

Environmental Impact Assessment Report (EIAR)

Crumhach Wind Farm, Co.
Sligo

Chapter 3 - Site Selection and
Reasonable Alternatives



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GLOSSARY OF TERMS

Term	Definition
Capacity Factor	The amount of energy that may be achieved from a renewable technology over the period of one calendar year
'Do-Nothing' Alternative	The environment of the site and its environs should the Proposed Project not be developed
Factor of Safety	A measure of the stability of a particular slope
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
Natural Heritage Areas	Legal conservation designations in Ireland used to protect habitats, species, and geological sites of national importance, under the Wildlife (Amendment) Act 2000. Primarily managed by the National Parks and Wildlife Service (NPWS)

GLOSSARY OF ACRONYMS

Acronym	Definition
BESS	Battery Energy Storage System
BMEP	Biodiversity Management and Enhancement Plan
C&D	Construction and Demolition
CAP	Climate Action Plan
CDP	County Development Plan
CRA	Collision Risk Assessment
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
FoS	Factor of Safety
GW	Gigawatt
km	Kilometres
kV	Kilovolt
met mast	Meteorological Mast
MW	Megawatt
NHA	Natural Heritage Area
PV	Photo Voltaic
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SPA	Special Protection Area
T	Turbine
ZTV	Zone of Theoretical Visibility

3. SITE SELECTION AND REASONABLE ALTERNATIVES

3.1 Introduction

Article 5(1)(d) of Directive 2011/92/EU¹ 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/EU² (the EIA Directive) requires that the Environmental Impact Assessment Report (EIAR) prepared by the Applicant 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 following references are used: the ‘Proposed Project’, the ‘Site’ the ‘Proposed Wind Farm’, the ‘Proposed Turbines’, ‘Proposed Grid Connection Route’, the ‘Existing Wind Farm’ and the ‘Existing Grid Connection’.

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 Project. 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 Environmental Protection Agency (EPA) ‘*Guidelines on The Information to be Contained in Environmental Impact Assessment Reports, 2022*’ (EPA, 2022), the presentation and consideration of reasonable alternatives investigated is an important part of the overall EIA process.

Hierarchy

EIA is concerned with projects. EPA, 2022 states 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.

¹ European Union (2011). Directive 2011/92/EU. European Parliament and European Council.

² European Union (2014). Directive 2014/52/EU. European Parliament and European Council.

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

EPA, 2022 states 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, 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*”.

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

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

- ‘Do Nothing’ Alternative
- Alternative Site Locations
- Alternative Renewable Energy Technologies
- Alternative Project Design Options:
 - Alternative Turbine Numbers and Model;
 - Alternative Turbine Layout and Design;
 - Alternative Substation Options
 - Alternative Proposed Grid Connection Route Options
 - Alternative Met Mast/LiDAR Compound
 - Alternative Design of Ancillary Structures
- Alternative Transport Route and Site Access

- Alternative Biodiversity Enhancement Measures
- Alternative Mitigation Measures

Each of these headings and how they relate to the Proposed Project, are addressed in the following sections. When considering the Proposed Wind Farm, given the intrinsic link between layout and design, the two will be considered together in this chapter.

3.2.1 ‘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, 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 repowering the Existing Wind Farm as part of the Proposed Project would be to leave the Existing Wind Farm site as it is, with no changes made to the existing operating 23 no. wind turbines within the Existing Wind Farm. In doing so, environmental effects in terms of emissions are likely to be neutral for the short term, however 13 no. of the existing turbines (existing Dunneill Wind Farm) are due to be decommissioned in accordance with their planning permissions in 2039. Once the 13 no. turbines are decommissioned, there will be a negative effect on greenhouse gas emissions. The 10 no. turbines which were commissioned in 2003 will be left in situ (existing Kingsmountain Wind Farm). However, these machines are aging and are not as efficient as the newer machines. Although these turbines do not have a decommissioning date, they will eventually break down and have to be decommissioned. The opportunity to continue capturing the available renewable energy resource with the Existing Wind Farm would be lost.

An alternative land use option to developing a renewable energy project in the greenfield sections of the Proposed Wind Farm (i.e. areas of the Proposed Wind Farm located outside the footprint of the Existing Wind Farm) would be to leave the area as it is with no changes made to the current land use practices of commercial forestry, turf cutting, and public road corridor.

In implementing the ‘Do-Nothing’ alternative, however, the opportunity to capture a significant part of Co. Sligo’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. Furthermore, the opportunity to implement the measures outlined in the Biodiversity Management and Enhancement Plan (BMEP) as outlined in Appendix 6-4 would also be lost.

As such, on the basis of the positive environmental effects arising from the Proposed Project when compared to the ‘Do-Nothing’ scenario, the ‘Do-Nothing’ scenario was not the chosen option. The existing land uses can and will continue in conjunction with the Proposed Project. A comparison of the potential environmental effects of the ‘Do-Nothing’ Alternative when compared against the chosen option of developing a new renewable energy project at this site are presented in Table 3-1 below.

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

Environmental Consideration	‘Do-Nothing’ Alternative	Chosen Option of developing a new renewable energy project
Population & Human Health	Existing Wind Farm	Approx. 100 jobs could be created during the construction,

Environmental Consideration	'Do-Nothing' Alternative	Chosen Option of developing a new renewable energy project
	No increase in local employment and no long-term financial contributions towards the local community. The Applicant's existing community fund of approximately €650,000 to local groups would be reduced upon the decommissioning of the existing turbines. No potential to supply an estimated 26,353 homes with clean renewable electricity once Existing Wind Farm is decommissioned. Greenfield site No potential for shadow flicker to give rise to impacts on sensitive receptors. No potential for effects on visual amenity due to the construction and operation of turbines. No potential for positive effects on air quality and climate change targets.	operation, and maintenance phases of the Proposed Project. Based on the assessment detailed in Chapter 5: Population & Human Health, and the mitigation measures proposed, there will be no significant effects related to shadow flicker and noise from the Proposed Project. As detailed in the assessment in Chapter 10: Air Quality, the Proposed Project will have no significant effects on air quality. As detailed in the assessment in Chapter 11: Climate, the Proposed Project will have a long-term moderate positive effect on climate. As detailed in Chapter 12: Noise and Vibration, the Proposed Project will have no significant effects on sensitive receptors due to noise and vibration. As detailed in Chapter 13: Landscape and Visual, there will be no significant effects on Landscape & Visual. The Proposed Turbines adhere to the recommended 500m set back distance in the 'Wind Energy Development Guidelines for Planning Authorities' (DoEHLG, 2006) (hereafter referred to as the 'Guidelines (DoEHLG, 2006) and 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 Guidelines (DoHPLG, 2019)) for the purpose of protecting visual amenity.
Biodiversity (including Birds)	Existing Wind Farm Potential for collision risk impacts during continued operation. No	As detailed in Chapter 6: Biodiversity, the development has been designed to avoid or mitigate impacts on biodiversity. The existing infrastructure onsite

Environmental Consideration	'Do-Nothing' Alternative	Chosen Option of developing a new renewable energy project
	potential for collision risk for birds and bats following decommissioning. Greenfield site No habitat loss. No potential for collision risk for birds and bats. No potential biodiversity enhancement measures would be put in place.	is being reused as much as is feasible. 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 6-4 for details. As detailed in the Bat Report in Appendix 6-2 of this EIAR, there is unlikely to be any significant increase in collision risk to bats from the Proposed Wind Farm. Therefore, there will be no significant effects on bats. 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	Existing Wind Farm Neutral - no excavation of peat and spoil during continued operation and during decommissioning. Greenfield site Neutral	As detailed in the assessment in Chapter 8: Land, Soils & Geology, no significant effects on land, land use, peat, soil and bedrock will occur. Geotechnical investigations followed by careful design will lead to no significant environmental impacts
Peat Stability	Existing Wind Farm Neutral - no potential for peat slippage during continued operation and during decommissioning. Greenfield site Neutral	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.

Environmental Consideration	'Do-Nothing' Alternative	Chosen Option of developing a new renewable energy project
Hydrology and Hydrogeology	Existing Wind Farm Neutral - maintenance of established drainage measures during operation. Potential for minor impacts on water associated with the decommissioning phase works. Greenfield site Neutral	As detailed in the assessment in Chapter 9: Hydrology and Hydrogeology, no significant effects on surface water or groundwater quality will occur.
Air Quality	Existing Wind Farm Neutral. Will not provide the opportunity for an overall increase in air quality or reduction of greenhouse gasses. Potential for minor air quality impacts associated with the works during the decommissioning phase. Greenfield site Neutral	As detailed in the assessment in Chapter 10: Air Quality, there will be no significant effects on air quality during the construction, and decommissioning phases. There will be a Long-term Moderate Positive Impact on air quality during the operational phase.
Climate	Existing Wind Farm Neutral. Will not provide the opportunity for a contribution to the reduction of greenhouse gases. Will not assist in achieving the renewable energy targets set out in the CAP 2025 Greenfield site Neutral.	As detailed in the assessment in Chapter 11: Climate, over the proposed 35-year lifetime of the Proposed Project, 55,760 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, 1,951,600 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. The addition of an estimated 102 megawatt (MW) clean energy to the national grid will be a positive contribution to the States renewable energy targets set out in the Climate Action Plan (CAP) 2025.
Noise & Vibration	Existing Wind Farm	Based on the assessment detailed in Chapter 12: Noise and

Environmental Consideration	'Do-Nothing' Alternative	Chosen Option of developing a new renewable energy project
	Potential for negative noise impacts on residential receptors during continued operation. Potential for negative noise impacts on nearby sensitive receptors during the decommissioning phase. No potential for further noise effects once the existing turbines are decommissioned. Greenfield site Neutral. No potential for noise impacts on nearby sensitive receptors.	Vibration, 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
Landscape & Visual	Existing Wind Farm Neutral. The existing 23 no. turbines are largely visible from the surrounding landscape and will be in situ until decommissioned. Greenfield site Neutral	As detailed in the assessment in Chapter 13: Landscape & Visual, the lack of nearby highly sensitive landscape and visual receptors, and the strategic siting of infrastructure will mitigate any potential for significant landscape and visual effects.
Cultural Heritage & Archaeology	Existing Wind Farm Neutral Greenfield site Neutral	As detailed in Chapter 14: Cultural Heritage, 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

Environmental Consideration	'Do-Nothing' Alternative	Chosen Option of developing a new renewable energy project
Material Assets	Existing Wind Farm Neutral for continued operational phase. Potential for impacts on transport and traffic due to greater traffic volumes during decommissioning phase. Potential generation of construction and demolition (C&D) waste during decommissioning phase. Greenfield site 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. 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.
Vulnerability of the Project to Major Accidents and Natural Disaster	No potential to be affected by or to cause major accidents or natural disasters	As demonstrated in Chapter 16: Major Accidents and Natural Disasters, 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). 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 Proposed Wind Farm was progressed over a 'Do-Nothing' scenario despite the potential environmental effects, as it was determined through the iterative design process and site visits carried out by the EIAR team that any potential environmental effects could be eliminated or appropriately mitigated as set out in detail in Chapters 5-16 of this EIAR. By progressing the Proposed Project, there is an opportunity to enhance the employment and investment in the local area and to capture the available renewable energy resource within Co. Sligo, 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 likely significant effects associated with the progression of the Proposed Project.

3.2.1 Alternative Site Locations

To ensure that the levelised costs of building each MW of electricity-generating capacity on a wind farm is controlled efficiently, it is incumbent on the design team to ensure that the most suitable site for development of a wind farm development is chosen. The process of identifying a suitable location for a development such as the Proposed Project is influenced by a number of factors. While wind speeds, the extent of suitable or available land, proximity to the grid connection point, and planning policy are all very important, a wind farm project must be commercially viable/competitive, as otherwise it will not attract the necessary project finance required to see it built.

The assessment carried out for the determination of a suitable location for the Proposed Project was a two-stage process. which are described in the following sections.

- Phase 1 – SSE Operational Site Portfolio Review
- Phase 2 – Site Specific Assessment

3.2.1.1 Phase 1 - SSE Operational Wind Farm Portfolio Review

SSE Renewables (Ireland) Ltd (The Applicant) have undertaken a review of their operational wind farm portfolio on sites approaching 20 years of operation with a view to determining if they should be decommissioned, the operational life extended, or if they were suitable for repowering.

Certain sites were considered unsuitable for repowering due to the proximity of nearby sensitive receptors. For these sites whereby they had associated planning restrictions on their operational life, extension of operational life applications were made to the relevant Planning Authority.

Other sites were considered suitable for repowering primarily due to their location and proximity of nearby sensitive receptors, in a process carried out similar to the constraints and facilitators outlined in Section 3.2.3.2.1 below. Two such sites were:

- Dunneill Wind Farm, Co. Sligo
- Kingsmountain Wind Farm, Co. Sligo

3.2.1.2 Phase 2 – Strategic Site Selection

The Dunneill and Kingsmountain projects were chosen as the site of the Proposed Wind Farm given the opportunity to approach their repowering as one project due to the sites existing in close proximity to each other and additional facilitators outlined in Section 3.2.3.2.1 below. Dunneill Wind Farm, which accounts for 13 no. turbines within the Existing Wind Farm received a grant of permission consisting of a fifteen-year continuation of the operational life of the existing wind farm from the date of expiration (March 2024). Kingsmountain Wind Farm, which accounts for 10 no. turbines within the Existing Wind Farm, has no expiration date on its grant of permission, however it is envisaged it will have reached the end of its operational life prior to the decommissioning of Dunneill Wind Farm.

Following the decision to repower the Existing Wind Farm, a site selection process was undertaken to see the viability of the repowering of the Existing Wind Farm. The site selection process for the Proposed Project has been informed by national, regional and local policy at a macro level (see Chapter 2: Background to the Proposed Project), as well as site specific factors that influence the turbine layout and the project design on the Proposed Wind Farm at a micro level (see Section 3.2.3 below).

During this site selection process and a review of the availability of land in a sparsely populated area around the Existing Wind Farm, the Applicant then considered the benefits of developing a greenfield

site in addition to repowering the Existing Wind Farm compared to repowering the Existing Wind Farm alone. The Proposed Wind Farm, inclusive of the greenfield land was then brought through the site selection process and was considered as a new renewable energy development with repowering elements.

3.2.1.2.1 Site Selection

Site selection for the development of a wind farm must be suitable for consideration under a number of criteria, such as:

- **Planning Policy**
- **Environmental Sensitivities:** Located outside areas designated for protection of ecological species and habitats;
- **Grid Connection:** Access to the national electricity grid possible within a viable distance;
- **Sensitive Receptors:** Capable of complying with required setbacks from sensitive receptors.

These criteria are explained further below in so far as they influenced the site identification exercise undertaken.

Planning Policy

Section 2.5.4 of Chapter 2 of this EIAR sets out in detail the planning policies of Sligo County Council with regards to wind energy development. The Proposed Project is situated within the administrative area of Sligo County Council and is therefore subject to the planning policies and objectives set out in the Sligo County Development Plan 2024-2030 (CDP). It is outlined in Chapter 31 of the CDP that *'Sligo's mountainous landscape and exposed location on the western seaboard combine to create good conditions for the generation of wind power.'*

At the time of writing, a Local Authority Renewable Energy Strategy is not available for Co. Sligo. Sligo County Council note they will prepare a Renewable Energy Strategy in accordance with the forthcoming Regional Renewable Electricity Strategy and the revised Methodology for Local Authority Renewable Energy Strategies as outlined in the CAP 2023, when published. It is stated that in the *'interim period, the Planning Authority will continue to assess all wind energy development proposal using the criteria set out in the DECLG's Wind Energy Guidelines (2006).'*

Further elaboration on the policies that identify the Site as being suitable for wind energy development are detailed in Section 2.5 of Chapter 2.

Environmental Sensitivities

The Site is located adjacent to 2 no. Nationally Designated or Natura 2000 sites, namely the Ox Mountain Bog Special Areas of Conservation (SAC) and Ox Mountain Bog Natural Heritage Area (NHA). Areas of the Ox Mountain Bog SAC are also situated within the Site. The nearest Proposed Turbine (T05) to the Ox Mountain Bog SAC and NHA is 160m from the boundary at its nearest point. A 970m section of the L2702 local road proposed to be upgraded is located adjacent to the Ox Mountain Bog SAC boundary. The proximity and connectivity to the Designated and Natura 2000 site was a key constraint in the design of the Proposed Project, which is detailed further in Section 3.2.3.2.1 below.

The nearest Special Protection Area (SPA) to the Proposed Wind Farm is Aughris Head SPA which is located approx. 6.3km north of the Proposed Wind Farm at its nearest point. The Proposed Grid Connection Route crosses the Ballysadare Bay SAC and Union Wood SAC entirely within the footprint of the existing public road corridor.

Grid Connection

The Existing Wind Farm is connected to the National Grid via 2 no. existing onsite control buildings, which in turn connect to the existing Cunghill 110 kilovolt (kV) Substation via underground cable route. It is intended that the Proposed Project will utilise this underground electrical connection to Cunghill, which will require no upgrade works.

The Proposed Project also intends to connect to the national grid via a 110kV underground electrical cabling route that is predominantly along the public road network. It will originate at the proposed onsite 110kV substation and connect into the existing Srananagh 220kV Substation, in the townland of Ballysumaghan, Co. Sligo. Details regarding potential alternative grid connection cabling route options are considered and presented in Section 3.2.3.4 below.

Sensitive Receptors

The Applicant sought to identify an area with a relatively low population density. Having reviewed the settlement patterns in the vicinity of the Existing Wind Farm, it emerged that there was a sufficient viable area to repower the section of the Site withing the Existing Wind Farm, as well increase the area of the Site in the greenfield area. As described in Chapter 5 of this EIAR, the population density of the Population Study Area is 8.84 persons per square kilometre. This is significantly lower than the average national population density of 73.27 persons per square kilometre. Further to this, the closest dwelling to the Proposed Turbines is located 735m north of the nearest turbine. This exceeds the requirements as set out in the Guidelines for a setback distance from sensitive receptors of 4 x tip height from a turbine (i.e. 720m in this case).

3.2.1.3 Site Selection Results

The Site has been identified as having potential for new wind energy development with repowering elements as a result of a nationwide search of the SSE Operational Wind Farm portfolio and of suitable lands. The site selection process has been constraints and facilitators led. Facilitators are factors that give an advantage to a Proposed Project, while constraints are restrictions that inform the location and design of a project by highlighting sensitivities. A constraints analysis was undertaken and included avoidance of environmental designations (Natura 2000 sites), review of national, regional and local policies and objectives, suitable wind speeds, adequate setbacks from sensitive receptors, proximity to national grid nodes, avoidance of direct impacts on known cultural heritage assets, and the potential to utilise existing infrastructure for access, and constructability.

Given the existence of Dunneill and Kingsmountain Wind Farms in close proximity to each other and shared access tracks and grid connection infrastructure, the site of the Existing Wind Farm allows for an area of suitable scale for incorporation into the Proposed Project, as well as adjacent greenfield sections to the west. This allowed for the Proposed Project to facilitate a larger scale in terms of capacity to capture the existing wind energy resource within the Site as a single development, rather than multiple smaller sites to generate the same export capacity as the Proposed Project.

The application of the above criteria, to identify if the Site was suitable with the inclusion of greenfield sections in addition to repowering of Existing Wind Farm, resulted in the selection of the Site for the Proposed Project as a candidate site to be brought forward for more detailed analysis.

The alternative would be to bring forward a site that did not pass one or all of the above phases of the screening process. In that instance, there would be the potential for the construction and operation of a wind energy development to have an adverse effect on ecologically designated and sensitive areas or a large number of sensitive receptors.

3.2.2 Alternative Renewable Energy Technologies

Both onshore and offshore wind energy development and solar energy developments will be required to ensure Ireland reaches the target set in the CAP 2025 to source 80% of our electricity from renewable energy by 2030. CAP 2025 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 (Gigawatt)
- Offshore Wind Capacity: 5GW (minimum)
- Solar Photo Voltaic (PV) Capacity: 8GW

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

3.2.2.1 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 Applicant for the Proposed Project is SSE Renewables (Ireland) Ltd SSE Renewables who 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.

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 CAP 2025 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 CAP 2025 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.

3.2.2.2 Solar

Commercial solar energy production is the harnessing and conversion of sunlight into electricity using PV arrays (panels). A large portion of the Proposed Project is situated within the site of the Existing Wind Farm. It would not be suitable based on the area already being utilised for a wind farm, to consider alternative technologies, such as solar. It was deemed at an early stage in the Proposed Project development that replacing the existing turbines with solar PV array would not be an environmentally sensitive option for the 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 B 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 Wind Farm, it would be located within the Solar North region of Ireland as delineated by the EirGrid report. The capacity factor for solar in this region is 12.0% (0.146). In order to achieve a c. 102MW output using solar PV arrays, there would be a requirement of approximately 163.2ha⁴, which represents approximately 10.5% 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.

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 3-2 below.

Table 3-2 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. 102MW)	Chosen Option (Proposed Wind Farm – c. 102MW)
Population & Human Health (incl. Shadow Flicker)	No potential for shadow flicker to affect sensitive receptors. Potential for glint and glare impacts on local receptors. Lower potential for noise and vibration effects. Lower potential for visual obstructions in the skyline due to solar farms being low-lying structures. 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. No potential for glint and glare impacts on sensitive receptors. 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. Based on the Assessment in Chapter 12 Noise and Vibration, the Proposed Project will have no significant effects on noise receptors. Based on the assessment in Chapter 13 Landscape, the Proposed Project will have no significant effects on residential visual amenity.

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. 102MW)	Chosen Option (Proposed Wind Farm – c. 102MW)
<i>Biodiversity & Ornithology</i>	Larger development footprint would result in greater habitat loss/impact due to the higher level of drainage requirement. Potential for glint and glare impacts on birds. No potential for collision risk on birds.	Smaller development footprint would result in a smaller habitat loss. As detailed in Chapter 6 Biodiversity, the development has been designed to avoid or mitigate impacts on biodiversity including bats and downstream aquatic receptors. 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.
<i>Land, Soils & Geology</i>	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. 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.
<i>Geotechnical/Peat Stability</i>	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.
<i>Hydrology and Hydrogeology</i>	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. Larger development footprint would result in a larger area of impermeable surfaces and	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. 102MW)	Chosen Option (Proposed Wind Farm – c. 102MW)
	would result in increased drainage requirements.	
<i>Air Quality</i>	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. 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. 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. As detailed in the assessment in Chapter 10, no significant effects on air quality will occur.
<i>Climate</i>	Reduced capacity factor of solar PV array technology would result in less carbon offset.	Greater capacity factor resulting in a shorter carbon payback period. As detailed in the assessment in Chapter 11 Climate, over the proposed 35-year lifetime of the Proposed Project, 1,951,600 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation.
<i>Noise & Vibration</i>	Potential for short-term noise impacts on nearby sensitive receptors during the construction phase. 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. 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.
<i>Landscape & Visual</i>	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 the assessment in Chapter 13, the landscape value of the Proposed Project is deemed to be of 'Low' value and sensitivity. Low sensitivity balanced with a substantial magnitude of change amounts to no significant effects on upon the

Environmental Consideration	Solar PV Array (c. 102MW)	Chosen Option (Proposed Wind Farm – c. 102MW)
		physical fabric of the landscape of the Proposed Wind Farm.
<i>Cultural Heritage & Archaeology</i>	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. As detailed in Chapter 14, 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.
<i>Material Assets</i>	Potential for greater traffic volumes during construction phase due to the number of solar panels required to achieve the same output. Potential impact for a lesser impact on road capacity due to no required accommodation works for solar panel delivery to the site. Greater potential for impacts on waste management due to increased plant on site giving rise to increase waste materials. No material difference for impacts on gas, water, aviation. No potential for impacts on telecommunications.	No material difference for impacts on gas, water, aviation. Buffers implemented on telecommunication links. 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.
<i>Vulnerability of the Proposed Project to Major Accidents and Natural Disasters</i>	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., landslide/peat stability, contamination and fire/explosion) are considered to be very unlikely to occur at any phase of the Proposed Project. A detailed risk assessment on potential risks relating to major accidents and

Environmental Consideration	Solar PV Array (c. 102MW)	Chosen Option (Proposed Wind Farm – c. 102MW)
		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.

Solar energy would require a larger development footprint. It was the aim of the Applicant to utilise as much of the Existing Wind Farm footprint as possible in order to facilitate the Proposed Wind Farm. The larger footprint required for solar energy would lead to additional environmental effects due to the presence of Annex 1 habitats and the nature of other peaty habitats that are present onsite. In addition, a solar development would have a higher potential environmental effect on Traffic & Transport (construction phase) and Biodiversity and Birds (habitat loss) at the Site.

For the reasons set out above, the proposal for a wind energy development at the Site was considered to be the most efficient method of electricity production with the lesser potential for significant environmental effects.

3.2.3 Alternative Project Design Options

3.2.3.1 Alternative Turbine Numbers and Model

The Proposed Turbines will have a potential power output in the 4 – 7MW range. It is proposed to remove the existing 23 no. turbines and install 17 no. turbines at the Proposed Wind Farm which could achieve approximately 102 MW output (mid-range capacity).

Such a development could be achieved on the site of the Proposed Wind Farm by replacing the existing turbines with turbines of approx. the same dimensions (for example 2.5 MW machines). However, this would necessitate the construction of 40 no. turbines to achieve a similar output. Furthermore, the use of smaller turbines would not make efficient use of the opportunity to reduce the footprint of the Proposed Wind Farm. The turbine models and their associated technologies are now deemed outdated; they are also no longer available on the commercial market as they have been superseded by more efficient and advanced models. The use of more efficient turbine models for repowering the Existing Wind Farm as part of the Proposed Project is also allowing the Applicant to significantly reduce the number of turbines to be constructed, while also achieving a larger generation output.

The proposed number of turbines takes account of all site constraints and the distances to be maintained between turbines and features such as roads and houses, while maximising the wind energy potential of the Proposed Wind Farm. The 17-turbine layout selected for the Proposed Wind Farm has the smallest development footprint of the other alternatives considered and makes use of existing infrastructure from the Existing Wind Farm as much as possible. The other alternatives considered included a 25-turbine layout which is discussed in further detail in Section 3.2.3.2.2 below.

The range of turbine dimensions being applied for as part of this EIAR is set out in Chapter 1. This EIAR provides a robust assessment of candidate turbines within that range of dimensions.

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

Table 3-3 Comparison of environmental effects between larger quantity of smaller turbines against the chosen option of a 17 no. turbine layout.

Environmental Consideration	Larger number of smaller turbine models	Chosen Option (17-no. turbine layout)
<i>Population & Human Health (incl. Shadow Flicker)</i>	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. 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, noise and vibration and visual amenity during the construction, operation and decommissioning phases of the Proposed Project. Decreased potential for shadow flicker due to greater setbacks from houses, greater separation between turbines thus reducing aggregated shadow flicker time. Smaller potential for noise impacts on nearby sensitive receptors due to a reduced number of turbines. As stated in Chapter 12 Noise and Vibration, there is no potential for significant noise and vibration effects from the proposed turbines. Furthermore, noise emissions can be curtailed to meet threshold criteria. As stated in Chapter 13 Landscape, there will be no significant visual effects on residential visual amenity in the landscape surrounding site and 'Moderate' residual visual effects will only occur for a relatively small number of properties in the area as a result of the Proposed Wind Farm.
<i>Biodiversity & Ornithology</i>	Larger development footprint would result in greater potential for habitat loss. 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.

Environmental Consideration	Larger number of smaller turbine models	Chosen Option (17-no. turbine layout)
		With the implementation of the mitigation measures described in Chapter 7 Birds, the residual effects for collision risk are not significant.
<i>Land, Soils & Geology</i>	Larger development footprint would result in greater volume of spoil to be generated, excavated and sorted. 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. Neutral – geotechnical investigations were carried out followed by careful design would lead to no significant environmental impacts. As detailed in the assessment in Chapter 8, no significant effects on peat, topsoil, and subsoils will occur.
<i>Geotechnical/Peat Stability</i>	Neutral (the larger quantity of smaller turbines would still be designed to minimise peat slippage).	Neutral (the 17 no. turbine layout has been designed to minimise peat slippage).
<i>Hydrology and Hydrogeology</i>	The larger quantity of smaller turbines would be designed to ensure no significant effects on hydrology, however a larger development footprint, would increase the potential for silt-laden runoff to enter receiving waterbodies.	The 17 no. turbine layout has been designed to minimise hydrological impacts. Furthermore, the smaller footprint would result in less potential for silt laden run-off to enter a waterbody. As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur.
<i>Air Quality</i>	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. As detailed in Chapter 10, there will be no significant effects on air quality as a result of the Proposed Project.

Environmental Consideration	Larger number of smaller turbine models	Chosen Option (17-no. turbine layout)
<i>Climate</i>	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. 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. As detailed in the assessment in Chapter 11 Climate, over the proposed 35-year lifetime of the Proposed Wind Farm, 1,951,600 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. The addition of an estimated 102MW clean energy to the national grid will be a positive contribution to the State's renewable energy targets set out in the CAP 2025.
<i>Noise & Vibration</i>	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. 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.
<i>Landscape & Visual</i>	Neutral – the majority of the existing 23 no. turbines are at least partially visible from the surrounding landscape.	The Proposed Wind Farm is an appropriately designed and suitably scaled project. Based on the assessment detailed in Chapter 13, there will be no significant effects on landscape from the Proposed Project.
<i>Cultural Heritage & Archaeology</i>	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. As detailed in the assessment in Chapter 14, 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

Environmental Consideration	Larger number of smaller turbine models	Chosen Option (17-no. turbine layout)
		under licence will be implemented during the construction phase.
<i>Material Assets – Traffic and Transport</i> <i>Material Assets – Utilities, Waste Management, Telecommunications and Aviation</i>	Potential for greater traffic volumes during construction phase due to larger development footprint and requirement for more construction materials and turbine components. 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).	Potential for smaller traffic volumes during construction phase due to smaller development footprint and requirement for fewer construction materials and turbine components. No material difference between the two options for gas, water, waste management, telecommunications and aviation as the turbine layout would still be designed to minimise impacts on material assets.
<i>Vulnerability to Major Accidents and Natural Disasters</i>	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., landslide/ peat stability, contamination and fire/explosion) are considered to be very unlikely to occur at any phase of the Proposed Project. 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.

3.2.3.2 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.

3.2.3.2.1 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:

- Sensitive receptors plus a minimum 720m 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 Section 6.3.5);
- Telecommunication Links plus operator specific buffer;
- Watercourses plus 50m buffer (including 100m watercourse buffer within freshwater pearl mussel catchment); and
- Archaeological Sites or Monuments, plus 'Zone of Notification' as required by the National Monuments Service.

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

- Lands are available for development;
- Good wind resource;
- Existing access points and general accessibility of all areas of the site due to Existing Wind Farm infrastructure; and,
- Limited extent of constraints.

⁵ <https://windenergyireland.com/images/files/9660bdfb5a4f1d276f41ae9ab54e991bb600b7.pdf>

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 Wind Farm encompassed habitat mapping, particularly in the context of the proximity of Designated Sites, and extensive surveying of birds and other fauna. This assessment, as described in Chapter 6 Biodiversity and Chapter 7 Birds of this EIAR, optimised the decision on the siting of turbines and the carrying out of any development works, such as the construction of roads and ancillary infrastructure.

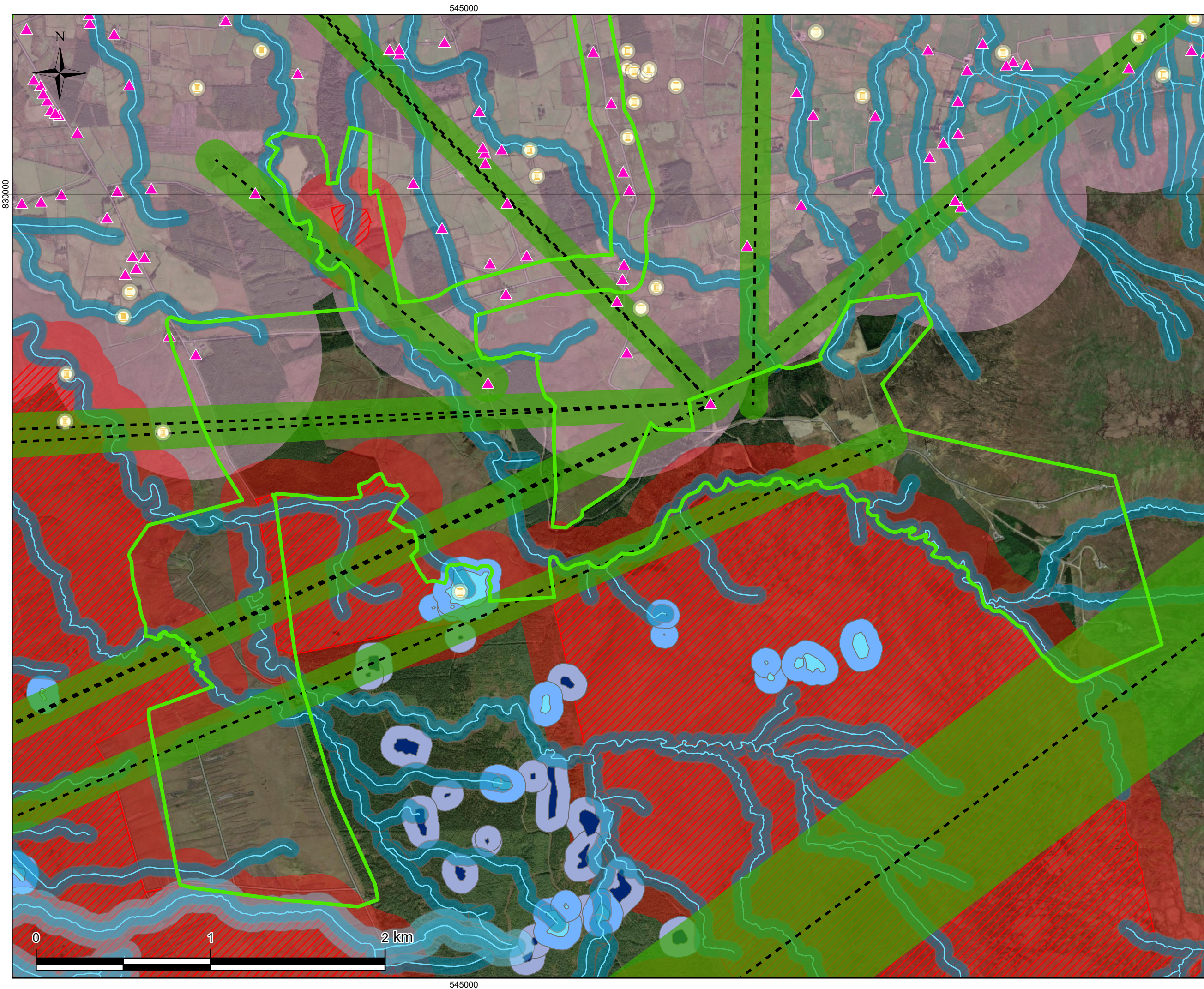
The hydrological and geotechnical investigations at the Proposed Wind Farm examined the proposed locations for turbines, upgrades to existing and new access tracks and other components of the Proposed Wind Farm, such as the proposed onsite 110kV substation. Where specific areas were deemed as being unsuitable 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 upland topography/nature of the terrain on site reflects the need for detailed consideration of peat stability within the Proposed Wind Farm. A Peat Stability Risk Assessment (Appendix 8-1) was undertaken for the Proposed Wind Farm, the findings of which have informed the iterative design process. 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 Proposed Wind Farm has a satisfactory margin of safety. Please see Appendix 8-1 for further details.

The archaeological investigations on the Proposed Wind Farm 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 onsite 110kV substation and identified key constraints and appropriate buffers / mitigation to inform design. Please see Chapter 14 Cultural Heritage for further details.

The turbine layout for the Proposed Wind Farm 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 6-4, for the Proposed Project were also refined through an iterative design process.



Map Legend

- EIAR Site Boundary
- Sensitive Receptors
- 720m Sensitive Receptor Buffer
- Special Area of Conservation
- SAC 200m Buffer
- Telecoms Links
- Telecoms Buffer
- Rivers
- Rivers - 50m Buffer
- Lakes
- Lakes - 50m Buffer
- Bog Pools
- Bog Pools - 50m Buffer
- Fresh Water Pearl Mussel 100m Buffer
- National Monuments
- National Monuments - 50m Buffer

Spatial Reference
Name: IREN95 Irish Transverse Mercator
Datum: IREN95
Projection: Transverse Mercator

SITE LOCATION - NOT TO SCALE

Drawing Title
Constraints and Facilitators Map

Project Title
Crumhach Wind Farm, Co. Sligo

Project No. 230841	Drawing No. 3-1	Scale 1:20,000
Drawn By MVN	Checked By BT	Date 06/08/2026

Email: info@mkoireland.ie / Website: www.mkoireland.ie

3.2.3.2.2 **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 the Proposed 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 production 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 Wind Farm 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. Cognisance was given to utilising as much built infrastructure from the Existing Wind Farm within the viable area outlined above as possible for the Proposed Wind Farm. Of the 9.0 ha development footprint of the Existing Wind Farm, approx. 3.7ha (41%) is incorporated into the final layout.

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 Proposed Wind Farm. The initial turbine layout comprised 25 no. turbines within the same study area. The proposed 17-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 Project went through six separate iterations. All six turbine layout iterations have not been included, but Plate 3-1 to Plate 3-4 below gives an indication of how the design of the turbine layout evolved during the design process.

Proposed Wind Farm Layout Iteration No. 1

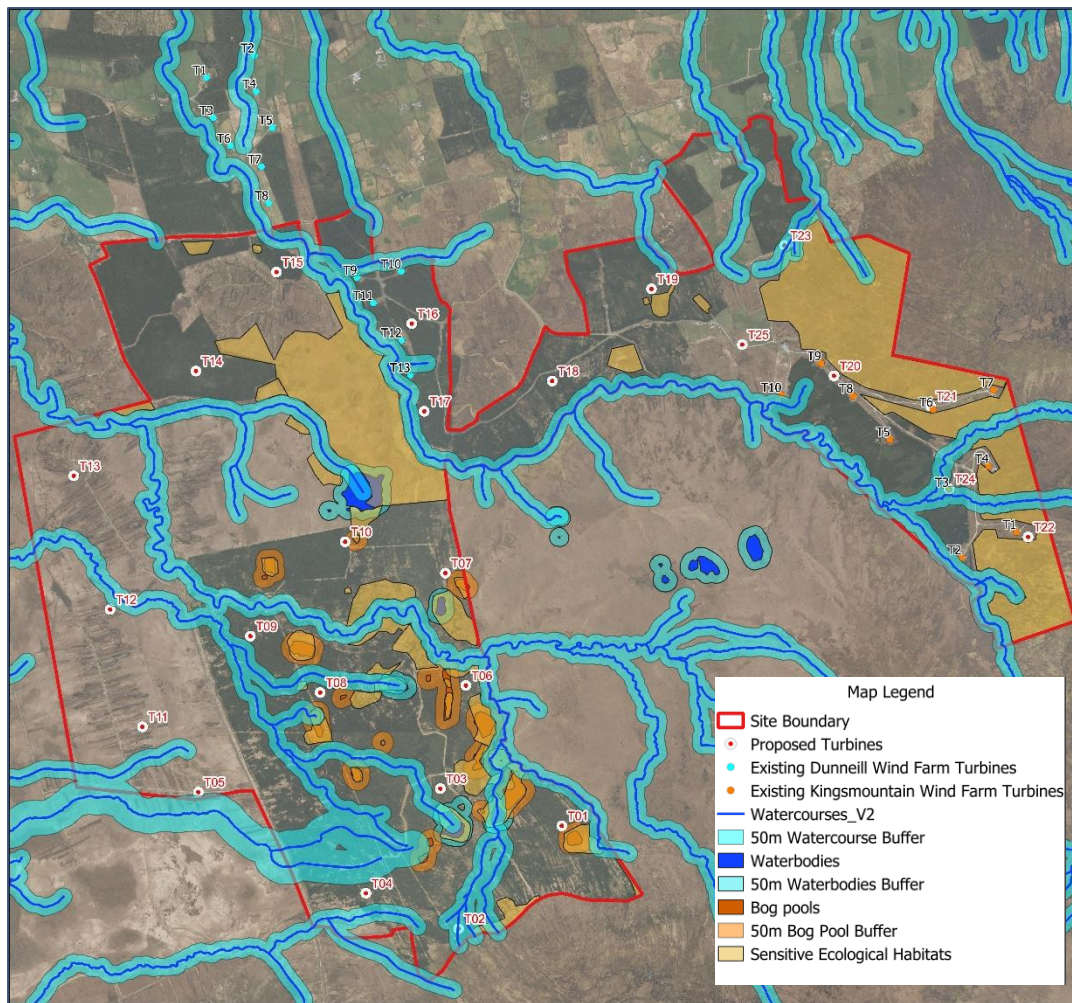


Plate 3-1 Proposed Wind Farm Layout Iteration No. 1

Iteration No. 1, as shown above in Plate 3-1, comprises the original proposed layout for the Proposed Wind Farm. This layout comprised 25 no. turbines with a maximum overall ground-to-blade tip height of 180 meters, rotor diameter range of 149m to 155m and hub height of 102.5 to 105m. Of the 25 no. turbines, 8 no. were proposed within the Existing Wind Farm, 5 no. of which utilise the hardstands of existing turbines, and the remaining 17 no. turbines were proposed within greenfield sections of the site.

The initial layout was a result of a preliminary desk-based constraint mapping exercise and identification of viable area as well as maximum potential energy output within identified boundary from wind energy analysis. Layout Iteration No. 1 was presented to the project team for detailed investigations and assessment. These investigations included detailed habitat mapping, ecological surveying, hydrological and geotechnical investigations of the Site.

Upon review of desk-based constraints and site surveys, several amendments to the layout were made. These amendments were primarily focused on the forestry block within the southern greenfield section of the Proposed Wind Farm. There were areas of the forestry block that contained deep peat, that was highly waterlogged and on steep slopes. Also present in this block were peatlands conforming to Annex I habitat. The overall hydrological connectivity of this area to adjacent and downstream Designated Sites, namely the Ox Mountain Bog SAC and the potential peat stability risk were identified at this iterative design stage. As a result, turbines T01-T04 and T06-T10 were removed from the layout. Due to the highly constrained conditions within this section of the Proposed Wind Farm site in regard to siting ancillary infrastructure for the Proposed Turbines, this section of the greenfield site was subsequently removed from the Proposed Wind Farm layout.

Proposed Wind Farm Layout Iteration No. 2

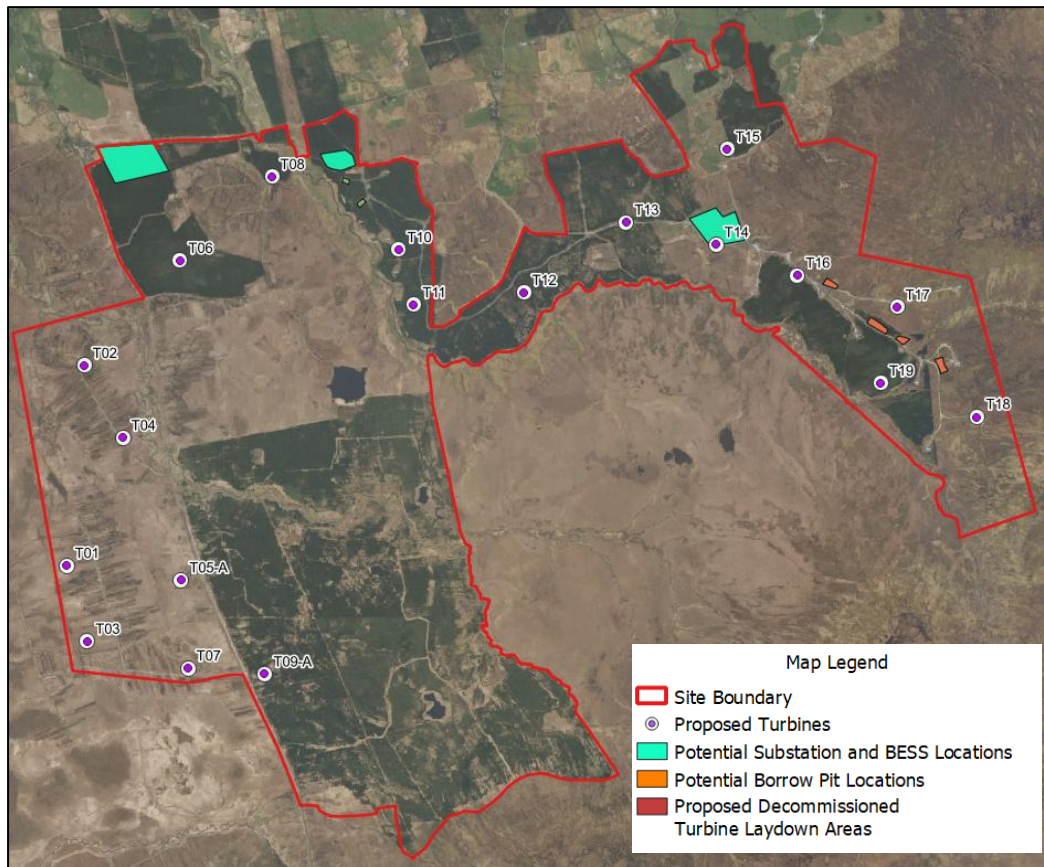


Plate 3-2 Proposed Wind Farm Layout Iteration No. 2

Iteration No. 2. is presented in Plate 3-2 above and comprises 19 no. turbines with a maximum overall ground-to-blade tip height of 180 meters, rotor diameter range of 149m to 155m and hub height of 102.5 to 105m, hardstands, 3 no. potential locations for an onsite 110kV substation and battery energy storage system (BESS) compound, 4 no. potential borrow pit locations and 2 no. dedicated set-down areas for decommissioning of the Existing Wind Farm as part of the Proposed Project. Of the 19 no. turbines, 9 no. were proposed within the Existing Wind Farm, 4 no. of which utilise the hardstands of existing turbines, and the remaining 10 no. turbines proposed within greenfield sections of the Proposed Wind Farm. The turbine layout was proposed based on maximum potential energy output from wind energy analysis within the revised viable area following identification of onsite constraints from site investigations by the design team.

Constraints that informed this design iteration include relevant setback from dwellings (720m in the case of the Proposed Project), setback from any telecommunication links, setback from National Monuments plus 30m buffer, setback from watercourses including a 50m buffer and 100m buffer on watercourses within a freshwater pearl mussel catchment, and avoidance of areas of high ecological sensitivity and potential for peat instability. Following scoping responses from telecommunication providers identifying links within the Site, Ai Bridges was commissioned to conduct a Telecommunications Impact Assessment of the Proposed Wind Farm, which outlined revisions to the Proposed Turbines within viable area and resulted in the removal of T09 and T18 and relocation of T04. The details of the assessment are outlined in Chapter 15 Material Assets and included in Appendix 15-6 Telecommunications Impact Assessment.

The layout in Iteration No. 2 was presented to the project team for detailed investigations and assessment. These investigations included habitat mapping, ecological surveying, intrusive site investigation and geotechnical surveys, hydrological investigations, and archaeological surveys of the Proposed Wind Farm.

Proposed Wind Farm Layout Iteration No. 3

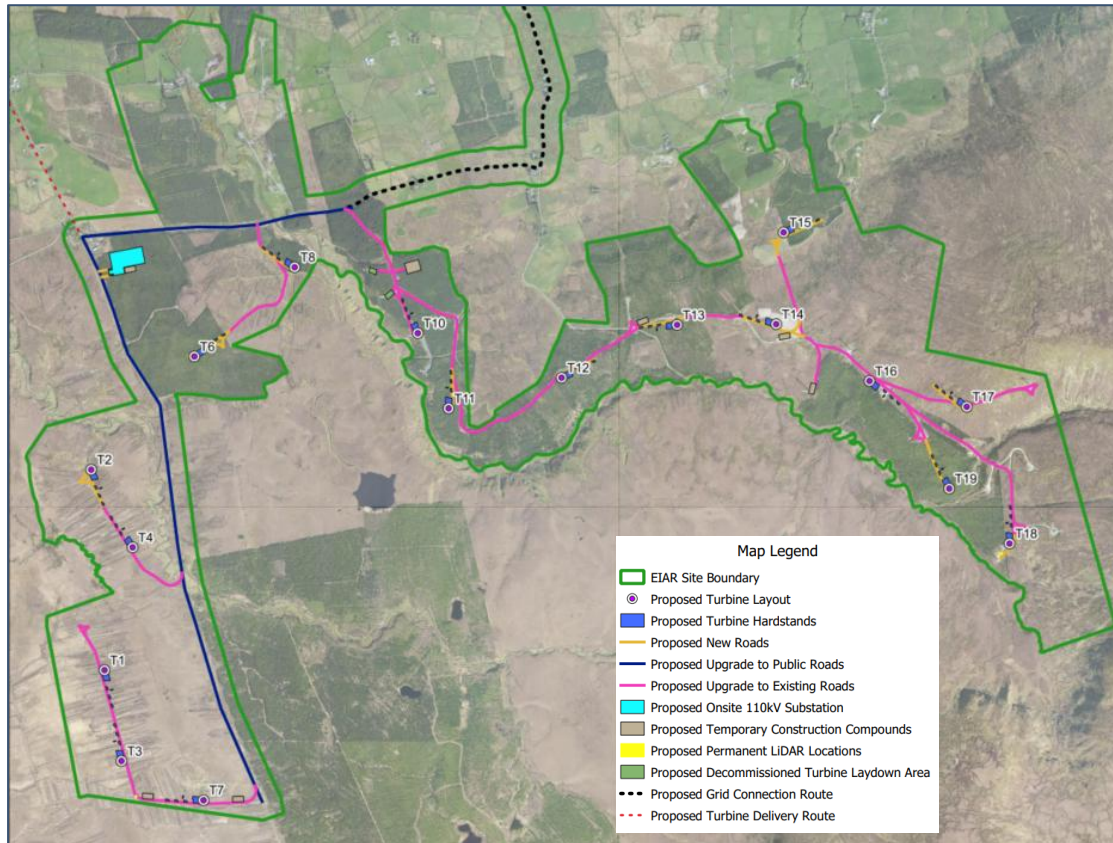


Plate 3-3 Proposed Wind Farm Layout Iteration No. 3

Layout Iteration No. 3 of the Proposed Wind Farm, as presented in Plate 3-3 above, comprises 17 no. turbines with a maximum overall ground-to-blade tip height of 176.6 to 180 meters, rotor diameter range of 136.2m to 149m and hub height of 105 to 110m, hardstands, onsite 110kV substation, site access tracks and site entrances, temporary construction compounds, decommissioned turbine set down areas and 2 no. onsite LiDAR compounds.

Comprehensive ecological surveys of the greenfield site identified the area surrounding T01 to T05 as likely conforming to Annex I degraded upland blanket bog habitat. To reduce impacts to this habitat, T05 was removed and T01 and T03 were micrositied along existing access tracks to be upgraded within degraded areas of cutover bog. T09 within the remaining viable area of the southern commercial forestry block was also removed to reduce the overall development footprint and potential for hydrological impacts on adjacent and downstream Designated Sites and the freshwater pearl mussel catchment.

Following further geotechnical investigations, the borrow pits were designed such that 2 no. borrow pits are proposed within the Existing Wind Farm, and a third new borrow location was identified in the centre of the Proposed Wind Farm. The layout also included the provision peat and spoil management areas around the Proposed Turbines and onsite 110kV substation.

Further micro-siting of turbines and access tracks were undertaken following the results of the cut and full and geotechnical exercises. The relocation of T07 approx. 150m west within the confines of the

constraints identified above also allowed for an increased separation distance from the local road network, thereby reducing landscape effects associated with nearby scenic routes.

Proposed Wind Farm Layout Iteration No. 4 – Final Layout

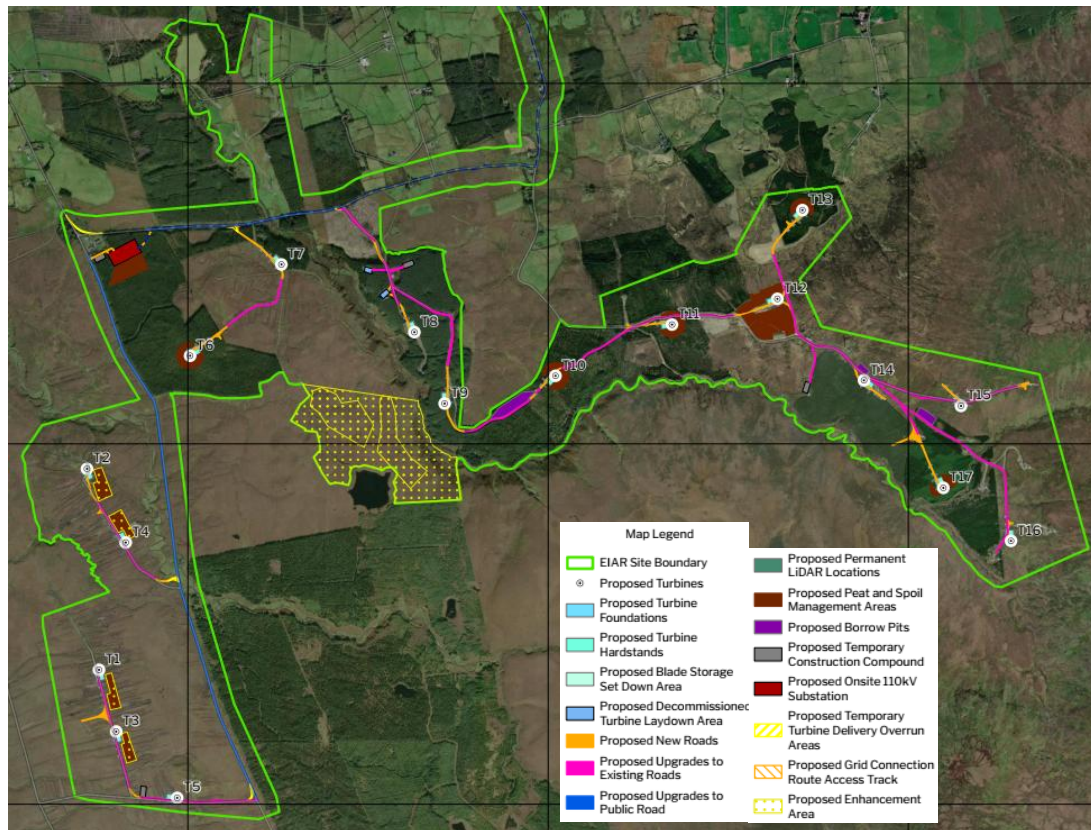


Plate 3-4 Proposed Wind Farm Layout Iteration No. 4 - Final Layout

Iteration No. 4, as presented in Plate 3-4 above, is comprised of 17 no. turbines with a maximum overall ground-to-blade tip height of 176.6 to 180 meters, rotor diameter range of 133.2m to 150m and hub height of 105 to 110m, hardstands, onsite 110kV substation, site access tracks and site entrances, 4 no. temporary construction compounds, decommissioned turbine set down areas, 2 no. onsite LiDAR compounds, 3 no. onsite borrow pits, peat and spoil management areas and biodiversity management and enhancement areas. The turbine numbers were also updated to reflect the final 17 no. turbine layout.

The peat and spoil management areas underwent detailed multidisciplinary site-surveys to ensure that the proposed areas were suitable from a geotechnical, hydrological, and ecological perspective. After all surveys were completed, the proposed peat and spoil management areas were redesigned and reduced in size to ensure that they do not encroach on any ecological constraints or hydrological buffers.

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

The final chosen turbine layout is considered the optimal layout given it has the least potential for environmental effects. The potential environmental effects of previous design iterations in comparison with the final turbine layout are presented in Table 3-4 below.

Table 3-4 Comparison of environmental effects of previous design iterations when compared against the final 17 no. turbine layout.

Environmental Consideration	Previous design iterations	Chosen Option of the Final 17. No Turbine Layout and all associated infrastructure
<i>Population & Human Health (incl. Shadow Flicker)</i>	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 (25 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (19 turbine layout). Shadow flicker effects would likely be similar for Proposed Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (17 turbine layout).	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. Based on the assessment detailed in Chapter 5, Chapter 12, Chapter 13, and the mitigation measures proposed, there will be no significant effects on population and human health from shadow flicker, noise and vibration and visual amenity during the construction, operation and decommissioning phases of the Proposed Project.
<i>Biodiversity & Ornithology</i>	Greater potential impact on identified sensitive ecological receptors due to location of infrastructure within designated set-back buffers (i.e., water course buffers). Larger development footprint would result in greater potential habitat loss in Proposed Wind Farm Layout Iteration No. 1 (25 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (19 turbine layout). 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. Habitat loss and collision risk effects are neutral for Proposed Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (17 turbine layout).	As detailed above and further in Chapter 6, the Proposed Wind Farm has been designed to avoid or mitigate impacts on biodiversity. The Proposed Project includes for a BMEP, providing a local boost to biodiversity and ornithology. Please see Appendix 6-4 for details. As detailed in Chapter 7 Birds, the Proposed Project has been designed to avoid or mitigate impacts on ornithological receptors. As detailed in the CRA in Appendix 7-6, there will be no significant effects on birds due to collision risk.
<i>Land, Soils & Geology</i>	Larger development footprint would have resulted in larger volume of peat and spoil to be excavated and crushed	As detailed in the assessment in Chapter 8, peat, topsoil and subsoil excavation volumes will be

Environmental Consideration	Previous design iterations	Chosen Option of the Final 17. No Turbine Layout and all associated infrastructure
	stone to be extracted for construction in Proposed Wind Farm Layout Iteration No. 1 (25 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (19 turbine layout). Similar Effects from excavation and extraction are for Proposed Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (17 turbine layouts).	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. 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. 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.
<i>Geotechnical/Peat Stability</i>	Greater potential for impacts due to peat stability for Proposed Wind Farm Layout Iteration No. 1 and No. 2 Geotechnical investigations followed by careful design would lead to reduced potential significant environmental impacts between Proposed Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (17 no. turbine layouts).	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.
<i>Hydrology and Hydrogeology</i>	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 (25 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (19 turbine layout). Potential for runoff is neutral for Proposed Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (17 turbine layout). Project design specific drainage design would remove 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	Previous design iterations	Chosen Option of the Final 17. No Turbine Layout and all associated infrastructure
<i>Air Quality</i>	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. 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 (25 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (19 turbine layout). Air quality emission effects are neutral for Proposed Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (17 turbine layout).	As detailed in Chapter 10, there will be no significant effects on air quality.
<i>Climate</i>	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 (25 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (19 turbine layout). 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 (25 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (19 turbine layout). 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 (17 turbine layouts).	As detailed in the assessment in Chapter 11, over the proposed 35-year lifetime of the Proposed Wind Farm, 1,951,600 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. The addition of an estimated 102MW clean energy to the national grid will be a positive contribution to the State's renewable energy targets set out in CAP 2025.
<i>Noise & Vibration</i>	A larger number of turbines could have a greater noise impact for	Based on the assessment detailed in Chapter 12 and the mitigation

Environmental Consideration	Previous design iterations	Chosen Option of the Final 17. No Turbine Layout and all associated infrastructure
	Proposed Wind Farm Layout Iterations No. 1 (25 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (19 turbine layout). The noise impacts are neutral for Proposed Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (17 turbine layout).	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.
<i>Landscape & Visual</i>	A larger number of turbines could have a greater visual impact for Proposed Wind Farm Layout Iteration No. 1 (25 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (19 turbine layout). Visual impacts are neutral for Proposed Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (17 turbine layout).	The smaller number of proposed turbines ensures a setback greatly exceeding that required in the Draft DoHPLG 2019 Guidelines. As detailed in the assessment in Chapter 13, there will be no significant effects on landscape and visual due to a lack of highly sensitive landscape and visual receptors, and the strategic siting of infrastructure. Increased separation distance of the Proposed Turbines from scenic routes leading to reduced landscape and visual effects.
<i>Cultural Heritage & Archaeology</i>	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 (25 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (19 turbine layout). Cultural heritage impacts are neutral for Proposed Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (17 turbine layout).	As detailed in the assessment in Chapter 14, 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.
<i>Material Assets – Traffic and Transport</i>	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 (25 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (19 turbine layout).	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 all the mitigation measures will be agreed with the roads authority

Environmental Consideration	Previous design iterations	Chosen Option of the Final 17. No Turbine Layout and all associated infrastructure
<i>Material Assets – Utilities, Waste Management, Telecommunications and Aviation</i>	Traffic impacts are neutral for Proposed Wind Farm Layout Iteration No. 3 and Proposed Wind Farm Layout Iteration No. 4 (17 turbine layout). Potential for impacts on telecommunications links for Proposed Wind Farm Layout Iteration No. 1 (25 turbines). No material difference between the Proposed Wind Farm Layout Iteration No. 2, 3, and 4 for gas, water, waste management, telecommunications and aviation.	prior to construction works commencing on site. No material difference between the Proposed Wind Farm Layout Iteration No. 1, 2, 3, and 4 for gas, water, waste management, telecommunications and aviation.
<i>Vulnerability to Major Accidents and Natural Disasters</i>	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 (25 turbine layout) and Proposed Wind Farm Layout Iteration No. 2 (19 turbine layout) due to increased land disturbance and larger excavation footprint. 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 (17 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., landslide/ peat stability, contamination and fire/explosion) are considered unlikely to occur at any phase of the Proposed Project. 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.

3.2.3.2.3 Alternative Internal Access Track Layout

Internal access tracks are required onsite to enable transport of infrastructure and construction materials within the Proposed Wind Farm. Such tracks must be of a gradient and width sufficient to allow safe movement of equipment and vehicles. 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.

It was decided at an early stage during the design process, that the tracks belonging to the Existing Wind Farm would be utilised to facilitate the movement of construction and maintenance vehicles where possible within the Proposed Wind Farm, to minimise the potential for impacts by using new tracks as an alternative. As the overall Proposed Wind Farm layout was finalised, the existing track layout was used as a marker for the location of the Proposed Turbines, taking into account the existing

infrastructure and site constraints, in order to ensure suitable linkages within the Proposed Wind Farm. The Proposed Wind Farm makes use of the existing access track network insofar as possible. It is proposed to upgrade 8.2km of the Existing Wind Farm access tracks, 4.3km of existing public road corridor. The extent of proposed new tracks as part of the Proposed Wind Farm is significantly reduced when compared to the utilisation and upgrade of existing tracks.

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

3.2.3.2.4 **Alternative Construction/Operational Entrance Options**

The Proposed Wind Farm is currently served by a number of existing tracks that form part of the Existing Wind Farm and existing access tracks within greenfield sections of the Proposed Wind Farm. As part of the Proposed Project, it is proposed to upgrade 2 no. existing entrances, construct 2 no. new entrances that connect to existing access tracks and facilitate the construction of 1 no. new site entrance. 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), maintenance/monitoring (operational phase), and removal of Proposed Wind Farm infrastructure (decommissioning phase).

Due to the nature of the Proposed Project, all proposed works will be local to the Proposed Wind Farm and as such, the construction phase will utilise 5 no. site entrance locations for construction material delivery. The Existing Wind Farm site entrance will serve as the main site entrance for the Proposed Wind Farm. Of the 5 no. site entrance locations, 2 no. are existing site entrances that will be upgraded, 2 no. utilise existing access tracks with new entrance locations proposed to ensure safe access and egress of traffic during the operational phase (please see Section 15.1.11 of Chapter 15 for further information), and 1 no. is a proposed new entrance to the proposed onsite 110kV substation.

Please refer to Section 4.5.1, Table 4-6 in Chapter 4: Description of the Proposed Project for further information on site entrances.

3.2.3.3 **Alternative Substations**

The decision was made at an early stage to re-use the Existing Wind Farm control buildings onsite as part of the Proposed Project which are connected to the national grid via existing underground cabling to Cunnghill 110kV substation. This was deemed the most environmentally sensitive approach as the internals and footprint of the control buildings will remain the same, so no additional groundworks or construction will occur. The upgrade works will be confined to the existing footprint of the control buildings and will be carried out to ensure that they are in compliance with current EirGrid specifications.

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. While the existing onsite control buildings were elected to be included as part of the Proposed Project, it was determined a new location for the proposed onsite 110kV substation was required as the locations of the existing control buildings did not allow for required expansion areas to facilitate the export capacity of the Proposed Project.

The identification of a suitable substation location was informed by a range of environmental, technical, and socio-economic considerations. Site selection was undertaken with the objective of minimising potential environmental effects while ensuring technical and operational feasibility. The principal constraints and features assessed as part of this process included:

- **Minimum distance from turbines** – typically at least 2.5 times the turbine fall distance, to ensure safety and compliance with regulations.
- **Natural screening** – preference for locations that benefit from existing topography or vegetation to reduce visual impact.
- **Grid connection feasibility** – proximity to the national grid, with a focus on achieving the shortest and most efficient cable route to minimise land disturbance and potential environmental effects.
- **Proximity to residential receptors**, ensuring appropriate separation distances from dwellings to limit potential effects related to noise, visual impact, and general amenity.
- **Ecological and Environmental constraints**, avoidance of designated sites, sensitive habitats, protected species, watercourses, flood zones, national monuments etc.
- **Land availability**– suitability of land size, access rights, and landowner agreements.
- **Planning and regulatory constraints** – compliance with local planning policies, zoning, and statutory requirements.

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. Based on the above two separate options were evaluated for the Proposed Wind Farm's onsite 110kV substation location.

An assessment was carried out to determine three potential locations for the proposed onsite substation: Substation Alternative 1, Substation Alternative 2, and Substation Alternative 3 (Chosen Option). Plate 3-6 below demonstrates all three proposed substation locations which are further detailed below.

Option 1 – Substation near Existing Wind Farm site entrance

This option looked at a substation location that would be accessed via the Existing Wind Farm site entrance that will be used as the main entrance of the Proposed Wind Farm. This location was considered due to its proximity to the existing road network, which would reduce land disturbance that may be caused by the underground cabling. This location also falls outside the minimum distance to turbines and avoids any sensitive habitats.

The topography here slopes down towards the Dunneill River to the south, which may have potential to result in impacts to the watercourse during construction of the substation as the development footprint would encroach on the 50m buffer from the watercourse. It was also considered that this location would require significant amounts of cut and fill to construct given the terrain.

Option 2 - Substation near Existing Wind Farm control building

The second option considered the onsite 110kV substation located along the Existing Wind Farm access road in close proximity to the eastern most existing onsite control building. This location was considered due to its proximity to the existing road network, which would reduce land disturbance that may be caused by the underground cabling. Connection to the national grid also makes it easily accessible for maintenance access. This location and avoids any sensitive habitats as it is within agricultural grassland, however, it is unable to also maintain the minimum distance to the Proposed Turbines and overlaps with areas identified as suitable for peat and spoil management within the Proposed Wind Farm.

Option 3 – Substation along L2702 Local Road (Chosen Option)

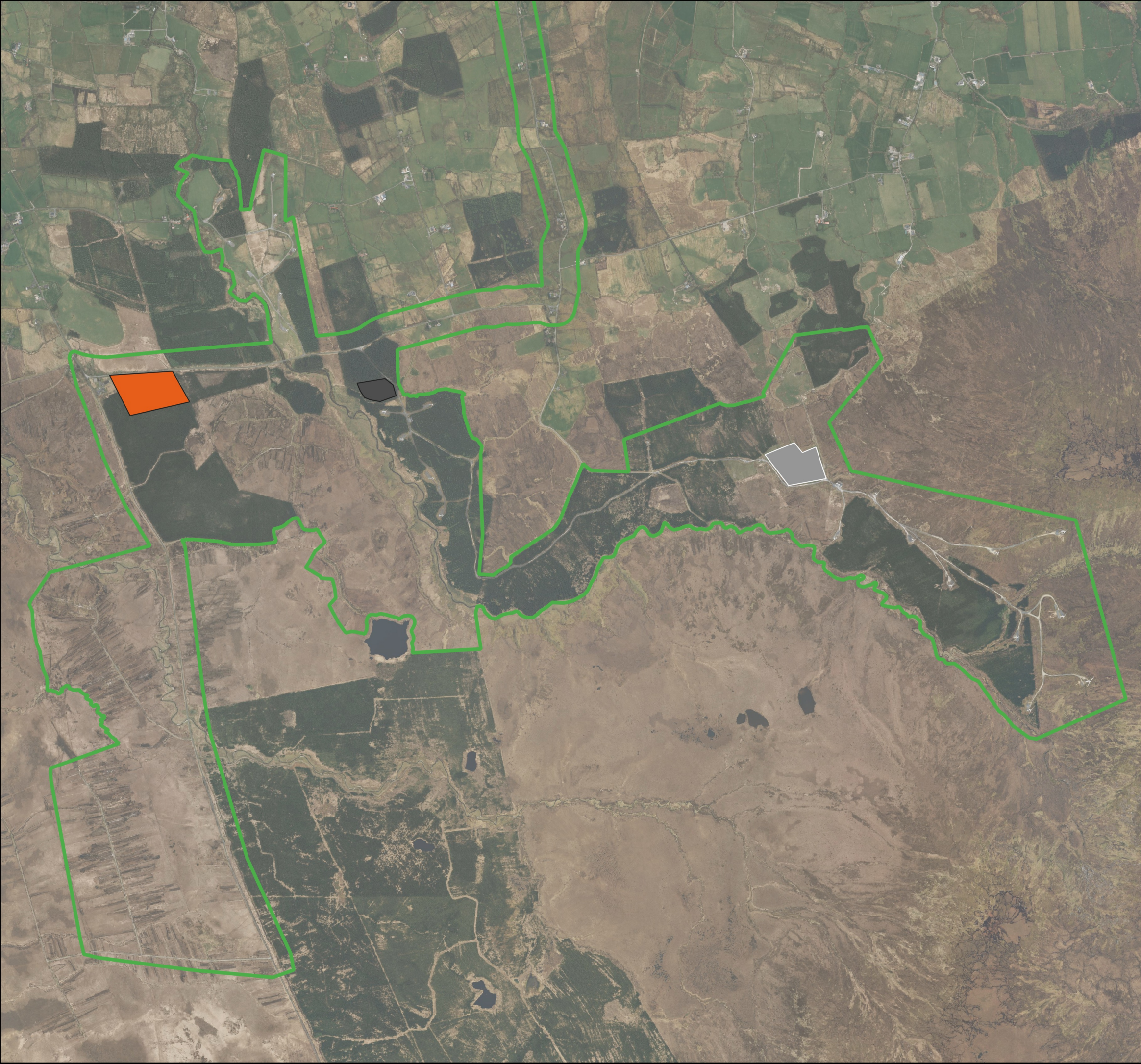
The third option considered the onsite 110kV substation located along the L2702 within the northwest section of the Proposed Wind Farm. This option is strategically positioned within the Proposed Wind Farm, close to the public road network and the Proposed Turbines within the greenfield sections. This area is of low ecological value, situated within an area of commercial conifer plantation, and is screened

from sensitive receptors by topography and vegetation to the north and west. This location also falls outside the minimum distance to turbines.

Option 3 was deemed to be suitable due to the habitats it is located on, proximity to the local road network in which to facilitate the connection of the greenfield sections of Proposed Wind Farm to the national grid, the presence of screening, and the existing ground conditions.

3.2.3.3.1 **Battery Energy Storage System Compound**

During the early stage design process for the Proposed Wind Farm, consideration was given to the inclusion of a battery energy storage system (BESS) compound adjacent to the proposed onsite 110kV substation options as noted in Layout Iteration No. 2 in Section 3.2.3.2.2 above. The assessment of the three substation options described in Section 3.2.3.3 above included consideration of a BESS compound footprint. The BESS compound was originally proposed in the early stages of the project design to ACP in the first pre-application meeting. As the preferred substation location (Option 3) was identified, further site investigations and constraints mapping within available lands for this Proposed Project infrastructure concluded that the sufficient area for inclusion of a BESS compound adjacent to the onsite 110kV substation was not available and was subsequently removed as an element of the Proposed Project.



Map Legend

-  EIAR Site Boundary
- Alternative Onsite 110kV Substation Locations
-  Option 1
-  Option 2
-  Option 3



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Drawing Title
Alternate Substation Locations

Project Title
Crumhach Wind Farm, Co. Sligo

Drawn By
EM

Checked By
BT

Project No.
230841

Drawing No.
Figure 3-2

Scale 1:20,000

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3.2.3.4 Alternative Proposed Grid Connection Route

While the Existing Grid Connection was considered favourable to reutilise to connect the Proposed Project to the national grid, the opportunity to increase the export capacity of the Existing Wind Farm was limited. On this basis, the reutilisation of the Existing Grid Connection as well as the provision of additional export capacity via a new grid connection was considered as part of the Proposed Project.

Underground electrical cables will transmit the power output from 10 no. of the Proposed Turbines to the existing Srananagh 220kV substation (see Section 4.3.2.7.3 Chapter 4 for export capacity breakdown), located approx. 41.1 kilometres to the east of the Proposed Wind Farm on new access tracks and within the public road corridor.

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 overhead line. An alternative to the c.41.1km underground cabling route would be to construct an approx. 32km overhead line from the proposed onsite substation to the existing Srananagh 220kV substation. While overhead lines are less expensive and allow for easier repairs when required, underground cabling will have no visual impact. For this reason, it was considered that underground cabling would be a preferable alternative to overhead lines. The Guidelines (DoEHLG, 2006) also indicate that underground cables are the preferred option for connection of a wind energy development to the national grid. The underground electrical cabling will follow the route of existing public roads, thereby minimising the amount of ground disturbance required and will have a reduced permanent visual impact due to the placement of the cabling route underground, with no above ground infrastructure visible in the operational phase.

Three options have been considered for the Proposed Grid Connection Route. The Proposed Grid Connection Route has been revised and refined to take account of the findings of the site investigations and baseline assessments. The TLI Group was engaged by the Applicant to carry out a preliminary grid connection route assessment for the Proposed Project. 2 no. potential routes to the Srananagh 220kV substation were considered in an initial feasibility assessment, which are shown in Figure 3-2 below.

Proposed Grid Connection Route Option 1

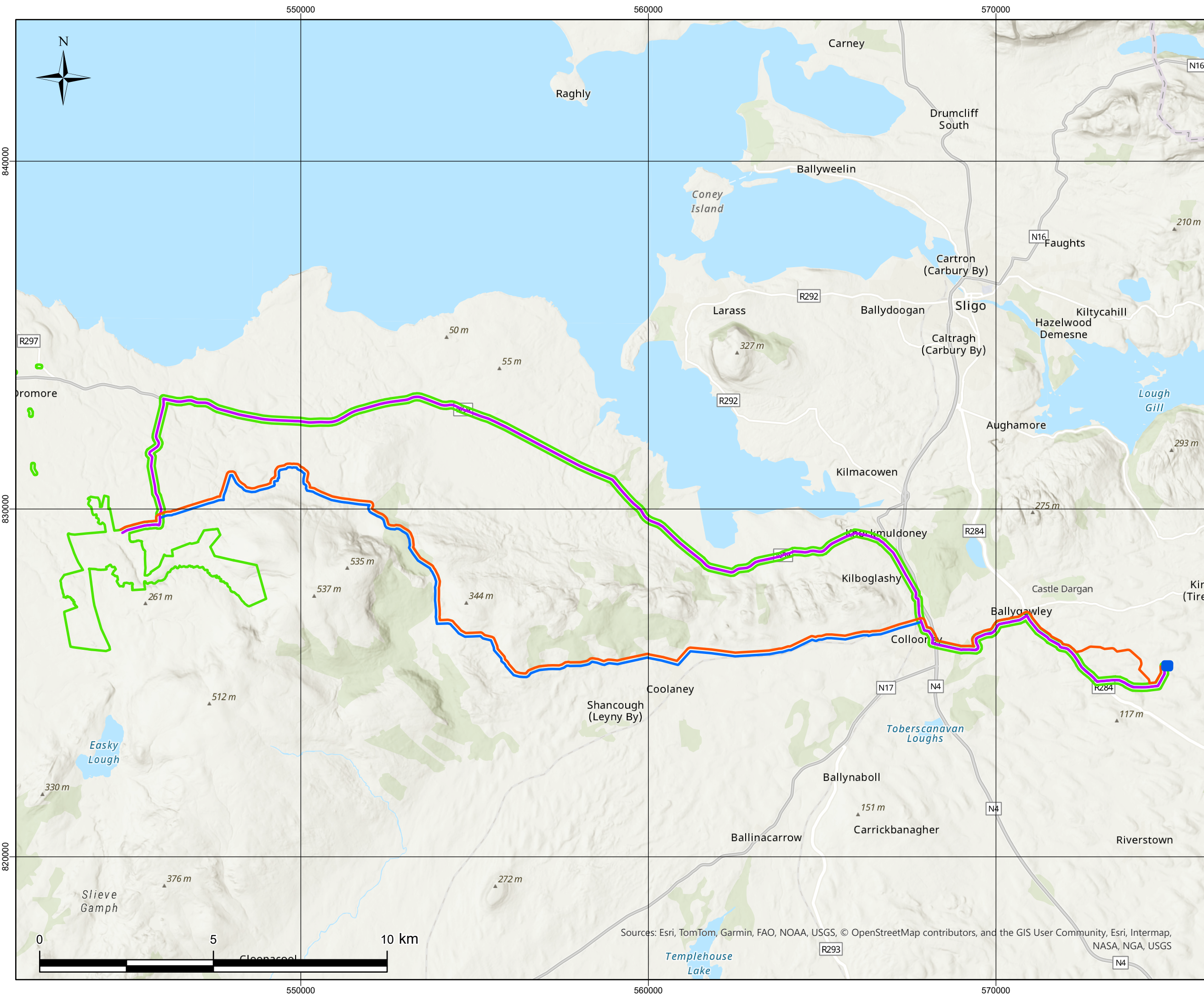
Option 1 is approximately 39.5 km long and mostly follows the regional and local road network. This route is mostly within rural area. This proposed route is the direct route along the local road and regional road. This option was identified as requiring a minimum of 33 no. EPA watercourse crossings to construct. As a result, it was determined that it would be appropriate to seek out a less constrained alternative underground cabling route.

Proposed Grid Connection Route Option 2

Option 2 is approximately 41.1 km long and mostly follows the National and local road network. This route is mostly within rural area. Use of such roads would be contingent on TII and local authority agreement. This option was identified as requiring a minimum of 21 no. EPA watercourse crossings to construct and therefore has a lower possibility of interaction with watercourses. Option 2 therefore was selected as the Proposed Grid Connection Route

Proposed Grid Connection Route Option 3

Option 3 is approximately 40.0 km long and mostly follows the regional and local road network. This route is mostly within rural area. This proposed route is largely similar to Option 1, instead leaving the R284 regional road east onto the L12021 local road prior to entering the access road to the Srananagh 220kV substation. This option was identified as requiring a minimum of 33 no. EPA watercourse crossings to construct. As a result, it was determined that it would be appropriate to seek out a less constrained alternative underground cabling route.



Map Legend

EIAR Site Boundary

Alternative Grid Connection Options

Grid Route Option 1

Grid Route Option 2

Grid Route Option 3

Existing 220kV Substation

Spatial Reference
Name: IRENET95 Irish Transverse Mercator
Datum: IRENET95
Projection: Transverse Mercator

N

SITE LOCATION - NOT TO SCALE

Alternate Proposed Grid Connection Routes

Project Title
Crumhach Wind Farm, Co. Sligo

Project No. 230841	Drawing No. 3-3	Scale 1:100,000
Drawn By MVN	Checked By BT	Date 04/06/2026

Email: info@mkofireland.ie / Website: www.mkofireland.ie

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Esri, Intermap, NASA, NGA, USGS

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Table 3-5 Comparison of environmental effects when compared against the chosen option (Proposed Grid Connection Route)

Environmental Consideration	Proposed Grid Connection Route Option 1	Proposed Grid Connection Route Option 2 (Chosen Option)	Proposed Grid Connection Route Option 3
Population & Human Health	Reduced potential for temporary visual impact for a shorter construction phase considering the longer route for Proposed Grid Connection Route Option 1 (39.5km), from presence of plant machinery onsite during the construction period. Reduced potential for temporary noise and dust impacts for a longer construction phase considering the longer route, from plant machinery onsite during construction phase.	Potential for temporary visual impact for a longer construction phase considering the longer route for Proposed Grid Connection Route Option 2 (41.1km), from presence of plant machinery onsite during the construction period. Potential for temporary noise and dust impacts for a longer construction phase considering the longer route, from plant machinery onsite during construction phase.	Potential for temporary visual impact for a longer construction phase considering the longer route for Proposed Grid Connection Route Option 3 (40.0km) from presence of plant machinery onsite during the construction period. Potential for temporary noise and dust impacts for a longer construction phase considering the longer route, from plant machinery onsite during construction phase.
Biodiversity (including Birds)	Low potential for impact on sensitive ecological receptors during the construction phase as Proposed Grid Connection Route Option 1 does passes through designated sites entirely within the public road corridor.	Low potential for impact on sensitive ecological receptors during the construction phase as Proposed Grid Connection Route Option 2 does passes through designated sites entirely within the public road corridor.	Low potential for impact on sensitive ecological receptors during the construction phase as Proposed Grid Connection Route Option 3 does passes through designated sites entirely within the public road corridor.
Land, Soils, & Geology	Lower volume of earthworks required due to longer route (39.5km). This underground cabling route option is entirely proposed within the public road corridor.	Greater volume of earthworks required due to longer route (approximately 41.1km). This underground cabling route option is entirely proposed within the public road corridor.	Greater volume of earthworks required due to longer route (approximately 40.0km). This underground cabling route option is entirely proposed within the public road corridor.
Hydrology and Hydrogeology	Greater potential for impacts on hydrology due to the proposed 33 no. EPA mapped watercourse crossings.	Reduced potential for impacts on hydrology due to the proposed 21 no. EPA mapped watercourse crossings.	Greater potential for impacts on hydrology due to the proposed 5 no. EPA mapped watercourse crossings.

Environmental Consideration	Proposed Grid Connection Route Option 1	Proposed Grid Connection Route Option 2 (Chosen Option)	Proposed Grid Connection Route Option 3
Air Quality	As a result of the shorter route (approximately 39.5km), this option has a greater potential for effects from dust, and vehicle emissions during construction.	As a result of the longer route (approximately 41.1km) this option has a greater potential for effects from dust, and vehicle emissions during construction.	As a result of the longer route (approximately 40.0km) this option has a greater potential for effects from dust, and vehicle emissions during construction.
Climate	As a result of the shorter route (approximately 39.5km), this option has a greater potential to result in increased vehicle emissions during the construction phase.	As a result of the longer route (approximately 41.1km), this option has a greater potential to result in increased vehicle emissions during the construction phase.	As a result of the longer route (approximately 40.0km), this option has a greater potential to result in increased vehicle emissions during the construction phase.
Noise & Vibration	Lower potential for noise and vibration impacts on nearby sensitive receptors during the construction phase due to the longer route (39.5km)	Greater potential for noise and vibration impacts on nearby sensitive receptors during the construction phase due to the longer route (41.1km)	Greater potential for noise and vibration impacts on nearby sensitive receptors during the construction phase due to the longer route (40.0km)
Landscape and Visual	Neutral – there is no material difference of environmental effect between all options considered.	Neutral – there is no material difference of environmental effect between all options considered.	Neutral – there is no material difference of environmental effect between all options considered.
Archaeology, Architectural and Cultural Heritage	Lower potential effect for impacts on cultural heritage or archaeology due to all infrastructure being proposed within the curtilage of the public road network.	Lower potential effect for impacts on cultural heritage or archaeology due to all infrastructure being proposed within the curtilage of the public road network.	Lower potential effect for impacts on cultural heritage or archaeology due to all infrastructure being proposed within the curtilage of the public road network.

Environmental Consideration	Proposed Grid Connection Route Option 1	Proposed Grid Connection Route Option 2 (Chosen Option)	Proposed Grid Connection Route Option 3
Material Assets	Proposed Grid Connection Route Option 1 measured approximately 39.5km in length and is located primarily in the public road corridor. The route follows local roads for approximately 31.6km of its extent, regional roads for approximately 6.3km of its extent and national roads for 0.6km of its extent. This would likely result in reduced traffic volumes considering the level of traffic using local roads and regional roads, and due to the shorter length (approximately 39.5km) of the route.	Proposed Grid Connection Route Option 2 measured approximately 41.1km in length and is located primarily in the road corridor. The route follows local roads for approximately 7.5km of its extent, regional roads for approximately 8.9km of its extent and national road for 23.4km. This would likely result in greater traffic impacts considering the level of traffic using national and roads and regional roads, and due to the longer length (approximately 41.1km) of the route.	Proposed Grid Connection Route Option 3 measured approximately 41.1km in length and is located primarily in the road corridor. The route follows local roads for approximately 33.7km of its extent and regional roads for approximately 5.3km of its extent. This would likely result in greater traffic impacts considering the level of traffic using local and roads and regional roads, and due to the longer length (approximately 40.0km) of the route

3.2.3.5 **Alternative Met Mast/LiDAR Compound**

As outlined in Plate 3-2 above, the Proposed Wind Farm layout iteration No. 2 included for a proposed onsite permanent meteorological (met) mast with a height of 100m in southwest of the Proposed Wind Farm, at the location of a temporary met mast onsite (SCC Ref. 2360208). The proposed met mast location was also constraints and facilitators led in its design, where an appropriate setback distance from the Proposed Turbines was incorporated during the design process. Following iterations to the layout of the Proposed Turbines, in order to maintain appropriate setbacks from the Proposed Turbines, the provision of 2 no. onsite LiDAR compounds was proposed, with one sited in the greenfield sections of the Proposed Wind Farm and the other using an existing hardstand within the Existing Wind Farm. This was chosen as an alternative as there will be no impact to the landscape or visual amenity while still providing the required onsite wind speed and data.

3.2.3.6 **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.

3.2.3.6.1 **Temporary Construction Compounds**

The temporary construction compounds will be used for the storage of all construction materials, turbine components, staff facilities and car parking areas for staff and visitors. The use of multiple temporary construction compounds was deemed preferable to the alternative of a single large compound. Principally, it will result in shorter distances for traffic movements within each section of the construction of the various infrastructure components. 2 no. construction compounds are strategically located on existing areas of hardstanding at two opposite ends of the site to facilitate the construction of the Proposed Wind Farm, while 2 no. additional compounds are proposed at strategic locations in the west of the Proposed Wind Farm and to facilitate the construction of the onsite 110kV substation. As a result, vehicle emissions and the potential for dust arising will be reduced.

3.2.3.6.2 **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 the project 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 access track network, and proximity to sensitive receptors.

During initial design stage, as presented in Plate 3-2 above, 4 no. areas were identified across the Proposed Wind Farm that would have potential to act as borrow pits. 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 3 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 initially proposed borrow pit locations and Figure 3-12 shows the location of the 3 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 3 no. proposed borrow pits would be carried forward to planning.

While some more durable, crushed stone for the finished surface layer of site access tracks and hardstanding areas will be sourced from fully authorised, local quarries (identified in Section 4.5.2 in Chapter 4), the majority of material for site access tracks, 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 17 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 3-6.

Table 3-6 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
<i>Population & Human Health (incl. Shadow Flicker)</i>	Potential for increased impact on residential amenity due to increased vehicular and dust emissions from increased vehicular movements on local roads. 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. Potential for increased impact on residential amenity due to increased noise and dust emissions associated with excavation of material at onsite borrow pits. 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.
<i>Biodiversity & Ornithology</i>	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. As detailed in Chapter 6, the Proposed Project has been designed to avoid or mitigate significant effects on biodiversity. As detailed in Chapter 7, the Proposed Project has been designed to avoid or mitigate impacts on ornithological receptors.
<i>Land, Soils & Geology</i>	No borrow pit excavation therefore no potential for additional impacts on land, soils and geology due to the extraction activities.	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.

	Additional peat landscaping would be required if no onsite borrow pits were available to deposit excavated peat and spoil.	As detailed in the assessment in Chapter 8, no significant effects on bedrock, peat and subsoils will occur.
<i>Geotechnical/ Peat Stability</i>	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.
<i>Hydrology and Hydrogeology</i>	No requirement for drainage from onsite borrow pits to be incorporated into project drainage design. 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. Decreased potential for silt laden runoff to enter watercourses due to decreased landscaping of peat and spoil required within the site. As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur.
<i>Air Quality</i>	Potential for increased vehicular exhaust emissions and dust emissions, along the construction haul route, due to increased traffic associated with delivery of material. 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. As detailed in the assessment in Chapter 10, no significant effects on air quality will occur.
<i>Climate</i>	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. Potential increase in greenhouse gas emissions due to larger disturbance of peat to facilitate excavation of proposed borrow pit locations. As detailed in the assessment in Chapter 11, no significant effects on climate will occur.
<i>Noise & Vibration</i>	Potential during construction phase for reduced noise impacts on nearby sensitive receptors due to the absence of excavation of material from onsite borrow pits. Potential during construction phase for increased noise and	Potential for increased noise and vibration impacts on nearby sensitive receptors due to excavation of material from onsite borrow pits. Potential during construction phase for reduced noise and vibration impacts on nearby sensitive receptors due to reduced traffic movements.

	vibration impacts on nearby sensitive receptors due to increased vehicular movements to and from the site.	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.
<i>Landscape & Visual</i>	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. During the operational phase, the use of an onsite borrow pit is neutral as the onsite borrow pits would be reinstated following use.
<i>Cultural Heritage & Archaeology</i>	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. As detailed in the assessment in Chapter 14, there will be no significant effects on Cultural Heritage. 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.
<i>Material Assets</i>	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. Based on the assessment detailed in Chapter 15 and the mitigation measures proposed, there will be no significant effects on traffic.
<i>Vulnerability to Major Accidents and Natural Disasters</i>	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. 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., landslide/peat stability, contamination and fire/explosion) are considered to be very unlikely to occur at any phase of the Proposed Project. 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.
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3.2.4 Alternative Transport Route and Site Access

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

3.2.4.1 Port of Entry

The ports of entry considered for the Proposed Turbines of the Proposed Project include Galway Harbour in Galway City and Killybegs Harbour in Co. Donegal due to their proximity to the Site. Both harbours offer roll-on roll-off procedures to facilitate import of wind turbines, however Killybegs Harbour was chosen due to the preference of primary use of the National and Regional roads where possible to access the Proposed Wind Farm.

3.2.4.1.1 Alternative Turbine Delivery Routes

For turbine transport, cognisance was taken of the haul routes used for other wind farm developments in the northwest 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. Of the proposed 134km turbine delivery route to the Proposed Wind Farm, only 6.6km will utilise local roads with the remainder being National Roads. In the case of the Proposed Project, consideration was given to the delivery route of the Existing Wind Farm.

The assessment of the most suitable delivery routes was conducted in parallel with the assessment of potential site entrances as outlined above in Section 3.2.3. After site visits were completed and detailed site investigative works were done, it was determined that the identified route from Killybegs Harbour for the purposes of turbine component delivery was appropriate and therefore no alternatives were considered. The utilisation of the route along the N59 to the Proposed Wind Farm was identified as the preferred option for abnormal load delivery given the limited road upgrade work required, opportunity to utilise an existing accommodation area (further details in Chapter 4 Section 4.5.3.1) and its proven suitability for the transport of turbine components from the construction of the Existing Wind Farm which utilised a similar route.

3.2.5 Alternative Biodiversity Management and Enhancement Measures

In combination with the evolution of the Proposed Wind Farm layout as described in Section 3.2.3.2 above, alternative BMEP measures were also considered as part of the Proposed Project. The Proposed Project will result in a loss of cutover/blanket bog and other peatland habitats, see Chapter: 6 Biodiversity for further details. The loss of these habitats will be offset through a BMEP (further detailed in Appendix 6-4). Iterations to the design of the Proposed Wind Farm layout further informed the extent of biodiversity enhancement and management measures considered, while the final layout was designed to reduce the potential for effects on key habitats.

The proposed biodiversity management and enhancement areas have been constraints and facilitators led in their design. For example, restoration of peatland habitat will only be developed in areas which have a suitable factor of safety value and negligible risk rating based on existing ground conditions and topography within the geotechnical and peat stability risk assessment included as Appendix 8-1 of the EIAR. The BMEP has also been prepared in combination with iterations to the peat and spoil

management plan (see Appendix 4-2) where possible to include peatland restoration measures within identified peat management areas within the Proposed Wind Farm. Full details on BMEP measures are included in Appendix 6-4.

3.2.6 **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 Proposed Wind Farm layout aims to avoid any environmentally sensitive areas. Where loss of habitat occurs in the Proposed Wind Farm, 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.