# Environmental Impact Assessment Report

## Lemanaghan Wind Farm, Co. Offaly

### Chapter 3 Site Selection and Reasonable Alternatives

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## GLOSSARY OF TERMS

| Term | Definition |
|---|---|
| Areas Deemed Open for Consideration for Wind Energy Developments | Areas that are characterised in the Offaly County Development Plan as *'open for consideration for wind energy development as these areas are characterised by low housing densities, do not conflict with European or National designated sites and have the ability by virtue of their landscape characteristics to absorb wind farm developments'* |
| Blade Oversail | Where the tip of the wind turbine blade protrudes from the rear of the delivery vehicle |
| Do Nothing Alternative | The environment of the site and it's environs should the Proposed Project not be developed |
| Natura 2000 site | A designated, protected area for biodiversity within the European Union. These sites are legally protected under the European Union Habitats Directive and Birds Directive . |
| NHA | Natural Heritage Area |
| Not Deemed Suitable for Wind Energy Developments | Areas that are characterised in the Offaly County Development Plan as *'(a) This area is considered to be generally unsuitable for wind farm development due to significant environmental, heritage and landscape constraints and housing density. (b) Individual small scale turbines will be considered on a case by case basis having regard to relevant exemption provisions in the* |

| | |
|---|---|
| | *Planning and Development Regulations 2001 as amended.*<br>*(c) Applications for re-powering (by replacing existing wind turbines) and extension of existing and permitted wind farms will be assessed on a case by case basis and will be subject to criteria listed in Development Management Standard 109 contained in Chapter 13 of Volume 1 of this County Development Plan and the Section 28 Wind Energy Development Guidelines.'* |
| OHL | Overhead Line |
| pNHA | Proposed Natural Heritage Area |
| PSRA | Geotechnical Peat Stability Risk Assessment |
| SAC | Special Area of Conservation |
| Shadow Flicker | A phenomenon when rotating wind turbine blades cast moving shadows over a narrow opening causing a rapidly alternating flickering light intensity |
| SPA | Special Protection Area |

## GLOSSARY OF ACRONYMS

| Acronym | Definition |
|---|---|
| BMEP | Biodiversity Management and Enhancement Plan |
| CRA | Collision Risk Assessment |
| GIS | Geographical Information Systems |
| MTN | Offaly West Midlands Trail Network |
| NHA | Natural Heritage Area |
| NOF | National Planning Framework |
| OHL | Overhead Line |
| SAC | Special Area of Conservation |
| SPA | Special Protection Area |
| TDR | Turbine Delivery Route |
| ZTV | Zone of Theoretical Visibility |

# 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: 'the Proposed Project', 'the Proposed Wind Farm', 'the Proposed Grid Connection', 'the Proposed Project site', and 'site'.

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. It provides an indication of the main reasons for selecting the chosen option, 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) 2022 Guidelines on the information to be contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) state that Strategic Environmental Assessment (SEA), is a higher tier form of environmental assessment that examines plans and programmes, examining the same factors as EIA but at a higher decision-making level, e.g., the higher level alternatives and effects of the plan or programme on environmental factors. SEA also considers strategic measures to avoid, reduce or mitigate likely effects, which may also be relevant during EIA scoping. Higher level considerations have been fully assessed and therefore do not need to be assessed again in the EIAR so as to reduce the amount of cumulative effects that need to be considered in an EIAR.

### Non-Environmental Factors

EIA is focused on the potential significant environmental effects of the Proposed Project 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 considerations.

### 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 on the preparation of EIAR (EU, 2017) 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 EU guidance (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 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 in 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 Project Design Options
    - Alternative Turbine Numbers and Model;
    - Alternative Turbine Layout and Development Design;
    - Alternative Substation and Grid Connection Options
    - Alternative Met Mast Locations
    - Alternative Design of Ancillary Structures
- Alternative Delivery Routes and Access Options for Turbine Component Delivery;
- Alternative Construction/Operational Entrance Options; 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. In implementing this 'Do-Nothing' alternative, the site would continue to be managed under the requirements of the IPC licence (P0500-01) and therefore the ongoing decommissioning activities, site management and environmental monitoring would continue. In addition, if the Proposed Project were not to proceed, the implementation of the Draft Cutaway Decommission and Rehabilitation Plan included as Appendix 2-4 of this EIAR (hereafter referred to as the Draft Rehabilitation Plan) as required under IPC Licence would still occur. These land uses and activities will also continue if the Proposed Project does proceed per BnM IPC Licence Obligations.

In implementing the 'Do-Nothing' alternative, however, the opportunity to capture a significant part of County Offaly's renewable energy resource would be missed, as would the opportunity to contribute to meeting Government and EU 2030 targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions. The opportunity to generate local employment, development contributions, and rates would also be forgone. In addition, the proposed amenity routes and associated carparks would not be constructed as part of the Proposed Project and therefore this recreational opportunity would be lost.

As such, on the basis of the positive environmental effects arising from the Proposed Project when compared to the 'Do-Nothing' alternative, the 'Do-Nothing' scenario was not the chosen option. The existing land uses and activities 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 wind energy project at the site are presented in Table 3-1 below.

*Table 3-1 Comparison of environmental effects of the 'Do-Nothing' alternative with the Proposed Project*

| Environmental Consideration | Do-Nothing Alternative (existing land uses continue) | Chosen Option of developing a wind energy development |
|---|---|---|
| ***Population & Human Health (incl. Shadow Flicker)*** | 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.<br><br>No potential for effects on visual amenity due to the construction and operation of turbines. | Approximately 100-120 jobs could be created during the construction, operation, and maintenance phases of the Proposed Project.<br><br>Based on the assessment and mitigation proposals detailed in Chapter 5 Population & Human Health, there will be no significant effects related to shadow flicker during the operational phase. |

| Environmental Consideration | Do-Nothing Alternative (existing land uses continue) | Chosen Option of developing a wind energy development |
|---|---|---|
| | No potential to supply an estimated 65,700 Irish households with clean renewable electricity<br><br>No potential to provide the local community with amenity walking trails. | The Proposed Project will also serve to provide dedicated amenity track for the local community and wider public. Amenity tracks will provide connectivity to national monuments and protected structures within the site. This will have no significant effects on amenity; the Proposed Project will have a positive, slight, long-term impact on amenity and tourism.<br><br>As detailed in the assessment in Chapter 10, the Proposed Project will have no significant effects on air quality.<br><br>As detailed in the assessment in Chapter 11, the Proposed Project will have no significant effects on climate. Please note, the Proposed Project will have a long-term moderate positive effect on climate.<br><br>As detailed in Ch 12, Noise and Vibration will have no significant effects on sensitive receptors.<br><br>As detailed in Chapter 14 Landscape and Visual, the landscape type and character of the area where the proposed turbines are sited comprises modified working landscape types of low sensitivity and can effectively accommodate wind energy development. Of the 20 no. viewpoints (VPs) assessed 1 no. was deemed imperceptible, 2 no. were deemed not significant, 8 no. were deemed slight, 8 no. were deemed moderate, and 1 no. was deemed significant. The number of receptors experiencing these effects is very low as the landscape surrounding the proposed turbines has a low population density. Visual effects will decrease with distance from the proposed turbines.<br><br>The proposed turbine locations adhere to the recommended 500m setback distance in the '*Wind Energy Development Guidelines for Planning Authorities'* (DoEHLG, 2006) (hereafter referred to as the 'DoEHLG 2006 Guidelines') and also the 4 times tip height set-back distance set out in the '*Draft Wind Energy Development Guidelines'* (December 2019) (hereafter referred to as the 'Draft DoHPLG 2019 Guidelines') for the purpose of protecting visual amenity and ensuring no significant effects from shadow flicker. |
| ***Biodiversity & Ornithology*** | No habitat loss.<br><br>No potential for collision risk for birds and bats.<br><br>No potential biodiversity enhancement measures would be put | Irrespective of the consenting or construction of the Proposed Project, the measures outlined in the Draft Rehabilitation Plan (Appendix 2-4) will be implemented by BnM in agreement with the EPA, per BnM's IPC Licence Obligations. |

| Environmental Consideration | Do-Nothing Alternative (existing land uses continue) | Chosen Option of developing a wind energy development |
|---|---|---|
| | in place. However, part of the BnM's statutory obligations under IPC licence requirements, Draft Rehabilitation Plans will continue to be implemented for the Proposed Project site. | As detailed in Chapter 6 Biodiversity, the Proposed Project has been designed to avoid or mitigate impacts on biodiversity including bats and downstream aquatic receptors.<br><br>The Proposed Project includes for a Biodiversity Management and Enhancement Plan (BMEP) proposal providing a local boost to biodiversity, including birds, and water quality. Please see Appendix 6-5 for details.<br><br>As detailed in the Bat Report in Appendix 6-1 of this EIAR, site-level collision risk for high collision risk bat species with proposed turbines was typically Low to Medium. Therefore, there will be no significant effects on bats.<br><br>As detailed in Chapter 7 Birds, the Proposed Project has been designed to avoid or mitigate impacts on ornithological receptors. As detailed in the Collision Risk Assessment (CRA) in Appendix 7-6, there will be no significant effects on birds due to collision risk. |
| ***Land, Soils & Geology*** | No excavation of peat and spoil. | As detailed in the assessment in Chapter 8, peat, topsoil and subsoil excavation volumes will be managed within the site, and the residual effects on peat, topsoil and subsoil are not significant. There will be no net loss of peat, topsoil or subsoil as a result of the Proposed Project. Peat, topsoil, and subsoil will be relocated within the site. Geotechnical investigations followed by careful design will result in no significant environmental impacts.<br><br>The peat and spoil management proposals discussed in Chapter 4 sets out the optimal treatment for peat and spoil excavated/ generated on site without creating significant impacts for biodiversity, hydrology, land use, etc. |
| ***Geotechnical/Peat Stability*** | No potential for peat slippage. The Proposed Project site is located on a relatively flat-lying site. The flat topography/nature of the terrain on site reflects the low risk of peat failure. | As detailed in Appendix 8-1, the findings of the peat stability risk assessment showed that the site has an acceptable margin of safety and is suitable for the development of the Proposed Project. |
| ***Water*** | Neutral - minor maintenance and minor repairs to the drainage network (where required) are part of IPC Licence requirements. | As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur. |
| ***Air Quality*** | Slight improvement on air quality due to the implementation of the Draft Rehabilitation Plans. See Appendix 2-4. However, it would not | As detailed in Chapter 10, there will be no significant effects on air quality from the Proposed Project. |

| Environmental Consideration | Do-Nothing Alternative (existing land uses continue) | Chosen Option of developing a wind energy development |
|---|---|---|
| | provide the opportunity for a greater overall improvement in air quality. | |
| ***Climate*** | The implementation of the Draft Rehabilitation Plan will aid in achieving climate targets relating to land-use. However, the opportunity would be lost for a reduction of greenhouse gases as the implementation of the Draft Rehabilitation Plan (Appendix 2-4) alone would not assist in achieving the renewable energy targets set out in the national and local climate action plans. | As detailed in the assessment in Chapter 11 Climate, over the proposed 35-year lifetime of the Proposed Project, 56,375 tonnes of carbon dioxide per annum will be displaced from traditional carbon-based electricity generation. Over the proposed 35-year lifetime of the Proposed Project, therefore, 1,973,125 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. The addition of an estimated 90MW clean energy to the national grid will be a positive contribution to the Ireland's renewable energy targets set out in the CAP25. |
| ***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 noise levels from the Proposed Project during the construction and operational phases. |
| ***Cultural Heritage & Archaeology*** | No potential for impacts on unrecorded, subsurface archaeology. | As detailed in Chapter 13, there will be no significant direct or indirect effects on known or unknown archaeology and cultural heritage during the construction, and decommissioning phases. During the operational phase, the effect on residential visual amenity will be less severe than that predicted by the Zone of Theoretical Visibility (ZTV) model as the model does not take natural screening and buildings into consideration which will alleviate if not remove the impact on setting altogether. Therefore, there will be no significant effects on monuments and protected structures.<br><br>Provision of amenity trails will serve to provide connectivity to national monuments and protected structures within the site and enable connectivity with the permitted Offaly West Midlands Trail Network (MTN); dedicated signage will enable a greater interpretation of cultural heritage within and around the site. |
| ***Landscape & Visual*** | Landscape and visual impacts avoided.<br><br>The key objective of the Draft Rehabilitation Plan (Appendix 2-4) for Lemanaghan Bog is environmental stabilisation via rewetting of cutover peatland to establish a naturally functioning wetland and encourage plants that prefer wetter conditions, such as Bog | As detailed in Chapter 14 Landscape and Visual, the landscape type and character of the area where the proposed turbines are sited comprises modified working landscape types of low sensitivity and can effectively accommodate wind energy development. Of the 20 no. viewpoints (VPs) assessed 1 no. was deemed imperceptible, 2 no. were deemed not significant, 8 no. were deemed slight, 8 no. were deemed moderate, and 1 no. was deemed significant. The number of receptors experiencing these effects is very low as |

| Environmental Consideration | Do-Nothing Alternative (existing land uses continue) | Chosen Option of developing a wind energy development |
|---|---|---|
| | Cotton. With the implementation of the Draft Rehabilitation Plan, there will be a positive increase in landscape and visual impact. | the landscape surrounding the proposed turbines has a low population density. Visual effects will decrease with distance from the proposed turbines.<br><br>The Draft Rehabilitation Plan will be implemented whether the Proposed Project proceeds or not. With the implementation of the Draft Rehabilitation Plan, there will be a positive increase in landscape and visual impact. |
| ***Material Assets (Traffic and Transport)*** | Neutral | As detailed in Chapter 15 Material Assets, there will be no significant effects on traffic and transport during the construction, operational, and decommissioning phases of the Proposed Project.<br><br>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*** | No potential to be affected by or to cause major accidents or natural disasters. | As demonstrated in Chapter 16, the risk of a major accident and/or disaster during the construction of the Proposed Project is considered 'low' in accordance with the '*Guide to Risk Assessment in Major Emergency Management*' (DoEHLG, 2010).<br><br>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>The Proposed Project will be designed and built in accordance with current best practice and, as such, mitigation against the risk of major accidents and/or disasters will be embedded through the design. With the implementation of all mitigation and monitoring measures detailed in the EIAR, there will not be significant residual effects associated with the construction, operation and decommissioning of the Proposed Project. |

For the reasons set out above, the proposal for a wind energy development at the Proposed Project site was progressed over the 'Do-Nothing' Alternative, this decision is cognisant of the potential environmental effects identified, both negative and positive arising from the Proposed Project. By progressing the Proposed Wind Farm there is an opportunity to create employment and investment in the local area and to capture the available renewable energy resource within County Offaly, 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

Bord na Móna (BnM) owns circa 80,000 hectares of land, primarily in the midlands of Ireland. An assessment of potential future uses of this landbank was published by BnM in 2011 in a document

entitled '*Strategic Framework for the Future Use of Peatlands*'. This report clearly identified the potential for the development of renewable energy (in particular wind energy) and other developments on BnM lands.

BnM's peatlands offer many advantages for the development of onshore wind farms, including:

- Industrial brownfield sites suitable for redevelopment;
- Of significant scale and present in large blocks;
- Open, unenclosed landscapes with good wind characteristics;
- Linked by rail or road passageways, suitable for cable connection;
- Generally flat and well drained, with minimal dangers of land slippage, and;
- Proven delivery of this type of development, as demonstrated by BnM's Bruckana, Mountlucas, Cloncreen, and Oweninny Wind Farms.

The Project Ireland 2040 National Planning Framework (NPF) identified a range of key future planning and development and place-making policy priorities for the Eastern and Midland Region that includes:

> *"Harnessing the potential of the region in renewable energy terms across the technological spectrum from wind and solar to biomass and, where applicable, wave energy, focusing in particular on the extensive tracts of publicly owned peat extraction areas in order to enable a managed transition of the local economies of such areas in gaining the economic benefits of greener energy."*

The first revision of the NPF[1], published in April 2025, updates the key future planning and development and place-making policy priorities for the Eastern and Midland Region, including:

> *"Developing the potential of the region in renewable energy terms, in accordance with the capacity allocation targets set out in Chapter 9: Climate Transition and Our Environment, across the technological spectrum from wind and solar to biomass and, where applicable, wave energy, focusing in particular on the extensive tracts of publicly owned peat extraction areas in order to support a managed just transition of local economies to greener energy"*

The assessment carried out for the determination of a suitable location for the Proposed Project is described in the following sections.

#### 3.2.3.1 Selection of Candidate Sites

In order to identify candidate sites, i.e., sites considered suitable for wind energy development, BnM conducted a technical review of lands which are either cut away or cutover. This involved desk studies and on-site surveys of the landbank. Known constraints were then applied across the landbank. The constraints applied were derived from various industry and regulatory guidelines, available Geographical Information Systems (GIS) datasets and on-site surveys (carried out as part of the peat extraction activity), and included the following:

- Planning Policy Context;
- Proximity to Sensitive Receptors;
- Peat Depths;
- Suitable wind speeds;
- Proximity to the national electricity grid; and
- Proximity to National and European Designated sites and onsite Environmental Sensitivities.

[1] https://cdn.npf.ie/wp-content/uploads/National-Planning-Framework-First-Revision-April-2025-1.pdf

### 3.2.3.2 Site-Specific Assessments

In order to identify sites within its landbank which might be suitable for wind energy development, BnM conducted a two-stage assessment process.

The first stage comprised the identification of a number of candidate sites via desk studies and on-site surveys of the landbank. Known constraints, derived from various industry and regulatory guidelines, available GIS datasets and on-site surveys (carried out as part of the peat extraction activity), were then applied to the dataset, including:

- Planning Policy Context;
- Proximity to Sensitive Receptors;
- Proximity to the national electricity grid;
- Proximity to National and European Designated sites and onsite Environmental Sensitivities;
- Peat depths, and;
- Suitable wind speeds.

The second stage of the assessment was used to select the sites with the best potential to deliver a successful wind farm project by 2030 to be further developed. This site-specific assessment was guided by the 2013 '*Methodology for Local Authority Renewable Energy Strategies*' report from the Sustainable Energy Authority of Ireland (SEAI) and informed by consultation with BnM's Works Management, Central Engineering, Construction, Ecology, Land and Property, and Planning teams.

Within the second stage of assessment, a number of sites were identified to be progressed by BnM; these include the following sites:

- Littleton, Co. Tipperary
- Ballydermot, Co. Offaly and Co. Kildare
- Consented Ballivor Wind Farm (PL Ref PA25M.316212)
- Clorhane, Co. Offaly
- Coolnamona, Co. Offaly
- Derryarkin, Co. Co. Offaly and Co. Westmeath
- Garryhinch, Co. Offaly and Co. Laois
- Timahoe 2 Solar Farm (Timahoe South), Co. Kildare – Operational Since November 2024
- Ballybeg, Co. Offaly

Key criteria were selected for the site-specific assessment, which not only covered the broad range of issues which can arise from wind farm development but also allowed for direct comparison between candidate sites to determine their relative suitability. The site-specific selection criteria and an outline of the basis for assessment for each criterion are listed in Table 3-2 below. To facilitate the selection process, greater emphasis was placed on certain criteria viewed as critical to site suitability, including environmental sensitivity, grid access/capacity, county development plans and zoning, and proximity to houses.

The criteria can be regarded as either a constraint to the Proposed Project or a facilitator for the Proposed Project. For example, the level of flooding at the site may reduce the available 'buildable' area or the lack of flooding may highlight the suitability of the site. The environmental effect of significant flooding may arise due to a requirement for deeper and more extensive drainage leading to potential downstream surface water impacts. In the case of BnM lands, the existing onsite drainage is a facilitator to the project as surface water is already managed in accordance with the EPA-administrated IPC licence.

### 3.2.3.3 Site Selection Results

The application of the above criteria resulted in the selection of a number of BnM Bogs for candidate wind farm sites, and 8 were identified to be developed via Joint Venture (JV) between BnM and SSE Renewables. These include the Proposed Project site at Lemanaghan Bog in Co. Offaly, which is the subject of the present application. There are 2 no. other projects for which separate planning applications will be submitted in the coming months:

- Littleton Wind Farm, Co. Tipperary; and
- Garryhinch Wind Farm, Co. Offaly and Co. Laois;

There are 5 no. BnM Bogs for which the JV has commenced environmental surveys to potentially develop projects for planning consideration:

- Bellair Bog, Co. Offaly and Co. Westmeath;
- Derryfadda Bog, Co. Galway;
- Coolnagun Bog, Co. Westmeath and Co. Longford;
- Kilberry Bog, Co. Kildare; and
- Cornafulla Bog, Co. Roscommon.

The JV intends to fully assess all these projects for suitability as all were considered to be viable sites for wind energy development. Each is a project in its own right which, if deemed suitable for planning consideration, 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 option with regards to their environmental impacts will be provided in the EIAR accompanying the applications for same.

The findings of the site-specific assessment process, which included a comparison of the site selection criteria and potential environmental effects is provided in Section 3.2.3.3.1 below.

#### 3.2.3.3.1 *Suitability of Lemanaghan Bog*

Lemanaghan Bog was progressed for detailed assessment and planning consideration due to its relatively low potential for environmental effects and the close proximity of its potential grid connection which would provide environmental and project viability benefits.

##### Planning Policy Context

The site falls across the administrative area of Offaly County Council and therefore, is subject to the planning policies and objectives set out in the Offaly County Development Plan 2021-2027 (OCDP).

County Offaly's Wind Energy Strategy[2] identifies areas within the County according to a hierarchy from the most optimal down to areas not generally considered suitable. There are two categories within the Wind Energy Strategy:

- Open for Consideration for Wind Energy development
- Not deemed Suitable for Wind Energy Development

The proposed turbines are located within an area designated as 'Areas Deemed Open for Consideration for Wind Energy Developments', with the exception of T05 which is located on the boundary of an area designated 'Not Deemed Suitable for Wind Energy Developments'. A detailed site-specific constraints assessment has been undertaken as part of the design process (see Chapter 3,

[2] https://www.offaly.ie/app/uploads/Combined-Copy.pdf

Section 3.2.5.2) which demonstrates that this area of the Proposed Project site is a suitable location for a wind turbine. Table 3-2 below presents the findings of the site-specific assessment for the Proposed Project and includes the basis for assessment and potential environmental effects associated with each of the key site selection criteria

Please see Section 2.6.4 of Chapter 2 for further information on the OCDP and County Offaly Wind Energy Strategy.

### Proximity to Sensitive Receptors

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 Population Study Area in 2022 as described in the Population and Human Health section of this EIAR is 31.4 persons per square kilometre, as described in Section 5.3.3 of Chapter 5 of this EIAR. This is considerably lower than the national population densities of 73.27 persons per square kilometre and lower than the population density of County Offaly, recorded at 38.96 persons per square kilometre. The proposed turbine positions achieve the recommended setbacks in the DoEHLG 2006 Guidelines and the Draft DoHPLG 2019 Guidelines

The nearest settlement to the proposed turbines is Ballycumber, located approximately 3.7km northwest of the nearest proposed turbine (T15).

### Peat Depths

As part of the design process for the Proposed Project, site investigations were undertaken across the Proposed Project site, to provide detail and clarity on the nature and extent of subsoils and bedrock as a means of characterising the Proposed Project site. This provided information on the most suitable location for turbines and associated infrastructure.
A total of 722 no. peat probes have been completed at the Proposed Project site. The combined peat probe dataset shows that peat depths across the Proposed Project site range from 0 to >6m with an average peat depth of 2m. 36% of peat depth probes recorded peat depths of 1.0m to 2.0m, and 23% of peat depth probes recorded peat depths of 2.0m to 3.0m. The remaining 20% of probes recorded peat depths of between 3.0 to 6.2m.

Peat depths have been determined to be suitable for development as outlined in Appendix 8-1 Geotechnical Peat Stability Risk Assessment (PSRA). The PSRA identifies that the Proposed Project site '*is suitable for development of the Proposed Project and is considered to be at low risk of peat failure*'.

### Suitable Wind Speeds

The Irish Wind Atlas produced by Sustainable Energy Authority of Ireland (SEAI) 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 in the midlands bog groups are between 7 – 8 m/s. While the wind resource of Ireland's midlands 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.

### Proximity to the National Grid

The Proposed Project intends to connect to the national grid via 0.8km of new overhead line (OHL) from the proposed onsite 220kV substation, in the townland of Cooldorragh, Co. Offaly, and will require to break into the existing Shannonbridge-Maynooth 220kV OHL which runs in a

northeast/southwest direction through the northern portion of the Proposed Project site. Details regarding potential alternative grid connection options are considered and presented in Section 3.2.5.3.

### Proximity to Designated Sites.

The site is not located within any Nationally Designated or Natura 2000 site.

The nearest Natura 2000 site to the Proposed Project site, i.e., Special Area of Conservation (SAC) or Special Protection Area (SPA), is the Ferbane Bog SAC which is located approximately 1.3km southwest of the Proposed Wind Farm.

The nearest national designated site, i.e. Natural Heritage Area (NHA) or proposed Natural Heritage Area (pNHA) to the Proposed Project is the Ferbane Bog pNHA which is located approximately 1.3km southwest of the Proposed Wind Farm.

No Natura areas in the site, low number of Natura sites in the wider area, mainly low value habitat on the site

*Table 3-2: Site-specific Selection Criteria and Basis for Assessment*

| Criterion | Basis for Assessment | Potential Environmental Effect |
|---|---|---|
| **Grid Access/ Capacity** | Grid Access/Capacity means the potential of the National Grid to accommodate future projects on the network. The proximity of a project to suitable grid nodes (i.e., those with spare capacity) should facilitate the selection of a project for a viable grid connection offer. | **Direct:** Land, Soil and Geology, Hydrology and Hydrogeology, Biodiversity.<br><br>**Indirect:** Noise and Vibration, Population and Human Health. |
| **Wind Resource Assessment** | The available wind resource (i.e., wind speed) directly translates into how much electrical output is available from the site. | **Direct:** Air Quality and Climate.<br><br>**Indirect:** Air Quality and Climate. |
| **County Development Plans (CDP) and Zoning** | County Development Plans typically indicate the areas of a county which are deemed preferred, open to consideration and not suitable for wind farm development. | **Direct:** Landscape and Visual, Cultural Heritage, Biodiversity.<br><br>**Indirect:** Major Accidents. |
| **Proximity to Houses** | Proximity to houses refers to how close the proposed wind turbines are to sensitive receptors. | **Direct:** Population and Human Health, Noise and Vibration, Shadow Flicker.<br><br>**Indirect:** Landscape and Visual. |
| **Population Density** | Population density refers to the density of housing and population in the surrounding environs to the Proposed Project site. The population density of the Doon, Ballycumber, Srah, and Ferbane Electoral Divisions, within which the Proposed Project site is located, is approximately 33 persons per $km^2$. This is lower of the County Offaly population density of 42 persons per $km^2$ and the average national population density of 73 persons per $km^2$. | **Direct:** Population and Human Health, Noise and Vibration, Shadow Flicker.<br><br>**Indirect:** Landscape and Visual. |
| **Environmental Sensitivity** | Environmental Sensitivity is the ecological sensitivity of the site based on proximity to sensitive areas within or around the site. | **Direct:** Biodiversity, Climate.<br><br>**Indirect:** Water and Major Accidents. |
| **Landscape Capacity/ Cumulative Impact** | This refers to the landscape's capacity to absorb wind farm developments. | **Direct:** Landscape and Visual. |

| Criterion | Basis for Assessment | Potential Environmental Effect |
|---|---|---|
| | | **Indirect:** Cultural Heritage. |
| **Aviation** | Airspace control and use to be considered. For the assessment, the criterion examines proximity of the site to local and regional airports (including Casement Aerodrome), proximity to National Motorway network, parachute zone, Military Operating Areas, etc. | **Direct:** Telecommunications, Aviation and Electromagnetic Frequency, and Major Accidents. |
| **Land Use** | Internal BnM consideration relating to alternative uses for each bog. | **Direct:** Cultural Heritage, Land, Soils and Geology, Hydrology and Hydrogeology, Biodiversity, Climate, Major Accidents. |
| **Communications Infrastructure** | Telecoms masts and signals in the vicinity and across the sites to be considered. | **Direct:** Telecommunications, Aviation and Electromagnetic Frequency. |
| **Flood Plain Analysis** | Flood Plain Analysis assesses the wind farm's location in terms of historical flooding data. It also considers if the site is pumped, or gravity drained. | **Direct:** Water and Major Accidents.<br><br>**Indirect:** Traffic and Transportation and Major Accidents. |
| **Supporting Infrastructure** | Proximity to national and regional road network sites with better road access require less modifications or upgrade to the local infrastructure to facilitate construction or delivery of turbine components to site. | **Direct:** Traffic and Transportation.<br><br>**Indirect:** Noise and Vibration, Air Quality, and Climate. |

## 3.2.4 Alternative Renewable Electricity Technologies

Both onshore and offshore wind energy development and solar energy developments will be required to ensure Ireland reaches the target set in the Climate Action Plan 2025 (CAP25) to source 80% of our electricity from renewable energy by 2030. CAP25 has set out the following targets for electricity generation:

- Share of electricity demand generated from renewable sources to up to 80% where achievable and cost effective, without compromising security of electricity supply;
- Onshore Wind Capacity: up to 9GW
- Offshore Wind Capacity: 5GW (minimum)
- Solar PV Capacity: 8GW

When considering alternative renewable energy developments to the Proposed Project, the Applicant considered offshore wind and commercial solar energy production.

### 3.2.4.1 Offshore Wind

Although the screening exercise was based on identifying lands for onshore wind development; another alternative source of renewable electricity generation would be offshore wind energy.

The Proposed Project is a Joint Venture between SSE Renewables and BnM. Both SSE Renewables and BnM have a keen interest in offshore wind farms and has explored potential offshore sites. SSE Renewables is a co-developer on the 25MW Arklow Bank project in the Irish Sea and BnM has recently launched an offshore partnership with Ocean Winds to identify and develop offshore wind energy opportunities around the coast of Ireland.

However, it is considered that due to delays with the regulatory process for offshore development, a combination of both onshore and offshore wind farm development will continue to be required to deliver on the ambitious renewable energy targets set out under CAP25 which include focusing on onshore wind energy developments to reach the 2025/2030 renewable energy targets. As such, the Applicant's primary focus is on onshore wind farms, and the Applicant will continue to explore potential development offshore in tandem with delivering suitable sites onshore such as the Proposed Project.

The Applicant is committed to playing a key role in helping the State achieve its CAP25 objectives while building upon its proven record of generating clean renewable energy to the national grid. As such, the option of an offshore project is not considered to be a reasonable alternative at this time.

### 3.2.4.2 Solar

Commercial solar energy production is the harnessing and conversion of sunlight into electricity using 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.

Please note, the amount of electrical energy output from renewable generation is generally described in terms of capacity factor. The capacity factor relates to the amount of energy that may be achieved from a renewable technology over the period of one calendar year. Generally solar PV has a lower capacity factor than wind generation. One factor in the energy yield difference is that solar PV does not produce electrical energy at night, but the wind can blow at any time of the day or night. The Proposed Wind Farm is located within the J wind region for Ireland, as delineated by the EirGrid '*Enduring Connection*

*Policy 2.3 Solar and Wind Constraints Report: Assumptions and Methodology'*.[3] The capacity factor for wind in this region is 35% (0.35). If solar PV was to be deployed on the Proposed Project site, it would be located within the Solar Middle region of Ireland as delineated by the EirGrid report. The capacity factor for solar in this region is 14.6% (0.146). In order to achieve a c. 90MW output using solar PV arrays, there would be a requirement of approximately 144ha[4], which represents approximately 11% of the site. Taking into account the factors outlined above, it has been determined that wind energy is the most suitable renewable energy technology for the site with the lesser potential for significant, adverse environmental effects.

Based on the above, the Proposed Wind Farm was progressed, as to achieve the same electricity output from solar energy as is expected from Proposed Wind Farm (c. 90MW), a larger development footprint would be required. As detailed in Section 1.1.1 in Chapter 1, the site encompasses an area of approximately 1,258 hectares and the permanent footprint of the Proposed Project measures approximately 34.3 hectares, which represents approximately 3% of 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 the Proposed Wind Farm at this site are presented in Table 3-3 below.

*Table 3-3 Comparison of environmental effects for an alternative technology e.g., solar when compared against the chosen option (wind turbines)*

| Environmental Consideration | Solar PV Array (c. 90MW) | Chosen Option (Wind Farm – c. 90MW) |
|---|---|---|
| ***Population & Human Health (incl. Shadow Flicker)*** | No potential for shadow flicker to affect sensitive receptors.<br><br>Potential for glint and glare impacts on local receptors.<br><br>Lower potential for noise and vibration effects. Lower potential for visual obstructions in the skyline due to solar farms being low-lying structures.<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. | 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.<br><br>No potential for glint and glare impacts on sensitive receptors.<br><br>Based on the assessment included in Chapter 10 and Chapter 11, the Proposed Project will have no significant effects 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.<br><br>Based on the Assessment in Chapter 12 Noise and Vibration, the Proposed Project will have no significant effects on noise receptors.<br><br>As detailed in Chapter 14 Landscape and Visual, the landscape type and character of the area where the proposed turbines are sited comprises modified working landscape types of low sensitivity and can effectively accommodate wind energy development. Of |

[3] *EirGrid (2024) Enduring Connection Policy 2.3 Solar and Wind Constraints Report: Assumptions and Methodology* <https://cms.eirgrid.ie/sites/default/files/publications/ECP-2.3-Solar-and-Wind-Constraints-Report-Assumptions-and-Methodology-v1.1.pdf>

[4] *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 (c. 90MW) | Chosen Option (Wind Farm – c. 90MW) |
|---|---|---|
| | | the 20 no. viewpoints (VPs) assessed 1 no. was deemed imperceptible, 2 no. were deemed not significant, 8 no. were deemed slight, 8 no. were deemed moderate, and 1 no. was deemed significant. The number of receptors experiencing these effects is very low as the landscape surrounding the proposed turbines has a low population density. Visual effects will decrease with distance from the proposed turbines. |
| ***Biodiversity & Ornithology*** | Larger development footprint would result in greater habitat loss/impact due to the higher level of drainage requirement.<br><br>Potential for glint and glare impacts on birds.<br><br>No potential for collision risk on birds. | Smaller development footprint would result in a smaller habitat loss.<br><br>As detailed in Chapter 6 Biodiversity, the development has been designed to avoid or mitigate impacts on biodiversity including bats and downstream aquatic receptors.<br><br>With the implementation of the mitigation measures described in Chapter 7 Birds, and Appendix 7-6, there will be no significant effects on birds relating to collision risk. Furthermore, there will be no impact for glint and glare on birds. |
| ***Land, Soils & Geology*** | Shallower excavations involved in solar PV array developments would result in reduced volume of peat and spoil to be excavated. | As detailed in the assessment in Chapter 8, there is no loss of peat, topsoil or subsoil as a result of the Proposed Project. Peat, topsoil and subsoil will be relocated within the Site. No significant effects on peat, soils and subsoils will occur.<br><br>The peat and spoil management proposals discussed in Chapter 4 sets out the optimal treatment for peat and spoil excavated/generated on site without creating significant impacts for biodiversity, hydrology, land use, etc. |
| ***Geotechnical/Peat Stability*** | Shallower excavations involved in solar PV array developments would decrease the potential for peat instability (construction phase). | Deeper excavations required which increases the potential for peat instability (construction phase). However, there is no potential for peat slippage. The Proposed Project is located on a relatively flat-lying site. The flat topography/nature of the terrain on site reflects the low risk of peat failure. |
| ***Water*** | Shallower excavations involved in solar PV array developments would result in reduced volume of peat and spoil to be excavated and stored on site, therefore reducing the potential for silt-laden runoff to enter receiving waterbodies.<br><br>Larger development footprint would result in a larger area of | Project design specific drainage design removes the potential for significant environmental effects. As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur. |

| Environmental Consideration | Solar PV Array (c. 90MW) | Chosen Option (Wind Farm – c. 90MW) |
|---|---|---|
| | impermeable surfaces and would result in increased drainage requirements. | |
| ***Air Quality*** | Increased potential for dust and other noxious emissions due to larger volume of transport movements to and from site and larger volume of plant and ground works on site due to the larger footprint.<br><br>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. | Reduced potential for dust and other noxious emissions due to smaller volume of plant and ground works on site due to a smaller footprint.<br><br>Increased capacity factor of wind energy technology would result in a reduced reliance on fossil fuels for energy generation and therefore increased air quality improvements.<br><br>As detailed in the assessment in Chapter 10, no significant effects on air quality will occur. |
| ***Climate*** | Reduced capacity factor of solar PV array technology would result in less carbon offset. | Greater capacity factor resulting in a shorter carbon payback period.<br><br>As detailed in the assessment in Chapter 11 Climate, over the proposed 35-year lifetime of the Proposed Project, 1,973,125 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.<br><br>Increased traffic movements and increased plant on site due to the larger footprint could lead to larger noise and vibration output during the construction phase.<br><br>Less potential for noise impacts on nearby sensitive receptors during the operational 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*** | Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology. | Smaller development footprint would decrease the potential for impacts on unrecorded, subsurface archaeology.<br><br>As detailed in Chapter 13, there will be no significant effects on known or unknown archaeology and cultural heritage during the construction, operation and decommissioning phases. Archaeological monitoring under licence will be implemented during the construction phase. |
| ***Landscape & Visual*** | Panelling potentially less visible from surrounding area due to the screening by vegetation and topography. | Greater visibility due to the vertical scale of the proposed turbines. As detailed in Chapter 14 Landscape and Visual, the landscape type and character of the area where the proposed |

| Environmental Consideration | Solar PV Array (c. 90MW) | Chosen Option (Wind Farm – c. 90MW) |
|---|---|---|
| | | turbines are sited comprises modified working landscape types of low sensitivity and can effectively accommodate wind energy development. Of the 20 no. viewpoints (VPs) assessed 1 no. was deemed imperceptible, 2 no. were deemed not significant, 8 no. were deemed slight, 8 no. were deemed moderate, and 1 no. was deemed significant. The number of receptors experiencing these effects is very low as the landscape surrounding the proposed turbines has a low population density. Visual effects will decrease with distance from the proposed turbines. |
| ***Material Assets*** | Potential for greater traffic volumes during construction phase due to the number of solar panels required to achieve the same output.<br><br>Potential impact for a lesser impact on road capacity due to no required accommodation works for solar panel delivery to the site.<br><br>Greater potential for impacts on waste management due to increased plant on site giving rise to increase waste materials.<br><br>No material difference for impacts on gas, water, aviation.<br><br>No potential for impacts on telecommunications. | No material difference for impacts on gas, water, aviation. Buffers implemented on telecommunication links.<br><br>As detailed in Chapter 15, there will be no significant effects on traffic volumes during the construction phase of the Proposed Project. A detailed Traffic Management Plan (Appendix 15-2) incorporating mitigation measures will be agreed with the roads authority prior to construction works commencing on site. |
| ***Major Accidents and Natural Disasters*** | Decreased vulnerability to major accidents and natural disasters due to low profile design. Shallower excavations involved in solar PV array developments would decrease the potential for peat instability during the construction phase. | 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 Project Design Options

### 3.2.5.1 Alternative Turbine Numbers and Model

The proposed wind turbines will have a potential power output in the 4-to-7-megawatt (MW) range. It is proposed to install 15 no. turbines at the Proposed Project site which will have an estimated installed capacity of 90MW. Such a wind farm could also be achieved on the site by using smaller turbines (for example 2.5MW machines). However, this would necessitate the installation of approximately 36 turbines to achieve a similar output. Furthermore, the use of smaller turbines would not make as efficient use of the wind resource available at higher elevations above ground level, having regard to the nature of the site. 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, steel, etc.) and increasing the potential for negative environmental impacts to occur on biodiversity, hydrology and traffic and transportation. 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 site. The 15-turbine layout selected for the site 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 site will have an overall ground-to-blade tip height of 220 metres, blade rotor diameter of 150 metres and hub height of 145 metres. The use of alternative, smaller turbines at this site would not be appropriate as they would fail to make the most efficient use of the wind resource passing over the site at higher elevations and would potentially require a larger development footprint. This alternative would potentially lead to additional negative 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 are presented in Table 3-4 below.

*Table 3-4 Comparison of environmental effects between larger quantity of smaller turbines against the chosen option of a 15 no. turbine layout.*

| Environmental Consideration | Larger number of smaller turbine models | Chosen Option (15-no. turbine layout) |
|---|---|---|
| ***Population & Human Health (incl. Shadow Flicker)*** | Greater potential for shadow flicker and noise impacts on nearby sensitive receptors due to the increased number of turbines. However, these can be curtailed to meet threshold criteria.<br><br>Smaller turbines would be less visually obstructive in the skyline; however, the larger development footprint would spread further across the landscape potentially occupying a larger portion of a viewpoint. | Based on the assessment detailed in Chapter 5 and the mitigation measures proposed, there will be no significant effects on population and human health from shadow flicker and noise and vibration during the construction, operation and decommissioning phases of the Proposed Project.<br><br>Decreased potential for shadow flicker due to greater setbacks from houses, greater separation between turbines thus reducing aggregated shadow flicker time.<br><br>Smaller potential for noise impacts on nearby sensitive receptors due to a reduced number of turbines.<br><br>As stated in Chapter 12 Noise and Vibration, there is no potential for significant noise and vibration effects from the proposed turbines. Furthermore, noise |

| Environmental Consideration | Larger number of smaller turbine models | Chosen Option (15-no. turbine layout) |
|---|---|---|
| | | emissions can be curtailed to meet threshold criteria.<br><br>As detailed in Chapter 14 Landscape and Visual, the landscape type and character of the area where the proposed turbines are sited comprises modified working landscape types of low sensitivity and can effectively accommodate wind energy development. Of the 20 no. viewpoints (VPs) assessed 1 no. was deemed imperceptible, 2 no. were deemed not significant, 8 no. were deemed slight, 8 no. were deemed moderate, and 1 no. was deemed significant. The number of receptors experiencing these effects is very low as the landscape surrounding the proposed turbines has a low population density. Visual effects will decrease with distance from the proposed turbines. |
| ***Biodiversity & Ornithology*** | Larger development footprint would result in greater potential for habitat loss.<br><br>Due to the greater number of turbines present there would be a much higher risk of collision for bird and bat populations at the site. | As detailed in Chapter 6 Biodiversity, the Proposed Project has been designed to avoid or mitigate impacts on biodiversity including bats and downstream aquatic receptors. As per Chapter 6 of this EIAR, there are no significant long-term negative effects expected on biodiversity receptors.<br><br>With the implementation of the mitigation measures described in Chapter 7 Birds, the residual effects for collision risk are not significant. |
| ***Land, Soils & Geology*** | Larger development footprint would result in greater volume of spoil to be generated, excavated and sorted.<br><br>Neutral – geotechnical investigations followed by careful design would lead to no significant environmental impacts. | Smaller footprint would result in smaller volume of peat and soils to be excavated and managed. The peat and spoil management proposals discussed in Chapter 4 sets out the optimal treatment for peat spoil generated on site without creating significant impacts for biodiversity, hydrology, land use, etc.<br><br>Neutral – geotechnical investigations were carried out followed by careful design would lead to no significant environmental impacts.<br><br>As detailed in the assessment in Chapter 8, no significant effects on peat, topsoil, and subsoils will occur. |
| ***Geotechnical/Peat Stability*** | Neutral (the larger quantity of smaller turbines would still be designed to minimise peat slippage). | Neutral (the 15 no. turbine layout has been designed to minimise peat slippage). |
| ***Water*** | The larger quantity of smaller turbines would be designed to ensure | The 15 no. turbine layout has been designed to minimise hydrological impacts. |

| Environmental Consideration | Larger number of smaller turbine models | Chosen Option (15-no. turbine layout) |
|---|---|---|
| | no significant effects on hydrology, however a larger development footprint, would increase the potential for silt-laden runoff to enter receiving waterbodies. | Furthermore, the smaller footprint would result in less potential for silt laden run-off to enter a waterbody.<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 vehicle and construction dust emissions due to an increased volume of construction material and turbine component deliveries to the site, giving rise to a reduced air quality locally for the construction phase. | Decreased potential for vehicle emissions and dust emissions due to a decreased volume of construction material and turbine component deliveries to the site.<br><br>As detailed in Chapter 10, there will be no significant effects on air quality as a result of the Proposed Project. |
| ***Climate*** | Increased potential for greenhouse gas emissions from the construction phase and a larger loss of carbon storing potential from the larger development footprint within the bog.<br><br>Decreased potential in terms of carbon savings due to increased potential for greenhouse gases identified above. | Decreased potential for vehicle emissions and dust emissions due to a decreased volume of construction material and turbine component deliveries to the Site.<br><br>As detailed in the assessment in Chapter 11 Climate, over the proposed 35-year lifetime of the Proposed Wind Farm, 1,973,125 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. The addition of an estimated 90MW clean energy to the national grid will be a positive contribution to the State's renewable energy targets set out in the CAP25. |
| ***Noise & Vibration*** | Potential for increased noise impacts on nearby sensitive receptors due to reduced separation distance between sensitive receptors and turbine locations and additional turbine generators. | Potential for decreased noise levels at nearby sensitive receptors due to increased separation distance between sensitive receptors and turbine locations.<br><br>Based on the assessment detailed in Chapter 12, there will be no significant effects on sensitive receptors during the construction operational and decommissioning phases from the Proposed Project. |
| ***Cultural Heritage & Archaeology*** | Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology. | Smaller development footprint would decrease the potential for impacts on unrecorded, subsurface archaeology.<br><br>As detailed in the assessment in Chapter 13, there will be no significant direct or indirect effects on known or unknown archaeology and cultural heritage during the construction, operation and decommissioning phases. Archaeological monitoring under licence will be implemented during the construction phase. |

| Environmental Consideration | Larger number of smaller turbine models | Chosen Option (15-no. turbine layout) |
|---|---|---|
| ***Landscape & Visual*** | Neutral - Smaller turbines may be less visually intrusive on the landscape. Equally, a larger number of smaller turbines would be spread over a wider area, taking up a greater portion of a viewpoint. | The Proposed Wind Farm is an appropriately designed and suitably scaled project.<br><br>As detailed in Chapter 14 Landscape and Visual, the landscape type and character of the area where the proposed turbines are sited comprises modified working landscape types of low sensitivity and can effectively accommodate wind energy development. Of the 20 no. viewpoints (VPs) assessed 1 no. was deemed imperceptible, 2 no. were deemed not significant, 8 no. were deemed slight, 8 no. were deemed moderate, and 1 no. was deemed significant. The number of receptors experiencing these effects is very low as the landscape surrounding the proposed turbines has a low population density. Visual effects will decrease with distance from the proposed turbines. |
| ***Material Assets – Traffic and Transport*** | Potential for greater traffic volumes during construction phase due to larger development footprint and requirement for more construction materials and turbine components. | Potential for smaller traffic volumes during construction phase due to smaller development footprint and requirement for fewer construction materials and turbine components. |
| ***Material Assets – Utilities, Waste Management, Telecommunications and Aviation*** | No material difference between the two options for gas, water, waste management, telecommunications and aviation as (the larger quantity of smaller turbines would still be designed to minimise impacts on material assets). | No material difference between the two options for gas, water, waste management, telecommunications and aviation as (the 15. no turbine layout would still be designed to minimise impacts on material assets). |
| ***Major Accidents and Natural Disasters*** | A larger number of turbines could have a greater potential risk relating to major accidents and 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 15-no. turbine layout with larger turbines was considered to have a lower overall environmental impact when compared to a larger number of smaller turbines.

### 3.2.5.2 Alternative Turbine Layout and Design

The design of the Proposed Wind Farm has been an informed and collaborative process from the outset, involving the designers, developers, engineers, landowners, environmental, hydrological, geotechnical, archaeological, and traffic specialists.

Throughout the preparation of the EIAR, the layout of the Proposed Wind Farm has been revised and refined to take account of the findings of all site investigations and baseline assessments, which have brought the design from its first initial layout to the Proposed Wind Farm 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 Chapter 2 of the EIAR: Background to the Proposed Project, while still seeking to ensure that a viable project can ultimately be constructed and connected to the national grid.

#### 3.2.5.2.1 *Constraints Mapping*

The design and layout of the proposed wind energy development follows the recommendations and guidelines set out in the DoEHLG 2006 Guidelines and the *'Best Practice Guidelines for the Irish Wind Energy Industry'*[5] (Irish Wind Energy Association, 2012).

The DoEHLG 2006 Guidelines are currently the subject of a targeted review. The proposed changes to the assessment of impacts associated with onshore wind energy developments are outlined in the document *'Proposed Revisions to Wind Energy Development Guidelines 2006 – Targeted Review'* (2013), the '*Review of the Wind Energy Development Guidelines 2006 – Preferred Draft Approach'* (June 2017), and the Draft DoHPLG 2019 Guidelines. A consultation process in relation to the Draft DoHPLG 2019 Guidelines closed on 19th February 2020. The proposed changes presented in the Draft DoHPLG 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 DoHPLG 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 DoHPLG 2019 Guidelines which is more onerous than the buffer zones as detailed in the current DoHPLG 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 2025 to publish revised wind energy development guidelines for onshore wind by Q1 2025 (refer to Section 1.2.2), it is possible that the Draft DoHPLG 2019 Guidelines are adopted during the consideration period for the Proposed Project. The relevant guidelines for the purposes of section 28 of the Act, remain those issued in DoEHLG 2006 Guidelines.

The constraints map for the site, as shown in Figure 3-1, encompasses the following constraints and associated buffers:

- Residential dwellings plus a minimum 880m buffer to the nearest turbine (meeting the proposed requirement for a separation distance of 4 times the proposed maximum tip height from the curtilage of properties in line with the Draft DoHPLG 2019 Guidelines);
- European (Natura 2000) and Designated sites plus 200m buffer;
- Habitats of County Importance (see Chapter 6: Biodiversity);

[5] https://windenergyireland.com/images/files/9660bdfb5a4f1d276f41ae9ab54e991bb600b7.pdf

- Telecommunication Links plus operator specific buffer;
- Overhead transmission lines plus 3.5 times proposed rotor diameter buffer (as required by EirGrid);
- Watercourses plus 50m buffer; and
- Archaeological Sites or Monuments, plus 'Zone of Notification' as required by the National Monuments Service (ROI).
- Draft DoHPLG 2019 Guidelines wind take separation distance of 2 rotor diameters from adjoining property boundaries
- Draft DoHPLG 2019 Guidelines setback from National and Regional roads and railways of a distance equal to the height of the turbine to the tip of the blade plus 10%.

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

- Lands are available for development;
- Good wind resource;
- No Natura 2000 or Designated sites located within the Proposed Project site;
- Proximity to existing 220kV transmission lines for grid connection;
- Accessibility of site via National, Regional, and Local Roads;
- Existing site access points/entrances; 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 wind farm layout was then developed to take account of all the constraints mentioned above and their associated buffer zones and the separation distances required. Following the mapping of all known constraints, detailed site investigations were carried out.

The ecological assessment of the Proposed Project site 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.

The hydrological and geotechnical investigations at the site examined the proposed locations for turbines, roads and other components of the Proposed Project, such as the proposed onsite 220kV 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 by constraints.

The flat topography/nature of the terrain on site reflects the low risk of peat failure. A Peat Stability Risk Assessment (Appendix 8-1) was undertaken for the Proposed Project site. A Factor of Safety (FoS) of less than 1.0 indicates that a slope is unstable; a FoS of greater than 1.0 indicates a stable slope. An acceptable FoS for slopes is generally taken as a minimum of 1.3. The stability analysis for this project, which analysed the turbine locations, access roads and substation, resulted in FoS above the minimum acceptable value of 1.3 and hence the site has a satisfactory margin of safety. Please see Appendix 8-1 for further details.

The archaeological investigations on the site identified all recorded national monuments and protected structures within the vicinity of the Proposed Project and within the site. Through desktop study and detailed field surveys, the archaeology investigations examined the proposed locations for turbines, roads, and other components of the Proposed Project, such as the proposed amenity track and onsite 220kV substation and identified key constraints and appropriate buffers / mitigation to inform design. Please see Chapter 13 Cultural Heritage for further details.

The turbine layout for the Proposed Project has also been informed by wind data, the results of noise assessments, shadow flicker and the separation distance to be maintained between turbines. Thus, the baseline environmental assessment of the site and wind farm design 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.

As the Proposed Wind Farm design was refined, the biodiversity and ornithology mitigation and enhancement measures, detailed in the BMEP included as Appendix 6-5, for the Proposed Project were also refined through an iterative design process. This process is outlined in Section 3.2.5.2.2 below.

Ferbane Bog SAC

Map Legend

EIAR Site Boundary

Sensitive Receptors

Sensitive Receptors

880m Sensitive Receptor Buffer

Hydrology

Watercourse

Watercourse 50m Buffer

Drains

Drains 20m Buffer

Public Well

Cultural Heritage

National Monuments

Class 1 Togher Buffer

Class 2 & 3 Togher Buffer

SMR Zone

Designated Sites

Special Area of Conservation

SAC 200m Buffer

Proposed Natural Heritage Area

pNHA 200m Buffe

Telecoms

Telecoms Links

20m Telecoms Buffer



Drawing Title

Constraints Map

Project Title

Lemanaghan Wind Farm

| Drawn By | Checked By |
|---|---|
| CJ | EC |
| Project No. | Drawing No. |
| 200804 | Figure 3-1 |
| Scale | Date |
| 1:25,000 | 2026-03-25 |

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### 3.2.5.2.2 Alternative Proposed Wind Farm Design Iterations

The final design of the Proposed Wind Farm 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 and the EIA scoping process with statutory and non-statutory consultees. As information regarding the Proposed Project was compiled and assessed, the number of turbines and the proposed layout have been revised and amended to take account of the physical constraints of the Proposed Project site and the requirement for buffer zones and other areas which should be avoided. The selection of the number of turbines and layout of same has also had regard to wind-take and the separation distance to be maintained between turbines, as well as landscape and visual, cultural heritage, noise and shadow flicker impacts. 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 Project 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 layout. The initial constraints study identified a significant viable area within the overall study area of the site. The initial turbine layout comprised 17 no. turbines within the same study area. The proposed 15-turbine final layout has been refined following feedback from the project team, the local community, and the need to ensure sufficient separation distances are maintained for on-site constraints. The Proposed Wind Farm went through eight separate iterations. All eight turbine layout iterations have not been included, but Plate 3-1 to Plate 3-5 below gives an indication of how the design of the turbine layout evolved during the design process.

## Proposed Wind Farm Layout Iteration No. 1

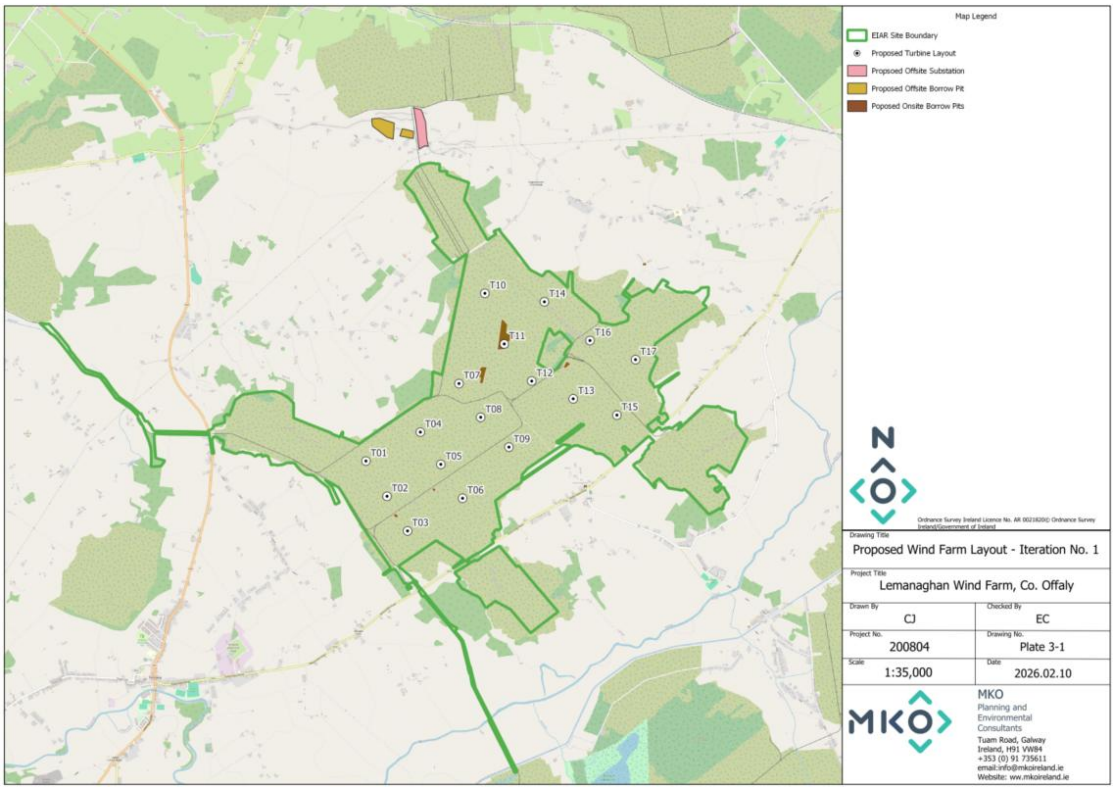



*Plate 3-1 Proposed Wind Farm Layout Iteration No. 1*

Iteration No. 1, which is presented in Plate 3-1 above, 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 17-no. turbine layout was identified within Lemanaghan Bog under BnM ownership with the feasibility of both offsite and onsite borrow pit locations and substation locations assessed. All proposed turbines were identified within Lemanaghan Bog with ancillary infrastructure proposed for Lemanaghan Bog and adjacent lands to the north. It was determined that it would be more environmentally sensitive and efficient to have all ancillary infrastructure (i.e., substation and borrow pits) located within Lemanaghan Bog, in the lands owned by BnM and therefore in close proximity of the proposed turbines.

## Proposed Wind Farm Layout Iteration No. 2

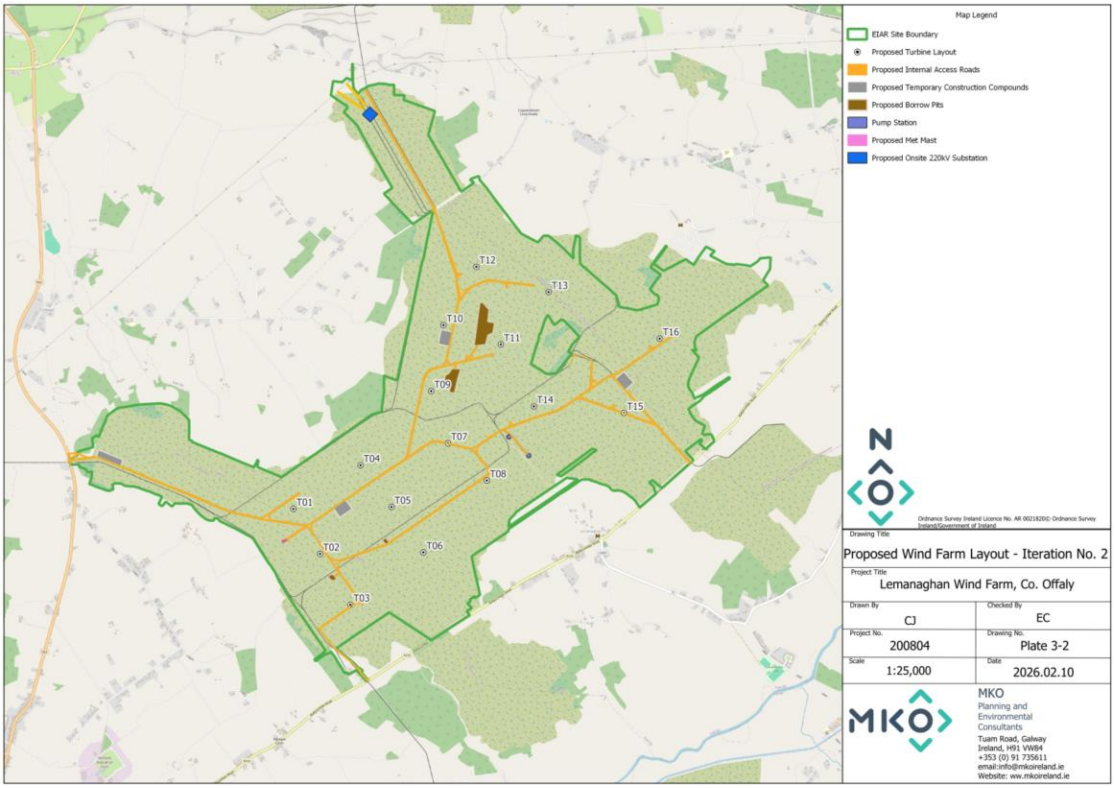



*Plate 3-2 Proposed Wind Farm Layout Iteration No. 2*

Iteration No. 2, which is presented in Plate 3-2 above, comprised of 16 no. turbines, internal access roads, proposed onsite 220kV substation, met mast, 4 no. borrow pits, and 4 no. temporary construction compounds.

In Layout Iteration No. 2 the EIAR Site Boundary was condensed to the main area of Lemanaghan Bog, with areas to the south removed from the EIAR Site Boundary due to ecological and archaeological constraints. This design iteration included initial proposed infrastructure siting of ancillary elements which were not previously considered, such as internal roads, temporary construction compounds and the met mast. Following design review, 1 no. turbine was removed from the layout to avoid mapped constraints, reducing the number of turbines from 17 no. down to 16 no. turbines. Layout Iteration No. 2 was presented to the wider EIAR team for further detailed investigations and assessment. These investigations included detailed archaeological investigations, habitat mapping, ecological surveying, and hydrological and geotechnical investigations of the Proposed Wind Farm.

## Proposed Wind Farm Layout Iteration No. 3

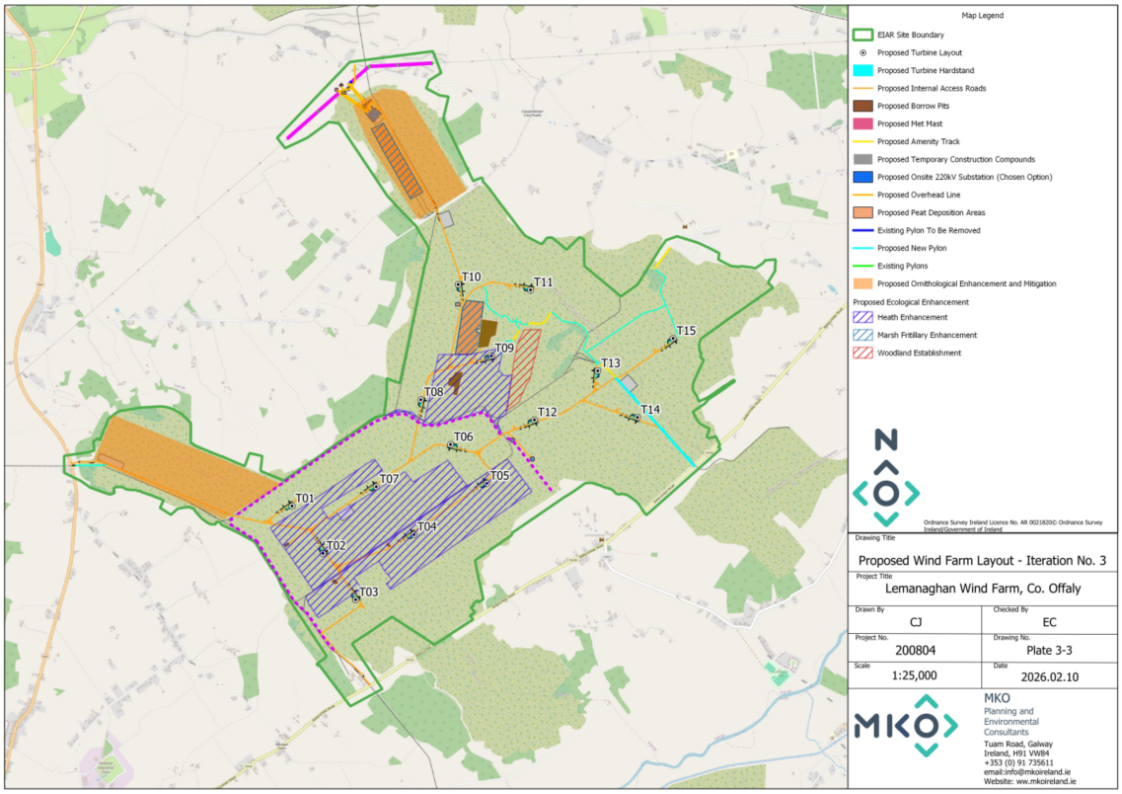



*Plate 3-3 Proposed Wind Farm Layout Iteration No. 3*

Iteration No. 3, which is presented in Plate 3-3 above, comprised of 15 no. turbines, hardstands, access roads, onsite 220kV substation, overhead line cabling into the existing Shannonbridge-Maynooth 220kV OHL and associated infrastructure, met mast, 5 no. temporary construction compounds, proposed amenity track, 2 no. peat deposition areas, 4 no. borrow pits, and other ancillary infrastructure. Iteration No. 3 introduced proposed ecological enhancement and proposed ornithological enhancement and mitigation areas which, along with the other proposed infrastructure was subject to detailed investigations which led to further refinement of the layout.

Ornithological enhancement and mitigation areas were proposed in the northern most section of Lemanaghan Bog, adjacent to the proposed onsite 220kV substation, and in the area of the bog east of the N62 site entrance (Site Entrance 1 – see Table 4-9 in Chapter 4 for further information). The area of the site adjacent to the proposed onsite 220kV substation was not progressed due to proximity to the Proposed Grid Connection infrastructure.

A detailed landscape and visual assessment of the turbine layout with a 200m tip height versus a 220m tip height was conducted to determine the potential effects of the Proposed Wind Farm on residential and visual amenity as well as cultural heritage. As there is a 10% difference in the maximum tip height of the two proposed turbine specifications, visual comparison revealed subtle differences, particularly at distances greater than 3km from the proposed turbines. From a residential and visual amenity perspective and cultural heritage perspective, it was determined that the required setbacks between turbines with a tip height of 220m afforded more screening from nearby receptors and decreased the horizontal extent of the view of the proposed turbines in close proximity. With this in mind, the Proposed Wind Farm was reduced from 16 no. to 15 no. turbines with a 220m tip height. Figure 3-2 below shows a comparative visualisation of the proposed 15 no. turbine layout with a tip height of 200m (Layout A in Figure 3-2) and a 220m tip height (Layout B in Figure 3-2) from Saint Manchan's Well.

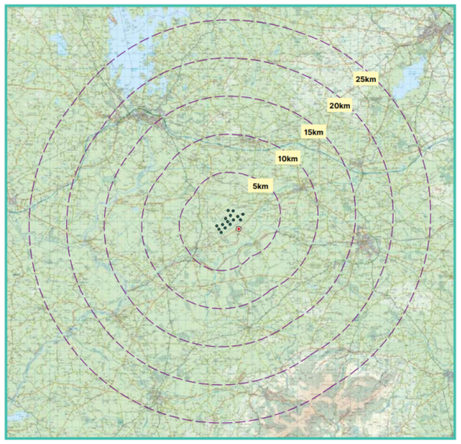
**View Point**

**Lemanaghan Monastic Site**

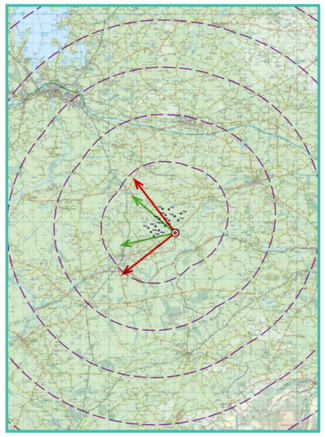
## Photomontage - Tip Height Comparison

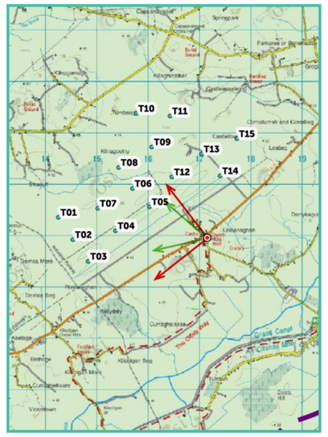
View from the Lemanaghan Monastic Site, located approximately 1.2km southeast of the nearest proposed turbine (T5)

| | |
|---|---|
| View point grid reference | E 617094 N 726964 |
| Date of image taken | 2024-06-11 |
| Time of image taken | 08:47 |
| View point elevation | 53m |
| Angle of Views | **A** 90° / 53.5° **B** 90° / 53.5° |
| View Direction (Image Centre) | **A** 277° / 284° **B** 8° / 353° |
| Number of proposed turbines visible | **A** 8/15 **B** 7/15 |
| Turbine Hub Height | 145m |
| Turbine Rotor Diameter | 150m |
| Turbine Tip Height | 220m |
| Montage Type | Type 4* Photomontage / Photowire /Survey / Scale Verifiable |
| Camera & Lens | Canon 5D Mark III / Full Frame Sensor with a 50mm Lens |
| Tripod | Manfrotto 190X extended to approx 1.5m. |
| Map Licence | ©Ordnance Survey Ireland. All rights reserved. Licence number CYAL50267517 |

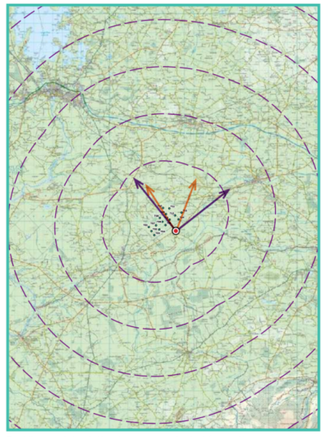


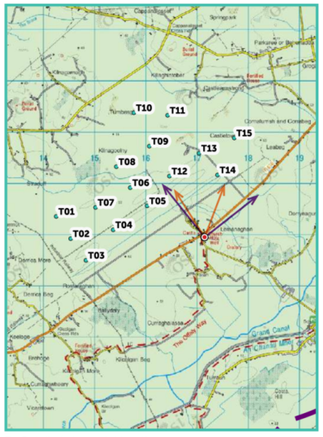
View point relative to 25km radius.


**A** - View point relative to proposed wind farm site.



**A** - Detail of view point location.


**B** - View point relative to proposed wind farm site.



**B** - Detail of view point location.

**Layout A**

200m Layout:

220m Layout:

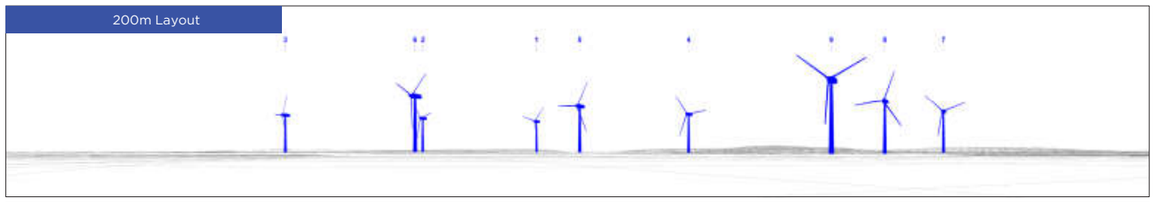
**Layout B**

200m Layout

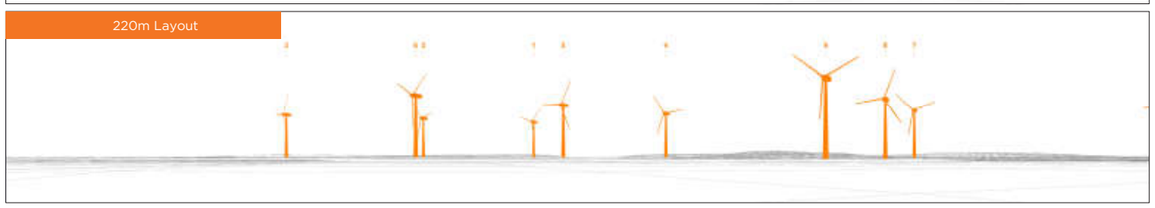
220m Layout

**Layout A**

200m Layout

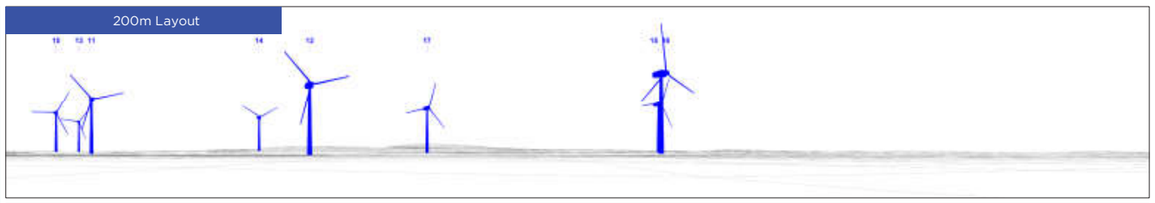


220m Layout



**Layout B**

200m Layout



220m Layout:

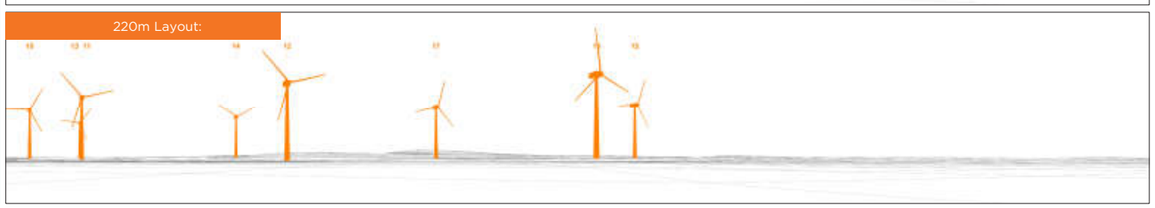


*Figure 3-2 15 no. Turbine Layout 200m Tip Height vs 220m Tip Height from Saint Manchan's Well*

As can be seen in Figure 3-2 above, a turbine layout with a 220m tip height offers increased natural screening from the mature trees located behind the ruined church due to the required separation distances between turbines and dwellings at this tip height. It should be noted that these trees are deciduous and will provide less screening in winter months. However, the increased setback distance of the turbines with a 220m tip height removes the turbines from the immediate visual context of the monastic site as identified in Section 14.7.3.4 of Chapter 14. For Iteration No. 3 the following changes were made:

- The Proposed Wind Farm reduced to 15 no. turbines at a 220m tip height and the turbines underwent renumbering.
- The temporary construction compound located between T14 and T15 was moved to facilitate better access to T13, T14, and T15 after T16 was removed.
- The temporary construction compound located between T09, T10, and T11 was moved to facilitate better access to new turbine locations for T08, T09, T10, and T1.
- An additional temporary construction compound was included for assessment at the proposed onsite 220kV substation.
- Proposed amenity tracks were introduced.
- Proposed peat deposition areas were introduced at key locations in the site to facilitate onsite management of excavated peat.
- EIAR Site Boundary was updated to take into account the Proposed Grid Connection infrastructure; and
- Proposed Grid Connection overhead line cabling to connect the proposed onsite 220kV substation to the national grid via the existing Shannonbridge-Maynooth 220kV overhead line (OHL) was proposed and underwent assessment by the wider EIAR team.
- Ecological enhancement areas (inclusive of marsh fritillary habitat enhancement, native woodland planting, and linear hedgerow establishment) were proposed and refined
- Ornithological enhancement and mitigation (inclusive of habitat creation for Whooper Swan and Lapwing) were proposed and refined

Turbine delivery site entrance and junction options were also included for consideration by the EIAR team and subject to site investigations.

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

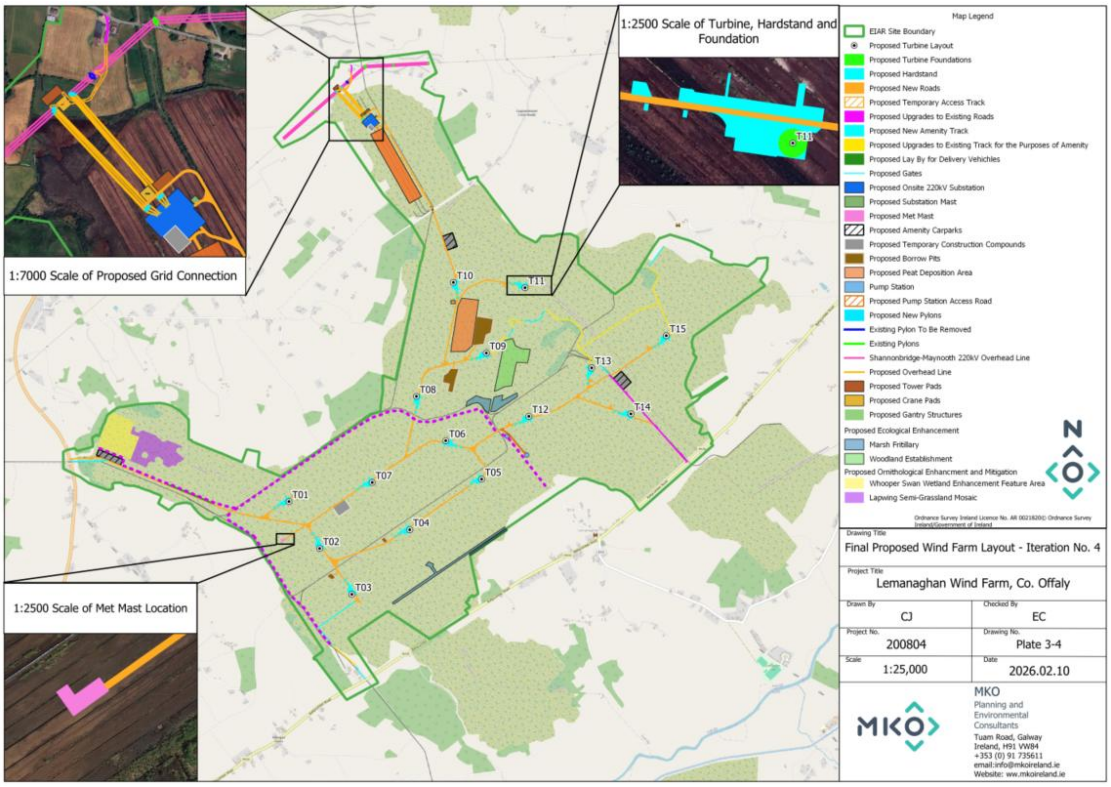



*Plate 3-4 Proposed Wind Farm Layout Iteration No. 4 – Final Proposed Wind Farm Layout*

Iteration No. 4 as presented in Plate 3-4 above is the final design change and is what constitutes the Proposed Project. The final layout for the Proposed Project comprised of 15 no. turbines with a maximum overall ground-to-blade tip height of 220m, a rotor diameter of 150m, and a hub height of 145m, a permanent met mast (145m), 5 no. temporary construction compounds, an onsite 220kV substation and associated grid connection infrastructure to connect into the existing OHL, 2 no. peat deposition areas, 4 no. borrow pits, proposed amenity track, ecological enhancement, ornithological enhancement and mitigation, and all ancillary infrastructure.

For the final Proposed Wind Farm layout the following changes were made:

- The EIAR Site Boundary was expanded to encompass all elements of the Proposed Grid Connection;
- Proposed onsite 220kV substation was moved 95m to the southwest to facilitate Proposed Grid Connection infrastructure under the existing Shannonbridge-Maynooth 220kV OHL to avoid infringing on hydrological constraints and associated buffers;
- Road layout was updated to facilitate access to updated proposed infrastructure locations and to avoid onsite cultural heritage constraints;
- Breakdown of roads (i.e., distinction between upgrades to existing track and proposed new roads) was provided;
- Temporary construction compound located north of T10 was moved approximately 0.2km south to avoid infringing on archaeological constraints and associated buffers;
- The amenity track was updated to identify existing track to be utilised for the purpose of amenity and new proposed amenity track
    - New amenity track and upgrades to existing track replaced proposed new road south of T03 to facilitate the connection of the Proposed Wind Farm to the permitted Offaly West Midlands Trail Network

- Facilitate access to the internal road network for the local community to engage with the Proposed Wind Farm once operational and the rich cultural heritage of the site while also avoiding infringement on updated archaeological constraints and associated buffers. Amenity tracks will provide connectivity to national monuments and protected structures within the site and those within the vicinity of the Proposed Wind Farm, i.e., Saint Manchan's Well;
- Confirmation of ornithological enhancement and mitigation by Site Entrance 1 – comprising 10ha for Whooper Swan habitat enhancement and mitigation and 10ha for Lapwing habitat enhancement and mitigation due to more suitable habitat (current and projected under the Draft Rehabilitation Plan (Appendix 2-4);
    - Designed with feedback from Hydro-Environmental Services (HES) and Tobar Archaeology (Tobar) to avoid all onsite environmental and archaeological constraints
- Refinement of ecological enhancement to align with future habitats identified within the Draft Rehabilitation Plan (Appendix 2-4);
    - Designed with feedback from HES and Tobar to avoid all onsite environmental and archaeological constraints
- Proposed gates and security compounds were proposed at site entrances (please see Table 4-9 in Chapter 4 for details);
- Inclusion of a proposed layby for HGVs and abnormal load delivery vehicles; and
- Inclusion of passing bays for all onsite construction traffic.

The potential environmental effects of previous design iterations in comparison with the final turbine layout are presented in Table 3-5 below.

*Table 3-5 Comparison of environmental effects of previous design iterations when compared against the final 15 no. turbine layout.*

| Environmental Consideration | Previous design iterations | Chosen Option of the Final 15. No Turbine Layout and all associated infrastructure |
|---|---|---|
| ***Population & Human Health (incl. Shadow Flicker)*** | A lower tip height (200m) will result in less screening for nearby receptors and a larger view of the horizontal extent of the proposed turbines in close proximity.<br><br>Likely potential for increased shadow flicker impacts on nearby sensitive receptors due to the increased number of turbines in Proposed Wind Farm Layout Iteration No. 1 (17 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (16 turbine layout).<br><br>Shadow flicker effects would likely be similar for Proposed Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (15 turbine layout). | Higher tip height (220m) will result in more screening for nearby sensitive receptors due to proposed turbine placement and will have a smaller view of the horizontal extent of the proposed turbines in close proximity.<br><br>Potential for reduced shadow flicker impacts on nearby sensitive receptors due to the reduced number of turbines, greater setbacks from houses, and greater separation between turbines.<br><br>Based on the assessment detailed in Chapter 5 and Chapter 12 and the mitigation measures proposed, there will be no significant effects on population and human health from shadow flicker and noise and vibration during the construction, operation and decommissioning phases of the Proposed Project. |
| ***Biodiversity & Ornithology*** | Greater potential impact on identified sensitive ecological receptors due to location of infrastructure within designated set-back buffers (i.e., water course buffers). | As detailed above and further in Chapter 6, the Proposed Wind Farm has been designed to avoid or mitigate impacts on biodiversity. |

| Environmental Consideration | Previous design iterations | Chosen Option of the Final 15. No Turbine Layout and all associated infrastructure |
|---|---|---|
| | Larger development footprint would result in greater potential habitat loss in Proposed Wind Farm Layout Iteration No. 1 (17 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (16 turbine layout).<br><br>Greater number of turbines in Proposed Wind Farm Layout Iteration No. 1 and Proposed Wind Farm Layout Iteration No. 2 would lead to a greater collision risk for bird and bat species on site.<br><br>Habitat loss and collision risk effects are neutral for Proposed Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (15 turbine layout). | The Proposed Project includes for a BMEP, providing a local boost to biodiversity and ornithology. Please see Appendix 6-5 for details.<br><br>As detailed in Chapter 7 Birds, the Proposed Project has been designed to avoid or mitigate impacts on ornithological receptors. As detailed in the Collision Risk Assessment (CRA) in Appendix 7-6, there will be no significant effects on birds due to collision risk. |
| ***Land, Soils & Geology*** | Larger development footprint would have resulted in larger volume of peat and spoil to be excavated and crushed stone to be extracted for construction in Proposed Wind Farm Layout Iteration No. 1 (17 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (16 turbine layout).<br><br>Effects from excavation and extraction are neutral for Proposed Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (15 turbine layouts). | As detailed in the assessment in Chapter 8, peat, topsoil and subsoil excavation volumes will be managed within the site, and therefore there will be no significant effects on peat, topsoil and subsoil. Geotechnical investigations followed by careful design will lead to no significant environmental impacts.<br><br>Smaller development footprint leads to a smaller volume of peat and spoil to be excavated and would require less crushed stone to be extracted for construction.<br><br>The peat and spoil management proposals discussed in Chapter 4 sets out the optimal treatment for peat and spoil excavated/generated on site without creating significant impacts for biodiversity, hydrology, land use, etc. |
| ***Geotechnical/Peat Stability*** | Geotechnical investigations followed by careful design would lead to no significant environmental impacts between Proposed Wind Farm layout iterations. | As detailed in Appendix 8-1, the findings of the peat assessment showed that the site has an acceptable margin of safety and is suitable for the development of the Proposed Project. |
| ***Water*** | Larger footprint would result in a greater potential for silt-laden runoff to enter natural watercourses within and around the site for Proposed Wind Farm Layout Iterations No. 1 (17 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (16 turbine layout).<br><br>Potential for runoff is neutral for Proposed Wind Farm Layout Iteration No. 3 and | As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur. |

| Environmental Consideration | Previous design iterations | Chosen Option of the Final 15. No Turbine Layout and all associated infrastructure |
|---|---|---|
| | Proposed Wind Farm Layout Iteration No. 4 (15 turbine layout).<br><br>Increased potential for impacts on groundwater schemes due to the location of infrastructure.<br><br>Project design specific drainage design would remove the potential for significant environmental effects. | |
| ***Air Quality*** | More turbines increase the potential to maximise the use of the site wind resource and the opportunity to further reduce the country's dependence on fossil fuels.<br><br>However, there would be an increased potential for impacts on air quality due to increased vehicle emissions and dust emissions as a result of increased volumes of material and turbine component deliveries required to facilitate the construction of the Proposed Wind Farm Layout Iterations No. 1 (17 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (16 turbine layout).<br><br>Air quality emission effects are neutral for Proposed Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (15 turbine layout). | As detailed in Chapter 10, there will be no significant effects on air quality. |
| ***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 of Proposed Wind Farm Layout Iterations No. 1 (17 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (16 turbine layout).<br><br>A larger number of turbines could result in a higher MW output in the operational phase which would result in a greater amount of carbon savings for Proposed Wind Farm Layout Iteration No. 1 (17 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (16 turbine layout).<br><br>Climate related emission effects (losses and savings) are neutral for Proposed Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (15 turbine layouts). | As detailed in the assessment in Chapter 11, over the proposed 35-year lifetime of the Proposed Wind Farm, 1,973,125 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. The addition of an estimated 90MW clean energy to the national grid will be a positive contribution to the State's renewable energy targets set out in CAP25. |
| ***Noise & Vibration*** | A larger number of turbines could have a greater noise impact for Proposed Wind Farm Layout Iterations No. 1 (17 turbine | Based on the assessment detailed in Chapter 12 and the mitigation measures proposed, there will be no |

| Environmental Consideration | Previous design iterations | Chosen Option of the Final 15. No Turbine Layout and all associated infrastructure |
|---|---|---|
| | layout) and Proposed Wind Farm Layout Iteration No. 2 (16 turbine layout).<br><br>The noise impacts are neutral for Proposed Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (15 turbine layout). | 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*** | A larger number of turbines and associated infrastructure could have a greater impact on unrecorded subsurface archaeology for Proposed Wind Farm Layout Iteration No. 1 (17 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (16 turbine layout).<br><br>Cultural heritage impacts are neutral for Proposed Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (15 turbine layout). | As detailed in the assessment in Chapter 13, there will be no significant effects on known or unknown archaeology and cultural heritage during the construction, operation and decommissioning phases.<br><br>Archaeological monitoring under licence will be implemented during the construction phase. |
| ***Landscape & Visual*** | A larger number of turbines could have a greater visual impact for Proposed Wind Farm Layout Iteration No. 1 (17 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (16 turbine layout).<br><br>Visual impacts are neutral for Proposed Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (15 turbine layout). | The smaller number of proposed turbines ensures a setback greatly exceeding that required in the Draft DoHPLG 2019 Guidelines. As detailed in Chapter 14 Landscape and Visual, the landscape type and character of the area where the proposed turbines are sited comprises modified working landscape types of low sensitivity and can effectively accommodate wind energy development. Of the 20 no. viewpoints (VPs) assessed 1 no. was deemed imperceptible, 2 no. were deemed not significant, 8 no. were deemed slight, 8 no. were deemed moderate, and 1 no. was deemed significant. The number of receptors experiencing these effects is very low as the landscape surrounding the proposed turbines has a low population density. Visual effects will decrease with distance from the proposed turbines. |
| ***Material Assets – Traffic and Transport*** | Potential for greater traffic volumes during construction phase due to larger development footprint and requirement for more construction materials and turbine components for Proposed Wind Farm Layout Iteration No. 1 (17 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (16 turbine layout).<br><br>Traffic impacts are neutral for Proposed Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (15 turbine layout). | As detailed in Chapter 15, there will be significant effects on traffic volumes during the construction phase of the Proposed Project. 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. |

| Environmental Consideration | Previous design iterations | Chosen Option of the Final 15. No Turbine Layout and all associated infrastructure |
|---|---|---|
| ***Material Assets – Utilities, Waste Management, Telecommunications and Aviation*** | No material difference between the Proposed Wind Farm layout Iteration no. 1, 2, 3, and 4 for gas, water, waste management, telecommunications and aviation. | No material difference between the Proposed Wind Farm layout Iteration no. 1, 2, 3, and 4 for gas, water, waste management, telecommunications and aviation. |
| ***Major Accidents and Natural Disasters*** | A larger number of turbines could have a greater potential risk relating to major accidents and natural disasters for the Proposed Wind Farm Layout Iteration No. 1 (17 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (16 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 Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (15 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 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. |

#### 3.2.5.2.3 *Alternative Internal Road Layout*

Internal roads are required onsite to enable transport of infrastructure and construction materials within the Proposed Project site. Such roads must be of a gradient and width sufficient to allow safe movement of equipment and vehicles. As the turbine layout was finalised, the most suitable routes between each component of the Proposed Project were identified, taking into account the shortest routes, existing access tracks, filtering out the physical and environmental constraints of the site, in particular archaeological constraints, and associated buffers and utilising the most direct route between turbines in order to minimise the footprint.

The site currently includes machine passes and railways that were used to take previously harvested peat off the bogs via tractor or rail. Due to their current low load-bearing capability, these machine passes are not considered suitable for turbine component delivery or the various wind farm construction machinery. Therefore, new internal roads are required for suitable access to and linkages between the various project elements, and efficient and safe movement of vehicles around the site by applying the required vehicle turning radii. Where possible, the new internal road network follows the existing machine passes. The internal road layout was adjusted relative to new turbine locations with each revision of the turbine layout.

Passing bays were designed for selected locations along the internal roads. These bays were located in specific areas to ensure minimum environmental effect by locating the passing bays away from higher value habitat and also in a configuration that facilitates the design of the amenity pathways/cycleways. Finally, amenity paths were added to the Proposed Wind Farm to enhance connectivity to national monuments and protected structures within the site and those within the vicinity of the Proposed Wind Farm, i.e., Saint Manchan's Well. The proposed amenity path links the Proposed Wind Farm internal road network to a public access point to the northeast of the site and in the west of the site at Site Entrance 1 (see Section 4.7.1 of Chapter 4 for further details). The proposed amenity path and internal roads links the Proposed Wind Farm to points of cultural heritage, such as Derryvane Cottage in the northeastern section of the Proposed Wind Farm. In addition, the amenity paths and internal roads to the west of the site, are proposed to link the Proposed Wind Farm with the permitted Midlands Trail Network (MTN) (PL Ref: 25/60014).

### 3.2.5.2.4 Alternative Construction/Operational Entrance Options

The Proposed Project site is currently served by a number of existing tracks and access roads due to its previous use as a commercially harvested bog. As part of the Proposed Project, it is proposed to upgrade 3 no. of existing entrances and facilitate 2 no. new site entrances. These site entrances will be used throughout the construction, operation, and decommissioning phases of the Proposed Project to enable delivery of materials and turbine components (construction phase), amenity access and maintenance/monitoring (operational phase), and removal of Proposed Project infrastructure (decommissioning phase). Please see Plate 3-5 below for the location context of all Proposed Project site entrances.

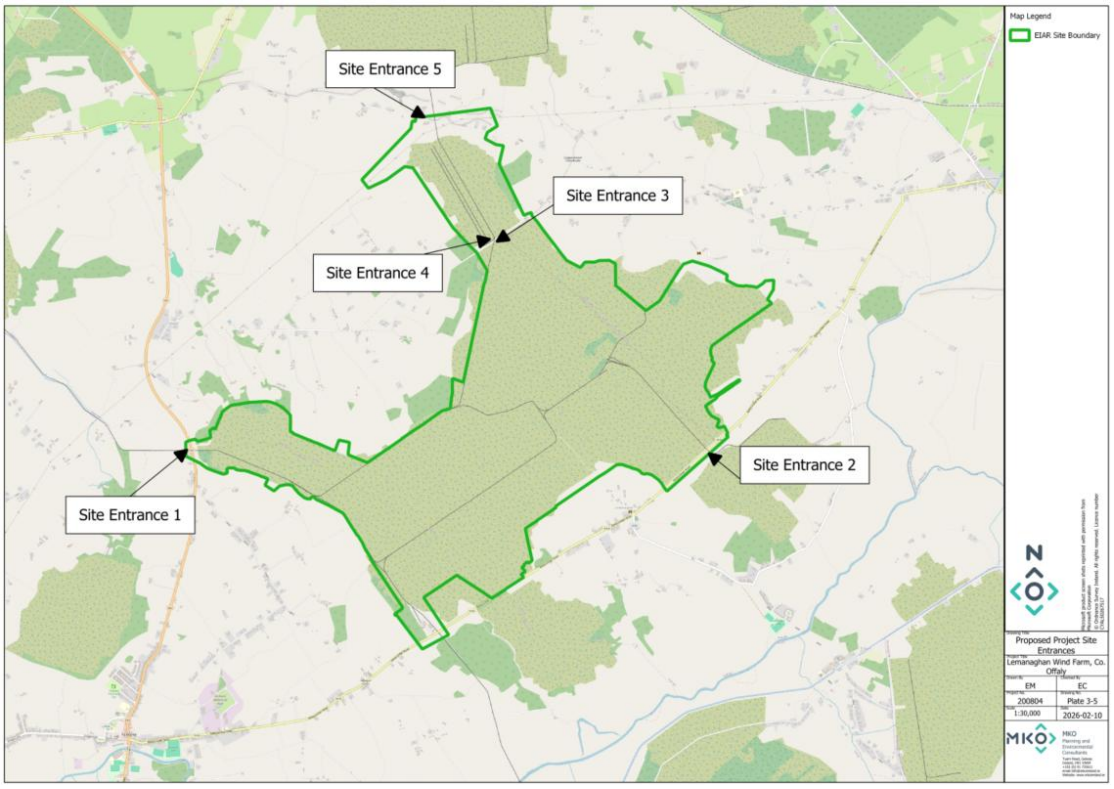



*Plate 3-5 Proposed Project Site Entrances*

Due to the nature of the Proposed Project, all proposed works will be local to the Proposed Project site and as such, the construction phase will utilise 4 no. site entrance locations for construction material delivery. Of the 4 no. site entrance locations, 3 no. are existing site entrances that will be upgraded, and 1 no. is a proposed new entrance on the northern side of the L7002. An existing agricultural site entrance off the L7001 local road network will also be upgraded to facilitate construction phase access to the Proposed Grid Connection infrastructure located under the existing Shannonbridge-Maynooth 220kV OHL.

At initial design stage, 6 no. site entrances were proposed, with all 6 being considered for use during the construction phase, with all but the existing agricultural site entrance off the L7001 local road being used during the operational phase to facilitate amenity and/or maintenance and monitoring activity. After a detailed traffic assessment was completed, it was determined that not all 6 no. proposed site entrances were suitable for the proposed use; furthermore, the proposed site entrance at the Lemanaghan Works was not progressed for assessment due to the entrance not having the required visibility to facilitate the safe egress of construction traffic in and out of the site onto the R436. The use of all remaining 5 no. proposed site entrance for construction was determined to not be suitable due to required visibility splays and the impact on the local road network. Furthermore, during the operational

phase, it was identified that further clarity on accessibility of the operational site entrances would be required.

Additionally, the traffic assessment has deemed only Site Entrance 1 (please see Table 4-9 in Chapter 4) as suitable for the purposes of abnormal load delivery. Abnormal load delivery vehicles will utilise the existing construction access off the N62 national road which will be widened to the south, and an extension of the existing underpass will be constructed (please see Figure 4-40 in Chapter 4 for details).

Furthermore, during the construction phase 4 no. site entrance locations are proposed to be utilised to facilitate the delivery of construction materials. Site Entrance 4 is located on the southern side of the L7002 local road, across from Site Entrance 3. Due to the requirement to create a crossroads junction at this location to facilitate construction traffic movement across the L7002 local road, it was determined that this would have a negative effect on traffic and therefore Site Entrance 4 was not progressed for use during the construction phase.

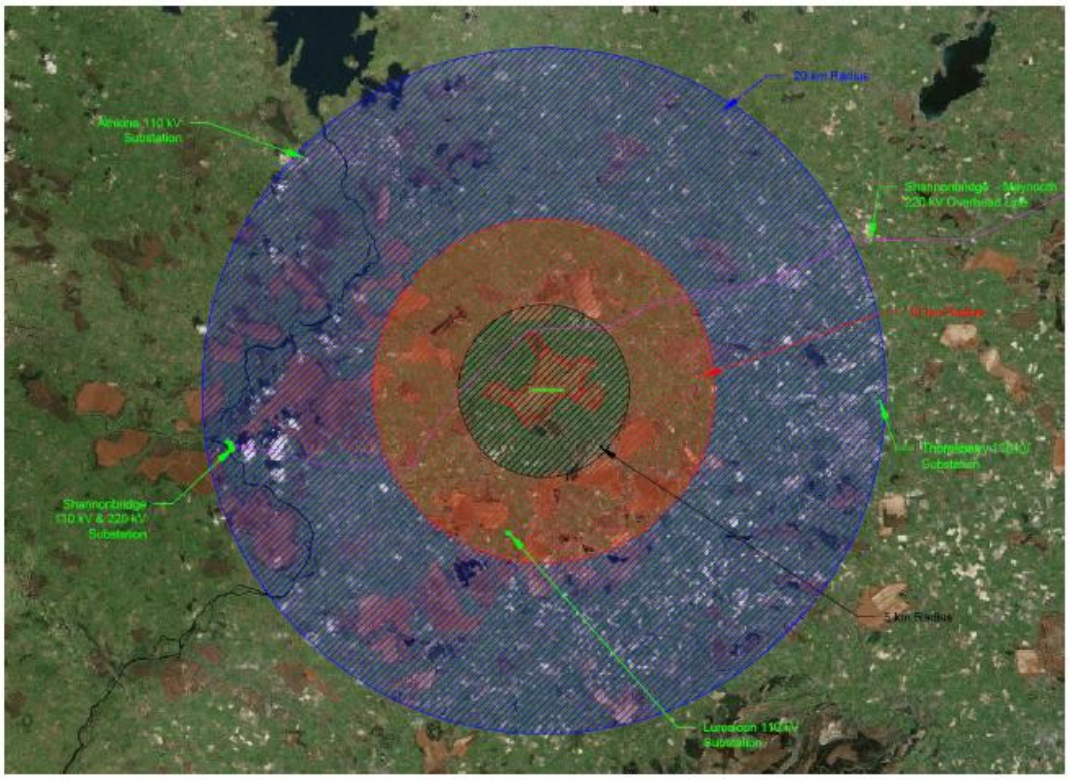
The operational phase will utilise 4 no. site entrance locations to facilitate maintenance and monitoring activity and amenity access. Of the 4 no. locations, 3 no. are the same as the identified construction phase entrances. Of the 4 no. site entrances to be used for the operational phase, 1 no. site entrance (Site Entrance 3) will be used for maintenance and monitoring activity only and 1 no. site entrances (Site Entrance 4), will be used for amenity access only. Site Entrance 5 will not be used during the operational phase.

Please refer to Section 4.7.1, Table 4-9 in Chapter 4: Description of the Proposed Project for further information on site entrances.

#### 3.2.5.3 Alternative Substation and Grid Connection

A number of grid connection options were assessed for the Proposed Project. Post preliminary wind farm design, the grid infrastructure in and around the site was assessed. See Figure 3-3 below for grid infrastructure relative to the site within 20km.

*Figure 3-3 Grid Infrastructure Relative to the Proposed Project site*




A key consideration in determining the grid connection method for a proposed wind energy development is whether the cabling is underground or run as an OHL or a combination thereof. An alternative to the use of only OHL (double-looped cabling) would be to construct an approx. 19.6km underground cable connection to the West Offaly Power Station in Shannonbridge, Co. Offaly. While DoEHLG 2006 Guidelines indicate that underground cables are the preferred option for connection of a wind energy development to the national grid, it was determined that due to the proximity of the existing OHL, it was more environmentally prudent to connect the Proposed Wind Farm to the national grid via either OHL or a combination of OHL and underground cable.

The MW output of the Proposed Wind Farm is such that it needs to connect to a substation with voltage capacity of at least 110kV. An assessment was carried out by the Applicant on the surrounding grid infrastructure and associated possible connection route options for the Proposed Wind Farm.

The TLI Group was engaged by the Applicant to preliminary grid route assessment for the Proposed Project. Please note, the grid connection feasibility assessment completed by TLI involved a feasibility assessment of proposed substation locations. Further information on these locations is presented below in Section 3.2.5.3.1.

The grid connections that were potentially viable options were assessed, the assessment identified seven potential connections for the Proposed Wind Farm to the national grid, such as:

- Connection to Shannonbridge – Maynooth 220kV overhead line – on site;
- Connection to Lumcloon 110kV Substation – 10km south of the Proposed Wind Farm
- Connection to Derrinlough 110kV Substation – 10km south of the Proposed Wind Farm
- Connection to Shannonbridge 110kV Substation – 20km west of the Proposed Wind Farm
- Connection to Shannonbridge 220kV Substation – 20km west of the Proposed Wind Farm

- Connection to Thornsberry 110kV – 20km east of the Proposed Wind Farm
- Connection to Athlone 110kV – 20km north of the Proposed Wind Farm

The above connection methods were assessed by TLI and options were ranked based on economic, technical, and environmental considerations; options were refined with due consideration being given to the following:

- Low level of public support for overhead lines;
- Proximity to the Proposed Project;
- Additional off-site land take; and
- Require routing through private lands.

The assessment concluded that the connection into the existing Shannonbridge-Maynooth 220kV OHL was the best option from an economic, technical, and environmental perspective.

Section 3.2.5.3.1 and Section 3.2.5.3.2 below outline the alternative substation locations and the associated alternative grid connection routes.

#### 3.2.5.3.1 *Proposed Substation Alternatives*

A desktop analysis was undertaken using identified constraints to identify three potential routes from the Proposed Wind Farm to the existing Shannonbridge-Maynooth 220kV OHL as identified from the TLI Assessment. Please see Figure 3-3 above for details on the surrounding national grid infrastructure within 20km of the site.

As the overhead line travels in a northeast to southwest orientation, the northernmost end (near Site Entrance 6) and the western most section (near Site Entrance 1) of the site were selected as the most suitable locations for the proposed onsite 220kV substation.

The TLI Group was engaged by the Applicant to carry out a preliminary grid route assessment for the Proposed Project, including feasibility of proposed substation locations. A desktop analysis was undertaken using identified constraints to identify three potential substation locations. An assessment was carried out to determine three potential locations for the proposed onsite substation: Substation Alternative 1 (Chosen Option), Substation Alternative 2, and Substation Alternative 3. Plate 3-6 below demonstrates all three proposed substation locations which are further detailed below.

- Substation Alternative 1 – located in the northernmost section of the site, approximately 0.4km south of the existing OHL and 0.3km southwest from the closest visual receptor. The L7001 local road and the houses dispersed along it are positioned at an elevated height in relation to the level of elevation of the proposed substation location with open views down onto the Lemanaghan Bog and the substation location available from a number of locations. In relation to the potential for mitigation in the form of vegetation planting along the boundary of the substation, the available setback distance increases the effectiveness of this type of screening, as the greater setback distances increase the degree to which the proposed substation will blend into the background vegetation. Furthermore, increasing the number of landscape features (treelines, drains, rows of peat, etc.) in the intervening space provides a sense of physical separation from the proposed substation and the receptors identified.
- Substation Alternative 2 - located in the northernmost section of the site, approximately 0.3km south of the existing OHL and approximately 0.3km south of the nearest visual receptor (i.e., inhabitable dwelling). This nearest visual receptor has high levels of visual screening in the direction of this alternative site from intervening vegetation. The next closest inhabitable dwellings have primary views directed to the southwest, making the view of the proposed onsite 220kV substation less central in the landscape but still visible from these locations. Substation Alternative 2 is a less

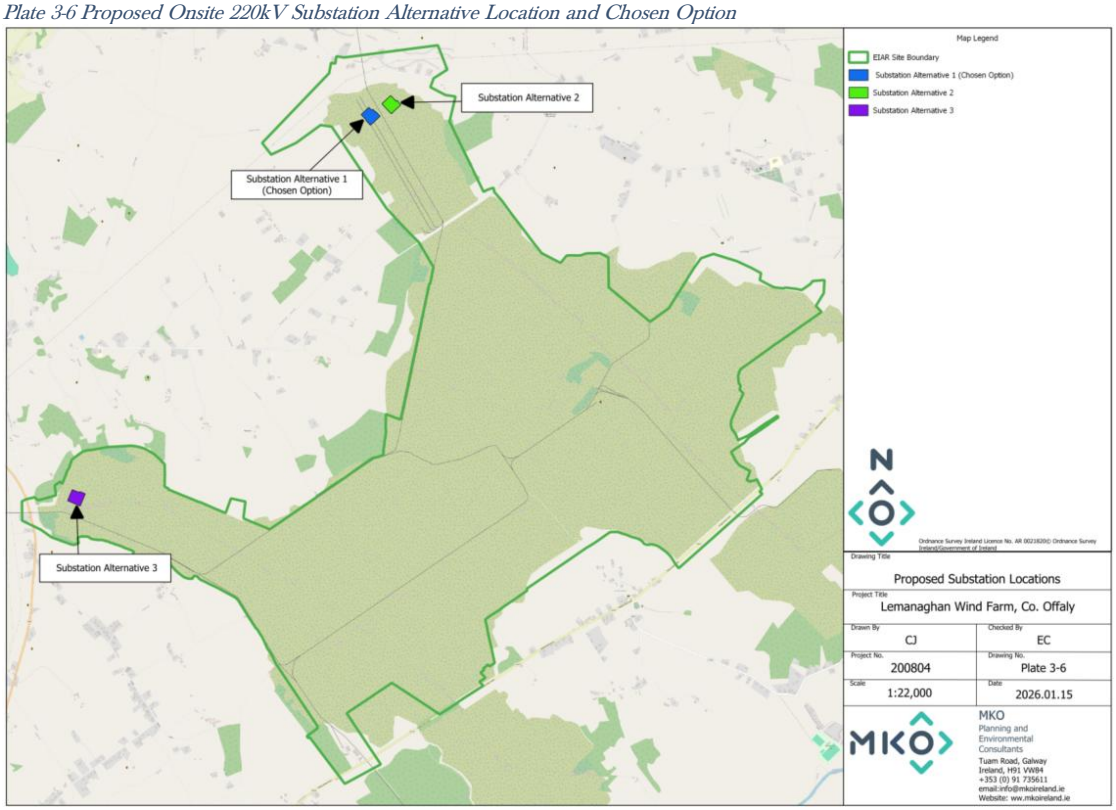
central location within views of the bog from the elevated position of the L7001 local road and the visual receptors located along it. Tall trees and vegetation along the site boundary provide a visual backdrop for the substation that will mitigate the visual impact resulting from its visibility, with the substation likely appearing more coherently placed within the landscape area in view. Varying levels of visual screening is also provided by tall vegetation that is located to the north of Substation Alternative 2.

- Substation Alternative 3 – located in the westernmost section of the site, approximately 1km southeast of the existing OHL and approximately 0.3km east from the nearest visual receptor. Tall trees and vegetation provide carrying screening to the east of Substation Alternative 3. However, there are open views into the bog from the N62 national road from a number of locations.

A review of the above considerations concluded that Alternative Substation 3 would result in a negative effect on residential visual amenity due to the lack of natural screening and proximity to visual receptors and the national road network. When considering Substation Alternative 1 and Substation Alternative 2 it was determined that the effects on visual receptors would be the same due to the proposed size of the substation and associated grid infrastructure required to connect into the national grid. For the purposes of the EIAR, it was determined that Alternative Substation 1 would be progressed for further assessment due to suitability of the Proposed Grid Connection option stemming from this substation (detailed in Section 3.2.5.3.2 below). Substation Alternative 1 was relocated at a later stage of the Proposed Project due to a redesign of Proposed Grid Connection infrastructure under the existing OHL; please see Section 3.2.5.3.2 below for details.

Please see the Substation Alternative 1 (Chosen Option), Substation Alternative 2, and Substation Alternative 3 on Plate 3-6 below.

*Plate 3-6 Proposed Onsite 220kV Substation Alternative Location and Chosen Option*




It is noted that while the operational lifespan of the Proposed Project is expected to be 35 years (after which the turbines may be replaced or decommissioned) the electricity substation and associated

infrastructure will remain in place as it will be under the ownership and control of the ESB Networks and/or EirGrid and will form a permanent part of the national electricity grid.

#### 3.2.5.3.2 *Proposed Grid Connection Alternatives*

##### Proposed Grid Connection Alternative 1

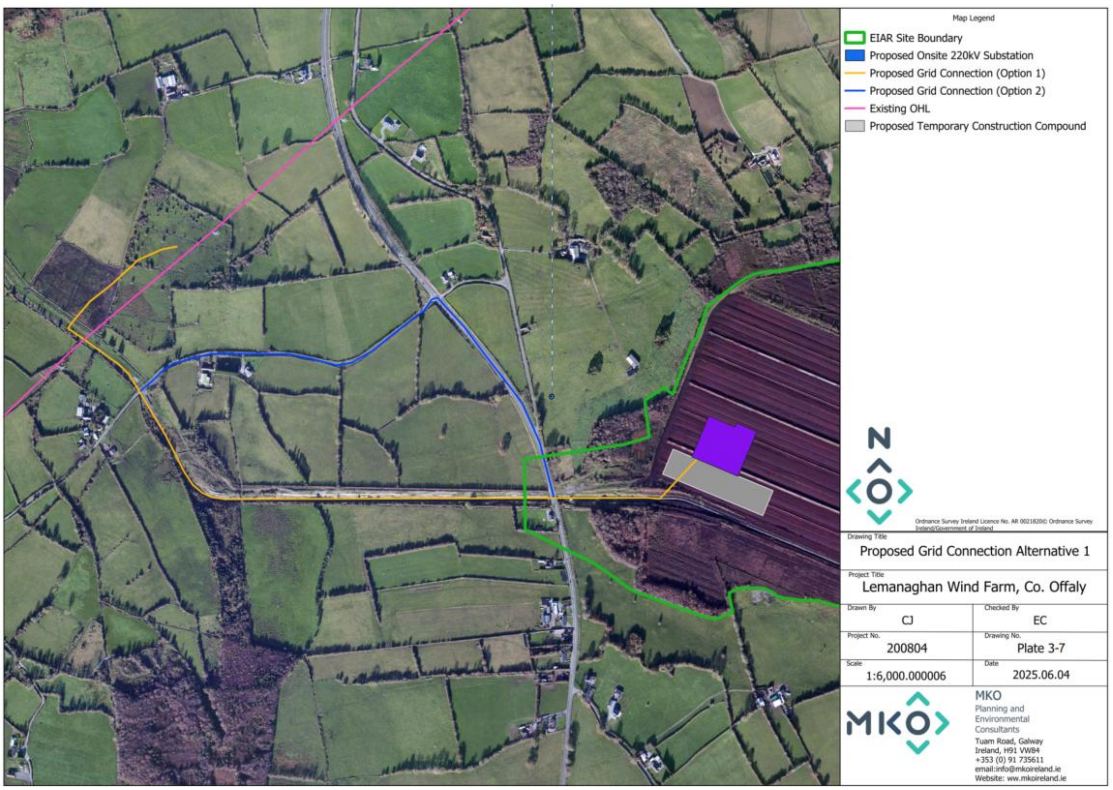



*Plate 3-7 Proposed Grid Connection Alternative 1*

Proposed Grid Connection Alternative 1, shown on Plate 3-7 above, requires the use of approximately 2km of underground electrical cabling to connect into the existing Shannonbridge–Maynooth 220kV OHL. Land use includes public road corridor and private agricultural land. It is proposed to break into the existing OHL dropping to individual gantry structures located at 2 no. proposed new steel masts within private land. The line will then carry on via underground cable; there are 2 potential routes for underground cabling:

- Return from the gantries through private land until reaching the existing BnM railway track which the underground cabling will then follow until reaching the Substation Alternative 3 (detailed in Section 3.2.5.3.1 above).
- Return from the gantries through private land until reaching the existing BnM railway track which the underground cabling will then follow until reaching the L7007 local road where it will turn off and continue in the road for 900m before meeting the L7018 local road. The underground cabling will then turn south in the L7018 local road where it will run for 625m until reaching the N62. It will continue in the N62 for 160m before turning east into the BnM railway track. The underground cabling will then follow this railway line before turning off to the Substation Alternative 3 (detailed in Section 3.2.5.3.1 above).

## Proposed Grid Connection Alternative 2

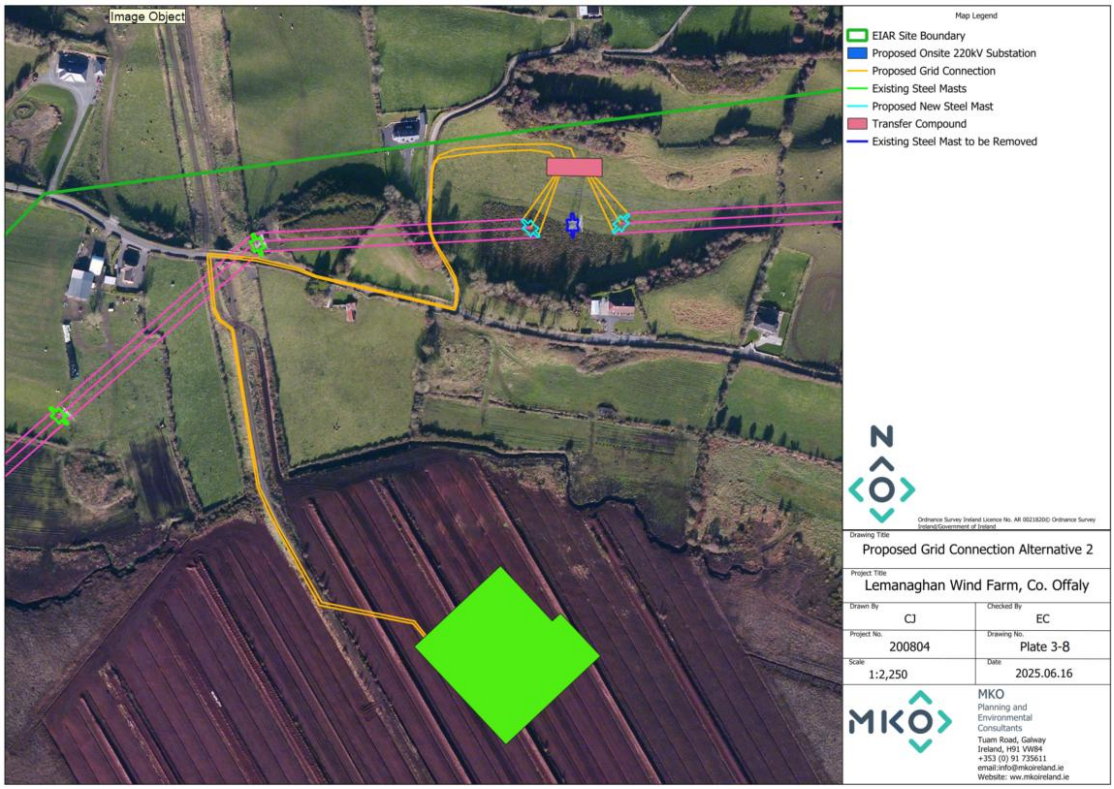



*Plate 3-8 Proposed Grid Connection Alternative 2*

Proposed Grid Connection Alternative 2, shown on Plate 3-8 above, requires the use of approximately 0.2km (double looped) of OHL connection and 0.9km of underground electrical cabling. Land use includes private land, bog remnant and cut away bog areas, BnM railways, and public road corridor. The underground route measures approximately 0.9km in length. Originating from Substation Alternative 2 (detailed in Section 3.2.5.3.1 above), the first section of the route is located in cutover bog and approx. 85m in length where it meets the existing BnM railway lines. The route then travels north along the railway line for approximately 330m before reaching the L7001 local road north of the site, where it travels east along the L7001 public road for approximately 220m before entering private land. Further infrastructure would be proposed within private land, i.e., the transfer compound from which the underground cable is converted to 100m of overhead line, 2 no. steel mast and 2 no. gantry structures. Note, 0.4km of the underground cabling associated with this alternative is located within the "Eiascir Riada" Geoheritage Audited Site. The "Eiascir Riada" Geoheritage site does not have statutory protection, however it does form part of Offaly's County Development Plan 2021-2027[6] (OCDP) (Chapter 4 BLP-35; Chapter 10 BHP-41) to protect and maintain the Clonmacnoise Monastery and characterised surrounds.

[6] *Offaly County Development Plan 2021-2027* <https://www.offaly.ie/stage-4-final-plan/>

## Proposed Grid Connection Alternative 3


*Plate 3-9 Proposed Grid Connection Alternative 3*

Proposed Grid Connection Alternative 3, shown on Plate 3-9 above, requires the use of approximately 0.8km of OHL connection (double-looped) to connect Alternative Substation 1 (detailed in Section 3.2.5.3.1 below) to the existing OHL. Land use includes private agricultural land, bog remnant and cut away bog areas. Proposed Grid Connection Alternative 1 would require 4 no. new steels masts, two of which would be proposed under the existing OHL. It is proposed to site new proposed steel masts either side of existing steel mast to allow for Proposed Grid Connection infrastructure to be built under the live line and allow construction of the rest of the required equipment to be completed before an outage is required for the final connection. Cabling would connect to 2 no. new proposed gantry structures which would connect to Alternative Substation 1 (detailed in Section 3.2.5.3.1 above).

A review of the above considerations concluded that Proposed Grid Connection Alternative 3 provides the most suitable connection method for the Proposed Wind Farm to the national grid. As outlined above, Proposed Grid Connection Alternative 3 does not interact with the “Eiascir Riada” Geoheritage Audited Site and does not utilise the public road network for underground cabling. Therefore, for the purposes of the EIAR, Proposed Grid Connection Alternative 3 was progressed for further assessment.

## Final Proposed Grid Connection Layout

An alteration to the Proposed Grid Connection infrastructure, shown in Plate 3-10, was carried out due to the presence of hydrological constraints in the field in which infrastructure was proposed. Updated appropriate setback buffers were determined and updated Proposed Grid Connection infrastructure was designed to take into account these setbacks and ensure no direct negative effects on hydrology. As a result of this redesign, the proposed onsite 220kV substation was moved to the southwest approximately 0.9km; please note the location of the line break into the existing OHL is taking place in the same location as in Proposed Grid Connection Alternative 3 (shown in Plate 3-9 above).

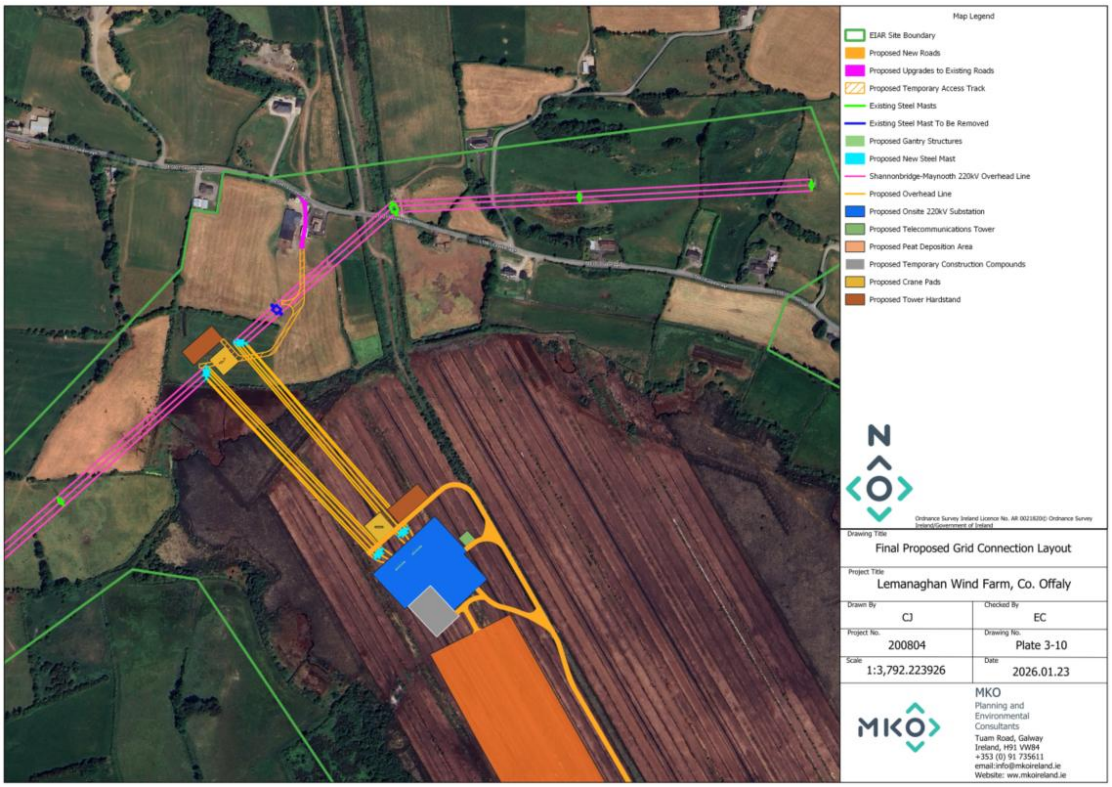



*Plate 3-10 Final Proposed Grid Connection Layout*

The final Proposed Grid Connection layout, shown in Plate 3-10 above, comprised the proposed onsite 220kV substation and associate telecommunications tower, 4 no, new steel masts, 2 no. gantry structures, 2 no. crane pads and 2 no. tower pads and all ancillary infrastructure.

A comparison of the potential environmental effects of the proposed alternative substation locations, as compared against the Final Proposed Grid Connection Layout are presented in Table 3-6 below.

*Table 3-6 Comparison of environmental effects of previous design iterations when compared against the final Proposed Grid Connection layout.*

| Environmental Consideration | Proposed Grid Connection Alternative 1 | Proposed Grid Connection Alternative 2 | Proposed Grid Connection Alternative 3 | Final iteration for Proposed Grid Connection layout and all associated infrastructure |
|---|---|---|---|---|
| ***Population & Human Health (incl. Shadow Flicker)*** | Potential for decreased visual impacts due to the majority of cabling proposed to be underground, with only 0.1km of OHL being required for Proposed Grid Connection Alternative 1. | Potential for decreased visual impacts due to the majority of cabling proposed to be underground, with only 0.1km of OHL being required for Proposed Grid Connection Alternative 2. | Visual impact is neutral for Proposed Grid Connection Alternative 3 and the Final Proposed Grid Connection Layout. | Based on the assessment detailed in Chapter 5 and Chapter 12, and the mitigation measures proposed, there will be no significant effects on population and human health, noise and vibration during the construction, operation and decommissioning phases of the Proposed Project. |
| ***Biodiversity & Ornithology*** | Potential for decreased habitat loss due to the majority of cabling being located within existing BnM railway and the public road network.<br><br>Potential for decreased impact on ornithological receptors due to the majority of cabling being proposed underground, and only 0.1km of OHL being required for Proposed Grid Connection Alternative 1. | Potential for increased habitat loss due to the required excavation through cutover peat and transitional scrubland.<br><br>Potential for decreased impact on ornithological receptors due to the majority of cabling being proposed underground, and only 0.1km of OHL being required for Proposed Grid Connection Alternative 2. | Habitat loss and collision impacts are neutral for Proposed Grid Connection Alternative 3. | As detailed in Chapter 6, the Proposed Grid Connection has been designed to avoid or mitigate impacts on biodiversity.<br><br>As detailed in Chapter 7, the Proposed Grid Connection has been designed to avoid or mitigate impacts on ornithological receptors. |
| ***Land, Soils & Geology*** | Potential for larger impact on land soils and geology due to the length of underground cable (approximately 2km) and associated require excavation and storage of all material associated with the underground cable route and the required infrastructure to connect into the existing OHL for Proposed Grid Connection Alternative 1. | Potential for larger impact on land soils and geology due to approximately 410m of the assumed underground cable route of Proposed Grid Connection Alternative 2 will be within the "Eiascir Riada" Geoheritage Audited Site. | Larger development footprint would result in a larger volume of peat and spoil being excavated and requiring storage for the Proposed Grid Connection Alternative 3. | As detailed in the assessment in Chapter 8, peat, topsoil and subsoil excavation volumes will be managed within the site, and therefore there will be no significant effects on peat, topsoil and subsoil. Geotechnical investigations followed by careful design will lead to no significant environmental impacts.<br><br>The peat and spoil management proposals discussed in Chapter 4 sets out the optimal |

| Environmental Consideration | Proposed Grid Connection Alternative 1 | Proposed Grid Connection Alternative 2 | Proposed Grid Connection Alternative 3 | Final iteration for Proposed Grid Connection layout and all associated infrastructure |
|---|---|---|---|---|
| | | | | treatment for peat and spoil excavated/generated on site without creating significant impacts for biodiversity, hydrology, land use, etc. |
| ***Geotechnical/ Peat Stability*** | Geotechnical investigations followed by careful design would lead to no significant environmental impacts between Proposed Grid Connection layout iterations. | Geotechnical investigations followed by careful design would lead to no significant environmental impacts between Proposed Grid Connection layout iterations. | Geotechnical investigations followed by careful design would lead to no significant environmental impacts between Proposed Grid Connection layout iterations. | As detailed in Appendix 8-1, the findings of the peat assessment showed that the site has an acceptable margin of safety and is suitable for the development of the Proposed Project. |
| ***Water*** | Potential for greater impact on sensitive hydrological receptors due to location of infrastructure within designated set-back buffers (i.e., water course buffers) with Proposed Grid Connection Alternative 1. | Potential for lesser impact on sensitive hydrological receptors as there is no interaction with watercourses or waterbodies as part of Proposed Grid Connection Alternative 2. | Greater potential impact on identified sensitive hydrological receptors due to location of infrastructure within designated set-back buffers (i.e., water course buffers) with Proposed Grid Connection Alternative 3.<br><br>Potential for runoff to enter natural watercourses within and around the Proposed Grid Connection is greater in Proposed Grid Connection Alternative 3. | As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur. |
| ***Air Quality*** | Potential for greater impacts on air quality due to required excavation associated with the underground electrical cable route and required infrastructure to connect into the existing OHL for Proposed Grid Connection Alternative 1. | Potential for greater impacts on air quality due to required excavation associated with the underground electrical cable route and required infrastructure to connect into the existing OHL for Proposed Grid Connection Alternative 2. | Larger potential to impact on air quality during grid connection build out phase due to larger footprint requirements in Proposed Grid Connection Alternative 3. | As detailed in the assessment in Chapter 10, no significant effects on air quality will occur. |

| Environmental Consideration | Proposed Grid Connection Alternative 1 | Proposed Grid Connection Alternative 2 | Proposed Grid Connection Alternative 3 | Final iteration for Proposed Grid Connection layout and all associated infrastructure |
|---|---|---|---|---|
| ***Climate*** | Potential for greater impacts on climate due to required excavation associated with the underground electrical cable route and required infrastructure to connect into the existing OHL for Proposed Grid Connection Alternative 1. | Potential for greater impacts on climate due to required excavation associated with the underground electrical cable route and required infrastructure to connect into the existing OHL for Proposed Grid Connection Alternative 2. | Larger potential to impact on climate during grid connection build out phase due to larger footprint requirements in Proposed Grid Connection Alternative 3. | As detailed in the assessment in Chapter 11, no significant effects on climate will occur. |
| ***Noise & Vibration*** | Potential for increased noise impacts on sensitive noise receptors due to the length of underground cable (approximately 2km) and associated require excavation and storage of all material associated with the underground cable route and the required infrastructure to connect into the existing OHL for Proposed Grid Connection Alternative 1. | Potential for increased noise impacts on sensitive noise receptors due to the length of underground cable (approximately 0.9km) and associated require excavation and storage of all material associated with the underground cable route and the required infrastructure to connect into the existing OHL for Proposed Grid Connection Alternative 2. | Larger potential to impact on noise sensitive receptors during grid connection build out phase due to larger footprint requirements in Proposed Grid Connection Alternative 3. | 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 Grid Connection during the construction and operational phase. |
| ***Cultural Heritage & Archaeology*** | Reduced potential to impact on unknown subsurface archaeology during grid connection build out phase due to the majority of cabling being located within existing BnM railway and the public road network for Proposed Grid Connection Alternative 1. | Potential for larger impact cultural heritage due to approximately 410m of the assumed underground cable route of Proposed Grid Connection Alternative 2 will be within the "Eiascir Riada" Geoheritage Audited Site. | Larger potential to impact on unknown subsurface archaeology during grid connection build out phase due to larger footprint requirements in Proposed Grid Connection Alternative 3. | As detailed in Chapter 13, the Proposed Project has been designed to avoid or mitigate impacts on cultural heritage. There will therefore be no significant effects on cultural heritage. |
| ***Landscape & Visual*** | Reduced potential for visual effects due to the majority of underground cabling being underground in | Reduced potential for visual effects due to the majority of underground cabling being underground in | Visual impacts are neutral from Proposed Grid Connection Alternative 3. | As detailed in Chapter 14 Landscape and Visual, the landscape type and character of the area where the proposed turbines are sited |

| Environmental Consideration | Proposed Grid Connection Alternative 1 | Proposed Grid Connection Alternative 2 | Proposed Grid Connection Alternative 3 | Final iteration for Proposed Grid Connection layout and all associated infrastructure |
|---|---|---|---|---|
| | Proposed Grid Connection Alternative 1. | Proposed Grid Connection Alternative 2. | | comprises modified working landscape types of low sensitivity and can effectively accommodate wind energy development. Of the 20 no. viewpoints (VPs) assessed 1 no. was deemed imperceptible, 2 no. were deemed not significant, 8 no. were deemed slight, 8 no. were deemed moderate, and 1 no. was deemed significant. The number of receptors experiencing these effects is very low as the landscape surrounding the proposed turbines has a low population density. Visual effects will decrease with distance from the proposed turbines. |
| ***Material Assets - Traffic*** | Increased potential for impact on local road infrastructure due to the requirement to utilise the N62 national road for construction traffic associated with the construction of Proposed Grid Connection Alternative 1. | Potential for impact on local road infrastructure is neutral due to access to Proposed Grid Connection infrastructure being from the L7002 local road in Proposed Grid Connection Alternative 2. | Potential for impact on local road infrastructure is neutral due to access to Proposed Grid Connection infrastructure being from the L7002 local road in Proposed Grid Connection Alternative 3. | As detailed in the assessment in Chapter 15, no significant effects on traffic will occur. |
| ***Material Assets- Utilities, Waste Management, Telecommunications and Aviation*** | No material difference between the options in potential for impact on gas, water, telecommunications, or aviation assets. | No material difference between the options in potential for impact on gas, water, telecommunications, or aviation assets. | No material difference between the options in potential for impact on gas, water, telecommunications, or aviation assets. | No material difference between the options in potential for impact on gas, water, telecommunications, or aviation assets. |
| ***Major Accidents and Natural Disasters*** | Required excavations for 2km of underground cabling could have a greater potential risk relating to major | Required excavations for 0.9km of underground cabling could have a greater potential risk relating to major | Impacts from major accidents and natural disasters are considered to be | As detailed in Chapter 17 the risk of a major accident and/or disaster during the construction of the Proposed Project is |

| Environmental Consideration | Proposed Grid Connection Alternative 1 | Proposed Grid Connection Alternative 2 | Proposed Grid Connection Alternative 3 | Final iteration for Proposed Grid Connection layout and all associated infrastructure |
|---|---|---|---|---|
| | accidents and natural disasters for Proposed Grid Connection Alternative 1 due to increased land disturbance. | accidents and natural disasters for Proposed Grid Connection Alternative 2 due to increased land disturbance. | neutral for Proposed Grid Connection Alternative 3. | 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. |

### 3.2.5.4 Alternative Met Mast Locations

The initial design included for one proposed anemometry mast located in the southwest section of the Proposed Project site, at a height of 145m. A free-standing mast (e.g., no guy wires) was chosen as it will have a reduced collision risk potential on ornithological receptors. After site visits were completed and detailed site investigative works were done, it was determined that the original proposed location for the proposed met mast was appropriate and therefore no alternatives were considered.

### 3.2.5.5 Alternative Design of Ancillary Structures

The supporting temporary infrastructure required for the Proposed Project include temporary construction compounds, temporary security cabins and temporary borrow pits.

#### 3.2.5.5.1 *Construction Compounds*

The construction compounds will be used for the storage of all construction materials, plant and turbine components. The construction compounds are interspersed at 5 no. separate locations throughout the site and are accessed via the internal site roads that will be constructed. The use of multiple temporary construction compounds was deemed preferable to the alternative of a single large compound in the centre of the site for a number of reasons. Principally, it will facilitate more efficient construction practices and will result in shorter distances for traffic movements within the site during construction. As a result, vehicle emissions and the potential for dust arisings will be reduced by making use of 5 no. construction compounds rather than 1 no. larger construction compound.

#### 3.2.5.5.2 *Construction Phase Borrow Pits*

The use of onsite borrow pits represents an efficient use of existing onsite resources and reduces the need to transport large volumes of construction materials along the local public road network to the site. The use of an onsite resource reduces the use of existing off-site quarry material assets.

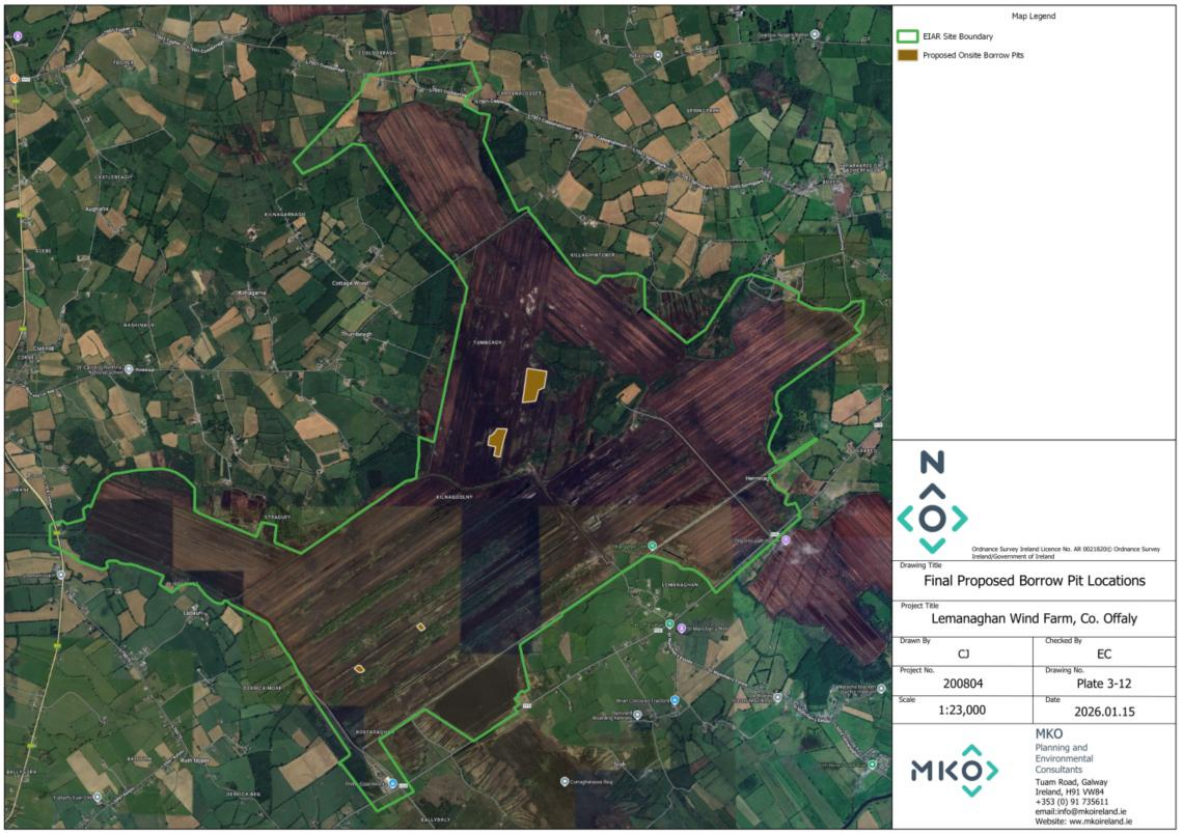
A review of potential construction phase borrow pit locations was carried out in consultation with the Applicant with input from field studies and external geotechnical experts who were familiar with the site. Existing GIS data and site constraints were also considered, namely aerial photography, peat depths, biodiversity, on site drainage, proximity to the proposed internal road network, and proximity to sensitive receptors.

At the initial design stage, as presented in Plate 3-1 above, 7 no. areas were identified across Lemanaghan Bog and private land to the north of the site that would have potential to act as borrow pits. Post detailed desktop review, 4 no. borrow pits on Lemanaghan Bog were identified and progressed for detailed site investigation (as presented in Plate 3-2 above) to determine the potential suitability for use in the construction phase of the Proposed Project. The findings of the geological site investigations concluded that the 4 no. potential borrow pits within the site were viable to extract material from for the purposes of the construction phase. Please see Appendix 8-1 for further detail on all site investigations on site. Plate 3-11 below provides detail on the location of all 7 no. initially proposed borrow pit locations and Plate 3-12 shows the location of the 4 no. borrow pits progressed for assessment purposes in the EIAR.

After further investigations and volume calculations, and discussions with surrounding landowners, it was determined that all 4-no. proposed borrow pits would be carried forward to planning.

*Plate 3-11 Initial Proposed Borrow Pit Locations*


*Plate 3-12 Final Proposed Borrow Pit Locations*



While more durable, crushed stone for the finished surface layer of site roads and hardstanding areas will be sourced from fully authorised, local quarries (identified in Section 4.7.2 in Chapter 4), the majority of material for site roads, turbine hardstands, etc. will be sourced from the proposed onsite borrow pits. An alternative to using on-site borrow pits was the option of sourcing of all stone and hardcore materials from a licensed quarry or quarries in the vicinity of the site. The movement of the volume of material required for the construction of a 15 no. turbine wind farm would result in a large temporary increase in construction traffic and heavy loads, in combination with a potential for an increase in noise and dust emissions along the haul routes and was therefore considered a less preferable option. The cost of importing the required volume of crushed stone was also a factor in choosing to obtain stone from an on-site borrow pit.

A comparison of the potential environmental effects when comparing the sourcing of stone from local, off-site quarries when compared against the chosen option (on-site borrow pits) is included below in Table 3-7.

*Table 3-7 Comparison of environmental effects when comparing sourcing all materials offsite against the selected option*

| Environmental Consideration | Sourcing all stone from local, off-site quarries | Chosen Option of obtaining majority of construction material from onsite borrow pits |
|---|---|---|
| ***Population & Human Health (incl. Shadow Flicker)*** | Potential for increased impact on residential amenity due to increased vehicular and dust emissions from increased vehicular movements on local roads.<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. | 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.<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*** | No borrow pit excavation would result in a reduced extent of habitat loss due to onsite excavation. | Larger development footprint which would result in increased extent of habitat loss due to onsite excavations.<br><br>As detailed in Chapter 6, the Proposed Project has been designed to avoid or mitigate impacts on biodiversity.<br><br>As detailed in Chapter 7, the Proposed Project has been designed to avoid or mitigate impacts on ornithological receptors. |
| ***Land, Soils & Geology*** | No borrow pit excavation therefore no potential for additional impacts on land, soils and geology due to the extraction activities.<br><br>Additional peat landscaping would be required if no onsite borrow pits were available to deposit excavated peat and spoil. | Slight increase in peat and spoil to be excavated but this will be offset by peat and spoil storage potential in borrow pits following excavation, in addition to peat and spoil landscaping.<br><br>As detailed in the assessment in Chapter 8, no significant effects on bedrock, peat and subsoils will occur. |
| ***Geotechnical/Peat Stability*** | Neutral – peat and spoil materials excavated will be landscaped across the site in designated areas. | Neutral – excess peat and spoil excavated from the construction of the wind farm will be deposited in borrow pits and/or landscaped in designated areas. |

| | | |
|---|---|---|
| ***Water*** | No requirement for drainage from onsite borrow pits to be incorporated into project drainage design.<br><br>Increased potential for silt laden runoff to enter watercourses due to additional landscaping of peat and spoil required within the site. | A drainage plan for onsite borrow pits will be incorporated into the Proposed Project drainage design.<br><br>Decreased potential for silt laden runoff to enter watercourses due to decreased landscaping of peat and spoil required within the site.<br><br>As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur. |
| ***Air Quality*** | 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. | Potential for less vehicular exhaust emissions and dust emissions if all stone was sourced onsite compared to delivery of stone to the site.<br><br>As detailed in the assessment in Chapter 10, no significant effects on air quality will occur. |
| ***Climate*** | Potential for increased greenhouse gas emissions from quarry trucks along the quarry haul routes due to an increased number of vehicular movements to and from the site. | Potential for decrease in greenhouse gas emissions from quarry trucks if all stone was sourced onsite compared to delivery of stone to the site.<br><br>Potential increase in greenhouse gas emissions due to larger disturbance of peat to facilitate excavation of proposed borrow pit locations.<br><br>As detailed in the assessment in Chapter 11, no significant effects on climate will occur. |
| ***Noise & Vibration*** | 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 vehicular movements to and from the site. | 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.<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. |
| ***Cultural Heritage & Archaeology*** | No borrow pit excavation onsite would remove potential for additional impacts on sub surface archaeology. | Slightly larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.<br><br>As detailed in the assessment in Chapter 13, there will be no significant effects on Cultural Heritage.<br><br>All excavations to take place on the Proposed Project site will be under the supervision of the Project Archaeologist to ensure no impacts to subsurface archaeology. |

| | | |
|---|---|---|
| ***Landscape & Visual*** | During the construction phase, potential for increased visual effects on nearby residential receptors due to increased vehicular movements to and from the site No effect on landscape and visual during the operational phase. | During the construction phase, potential for increased visual effects on nearby residential receptors due to open rock face being visible.<br><br>During the operational phase, the use of an onsite borrow pit is neutral as the onsite borrow pits would be reinstated following use. |
| ***Material Assets*** | Increased potential for impact on the public road network during construction phase due to vehicular movements to and from the site. | Less potential for impact on public road network and users compared to delivery all stone to site which would give rise additional traffic.<br><br>Based on the assessment detailed in Chapter 15 and the mitigation measures proposed, there will be no significant effects on traffic. |
| ***Major Accidents and Natural Disasters*** | Smaller development footprint would result in a lower risk in relation to major accidents and natural disasters due to decreased land disturbance and smaller excavation footprint. | 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.<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. |

#### 3.2.5.5.3 Amenity Track

The proposed amenity tracks within the Proposed Wind Farm will serve to facilitate connectivity to national monuments and protected structures within the site.

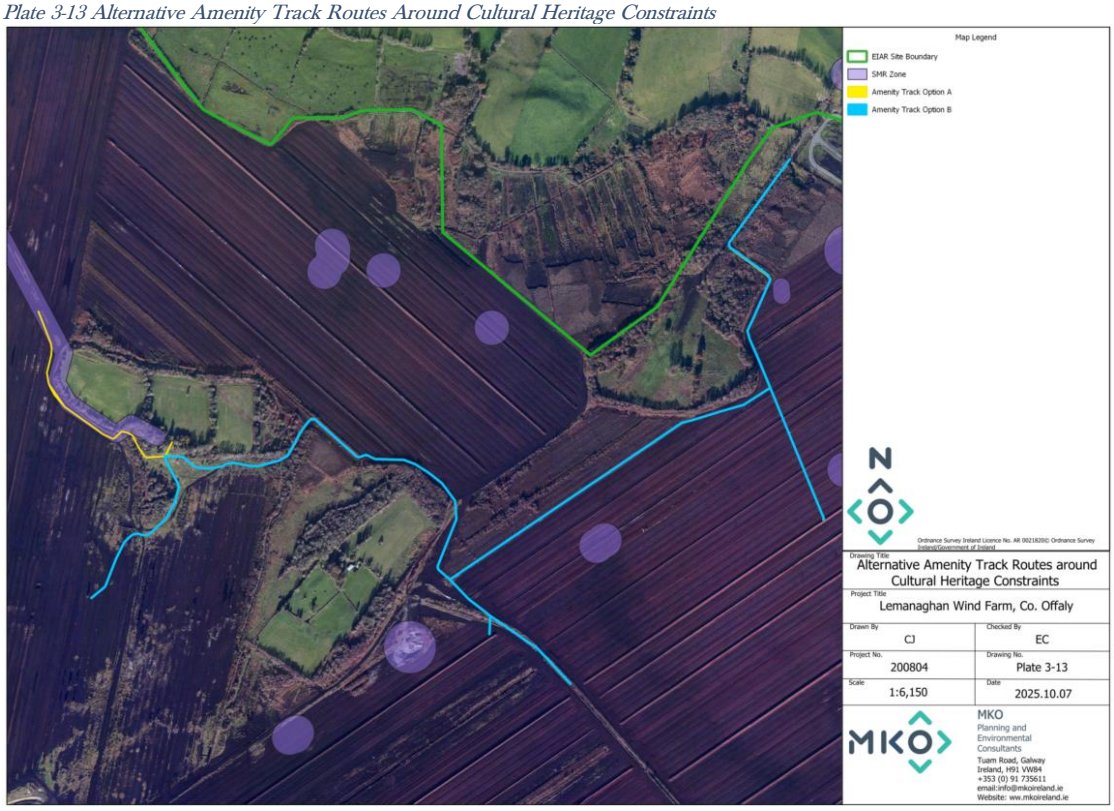
The amenity tracks were designed as part of the overall Proposed Project design process detailed in Section 3.2.5.2.2 above and during public consultation. The amenity tracks were designed to take account of the rich cultural heritage on-site and in the local areas. The proposed amenity design was further refined during the constraints review. A degraded stone-paved road, 1.5km in length and 3m wide, was identified running roughly east to west across a section of the Proposed Wind Farm. This road forms a historic connection from a derelict house known locally as Derryvane Cottage in the centre of the Proposed Wind Farm to farmland to the west. The first iteration of the Proposed amenity track, identified a section of the path as running along the length of this historic stone-paved road; after a detailed constraints review by the Project Archaeologist, it was determined that infringing on the Sites and Monuments Records (SMR) buffer zone of the stone-paved road would result in a negative impact on cultural heritage. Therefore, the proposed amenity track was redesigned to avoid this constraint.

As part of the amenity proposals for the site, there will be signposts throughout the amenity informing visitors of the rich cultural heritage of the Lemanaghan Bog and focal points of interest. Information on this stone-paved road, as well as other cultural heritage monuments and recorded structures within and around the site, will be provided on these signposts. Please see Section 4.4.1.9 of Chapter 4 for further information on amenity at the site.

Plate 3-14 below detailed the two routes assessed for the purposes of amenity. Option A follows along the SMR Zone of the stone paved road and Option B utilises existing track on the site to redirect down

and connect into the proposed new roads adjacent to T09. As identified above, through further archaeological assessment and environmental surveys, it was determined that Option A had the potential to negatively impact on cultural heritage within the Proposed Wind Farm and therefore Option B emerged as the preferred route to limit archaeological impacts. A comparison of the potential environmental effects when comparing the Option A to Option B is illustrated on Plate 3-13 below.

*Plate 3-13 Alternative Amenity Track Routes Around Cultural Heritage Constraints*




## 3.2.6 Alternative Delivery Routes for Turbine Component Delivery

This section discusses the options considered for turbine component delivery to the Proposed Wind Farm, the options considered for the construction phase site entrances and the options considered for the operational phase for maintenance and amenity use.

### 3.2.6.1 Alternative Component Delivery Routes

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 or haul route to the Proposed Wind Farm, alternatives were considered in relation to turbine components, general construction-related traffic, and site access locations.

#### 3.2.6.1.1 *Alternative Ports 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 final

selection will be driven by commercial, availability and scheduling considerations. There are clear access routes for all four ports utilising the motorway network to the proposed haul route to the site. For the purpose of this EIAR, the primary port of entry assessed is the Port of Galway which has been assessed in detail in Chapter 15 of this EIAR.

#### 3.2.6.1.2 *Alternative Turbine Delivery Routes*

For turbine transport, cognisance was taken of the haul routes used for other wind farm developments in the Midlands in addition to the general preference to primarily use National and Regional roads where possible with minimal requirements for junction accommodation works. This approach was deemed preferable to using local roads to minimise significant upgrade works to local roads and associated environmental effects.

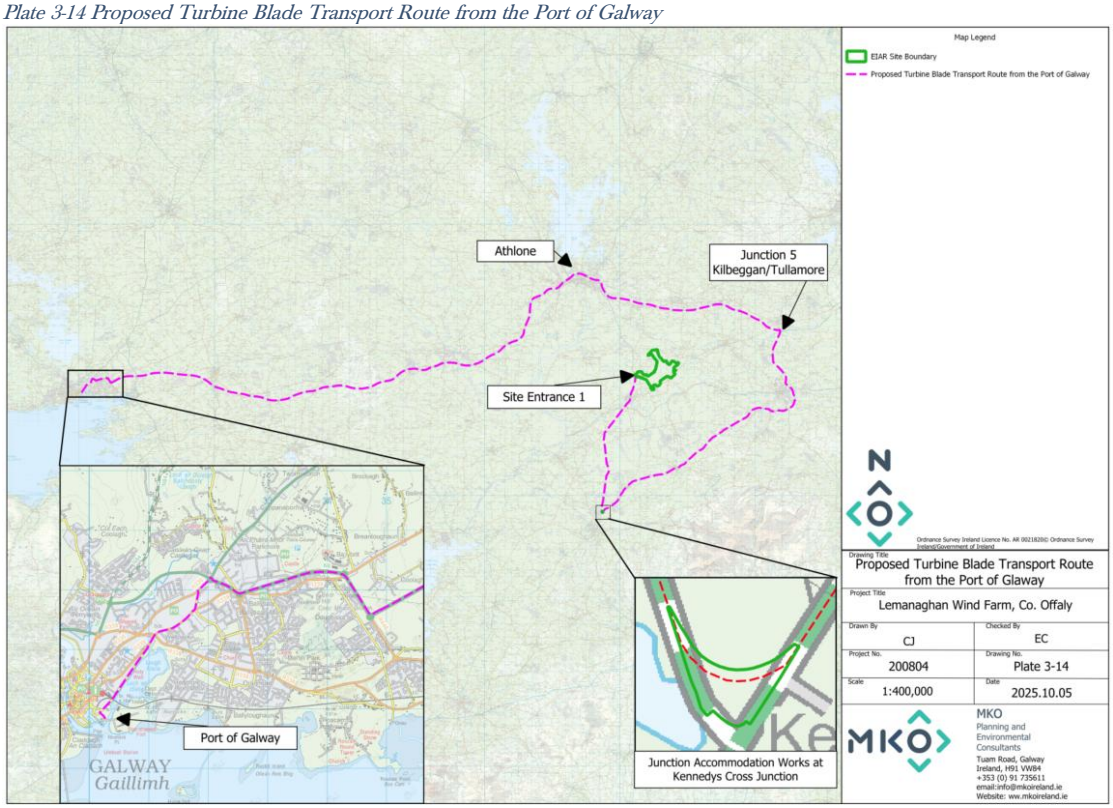
The assessment of the most suitable delivery routes was conducted in parallel with the assessment of potential site entrances as outlined above. For the delivery of turbine components to the site, the Port of Galway was identified as the most appropriate route. From the Port of Galway, turbine infrastructure will be delivered to site via north from the Galway Port through Galway City via the Lough Atalia Road, the R339 Wellpark Road, northwest onto the R336 Tuam Road, before turning west onto the N6 National Road for approximately 3.7km where the N6 joins the M6. The transport vehicles will merge onto the M6 and head west towards to the Proposed Wind Farm.

After site visits were completed and detailed site investigative works were done, it was determined that the identified route from the Port of Galway for the purposes of turbine component delivery was appropriate and therefore no alternatives were considered. The utilisation of the identified route from the M6 to the Proposed Wind Farm was identified as the preferred option for abnormal load delivery given the limited road upgrade work required and its proven suitability for the transport of turbine components from the recently constructed Derrinlough Wind Farm, which is located directly to the south of the Proposed Wind Farm.

Further, the transport analysis (as presented in Chapter 15 of this EIAR), shows that only localised accommodation works will be required to accommodate delivery of the proposed turbines and these works are assessed in the EIAR. The turbine transport route will utilise the national and primary roads available to ensure the road network holds the capacity to manage large loads.

Please see Plate 3-14 below which shows the turbine delivery route from the Port of Galway.

*Plate 3-14 Proposed Turbine Blade Transport Route from the Port of Galway*




## 3.2.7 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 and environmentally 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, dedicated enhancement and mitigation have been proposed, the design of which has been refined through the constraints -led iterative design process. Any commercial forestry felled within the footprint of the Proposed Wind Farm infrastructure 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.