Farm has been revised and refined to take account of the findings of all desk-based assessments, site surveys/ investigations and baseline

assessments which have brought the design from its first initial layout to the current proposed layout; please see Section 3.2.6 below for further details.



## 3.2.4 Alternative Renewable Energy Technologies

The Proposed Project will be located on a site where agriculture and commercial forestry will continue to be carried out around the footprint of the Proposed Wind Farm.

Both onshore and offshore wind energy development and solar energy developments will be required to ensure Ireland reaches the target set in the CAP 2024 to source 80% of our electricity from renewable energy by 2030. It is not a case of 'either' 'or'. When considering other renewable energy technologies in the area, the Applicant considered commercial solar energy production as an alternative on the Proposed Wind Farm.

Commercial solar energy production is the harnessing and conversion of sunlight into electricity using photovoltaic (PV) arrays (panels). During the initial stages of the Proposed Project design, a combination of solar energy and wind energy were considered for the Proposed Project at this site. However, this was subject to land availability at the time and the Proposed Wind Farm was progressed, as to achieve the same electricity output from solar energy as is expected from Proposed Wind Farm (c. 46.2MW), a larger development footprint would be required. As detailed in Section 1.1.1 in Chapter 1, the site encompasses an area of approximately 370 hectares and the permanent footprint of the Proposed Project measures approximately 7.3 hectares, which represents approximately 2% of the site. In order to achieve a c. 46.2MW output using solar PV arrays, there would be a requirement of approximately 73.9ha[1], which represents approximately 20% of the site.

In addition, a solar development would have a higher potential environmental effect on Traffic & Transport (construction phase) and Biodiversity and Birds (habitat loss) at the site, as detailed below. Taking into account the hydrology and farming practices in the area, it has been determined that wind energy is the most suitable renewable energy technology for the site.

A comparison of the potential environmental effects of the development of a solar PV array when compared against the chosen option of developing wind turbines at the Proposed Project site is presented in Table 3-2 below.

*Table 3-2 Comparison of environmental effects when compared against the chosen option (wind turbines)*

| Environmental Consideration | Solar PV Array (with up to 46.2 MW Output) | Chosen Option (Wind Turbines) |
|---|---|---|
| Population & Human Health (incl. Shadow Flicker) | Relatively lower long-term financial contributions towards the local community (i.e., community benefit fund) on a per MWh basis).<br><br>No potential for shadow flicker to affect sensitive receptors. | Higher long-term financial contributions towards the local community (i.e., community benefit fund) on a per MWh basis.<br><br>Based on the assessment detailed in Chapter 5 and the mitigation measures proposed, there will be no significant effects related to shadow flicker from the Proposed Wind Farm. |

[1] *Approximately 1.6 - 2 ha are required for each MW of solar panels installed based on approximately 4000 panels per MW (taken from the Sustainable Energy Authority Solar Energy FAQ publication which can be accessed here: https://www.seai.ie/publications/FAQs_on_Solar_PV.pdf). For the purposes of comparison, a minimum value of 1.6 ha has been assumed.*

| Environmental Consideration | Solar PV Array (with up to 46.2 MW Output) | Chosen Option (Wind Turbines) |
|---|---|---|
| | Potential for glint and glare impacts on local receptors.<br><br>Based on the renewable energy outputs associated with solar PV, using solar PV at the site would have a positive effect on human health due to the production of clean renewable energy and the offsetting of emissions (e.g., nitrogen, sulphur dioxide) which are produced from fossil fuel powered sources of electricity. | No potential for glint and glare impacts on local receptors.<br><br>Based on the assessment included in Chapter 10 and Chapter 11, the Proposed Project will have a long term moderate positive effect on human health due to the production of clean renewable energy and the offsetting of emissions (e.g., nitrogen, sulphur dioxide) which are produced from fossil fuel powered sources of electricity. |
| Biodiversity & Ornithology | Larger development footprint would result in greater potential habitat loss.<br><br>No potential for collision risk for birds.<br><br>Potential for glint and glare impacts on birds. | As detailed in Chapter 6, the development has been designed to avoid or mitigate impacts on biodiversity.<br><br>As detailed in Chapter 7, the Collision Risk Assessment (CRA) indicated that the impact of the Proposed Wind Farm on birds corresponds to a **Low - Very Low** effect significance. No potential for glint and glare impacts on birds. |
| Land, Soils & Geology | Shallower excavations involved in solar PV array developments would result in reduced volume of spoil to be excavated. | As detailed in the assessment in Chapter 8 and the mitigation measures proposed, no significant effects on soils and subsoils will occur. |
| Water | Shallower excavations involved in solar PV array developments would result in reduced volume of spoil to be excavated, therefore reducing the potential for silt-laden runoff to enter receiving waterbodies. | As detailed in the assessment in Chapter 9 and the mitigation measures proposed, no significant effects on surface water or groundwater quality will occur. |
| Air Quality | Reduced capacity factor of solar PV array technology would result in more reliance on fossil fuels for energy generation and therefore decreased air quality improvements. | As detailed in the assessment in Chapter 10, the Proposed Project will provide an alternative to electricity generated from fossil fuel sources and will result in a long-term, moderate, positive impact on air quality. |
| Climate | Reduced capacity factor of solar PV array technology | As detailed in the assessment in Chapter 11, over the proposed 35-year lifetime of |

| Environmental Consideration | Solar PV Array (with up to 46.2 MW Output) | Chosen Option (Wind Turbines) |
|---|---|---|
| | would result in less carbon offset. | the Proposed Wind Farm, 1,305.220 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. |
| Noise & Vibration | Potential for short-term noise impacts on nearby sensitive receptors during the construction phase. | Based on the assessment detailed in Chapter 12 and the mitigation measures proposed, there will be no significant effects on sensitive receptors due to an increase in noise levels from the Proposed Project during the construction and operational phase |
| Cultural Heritage & Archaeology | Neutral | As detailed in the assessment in Chapter 13, there will be no significant effects to known cultural heritage assets or recorded archaeological monuments. There will be no significant direct or indirect impacts on Cultural Heritage. |
| Landscape & Visual | Panelling potentially less visible from surrounding area due to screening by vegetation and topography. | As detailed in the assessment in Chapter 14, the landscape value and sensitivity of the Proposed Wind Farm was deemed to be Low. Low sensitivity balanced with a substantial magnitude of change amounts to long-term landscape effects of Moderate significance upon the physical fabric of the landscape of the site. |
| Material Assets | Neutral | As detailed in Chapter 15, there will be temporary negative imperceptible to slight impact on traffic volumes during the construction phase of the Proposed Project. A detailed Traffic Management Plan incorporating all the mitigation measures will be agreed with the roads authority prior to construction works commencing on site. |
| **Major Accidents and Natural Disasters** | Larger development footprint would result in a higher risk in relation to major accidents and natural disasters due to increased land disturbance.<br><br>Lower potential risk in relation to bridge/structural collapse due to the lighter project components required. | As detailed in Chapter 16 the risk of a major accident and/or disaster during the construction of the Proposed Project is considered 'low'. The highest risk scenarios to the Proposed Project (i.e., contamination and fire/explosion) are considered to be unlikely to occur at any phase of the Proposed Project.<br><br>A detailed risk assessment on potential risks relating to major accidents and natural disasters is provided in Section 16.4 of Chapter 16 of this EIAR. |

While there are positive and negative environmental aspects of both renewable energy development options, neither is likely to have significant adverse effects; however, given the particular suitability of the site for wind energy development, the lesser area of land required and the greater positive impact of wind energy generation from a climate and air quality perspective, it was considered the more suitable option and the most efficient method of electricity production with the lesser potential for significant environmental effects.

## 3.2.5 Alternative Turbine Numbers and Model

The proposed wind turbines will have a potential power output of 6.6 megawatts (MW). It is proposed to install 7 turbines at the Proposed Wind Farm which could achieve approximately 46.2 MW output under the maximum scenario of turbine parameters that were assessed within the EIAR; please refer to Table 1-3 in Chapter 1 of this EIAR for details on the three scenarios that were utilised for assessment within this EIAR. Such a renewable energy output could also be achieved on the Proposed Wind Farm site by using smaller turbines (for example 2.5 MW machines). However, this would necessitate the installation of over 18 turbines to achieve a similar output. Furthermore, the use of smaller turbines would not make efficient use of the wind resource available having regard to the nature of the Proposed Wind Farm. A larger number of smaller turbines would result in the wind farm occupying a greater footprint within the site, with a larger amount of supporting infrastructure being required (i.e., roads etc) and increasing the potential for environmental impacts to occur. The proposed number of turbines takes account of all site constraints and the distances to be maintained between turbines and features such as roads and houses, while maximising the wind energy potential of the Proposed Wind Farm. The 7-turbine layout selected for the Proposed Wind Farm has the smallest development footprint of the other alternatives considered, while still achieving the optimum output at a more consistent level than would be achievable using different turbines.

The turbine model to be installed on the Proposed Wind Farm will have an overall ground-to-blade tip height range of 179.5m – 180m, a rotor diameter range of 149m – 155m, and a hub height range of 102.5m to 105m. For the purposes of this EIAR a range of turbines within the proposed dimensions has been assessed. The EIAR therefore provides a robust assessment of the turbines that could be considered within the overall development description. The use of alternative smaller turbines at the Proposed Wind Farm would not be appropriate as they would fail to make the most efficient use of the wind resource passing over the Proposed Wind Farm and would potentially require a larger development footprint. This alternative would potentially lead to additional environmental effects.

A comparison of the potential environmental effects of the installation of a larger number of smaller wind turbines when compared against the chosen option of installing a smaller number of larger wind turbines on the Proposed Wind Farm is presented in Table 3-3 below.

*Table 3-3 Comparison of environmental effects when compared against the chosen option (larger wind turbines)*

| Environmental Consideration | Larger number of smaller turbines | Chosen option of a 7-no. turbine layout |
|---|---|---|
| Population & Human Health (incl. Shadow Flicker) | Likely potential for increased shadow flicker impacts on nearby sensitive receptors due to the increased number of turbines. | Based on the assessment detailed in Chapter 5 and the mitigation measures proposed, there will be no significant effects related to shadow flicker from the Proposed Wind Farm. |
| Biodiversity & Ornithology | Larger development footprint would result in greater potential for habitat loss. | Smaller footprint would result in less habitat being lost. As detailed in Chapter 6, the Proposed Wind Farm has been designed to avoid or mitigate impacts on biodiversity. |

| Environmental Consideration | Larger number of smaller turbines | Chosen option of a 7-no. turbine layout |
|---|---|---|
| | | As detailed in Chapter 7, the Collision Risk Assessment (CRA) indicated that the impact of the Proposed Wind Farm on birds corresponds to a **Low - Very Low** effect significance. |
| Land, Soils & Geology | Larger development footprint would result in greater volume of spoil to be excavated and stored. | Smaller footprint would result in smaller volume of soils to be excavated and managed.<br><br>As detailed in the assessment in Chapter 8, no significant effects on soils and subsoils will occur. |
| Water | Larger development footprint, therefore, increasing the potential for silt-laden runoff to enter receiving watercourses. | Smaller footprint would result in less potential for silt-laden run-off to enter a watercourse.<br><br>As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur. |
| Air Quality | Increased potential for impacts on air quality due to an increased vehicles emissions and dust emissions due to an increased volume of material and turbine component deliveries to the site during the construction phase. | A smaller footprint would result in less dust and vehicle emissions during the construction phase. |
| Climate | Increased potential for vehicle emissions and dust emissions due to an increased volume of material and turbine component deliveries to the site during the construction phase. | As detailed in the assessment in Chapter 11, over the proposed thirty-five-year lifetime of the Proposed Wind Farm, 1,305,920 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. |
| Noise & Vibration | Potential for increased noise impacts on nearby sensitive receptors. | Potential for less noise impacts on nearby sensitive receptors during the construction and operational phase.<br><br>Based on the assessment detailed in Chapter 12 and the mitigation measures proposed, there will be no significant effects on sensitive receptors due to an increase in noise levels from the Proposed Project during the construction and operational phase. |

| Environmental Consideration | Larger number of smaller turbines | Chosen option of a 7-no. turbine layout |
|---|---|---|
| Cultural Heritage & Archaeology | Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology. | As detailed in the assessment in Chapter 13, there will be no significant effects to known cultural heritage assets or recorded archaeological monuments. |
| Landscape & Visual | A larger number of turbines would have a greater visual impact. | The Proposed Wind Farm is an appropriately designed and suitably scaled project, no significant visual effects are deemed to arise from residential visual amenity in the landscape surrounding site and 'Moderate' residual visual effects will only occur for a relatively small number of properties in the area. |
| Material Assets | Greater traffic volumes during construction phase due to larger development footprint and requirement for more construction materials and turbine components. | Less traffic volumes due to smaller footprint and less component deliveries.<br><br>As detailed in Chapter 15, there will be temporary negative imperceptible to slight impact on traffic volumes during the construction phase of the Proposed Project. A detailed Traffic Management Plan incorporating all the mitigation measures will be agreed with the roads authority prior to construction works commencing on site. |
| **Major Accidents and Natural Disasters** | Larger development footprint would result in a higher risk in relation to major accidents and natural disasters due to increased land disturbance and a larger excavation footprint. | As detailed in Chapter 16 the risk of a major accident and/or disaster during the construction of the Proposed Project is considered 'low'. The highest risk scenarios to the Proposed Project (i.e., contamination and fire/explosion) are considered to be unlikely to occur at any phase of the Proposed Project.<br><br>A detailed risk assessment on potential risks relating to major accidents and natural disasters is provided in Section 16.4 of Chapter 16 of this EIAR. |



For the reasons set out above, the proposal for a 7-no. turbine layout with larger turbine was considered to have the least amount of environmental effects when compared to a larger number of smaller turbines.

## 3.2.6 Alternative Turbine Layout and Development Design

The design of the Proposed Project has been an informed and collaborative process from the outset, involving the designers, developers, engineers, landowners, environmental, hydrological and geotechnical, archaeological specialists and traffic consultants. The aim being to reduce potential for environmental effects while designing a project capable of being constructed and viable.

Throughout the preparation of this EIAR, the layout of the Proposed Wind Farm has been revised and refined to take account of the findings of all site investigations, which have brought the design from its first initial layout to the current proposed layout. The design process has also taken account of the recommendations and comments of the relevant statutory and non-statutory organisations, the local community and local authorities as detailed in Section 2.7 and Section 2.8 of Chapter 2.

### 3.2.6.1 Constraints and Facilitators Mapping

The design and layout of the Proposed Project follows the recommendations and guidelines set out in the *'Wind Energy Development Guidelines'* (Department of the Environment, Heritage and Local Government, 2006) (hereafter referred to as DoEHLG 2006 Guidelines) and the Draft DoEHLG 2019 Guidelines) and the *'Best Practice Guidelines for the Irish Wind Energy Industry'* (Irish Wind Energy Association, 2008).

The DoEHLG 2006 Guidelines were the subject of a targeted review. The proposed changes to the assessment of impacts associated with onshore wind energy developments were outlined in the document Draft DoEHLG 2019 Guidelines. A consultation process in relation to the Draft DoEHLG 2019 Guidelines closed on 19th February 2020. The proposed changes presented in the Draft DoEHLG 2019 Guidelines give certain focus on the setback distance from residential properties (four times the proposed maximum tip height), along with shadow flicker and noise requirements relative to sensitive receptors. At time of writing, the Draft DoEHLG 2019 Guidelines have not yet been adopted, and the relevant guidelines for the purposes of section 28 of the Planning and Development Act 2000, as amended, remain those issued in 2006. The constraints mapping process involves the placing of buffers around different types of constraints so as to clearly identify the areas within which no development works will take place. The size of the buffer zone for each constraint has been assigned either using guidance presented in the Draft DoEHLG 2019 Guidelines which is more onerous than the buffer zones as detailed in the current DoEHLG 2006 Guidelines or based on industry best practice.

Notwithstanding this, however, due to the timelines associated with the planning process for renewable energy projects and the commitment within the CAP 2024 to publish Draft Revised Wind Energy Development Guidelines (refer to Section 1.2.2), it is possible that the Draft DoEHLG 2019 Guidelines are adopted during the consideration period for the Proposed Project. Should the Draft DoEHLG 2019 Guidelines be adopted in advance of a planning decision being made on the Proposed Project, the Proposed Project will be capable of achieving the requirements of the Draft DoEHLG 2019 Guidelines as currently proposed.

The constraints map for the Proposed Wind Farm, as shown in Figure 3-1, was produced following a desk study of all site constraints. Figure 3-1 encompasses the following constraints and associated buffers:

- Residential dwellings plus a minimum 720-metre buffer (achieving the requirement for a 4x tip height separation distance from properties in line with the new Draft Guidelines).
- Natura 2000 sites plus 100-metre buffer;
- Telecommunication Links plus operator specific buffer;
- Natural Watercourses plus 50-metre buffer;
- Archaeological Sites or Monuments, 30-metre buffer, plus 'Zone of Notification' as required by the National Monuments Service (ROI).

Facilitators at the site build on the existing advantages and include the following:

- Available lands for development;
- Good wind resource;
- Existing access points and general accessibility of all areas of the site due to existing road infrastructure; and
- Limited extent of constraints.

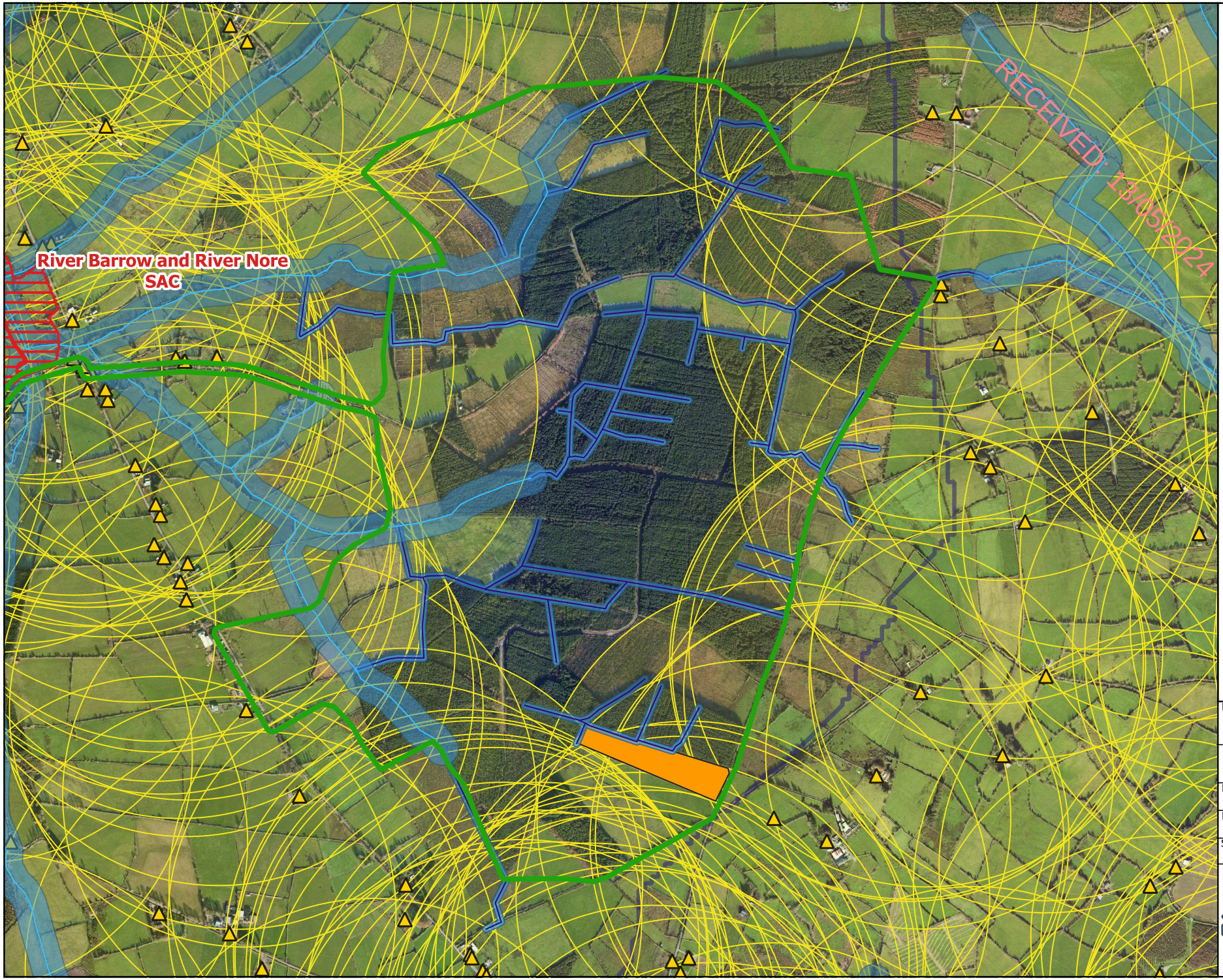
The inclusion of the constraints on a map of the study area allows for a viable area to be identified. An initial turbine layout is then developed to take account of all the constraints mentioned above and their associated buffer zones and the separation distance required between the turbines. Following the mapping of all known constraints, detailed site investigations were carried out by the project team. The ecological assessment of the Proposed Project encompassed habitat mapping and extensive surveying of birds and other fauna. This assessment, as described in Chapter 6 of this EIAR on Biodiversity, optimised the decision on the siting of turbines and the carrying out of any development works, such as the construction of roads. This assessment, as described in Chapter 9 of this EIAR on Water, optimised the decision on the siting of turbines, roads and the onsite substation. Where specific areas were deemed as being unsuitable for the siting of turbines or roads, etc., alternative locations were proposed and assessed, taking into account the areas that were already ruled out of consideration. The turbine layout for the Proposed Wind Farm has also been informed by the results of noise, landscape, and visual and shadow flicker assessments as they became available.

#### 3.2.6.2 Turbine Layout

The final proposed turbine layout takes account of all site constraints and the distances to be maintained between turbines and from houses, roads, etc. The layout is based on the results of all site investigations that have been carried out during the EIAR process. As information regarding the Proposed Project was compiled and assessed, the proposed layout has been revised and amended to take account of the physical constraints of the Proposed Wind Farm and the requirement for buffer zones and other areas in which no turbines could be located. The selection of turbine number and layout has also had regard to wind-take, noise and shadow flicker impacts and the separation distance to be maintained between turbines. The EIAR and Proposed Project design process was an iterative process, where findings at each stage of the assessment were used to further refine the design, always with the intention of minimising the potential for environmental impacts.

The development of the final Proposed Wind Farm layout has resulted following feedback from the various studies and assessments carried out as well as ongoing negotiations and discussions with landowners and the local community.

There were several reviews of the specific locations of the various turbines during the optimisation of the Proposed Wind Farm site layout. The initial constraints study identified a significant viable area within the overall study area of the site. The initial turbine layout comprised 10 no. turbines within a larger study area. The proposed 7-turbine final layout has been refined following feedback from the project team, landowners, neighbours and the need to ensure sufficient separation distances are maintained for on-site constraints. The Proposed Wind Farm went through 5 separate iterations. All 5 turbine layout iterations have not been included, but Plate 3-1 to Plate 3-4 below gives an indication of how the design of the turbine layout evolved during the design process.




## Map Legend

EIAR Site Boundary

Hydrology

Watercourses

50m Watercourse Buffer

Drains

10m Drain buffer

Biodiversity

Marsh Fritillary Constraint

Sensitive Receptors

Sensitive Receptors

720m Sensitive Receptor Buffer

Designated Sites

Special Area of Conservation (SAC)

100m SAC Buffer



N

Drawing Title
Constraints and Facilitators

Project Title
Seskin Wind Farm, Co. Carlow

| Drawn By | Checked By |
|---|---|
| CJ | EC |
| Project No. 220246 | Drawing No. Figure 3-1 |
| Scale 1:15,000 | Date 30/04/2024 |

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: ww.mkoireland.ie

### 3.2.6.2.1 *Proposed Layout Iteration No. 1*

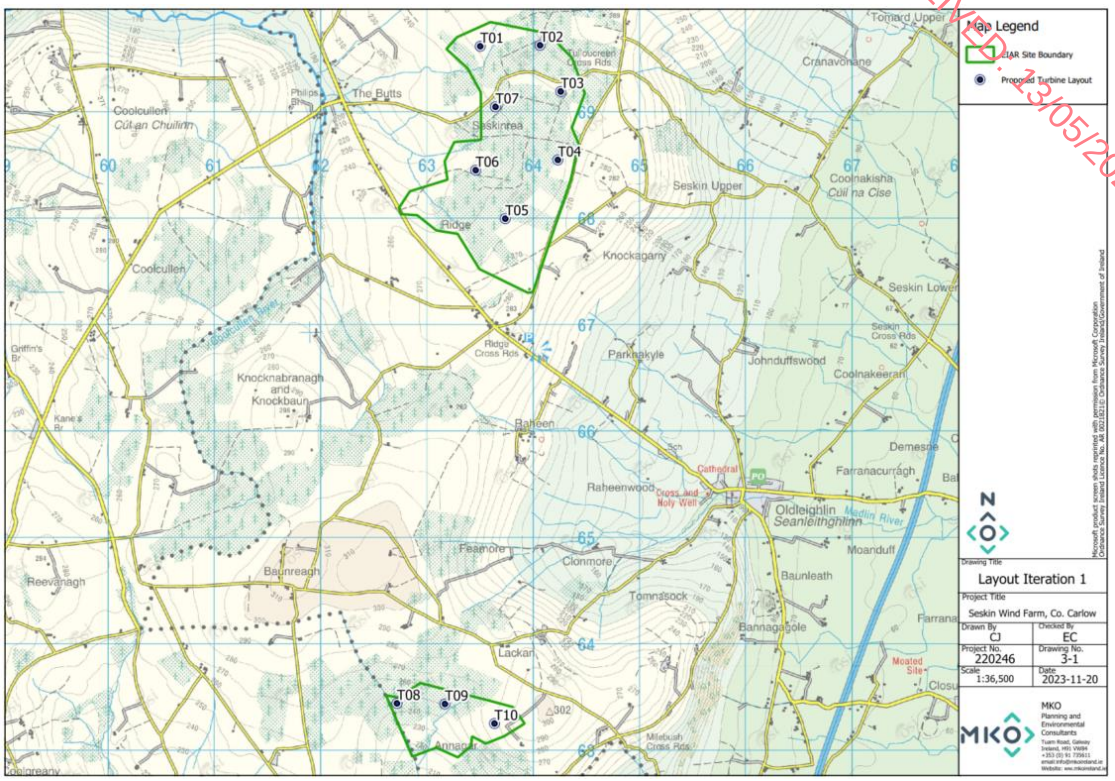



*Plate 3-1 Proposed Layout Iteration No. 1*

Iteration No. 1 which is presented in Plate 3-1 is the initial turbine layout which was based on a preliminary constraint mapping exercise and identification of a viable area for turbine siting. A larger viable area for a 10-no. turbine layout was identified within the overall study area during the constraints mapping process. This included for two clusters, a larger 7 no. turbine array near the Ridge, and a smaller 3 no. turbine array approx. 4.6km to the south near the Carlow-Kilkenny border. It was determined that it would be more environmental sensitive and efficient to have a single cluster of turbines at the larger viable area.

### 3.2.6.2.2 *Proposed Layout Iteration No. 2*



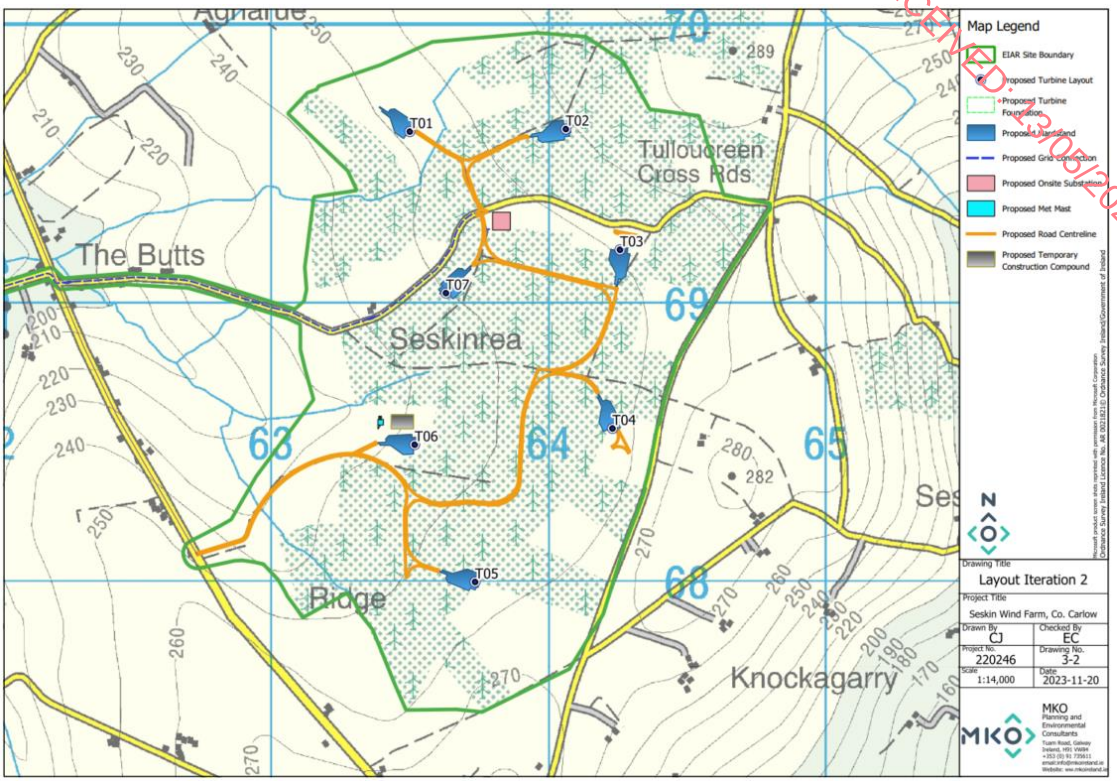



*Plate 3-2 Proposed Layout Iteration No. 2*

Iteration No. 2 which is presented in Plate 3-2 comprised of 7 No. turbines, hardstands, access roads on-site substation and grid connection, met mast, and a temporary construction compound. The alternative grid connection electrical cabling routes are further detailed in Section 3.2.8 below.

Layout Iteration No. 2 was presented to the project team for detailed investigations and assessment. These investigations included habitat mapping, ecological surveying, hydrological and geotechnical investigations of the Proposed Wind Farm.

### 3.2.6.2.3 *Proposed Layout Iteration No. 3*



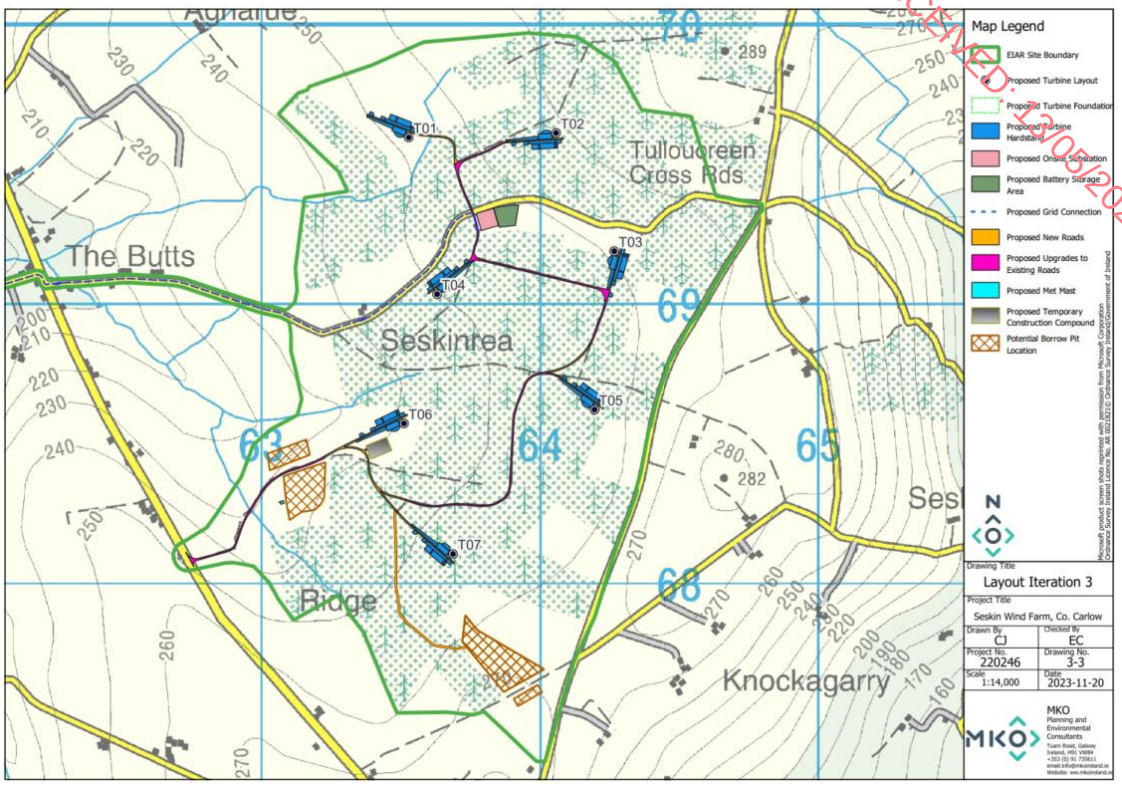



*Plate 3-3 Proposed Layout Iteration No. 3*

Iteration No. 3 which is presented in Plate 3-3 comprised of 7 No. turbines, hardstands, access roads, onsite substation and battery storage, grid connection, met mast, temporary construction compound, and potential borrow pit locations that underwent site investigative work. Iteration No. 3 was subject to detailed investigations which led to further refinement of the layout.

For Iteration No. 3 the following changes were made:

- The turbines underwent renumbering.
- The met mast was relocated to an adjacent field to accommodate a realignment of Turbine No. 6 and its associated hardstand, with the temporary construction compound being realigned accordingly.
- The road layout near Turbine No. 1 was realigned to avoid sensitive ecological receptors.
- Turbine No. 7 (previously numbered Turbine No. 5) was moved north-east in order to avoid marsh fritillary supporting habitat.

A battery energy storage compound was included adjacent to the onsite substation. Turbine delivery site entrance and junction options were also included for consideration by the EIAR team and subject to site investigations.

### 3.2.6.2.4 Proposed Layout Iteration No. 4 – Final Proposed Wind Farm Layout




*Plate 3-4 Proposed Layout Iteration No. 4 – Final Proposed Wind Farm Layout*

Iteration No. 4 as presented in Plate 3-4 comprised of 7 No. turbines with a maximum overall ground-to-blade tip height range of 179.5m – 180m, a rotor diameter range of 149m – 155m, and a hub height range of 102.5m to 105m, one met mast (36.5m), two temporary construction compounds, one onsite substation and battery storage compound, and one grid connection underground electrical cabling route which is further detailed in Section 3.2.8.

When considering the site characteristics, including topography, ground conditions, ecological receptors, sensitive noise receptors and surface features, it was determined not to develop an onsite borrow pit. For this layout, peat and spoil management areas were identified throughout the site.

The revisions to the layout were found to have no greater environmental, ecological, and hydrological effects when compared to the other layout iterations considered (Iteration No. 1 to 3).

The final proposed turbine layout as presented in Plate 3-4 takes account of all site constraints (e.g., ecology, ornithology, hydrology, etc.) and design constraints (e.g., setback distances from houses and distances between turbines on-site etc.). The layout also takes account of the results of all site investigations and baseline assessments that have been carried out during the EIAR process.

The final chosen turbine layout is considered the optimal layout given it has the least potential for environmental effects.

A comparison of the potential environmental effects of initial iterations of the turbine layout as compared against the final turbine layout are presented in Table 3-4 below.

*Table 3-4 Comparison of environmental effects when compared against the chosen option (final layout)*

| Environmental Consideration | Initial Turbine Layouts and all associated infrastructure | Chosen Option of the Final 7. No Turbine Layout and all associated infrastructure |
|---|---|---|
| Population & Human Health (incl. Shadow Flicker) | Likely potential for increased shadow flicker impacts on nearby sensitive receptors due to the increased number of turbines in Proposed Layout Iteration No. 1 (10 turbine layout).<br><br>Shadow flicker effects would likely be similarly for Proposed Layout Iteration No. 2 and 3 (7 turbine layout). | Potential for reduced shadow flicker impacts on nearby sensitive receptors due to the reduced number of turbines<br><br>Based on the assessment detailed in Chapter 5 and the mitigation measures proposed, there will be no significant effects related to shadow flicker from the Proposed Wind Farm. |
| Biodiversity & Ornithology | Larger development footprint would result in greater potential habitat loss in Proposed Layout Iteration No 1 (10 turbine layout).<br><br>Habitat loss effects are neutral for Proposed Layout Iteration No. 2 and 3 (7 turbine layout).<br><br>Greater potential impact on identified sensitive ecological receptors due to location of infrastructure within designated set-back buffers for Proposed Layout Iterations No. 1, 2, and 3 | As detailed in Chapter 6, the development has been designed to avoid or mitigate impacts on biodiversity. Biodiversity enhancement areas have been determined and are detailed in Appendix 6-4 of this EIAR.<br><br>As detailed in Chapter 7, the Collision Risk Assessment (CRA) indicated that the impact of the Proposed Wind Farm on birds corresponds to a **Low - Very Low** effect significance. |
| Land, Soils & Geology | Greater potential impact on identified soils and subsoils due to location of infrastructure for Proposed Layout Iteration No 1, 2, and 3. | A smaller footprint would result in smaller volume of soils to be excavated and managed.<br><br>As detailed in the assessment in Chapter 8, no significant effects on soils and subsoils will occur. |
| Water | Larger footprint would result in a greater potential for silt-laden runoff to enter natural watercourses within and around the site for Proposed Layout Iteration No 1 (10 turbine layout).<br><br>Potential for runoff is neutral for Proposed Layout Iteration No. 2 and 3 (7 turbine layout). | Smaller footprint would result in a reduced potential for silt-laden runoff to enter natural watercourses.<br><br>As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur. |

| Environmental Consideration | Initial Turbine Layouts and all associated infrastructure | Chosen Option of the Final 7. No Turbine Layout and all associated infrastructure |
|---|---|---|
| Air Quality | Increased potential for impacts on air quality due to an increased vehicles emissions and dust emissions due to an increased volume of material and turbine component deliveries to the site during the construction phase for Proposed Layout Iteration No 1 (10 turbine layout).<br><br>Air quality emission effects are neutral for Proposed Layout Iteration No 2 and 3 (7 turbine layout). | As detailed in the assessment in Chapter 10, no significant effects on air quality will occur. |
| Climate | A larger number of turbines could result in a greater amount of exhaust emissions from construction vehicles and plant and the transport of materials and workers to/from the site Proposed Layout Iteration No. 1 (10 turbine layout).<br><br>Climate related emission effects are neutral for Proposed Layout Iteration No. 2 and 3 (7 turbine layout). | As detailed in the assessment in Chapter 11, over the proposed 35-year lifetime of the Proposed Wind Farm, 1,305,920 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. |
| Noise & Vibration | A larger number of turbines could have a greater noise impact for Proposed Layout Iteration No. 1 (10 turbine layout).<br><br>The noise impacts are neutral for Proposed Layout Iteration No. 2 and 3 (7 turbine layout). | Based on the assessment detailed in Chapter 12 and the mitigation measures proposed, there will be no significant effects on sensitive receptors due to an increase in noise levels from the Proposed Project during the construction and operational phase. |
| Cultural Heritage & Archaeology | Neutral | Neutral |
| Landscape & Visual | A larger number of turbines could have a greater visual impact for Proposed Layout Iteration No. 1 (10 turbine layout).<br><br>Visual impacts are neutral for Proposed Layout Iteration No. 2 and 3 (7 turbine layout). | As detailed in the assessment in Chapter 14, the lack of highly sensitive landscape and visual receptors, and the strategic siting of infrastructure will mitigate any potential for significant landscape and visual effects. |
| Material Assets | Neutral | Neutral |

| Environmental Consideration | Initial Turbine Layouts and all associated infrastructure | Chosen Option of the Final 7. No Turbine Layout and all associated infrastructure |
|---|---|---|
| **Major Accidents and Natural Disasters** | A larger number of turbines could have a greater potential risk relating to major accidents and natural disasters for Proposed Layout Iteration No. 1 (10 turbine layout) due to increased land disturbance and larger excavation footprint.<br><br>Impacts from major accidents and natural disasters are considered to be neutral for Proposed Layout Iteration No. 2 and 3 (7 turbine layout). | As detailed in Chapter 16 the risk of a major accident and/or disaster during the construction of the Proposed Project is considered 'low'. The highest risk scenarios to the Proposed Project (i.e., contamination and fire/explosion) are considered to be unlikely to occur at any phase of the Proposed Project.<br><br>A detailed risk assessment on potential risks relating to major accidents and natural disasters is provided in Section 16.4 of Chapter 16 of this EIAR. |



#### 3.2.6.3 Road Layout

Access tracks are required onsite in order to enable transport of infrastructure and construction materials within the Proposed Wind Farm. Such tracks must be of a gradient and width sufficient to allow safe movement of equipment and vehicles. It was decided at an early stage during the design of the Proposed Project that maximum possible use would be made of existing roadways and tracks where available to minimise the potential for impacts by using new roads as an alternative.

As the overall Proposed Project layout was finalised, the most suitable routes between each component of the development were identified, taking into account the existing roads and the physical constraints of the Proposed Project. Locations were identified where upgrading of the existing road would be required and where new roads are to be constructed, in order to ensure suitable access to and linkages between the various project elements, and efficient movement around the Proposed Project.

An alternative option to making maximum use of the existing road network within the Proposed Wind Farm would be to construct a new road network, having no regard to existing roads or tracks. This approach was not favoured, as it would require unnecessary disturbance to the site and create the potential for additional environmental impacts to occur. It would also result in an unnecessary requirement for additional cut and fill material to be used in the construction of new roads.

### 3.2.7 Alternative Design of Ancillary Structures

The ancillary structures required for the Proposed Project include the substation and battery energy storage compounds, meteorological mast and underground electrical cabling. The siting of these structures have been summarised in Section 3.2.6 above. The siting of the temporary construction compounds have been discussed below.

#### 3.2.7.1 Construction Compounds

The temporary construction compounds will be used for the storage of all construction materials, turbine components, staff facilities and car-parking areas for staff and visitors. The use of two temporary construction compounds was deemed preferable to the alternative of a single large compound. Principally, it will result in shorter distances for traffic movements within the site during construction. As the Proposed Project layout became more define, the temporary construction compounds were sited to

facilitate the most efficient flow of construction processes within the site. The construction compounds are located strategically within each section of the site to facilitate the construction of the various infrastructure components. As a result, vehicle emissions and the potential for dust arising will be reduced. Further information on the siting of the temporary construction compounds is provided in Section 3.2.6 above.



### 3.2.7.2 Deliveries of Materials from Nearby Quarries

In order to facilitate the construction of the Proposed Project, all of the crushed stone, hardcore materials and ready-mix concrete that will be required during the construction phase will be sourced from local, appropriately authorised quarries. For the purposes of assessment within the EIAR, 5 no. quarry and ready-mix concrete batching plants (RMC) were identified within 20km of the Proposed Wind Farm, one of which has been selected and is shown in Figure 4-23. The transport routes for general construction materials for the purposes of this assessment, is as per the access routes considered in Chapter 15.

Deliveries of stone and ready-mix concrete for use in construction of the Proposed Project, are discussed in further detail in Chapter 15 of this EIAR. Site investigation works were carried out at the Proposed Wind Farm to determine if it would be feasible to extract rock from an onsite borrow pit as an alternative to sourcing materials from nearby quarries. The use of onsite borrow pits would eliminate the need to transport large volumes of construction material along the local public road network to the site. However, when considering the site characteristics, including topography, ground conditions, ecological receptors, and surface features, it was determined not to develop an onsite borrow pit.

A comparison of the potential environmental effects of the chosen option of obtaining all stone material offsite when compared to the alternative of using onsite borrow pits is presented in Table 3-5 below.

*Table 3-5 Comparison of environmental effects when compared against the chosen option (Deliveries of Materials from Nearby Quarries)*

| Environmental Consideration | Obtaining all stone from onsite borrow pits | Chosen Option of obtaining all stone material offsite (Deliveries of Materials from Nearby Quarries) |
|---|---|---|
| Population & Human Health | Less potential for impact on residential amenity when compared to quarries, due to vehicular and dust emissions from additional traffic associated with movement of material on and off-site.<br><br>Potential for increased impact on residential amenity due to increased noise and dust emissions associated with excavation of material at onsite borrow pits. | Potential for increased impact on residential amenity due to increased vehicular and dust emissions from increased traffic movements.<br><br>Potential for reduced impact on residential amenity due to reduced noise and dust emissions associated with the absence of excavation of material at onsite borrow pits.<br><br>Based on the assessment detailed in Chapter 5 and the mitigation measures proposed, there will be no significant effects on residential amenity from the Proposed Project. |
| Biodiversity & Ornithology | Larger development footprint which would result in increased extent of habitat loss due to onsite excavations. | No borrow pit excavation therefore no habitat loss. As detailed in Chapter 6, the Proposed Wind Farm has been designed to avoid or mitigate impacts on biodiversity. |

| Environmental Consideration | Obtaining all stone from onsite borrow pits | Chosen Option of obtaining all stone material offsite (Deliveries of Materials from Nearby Quarries) |
|---|---|---|
| Land, Soils & Geology | Potential for increased impact on lands, soils and geology due to excavation of material at onsite borrow pits. | No borrow pit excavation therefore no potential for additional impacts on land, soils and geology due to the extraction activities. As detailed in the assessment in Chapter 8, no significant effects on bedrock, peat and subsoils will occur. |
| Water | A drainage plan for onsite borrow pits would be required to be incorporated into project drainage design. | No requirement for drainage from onsite borrow pits to be incorporated into project drainage design. As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur. |
| Air Quality | Potential for less vehicular exhaust emissions and dust emissions if all stone was sourced onsite compared to delivery of stone to the site. | Potential for increased vehicular exhaust emissions and dust emissions, along the construction haul route, due to increased traffic associated with delivery of material.<br><br>Potential for reduced dust emissions due to the absence of onsite excavation of borrow pits. |
| Climate | Potential for less vehicular exhaust emissions if all stone was sourced onsite compared to delivery of stone to the site | As detailed in the assessment in Chapter 11, no significant effects on climate will occur. Over the proposed 35-year lifetime of the Proposed Wind Farm, 1,305,920 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. |
| Noise & Vibration | Potential for increased noise and vibration impacts on nearby sensitive receptors due to excavation of material from onsite borrow pits.<br><br>Potential during construction phase for reduced noise and vibration impacts on nearby sensitive receptors due to reduced traffic movements. | Potential during construction phase for reduced noise impacts on nearby sensitive receptors due to the absence of excavation of material from onsite borrow pits.<br><br>Potential during construction phase for increased noise and vibration impacts on nearby sensitive receptors due to increased traffic movements.<br><br>Based on the assessment detailed in Chapter 12 and the mitigation measures proposed, there will be no significant effects on sensitive receptors due to an increase in noise levels from the Proposed Project, during the construction phase. |

| Environmental Consideration | Obtaining all stone from onsite borrow pits | Chosen Option of obtaining all stone material offsite (Deliveries of Materials from Nearby Quarries) |
|---|---|---|
| | | |
| Cultural Heritage & Archaeology | Larger development footprint, therefore increasing potential for impacts on sub-surface archaeology | No borrow pit excavation onsite, therefore no potential for additional potential impacts on sub surface archaeology. As detailed in the assessment in Chapter 13, the significance of direct effects will be imperceptible - moderate and no significant effects will occur. There will be no significant direct or indirect impacts on Cultural Heritage. |
| Landscape & Visual | Neutral (as onsite borrow pits would be reinstated following use) | Neutral |
| Material Assets | Less potential for impact on public road network and users compared to delivery all stone to site which would give rise additional traffic. | Increased potential for impact on public road network compared to the development of an on-site borrow pit however as detailed in Chapter 15, the impact will be slight and temporary. A detailed Traffic Management Plan incorporating all the mitigation measures will be agreed with the roads authority prior to construction works commencing on site. |
| **Major Accidents and Natural Disasters** | Larger development footprint would result in a higher risk in relation to major accidents and natural disasters due to increased land disturbance and larger excavation footprint. | As detailed in Chapter 16 the risk of a major accident and/or disaster during the construction of the Proposed Project is considered 'low'. The highest risk scenarios to the Proposed Project (i.e., contamination and fire/explosion) are considered to be unlikely to occur at any phase of the Proposed Project.<br><br>A detailed risk assessment on potential risks relating to major accidents and natural disasters is provided in Section 16.4 of Chapter 16 of this EIAR. |

### 3.2.8 Alternative Grid Connection Route Options

The Proposed Wind Farm will connect to the national grid via underground electrical cabling, located primarily within the public road corridor. Underground electrical cables will transmit the power output from each wind turbine to the proposed onsite 38kV substation, and from there to the existing Kilkenny 110kV substation, via the Proposed Grid Connection Route, measuring approx. 20.1km in length.

A key consideration in determining the grid connection method for a proposed wind energy development is whether the cabling is undergrounded or run as an overhead line. While overhead lines

are less expensive and allow for easier repairs when required, underground lines will have no visual impact. For this reason, it was considered that underground lines would be a preferable alternative to overhead lines. The DoEHLG 2006 Guidelines and the Draft DoEHLG 2019 Guidelines also indicate that underground cables are the preferred option for connection of a wind energy development to the national grid. The Proposed Grid Connection Route will follow the route of existing public roads, thereby minimising the amount of ground disturbance required. The Proposed Wind Farm will have an estimated maximum exporting capacity of 46.2MW; this is such that it can connect to either 38kV substation or a 110kV substation using a step-up transformer. The substations that were considered for connecting the Proposed Wind Farm to the national grid were:



- Carlow 110kV Electricity Substation
- Kilkenny 110kV Electricity Substation

Therefore, an underground grid connection cabling route to each of these existing substations was considered and assessed in order to determine which route would be brought forward as part of the planning application.

The TLI Group were engaged by the Applicant to carry out a preliminary grid route assessment for the Proposed Project. A desktop analysis was undertaken using identified constraints to identify three potential routes from the Proposed Wind Farm to the two ESB substations detailed above. Figure 3-2 below demonstrates all three underground grid connection (UGC) route options proposed which are further detailed below.

### 3.2.8.1.1 Grid Connection Route Options Iteration No. 1



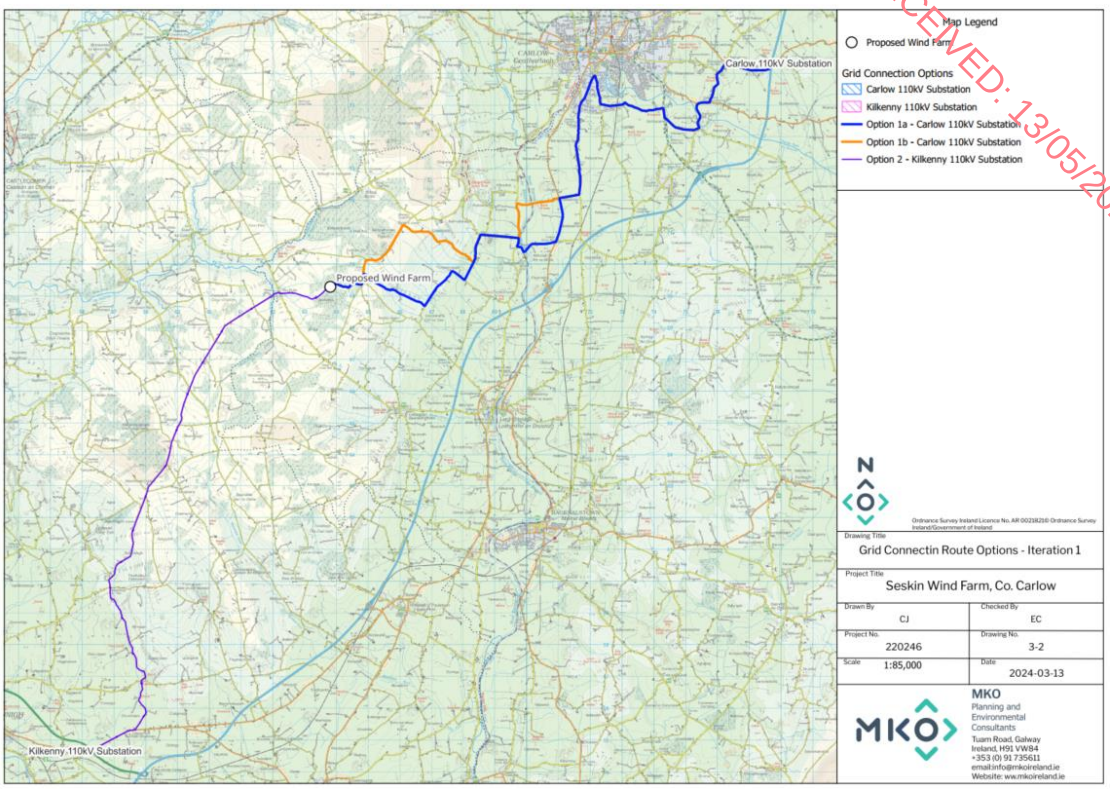



*Figure 3-2 Grid Connection Route Options*

The layout in Grid Connection Route Option Iteration No. 1 as presented in Figure 3-2 comprises three grid connection options:

- Option 1a: underground grid connection cable (UGC) route from Carlow 110kV Substation to the onsite 38kV substation location
- Option 1b: underground grid connection cable (UGC) (single circuit) route from Carlow 110kV substation to the onsite 38kV substation location
- Option 2: underground grid connection cable (UGC) (single circuit) route from Kilkenny 110kV substation to the onsite 38kV substation location.

The outputs from the TLI preliminary grid assessment are summarised below in Table 3-6.

*Table 3-6 Comparison Summary Table – Sourced from TLI Preliminary Route Development Assessment*

| Assessment Criteria | Option 1a – UGC to Carlow 110kv Substation | Option 1b – UGC to Carlow 110kv Substation | Option 2 – UGC to Kilkenny 110kv Substation |
|---|---|---|---|
| Length | 25 | 24.7 | 20.1km |
| Length of Cable within Private Land | 0 | 748m | 0 |
| Railway Crossings | 1 | 1 | 0 |
| Bridge Crossings (Possible GDD) | 12 | 5 | 7 |
| HDD Crossings (Open River) | 1 | 1 | 0 |
| Watercourse/Culvert Crossings (TBC) | 1 | 6 | 3 |
| High Pressure Gas Crossing | 1 | 1 | 0 |

| | | | |
|---|---|---|---|
| Private Lands | 0 | 2 | 0 |
| Sharp Bend | 17 | 16 | 6 |



Option 1a, as presented in Figure 3-2, is an underground grid connection cable route connecting the proposed onsite 38kV substation to the existing Carlow 110kV substation. The Carlow 110kV substation is located approximately 23.8km northeast of the proposed onsite 38kV substation. The grid connection cabling route would run along a combination of local, regional, and national roads, measuring 25km in length. The most notable constraint on this route is the high number of bridges found from initial surveys. The Milford Wier assessed as part of this route was identified as a major obstacle for the proposed works due to the scale of its rampart over the River Barrow, and spatial requirement issues. This route requires crossing of an Irish Rail and High-Pressure Gas Line. This route is also the longest grid connection route.

Option 1b, as presented in Figure 3-2, is an underground grid connection cable route connecting the proposed onsite 38kV substation to the existing Carlow 110kV substation. The grid connection cabling route would run along a combination of local, regional, and national roads. The cabling route measures approximately 24.7km in length. This route would follow a similar route to Option 1a but follows a more northerly section of local roads. The route also looks to avoid the Milford Wier by utilising parcels of private third-party land folios to cross the River Barrow via Horizontal Directional Drilling (HDD). This route is located along the outskirts of Carlow town, a heavily congested area. This route, like Option 1a, must cross an Irish Rail Line and a High-Pressure Gas Line.

Option 2, as presented in Figure 3-2, is an underground grid connection cable route connecting the proposed onsite 38kV substation to the existing Kilkenny 110kV substation. The Kilkenny 110kV substation is located approximately 20km to the southwest of the proposed onsite 38kV substation. The grid connection cabling route would run along both local and regional roads. The cabling route measures 20.1km in length and is the shortest grid connection route, it requires less watercourse crossings than Option 1a and 1b and has a more favourable alignment due to the reduced presence of bends and obstructions.

The Chosen Option 2 to Kilkenny 110kV substation, presented in Figure 3-2, is considered the optimal route given it has the least potential for environmental effects when compared to Options 1a and 1b.

### 3.2.8.1.2 Grid Connection Route Iteration 2 - Final Grid Connection Layout



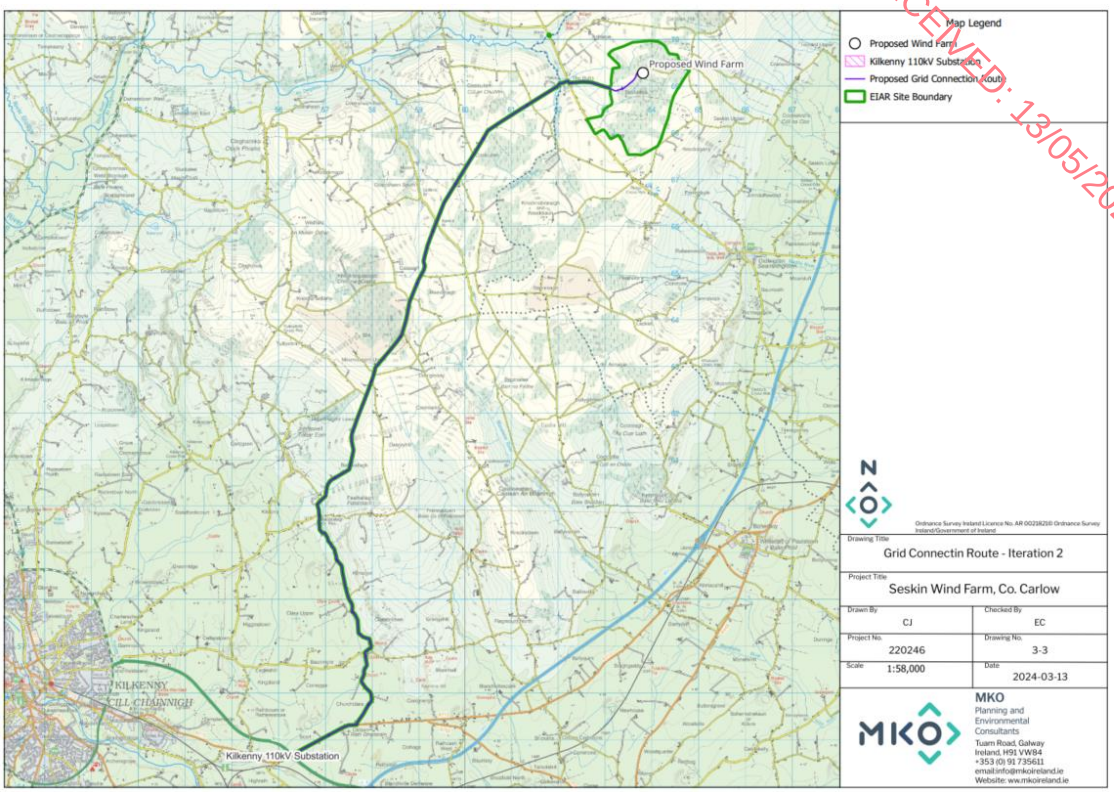



*Figure 3-3 Grid Connection Route – Final Layout*

The layout in grid connection Option 2, as presented in Figure 3-3, comprises 20.1km of underground 38kV electrical cabling connecting the proposed onsite 38kV substation to the existing Kilkenny 110kv substation.

The final underground cable route as presented in Figure 3-3 takes account of all site constraints (e.g., ecology, archaeology, hydrology, peat depths etc.) and design constraints (e.g., third party lands). The final underground cable route also takes account of the findings from the site investigations and baseline assessments that have been carried out during the EIAR process.

A comparison of the potential environmental effects of Option 1a and 1b when compared against the chosen option (Option 2) is presented in Table 3-7 below.

*Table 3-7 Comparison of environmental effects when compared against the chosen option (Option 2 - Kilkenny 110kV substation)*

| Environmental Consideration | Option 1a – Carlow 110kv Substation | Option 1b – Carlow 110kV Substation | Chosen Option 2 – Kilkenny 110kV Substation |
|---|---|---|---|
| Population & Human Health | Neutral - Option 1a is in the public road network. There is no material environmental effect difference between all options considered | Neutral - Option 1b is in the public road network. There is no material environmental effect difference between all options considered. | Neutral - Option 2 is in the public road network. There is no material environmental effect difference between all options considered |
| Biodiversity (including Birds) | Potential for greater impact on sensitive ecological receptors during the construction phase as Option 1a is located within the River Barrow and River Nore SAC. | Potential for greater impact on sensitive ecological receptors during the construction phase as Option 1b is located within River Barrow and River Nore SAC | Low potential for impact on sensitive ecological receptors during the construction phase.<br><br>As detailed in Chapter 6, the nearest Natura 2000 site to the proposed grid connection cabling route is the River Barrow and River Nore SAC, which is adjacent Option 2 at its closest point, within the public road corridor.<br><br>As detailed in Chapter 6, the development has been designed to avoid or mitigate impacts on biodiversity. |
| Land, Soils & Geology | Neutral - There is no material environmental effect difference between all options considered. | Neutral - There is no material environmental effect difference between all options considered. | Neutral - There is no material environmental effect difference between all options considered. |
| Geotechnical | Neutral - There is no material environmental effect difference between all options considered. | Neutral - There is no material environmental effect difference between all options considered. | Neutral - There is no material environmental effect difference between all options considered. |
| Water | Option 1a has 12 no. Possible HDD Bridge Crossings, 1 no. HDD Open River Crossing, and 1 no. Watercourse/Culvert Crossing | Option 1b has 5 no. Possible HDD Bridge Crossings, 1 no. HDD Open River Crossing, and 6 no. Watercourse/Culvert Crossings | Option 2 has 7 no. Possible HDD Bridge Crossings and 2 no. Watercourse/Culvert Crossings |

| Environmental Consideration | Option 1a – Carlow 110kv Substation | Option 1b – Carlow 110kV Substation | Chosen Option 2 – Kilkenny 110kV Substation |
|---|---|---|---|
| | | | As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur. |
| Air Quality | Given the maximum potential length of Option 1a is 25km and is 0.3km longer than that of Option 1b and is 4.9km longer than that of Option 2 there is more potential for dust emissions and vehicle emissions impacts associated with Option 1a when compared to Option 1b and Option 2. | Given that the maximum potential length of Option 1b is approx. 24.7km and is 0.3km shorter than Option 1a there is potential for less dust emissions and vehicle emissions impacts associated with Option 1b when compared to Option 1a.<br><br>Given that the maximum potential length of Option 1b is 24.7km and is 4.6km longer than Option 2 there is potential for more dust and vehicle emissions associated with Option 1b when compared to Option 2. | Given the maximum potential length of Option 2 is approx. 20.1km and is 4.9km shorter than that of Option 1a and 4.6km shorter than Option 1b there is the potential for less dust emissions and vehicle emissions impacts associated with Option 2 when compared to Options 1a and 1b.<br><br>As detailed in the assessment in Chapter 10, no significant effects on air quality will occur. |
| Climate | Given the maximum potential length of Option 1 is 25km and is 0.3km longer than that of Option 1b and is 4.9km longer than that of Option 2 there is the potential for more traffic emissions and land disturbance associated with Option 1a when compared to Option 1b and Option 2. | Given that the maximum potential length of Option 1b is approx. 24.7km and is 0.3km shorter than Option 1a there is potential for less traffic emissions and land disturbance associated with Option 1b when compared to Option 1a.<br><br>Given that the maximum potential length of Option 2 is 20.1km and is 4.6km shorter than Option 1b there is potential for more traffic | Given the maximum potential length of Option 2 is 20.1km and is 4.9km shorter than that of Option 1a and 4.6km shorter than Option 1b there is the potential for less traffic emissions and land disturbance associated with Option 2 when compared to Option 1a and Option 1b.<br><br>As detailed in the assessment in Chapter 11, no significant effects on climate will occur. |

| Environmental Consideration | Option 1a – Carlow 110kv Substation | Option 1b – Carlow 110kV Substation | Chosen Option 2 – Kilkenny 110kV Substation |
|---|---|---|---|
| | | emissions and land disturbance associated with Option 1b when compared to Option 2. | |
| Noise & Vibration | Potential for noise impacts on nearby sensitive receptors during the construction phase.<br><br>Given the maximum potential length of Option 1a is longer than that of Option 1b and Option 2 there is the potential for more noise impacts associated with Option 1a when compared to Option 1b and Option 2. | Potential for noise impacts on nearby sensitive receptors during the construction phase.<br><br>Given the maximum potential length of Option 1b is shorter than Option 1a there is the potential for less noise impacts associated with Option 1b when compared to Option 1a.<br><br>Given the maximum potential length of Option 1b is longer than Option 2 there is the potential for more noise impacts associated with Option 1b when compared to Option 2. | Potential for noise impacts on nearby sensitive receptors during the construction phase.<br><br>Given the maximum potential length of Option 2 is less than that of Option 1a and 1b there is the potential for greater noise impacts associated with Option 1a and 1b when compared to Option 2.<br><br>Based on the assessment detailed in Chapter 12 and the mitigation measures proposed, there will no significant effects on sensitive receptors due to an increase in noise levels from the grid connection, during the construction phase. |
| Cultural Heritage & Archaeology | Neutral – There is no material environmental effect difference between all considered options. | Neutral – There is no material environmental effect difference between all considered options. | Neutral – There is no material environmental effect difference between all considered options. |
| Landscape & Visual | Neutral – There is no material environmental effect difference between all considered options. | Neutral – There is no material environmental effect difference between all considered options. | Neutral – There is no material environmental effect difference between all considered options. |
| Material Assets | Potential for more traffic volumes during construction phase of Option 1a given the longer length of cable when compared to Option 1b and Option 2. | Potential for less traffic volumes during construction phase of Option 1b given the shorter length of cable when compared to Options 1a. | Potential for less traffic volumes during construction phase of Option 2 given the shorter length of cable when compared to Option 1a and 1b. |

| Environmental Consideration | Option 1a – Carlow 110kv Substation | Option 1b – Carlow 110kV Substation | Chosen Option 2 – Kilkenny 110kV Substation |
|---|---|---|---|
| | | Potential for more traffic volumes during construction phase of Option 1b given the longer length of cable when compared to Option 2. | As detailed in Chapter 15, the impact will be slight and temporary. A detailed Traffic Management Plan (Appendix 15-2) incorporating all the mitigation measures will be agreed with the roads authority prior to construction works commencing on site. |
| **Major Accidents and Natural Disasters** | Potential for larger impact on major accidents and natural disasters during the construction phase of Option 1a given the longer length of cable when compared to Option 1b and Option 2. | Potential for smaller impact on major accidents and natural disasters during construction phase of Option 1b given the shorter length of cable when compared to Options 1a.<br><br>Potential for larger impact on major accidents and natural disasters during construction phase of Option 1b given the longer length of cable when compared to Option 2. | Potential for smaller impact on major accidents and natural disasters during construction phase of Option 2 given the shorter length of cable when compared to Option 1a and 1b.<br><br>As detailed in Chapter 16 the risk of a major accident and/or disaster during the construction of the Proposed Project is considered 'low'. The highest risk scenarios to the Proposed Project (i.e., contamination and fire/explosion) are considered to be unlikely to occur at any phase of the Proposed Project.<br><br>A detailed risk assessment on potential risks relating to major accidents and natural disasters is provided in Section 16.4 of Chapter 16 of this EIAR. |

## 3.2.9 Alternative Transport Route and Site Access

Wind turbine components (blades, nacelles and towers) are not manufactured in Ireland and therefore must be imported from overseas and transported overland to the Proposed Wind Farm. With regard to the selection of a transport route to the Proposed Wind Farm, alternatives were considered in relation to turbine components, general construction-related traffic, and site access locations.

Wind turbine components will be delivered from the Port of Waterford to the Proposed Wind Farm. Key considerations in determining the turbine delivery route are road widening requirements, modifications to street furniture, vertical alignment of roads, and structural assessments of road infrastructure due to the abnormal loads of wind turbine components. Collett were engaged by the Applicant to carry out a preliminary assessment on proposed turbine delivery routes for the Proposed Project. A desktop analysis was undertaken using identified constraints to identify three potential routes from the Port of Waterford to the Proposed Wind Farm site entrance. Figure 3-4 below demonstrates all three proposed turbine delivery routes proposed which are further detailed below.

#### 3.2.9.1.1 *Turbine Delivery Route Options Iteration No. 1*

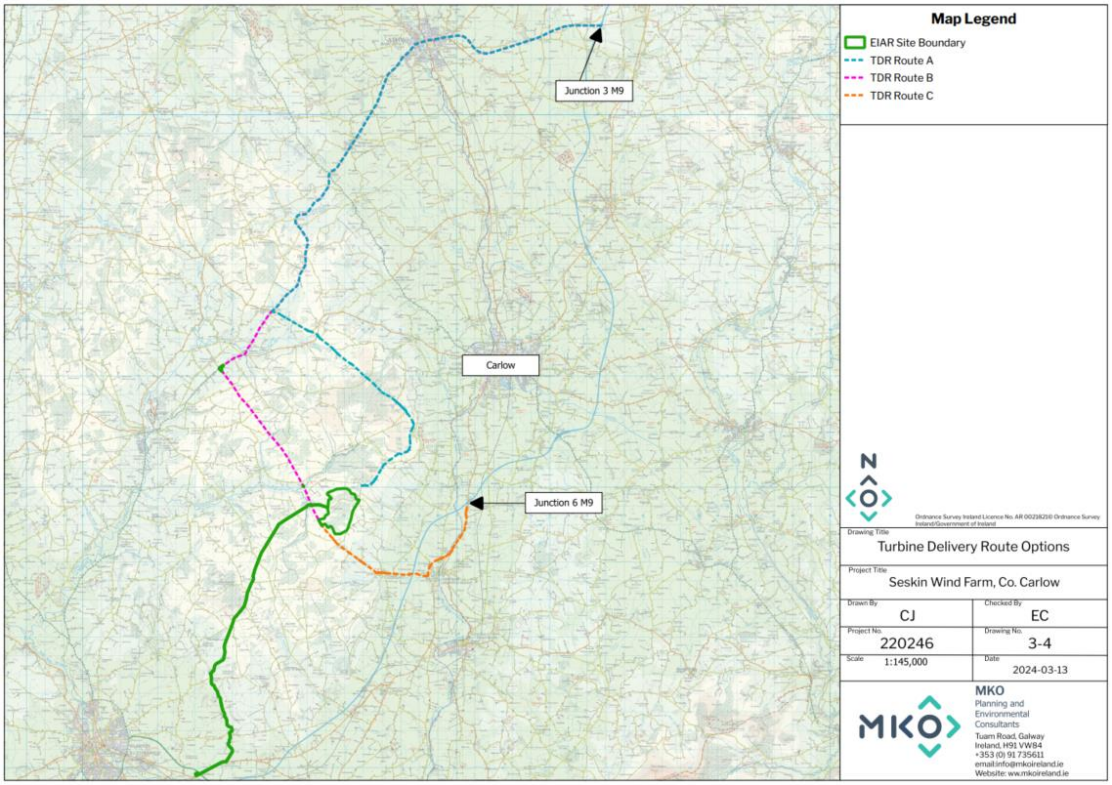



*Figure 3-4 Turbine Delivery Route Options Iteration No. 1*

## 3.2.9.2 Port of Entry

The alternatives considered for the port of entry of wind turbines into Ireland for the Proposed Project include the Port of Galway, Shannon Foynes Port, the Port of Waterford, and Dublin Port. Shannon Foynes Port is the principal deepwater facility on the Shannon Estuary and caters for dry bulk, break bulk, liquid and project cargoes. Port of Galway and Dublin Ports also offers a roll-on roll-off procedure to facilitate import of wind turbines. The Port of Waterford offers Lift-On Lift-Off, Bulk Handling, Project Pilotage, Towage & Tugs, Rail Transport, Cruise, Storage and Rental services. All four ports, and indeed others in the state, offer potential for the importing of turbine components. The primary chosen port of entry is the Port of Waterford due to its proximity from the port to the M9 motorway, in

which the exit to the national and regional roads towards the Proposed Project is accessible and the storage capacity for wind farm infrastructure is available.



#### 3.2.9.3 Turbine Delivery Route A

Turbine Delivery Route A involved the delivery of turbine components from the Port of Waterford in Co. Waterford to the Proposed Wind Farm. The route involved the National Road network (N25, N29, N78) the motorway network (M9), the regional road network (R430), and the local road network (L3896, L7130). Route A involved the turbine delivery vehicle exiting the M9 at Junction 3 towards Athy and traveling southwest towards to the site. This route was screened out due to the degree of works that would be required to facilitate a turbine blade transport vehicle, as well as the requirement for a site entrance to the north-eastern corner of the site.

#### 3.2.9.4 Turbine Delivery Route B

Turbine Delivery Route B involved the delivery of turbine components from the Port of Waterford in Co. Waterford to the Proposed Wind Farm. The route involved the National Road network (N25, N29, N9, N78) the motorway network (M9), the regional road network (R448) and the local road network (L3037). Route B involved the turbine delivery vehicle exiting the M9 at Junction 6 and traveling south through Leighlinbridge and northwest through Oldleighlin towards the Proposed Wind Farm. This route was screened out due to the degree of works that would be required to facilitate a turbine blade transport vehicle.

#### 3.2.9.5 Turbine Delivery Route C

Turbine Delivery Route C, the chosen route for the Proposed Project, involves the delivery of turbine components from the Port of Waterford to the Proposed Wind Farm, utilising the Motorway network (M9), National Road network (N25, N29, N9 N78) and the local road network (L1834, L1835, L3037). Route C involves the vehicle exiting the M9 at Junction 3 to Athy and travelling southwest towards the Proposed Wind Farm. Route C was chosen due to fewer potential pinch points where road widening may be required along the route compared to Route's A and B.

A comparison of the potential environmental effects of the alternative access route's when compared against the chosen route is presented in Table 3-8 below.

Route C has been proven suitable for the transport of turbine components, and the transport analysis (as presented in Section 15.1 of this EIAR), shows that only minor accommodation works will be required to accommodate the proposed turbines.

All construction traffic will use designated haul routes only, as agreed with the local authority. An alternative to this would be to allow for more direct access to the site using multiple approach routes; however, this is more likely to give rise to additional traffic and road impacts.

The delivery of turbine components including blades, tower sections and nacelles is a specialist operation owing to the oversized loads involved. As detailed in Section 15.1 of this EIAR, turbines blades will be delivered to site using a Super Wing Carrier. When considering turbines transport routes, alternative modes of transport were also considered. Depending on the selected turbine delivery route and the turbine manufacturer, a blade adapter or blade transporter may also be used, if deemed appropriate, for delivery of turbines to the Proposed Wind Farm.

*Table 3-8 - Comparison of environmental effects when compared against the chosen option (Route C)*

| Environmental Consideration | Route A | Route B | Chosen Route C |
|---|---|---|---|
| Population and Human Health | Greater potential for impacts on human health as more accommodation works would be required along the route, giving rise to more vehicular emissions, dust emissions, noise and traffic disruption when compared to Route C. | Greater potential for impacts on human health as more accommodation works would be required along the route, giving rise to more vehicular emissions, dust emissions, noise and traffic disruption when compared to Route C. | Less potential for impacts on human health as fewer accommodation works would be required along the route, giving rise to less vehicular emissions, dust emissions, noise and traffic disruption when compared to Route's A and B. |
| Biodiversity (including Birds) | Neutral | Neutral | Neutral |
| Land, Soils and Geology | Neutral | Neutral | Neutral |
| Water | Neutral | Neutral | Neutral |
| Air Quality | Greater potential for impacts on air quality as more accommodation works would be required along the route giving rise to more vehicular and dust emissions when compared to Route C. | Greater potential for impacts on air quality as more accommodation works would be required along the route giving rise to more vehicular and dust emissions when compared to Route C. | Less potential for impacts on air quality as fewer accommodation works would be required along the route giving rise to less vehicular and dust emissions when compared to Route's A and B. |
| Climate | Greater potential for impacts on climate as more accommodation works would be required along the route giving rise to more vehicular emissions when compared to Route C. | Greater potential for impacts on climate as more accommodation works would be required along the route giving rise to more vehicular emissions when compared to Route C. | Less potential for impacts on climate as fewer accommodation works would be required along the route giving rise to less vehicular emissions when compared to Route's A and B. |
| Noise and Vibration | Greater potential for impacts in relation noise and vibration as more accommodation works | Greater potential for impacts in relation noise and vibration as more accommodation works would | Less potential for impacts in relation noise and vibration as fewer accommodation |

| | | | |
|---|---|---|---|
| | would be required along the route giving rise to more noise emissions and potential vibration when compared to Route C. | be required along the route giving rise to more noise emissions and potential vibration when compared to Route C. | works would be required along the route giving rise to less noise emissions and potential vibration when compared to Route's A and B. |
| Cultural Heritage | Greater potential for impacts on unrecorded, sub-surface archaeology due to more accommodation works being required, and therefore excavations, along this route when compared to Route C. | Greater potential for impacts on unrecorded, sub-surface archaeology due to more accommodation works being required, and therefore excavations, along this route when compared to Route C. | Less potential for impacts on unrecorded, sub-surface archaeology due to fewer accommodation works being required, and therefore excavations, along this route when compared to Route's A and B. |
| Landscape and Visual | Neutral | Neutral | Neutral |
| Material Assets | Greater potential for impacts in relation to traffic as more accommodation works required which could give rise to traffic disruption when compared to Route C. | Greater potential for impacts in relation to traffic as more accommodation works required which could give rise to traffic disruption when compared to Route C. | Less potential for impacts in relation to traffic as fewer accommodation works required which could give rise to traffic disruption when compared to Route's A and B. |
| **Major Accidents and Natural Disasters** | Greater potential for impacts in relation to major accidents and natural disasters as more accommodation works are required which could give rise to a larger degree of land disturbance when compared to Route C. | Greater potential for impacts in relation to major accidents and natural disasters as more accommodation works are required which could give rise to a larger degree of land disturbance when compared to Route C. | Less potential for impacts in relation to major accidents and natural disasters as fewer accommodation works are required when compared to Route's A and B. |

## 3.2.10 Alternative Mitigation Measures

Mitigation by avoidance has been a key aspect of the Proposed Project's evolution through the selection and design process. Avoidance of the most ecologically sensitive areas of the site limits the potential for environmental effects. As noted above, the site layout aims to avoid any environmentally sensitive areas. Where loss of habitat occurs in the site, this has been mitigated with the proposal of habitat enhancement and improved habitat connectivity with hedgerow replanting within the Proposed Wind Farm. Any forestry felled within the footprint of the Proposed Wind Farm will be replaced offsite, with no net loss. The alternative to this approach is to encroach on the environmentally sensitive areas of the site and accept the potential environmental effects and risk associated with this.

The best practice design and mitigation measures set out in this EIAR will contribute to reducing any risks and have been designed to break the pathway between the site and any identified environmental receptors. The alternative is to either not propose these measures or propose measures which are not best practice and effective and neither of these options is sustainable.