Environmental Impact Assessment Report (EIAR)

Gannow Renewable Energy Development, Co. Galway

Chapter 3 – Consideration of Reasonable Alternatives

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3.1 Introduction

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

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

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

For the purposes of this EIAR, the various project components are described and assessed using the following references: 'Proposed Project', 'Proposed Wind Farm', 'proposed turbines', 'Proposed Grid Connection', 'Site' and 'Proposed Wind Farm site'. Please see Section 1.1.1 of this EIAR for further details. A detailed description of the Proposed Project is provided in Chapter 4 Description of the Proposed Project of this EIAR.

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 Proposed Wind Farm site. This section also outlines the design considerations in relation to the Proposed Wind Farm and Proposed Grid Connection. It provides an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects. The consideration of alternatives is an effective means of avoiding environmental impacts. As set out in the 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 in some instances neither the applicant nor the competent authority can be realistically expected to examine options that have already been previously determined by a higher authority, such as a national plan or regional programme for infrastructure.

Non-environmental Factors

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

Site-specific Issues

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 Proposed Wind Farm Design Options:
  - Alternative Turbine Numbers and Model
  - Alternative Turbine Layout and Development Design
  - Alternative Road Layout
  - Deliveries of Material from Nearby Quarries
  - Alternative Turbine Component Delivery Option
    - Alternative Port of Entry
    - Alternative Component Delivery Route
    - Alternative Site Access Points
  - Alternative Design of Ancillary Structures
    - Alternative Internal Site Cabling Route
    - Alternative Meteorological Mast Location
    - Construction Compounds
- Alternative Proposed Grid Connection Design Options
  - Alternative Substation Location
  - Alternative Grid Connection Cabling Route Options

- Alternative Mitigation Measures

Each of these is addressed in the following sections. When considering the Proposed Project, given the intrinsic link between layout and design, the two will be considered together in this chapter.

3.2.2 'Do Nothing' Alternative

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

An alternative land-use option to developing a renewable energy project at the Site would be to leave the Site as it is, with no changes made to the current land-use practices of low intensity agriculture, commercial forestry, and peat cutting activities on the Proposed Wind Farm site, and public road corridor, native woodland, private track, and private land principally used by agriculture along the Proposed Grid Connection. In doing so, the environmental effects in terms of emissions are likely to be neutral.

By implementing this 'Do-Nothing' alternative, however, the opportunity to capture the available renewable energy resource would be lost, as would the opportunity to contribute to meeting Government and EU targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions. The opportunity to generate local employment, local authority development contributions, rates and investment in the local area would also be lost. Furthermore, the opportunity to implement the measures outlined in the Biodiversity Management and Enhancement Plan (BMEP) would also be lost. Please see Appendix 6-4 BMEP for details.

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 renewable energy project at the Site are presented in Table 3-1 below.

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

Environmental Consideration	Do-Nothing Alternative	Chosen Option of developing a renewable energy project
Population & Human Health	No increase in local employment and no long-term financial contributions towards the local community. No potential for shadow flicker and noise to affect sensitive receptors. No potential for effects on visual amenity due to the construction and operation of turbines.	Approximately 100 jobs could be created during the construction, operation, and maintenance phases of the Proposed Project. Based on the assessment and mitigation proposals detailed in Chapter 5 Population & Human Health, there will be no significant effects related to shadow flicker during the operational phase. As detailed in the assessment in Chapter 10 Air Quality, the Proposed Project will have a Long-term Moderate Positive Impact on air quality.

Environmental Consideration	Do-Nothing Alternative	Chosen Option of developing a renewable energy project
	No potential for positive effects on air quality and climate change targets. No potential to supply an estimated 35,040 homes with clean renewable electricity	As detailed in the assessment in Chapter 11 Climate, the Proposed Project will have a long-term Moderate Positive Impact on climate. As detailed in Chapter 12 Noise and Vibration, residual effects from Noise and Vibration are predominantly short-term, negative and slight for the short-term construction and decommissioning phases. For the Operational Phase, the residual effects range from not significant to imperceptible on sensitive receptors. As detailed in Chapter 13 Landscape and Visual, the landscape type and character of the area where the proposed turbines are sited comprises modified working landscape types of low sensitivity and can effectively accommodate wind energy development. Of the 13 no. viewpoints (VPs) assessed 5 no. were deemed not significant, 4 no. were deemed slight, 3 no. were deemed moderate, and 1 no. was deemed significant. The number of receptors experiencing these effects is very low as the landscape surrounding the proposed turbines has a significantly low population density. Visual effects will decrease with distance from the proposed turbines. The proposed turbine locations 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)) for the purpose of protecting residential visual amenity.
Biodiversity (including Birds)	No habitat loss. No potential for collision risk for birds and bats No potential biodiversity enhancement measures would be put in place.	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. The Proposed Project includes for a BMEP, providing a local boost to biodiversity and water quality. Please see Appendix 6-4 for details. As detailed in Chapter 6 Biodiversity, the development has been designed to avoid or mitigate impacts on biodiversity including bats and downstream aquatic receptors.

Environmental Consideration	Do-Nothing Alternative	Chosen Option of developing a renewable energy project
		As detailed in the Collision Risk Assessment (CRA) in Appendix 7-6, the impact of the proposed turbines on birds corresponds to a Low - Very Low effect significance.
Land, Soils & Geology	No excavation of large volumes of peat and spoil	As detailed in the assessment in Chapter 8 Land Soils and Geology, peat, topsoil and subsoil excavation volumes will be managed within the Proposed Wind Farm, and the residual effects on peat, topsoil and subsoil are not significant. Geotechnical investigations followed by careful design will lead to no significant environmental impacts. The peat and spoil management proposals discussed in Chapter 4 Description of the Proposed Project sets out the optimal treatment for peat and spoil excavated/generated on site without creating significant impacts for biodiversity, hydrology, land use etc.
Water	Neutral	As detailed in the assessment in Chapter 9 Water, no significant effects on surface water or groundwater quality will occur.
Air Quality	Will not provide the opportunity for an overall increase in air quality or reduction of greenhouse gasses.	As detailed in Chapter 10, 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	Will not provide the opportunity for a contribution to the reduction of greenhouse gases. No potential to assist in achieving the renewable energy targets set out in the Climate Action Plan 2025.	As detailed in the assessment in Chapter 11 Climate, over the proposed 35-year lifetime of the Proposed Wind Farm, 30,568 tonnes of carbon dioxide per annum will be displaced from traditional carbon-based electricity generation. Over the proposed 35-year lifetime of the Proposed Wind Farm therefore, 1,069,880 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. The addition of an estimated 48.8MW clean energy to the national grid will be a positive contribution to the States renewable energy targets set out in the Climate Action Plan 2025 (CAP25).
Noise & Vibration	No potential for noise impacts on nearby sensitive receptors.	Based on the assessment detailed in Chapter 12 and the mitigation measures proposed, there will be no significant effects on sensitive receptors due to an increase in noise levels

Environmental Consideration	Do-Nothing Alternative	Chosen Option of developing a renewable energy project
		from the Proposed Project during the construction and operational phase.
Landscape & Visual	No potential for effects on visual amenity due to the construction and operation of turbines.	As detailed in Chapter 13, the landscape type and character of the area where the proposed turbines are sited comprises modified working landscape types of low sensitivity and can effectively accommodate wind energy development. Of the 13 no. viewpoints (VPs) assessed 5 no. were deemed not significant, 4 no. were deemed slight, 3 no. were deemed moderate, and 1 no. was deemed significant.
Archaeology, Architectural and Cultural Heritage	No potential for impacts on unrecorded, subsurface archaeology.	As detailed in the assessment in Chapter 14 (Archaeological, Architectural and 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, there will be some not significant to moderate residual indirect effects on monuments and protected structures. However, in reality the effect will be less severe since the ZTV model does not take natural screening and buildings into consideration which will alleviate if not remove the impact on setting altogether.
Material Assets	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 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 detailed 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 highest risk scenarios to the Proposed Project (i.e., contamination and fire/explosion) are considered to be unlikely to occur at any phase of the Proposed Project.

Environmental Consideration	Do-Nothing Alternative	Chosen Option of developing a renewable energy project
		The Proposed Project will be designed and built in accordance with current best practice and, as such, mitigation against the risk of major accidents and/or disasters will be embedded through the design. With the implementation of all mitigation and monitoring measures detailed in the EIAR, there will not be significant residual effects associated with the construction, operation and decommissioning of the Proposed Project,

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

3.2.3 Alternative Site Locations

To ensure that the Levelised Costs of building each Megawatt 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 area of suitable or available land, proximity to a grid connection point and planning policy are all very important, a wind farm project must be commercially viable/competitive, as otherwise it will never attract the necessary project finance required to see it built.

The Site has been identified as having potential for a wind energy development as a result of a nationwide search 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 nationwide 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, access and constructability.

3.2.3.1 Strategic Site Selection

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

As set out in Section 1.3 of this EIAR, the Applicant company, Gannow Ltd., is an associated company of Enerco Energy Ltd., which is an Irish-owned, Cork-based company with extensive experience in the design, construction and operation of wind energy developments throughout Ireland, with projects currently operating or in construction in Counties Cork, Kerry, Limerick, Clare, Galway, Mayo and Donegal. By Q2 2025, Enerco associated companies had over 925 Megawatts (MW) of wind generating capacity in commercial operation and under construction, with a further c.400MW of projects at various stages in its portfolio to assist in meeting Ireland's renewable energy targets. Enerco Energy Ltd. invests a significant amount of time and resources identifying and investigating sites for renewable energy proposals throughout the Country.

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

- **Environmental Sensitivities**: Located outside of EU Natura 2000 sites; locations outside of National designations; Article 17 Annex I 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;
- **Site Scale:** Sufficient area of unconstrained land that could potentially accommodate a wind farm development and turbine spacing requirements.
- **Local Policy:** alignment with the wind energy strategy (i.e., in an area deemed 'open to consideration') of the relevant local authority

The criteria above will be explained further below in so far as they influenced the site selection exercise undertaken.

3.2.3.1.1 *Environmental Sensitivities*

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

The nearest Natura 2000 site to the Proposed Wind Farm, i.e. Special Area of Conservation (SAC) or Special Protection Area (SPA) is the Monivea Bog SAC, which is located approximately 4.3km to the north of the Proposed Wind Farm at its closest point (i.e., T03). The Monivea Bog SAC has many qualifying interests relating to both active and degraded raised bogs. The nearest national designated site, i.e. Natural Heritage Area (NHA) or proposed Natural Heritage Area (pNHA) to the Proposed Wind Farm is the Raford River Bog NHA which is located approximately 0.9km southeast of the Proposed Wind Farm at its closest point (i.e., T08). The Raford River Bog NHA has a key qualifying interest of the presence of peatland that is remanent of a much larger bog that is not reclaimed for agricultural.

The nearest Natura 2000 site to the Proposed Grid Connection is the Monivea Bog SAC, which is located approximately 2.1km to the north of the Proposed Grid Connection at its closest point. The nearest national designated site, i.e. Natural Heritage Area (NHA) or proposed Natural Heritage Area (pNHA) to the Proposed Grid Connection is the Lough Tee Bog NHA which is located approximately 3.5km north of the Proposed Grid Connection at its closest point. The Lough Tee Bog NHA has a key qualifying interest of the presence of raised bog that includes both areas of high bog and cutover bog.

3.2.3.1.2 *Article 17 Annex I Habitat*

Within the Proposed Wind Farm site, Article 17 Annex 1 Active Raised Bog habitat has been identified through assessment of available resources and through comprehensive multi-season site surveys. The Proposed Project has been designed to avoid and/or mitigate any potential effects and therefore there is no Proposed Project infrastructure sited within this area.

A small section of the Article 17 Annex 1 Active Raised Bog is encompassed in 1 no. of the biodiversity management and enhancement proposals for the Proposed Wind Farm, please refer to Appendix 6-4 BMEP and Chapter 6 Biodiversity for further details regarding habitats and proposed enhancement/management measures within the Proposed Wind Farm.

3.2.3.1.3 *Grid Connection*

The Proposed Project intends to connect to the national grid via 38kV underground electrical cabling predominantly along the local and regional road network, as well as private land, from the proposed onsite 38kV substation to the existing Cashla 220kV substation, in the townland of Barrettspark, Co.

Galway. Details regarding potential alternative grid connection options are considered and presented in Section 3.2.6.

3.2.3.1.4 Sensitive Receptors

The Applicant sought to identify an area with a relatively low population density. Having reviewed the settlement patterns in the vicinity, the study area has emerged as suitable to accommodate the Proposed Project. The population density of the Population Study Area in 2022 as described in the Population and Human Health section of this EIAR is 20.28 persons per square kilometre, as described in Chapter 5 of this EIAR. This is considerably lower than the national population densities of 73.27 persons per square kilometre and lower than the population density of County Galway, recorded at 31.43 persons per square kilometre. The proposed turbine positions achieve the recommended setbacks in the Guidelines (DoEHLG, 2006).

The nearest settlement to the proposed turbines is Attymon, located approximately 1km northwest of the nearest proposed turbine (T01) and is classified as a rural node in the settlement hierarchy of the Galway County Development Plan (GCDP)[1].

3.2.3.1.5 Site Scale

The Site, covering a total of 884 hectares, comprises a mix of pastoral agriculture, peatlands, low-density residential, and small-scale commercial forestry and has an elevation range of 65m mOD to 80m mOD. The adjacent land use predominantly comprises the same. The Proposed Wind Farm benefits from existing farm tracks (approx. 3.8km). The Proposed Wind Farm will be easily accessible via a new proposed site entrance off the L3115 local road to the west of the Proposed Wind Farm site. The Site comprises habitats of varying ecological value; please note, all proposed infrastructure maintains appropriate setback distances from sensitive ecological receptors.

As such, with its proximity to grid, accessibility, and achievable setbacks from sensitive receptors, the Site affords a largescale area that is sufficiently unconstrained to accommodate an 8-turbine wind farm development. The constraints and facilitators mapping process is outlined in Section 3.2.5.2.1.

3.2.3.1.6 Local Policy

The Site falls across the administrative area of Galway County Council and therefore, is subject to the planning policies and objectives set out in the Galway County Development Plan 2022-2028 (GCDP).

County Galway's Local Authority Renewable Energy Strategy (LARES) is included as Appendix 1 of the GCDP. The LARES identifies areas within the County according to a hierarchy from the most optimal down to areas not generally considered suitable. There are five categories within the LARES:

- Strategic Areas -
- Acceptable in Principle
- Open To Consideration
- Generally to be Discouraged
- Not Open to Consideration

The proposed turbines are wholly located within an area designated as Open for Consideration (OTC). As outlined in the LARES classification, OTC areas are areas where *"Wind Energy development is likely to be favourable considered - subject to the results of more detailed assessment of polices and potential effects."* Wind turbines located in OTC areas are therefore open to development, subject to conformance with the LARES and the proper planning and sustainable development of the area.

[1] *Galway County Development Plan Chapter 2 – Core Strategy, Settlement Strategy, and Housing Strategy (2022)* <https://consult.galway.ie/en/Chapter2_Core_Strategy_Settlement_Strategy_and_Housing_Strategy.pdf>

Please see section 2.5.4 for further information on the GCDP and County Galway LARES.

3.2.3.1.7 Summary

From the review of the criteria set out above, the Site was identified as a suitable location for the provision of a renewable energy development of the scale proposed. The Proposed Wind Farm site is located on a mix of agriculture-pastoral lands and peatland which allows the Proposed Wind Farm to take advantage of the existing access roads (some of which will be upgraded) and highlights the suitability of the Proposed Wind Farm site as it can make sustainable use of established items of infrastructure. Please note, all required setbacks from sensitive receptors, as set out above, are achievable.

The Proposed Wind Farm site is not located within or adjacent to EU or National protected areas, but please note that Article 17 Active Raised Bog is present within the Proposed Wind Farm site. No infrastructure is proposed within these areas, however as identified above, proposed biodiversity enhancement and management proposals do encompass a portion of this area. These measures include drain blocking in cutover bog outside the identified Article 17 Annex 1 Active Raised Bog and will enable the safeguarding of these areas from peat cutting activities.

From the review of the criteria set out above, the Proposed Grid Connection was identified for the provision of a connection of the Proposed Wind Farm to the national grid. The 38kV underground electrical cabling route is primarily located in the public road corridor with three sections of private land (encompassing both existing private access track and agricultural land) being required.

The Proposed Grid Connection will interact with the Irish Rail Galway-Dublin rail line at 1 no. location, a historic railway no longer in use at 1 no. location, the Gas Networks Ireland (GNI) network at 2 no locations, and the M17 motorway at 1 no. location. At the Irish Rail crossing the Proposed Grid Connection underground cabling route will utilise horizontal directional drilling (HDD). At the historic railway crossing the railway itself is located within a bridge traversing above the public road (L7126), the Proposed Grid Connection underground cable route will remain within the curtilage of the public road and will not adversely affect the integrity of the bridge (See Clifton Scannell Emerson structural report in Appendix 2-1 – Appendix A). Where the Proposed Grid Connection interacts with a GNI high-pressure pipeline, the underground cabling will utilise HDD. Where the Proposed Grid Connection interacts with GNI telecommunication ducts, the underground cabling route will run parallel to the line for approximately 0.16km within the public road corridor (L3103) before turning right onto the L7108. Where the Proposed Grid Connection interacts with the M17 Motorway, the underground cable route will be placed within the local road network (the L31030) which traverses under the M17 motorway via an underpass. Please see Section 15.3.3.1.4 of Chapter 15 Material Assets for further detail. The Applicant has undergone scoping with Irish Rail, GNI, and TII and will hold further consultation prior to any activities around the railway, high-pressure pipeline, and the motorway to ensure no significant impacts occur.

Factoring all required environmental constraints into the project design, a site of considerable scale, with an estimated installed capacity of 48.8MW, and potential to power approximately 35,624 Irish households with renewable energy and displace 30,568 tonnes of carbon dioxide per annum (1,069,880 tonnes over the 35-year operational life) was established. The Site is considered appropriate for wind energy development and represents a positive contribution to National and EU climate action targets.

Once the current Proposed Wind Farm site emerged as a suitable location for the provision of the Proposed Project, the applicants approached the relevant landowners in order to assemble the land necessary for the Proposed Project. Arising from site assembly discussions, the current Site was identified and brought forward as being capable of accommodating a cohesive viable area of sufficient size to cater for the Proposed Project. While the outcome of the site selection process has identified the Site as a suitable location for a renewable energy development of the nature proposed, it does not preclude other sites within the vicinity being brought forward for consideration in the future.

Throughout the design process, the layout of the Proposed Project has been revised and refined to take account of the findings of all desk-based assessments, site surveys/ investigations and baseline assessments which have brought the design from its first initial layout to the current proposed layout; please see Section 3.2.5 below for further details.

3.2.4 Alternative Renewable Energy Technologies

The Proposed Project will be located in a site where peat cutting activities, commercial forestry, and pastoral agriculture will continue to be carried out around the footprint of the Proposed Wind Farm.

Both onshore and offshore wind energy development will be required to ensure Ireland reaches the target set in the Climate Action Plan 2025 (CAP25) to source 80% of our electricity from renewable energy by 2030. It is not a case of 'either' 'or'. CAP25 has set out the following targets for electricity generation:

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

When considering other renewable energy technologies in the area, the Applicant considered offshore wind and commercial solar energy production as an alternative on the Proposed Wind Farm site.

3.2.4.1 Offshore Wind

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

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

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

3.2.4.2 Solar Energy

The Proposed Project will be located on a site where agriculture, peat cutting activities, and small-scale commercial forestry will continue to be carried out around the footprint of the Proposed Wind Farm.

Commercial solar energy production is the harnessing and conversion of sunlight into electricity using photovoltaic (PV) arrays (panels). To achieve the same maximum estimated electricity output from solar energy as is expected from the Proposed Wind Farm (c. 48.8MW), a larger development footprint would be required. As detailed in Section 1.1.1 in Chapter 1, the EIAR Site Boundary encompasses an area of approximately 884ha and the permanent footprint of the Proposed Project measures approximately 7.6ha, which represents approximately 0.9% of 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*'.[2] The capacity factor for wind in this region is 35% (0.35). If solar PV was to be deployed on the Proposed Wind Farm site, it would be located within the Solar Middle region of Ireland as delineated by the EirGrid report. The capacity factor for solar in this region is 14.6% (0.146).

Therefore, for a solar PV array of the scale necessary to provide the same electricity output as the Proposed Wind Farm, it would require a footprint of approx. 76.8 hectares[3] or 9% of the overall Site. In addition, a solar development of this scale, would have a higher potential environmental effect on Traffic and Transport (construction phase), Air Quality (construction phase) and Biodiversity (including Birds) (habitat loss), a greater potential for direct impacts on unknown subsurface archaeology (construction phase) and glint and glare at the Site (operational phase).

Taking into account the factors outlined above, and considering the farming practices in the area, 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 Project at this Site are presented in Table 3-2 below.

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

Environmental	Solar PV Array (with up to 48.8MW Output)	Chosen Option
Population & Human Health (incl. Shadow Flicker)	Relatively lower long-term financial contributions towards the local community (i.e., community benefit fund) on a per MWh basis. Lower potential for noise and vibration effects. Lower potential for visual obstructions in the skyline due to solar farms being low lying structures. No potential for shadow flicker to affect sensitive receptors. Potential for glint and glare impacts on local receptors. Based on the renewable energy outputs associated with solar PV, using solar PV at the Site would	Higher long-term financial contributions towards the local community (i.e., community benefit fund) on a per MWh basis. 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 Project. Greater potential for noise and vibration during construction, operational and decommissioning phases. Greater potential for visual effects during operational phase. No material difference between the two options during construction and decommissioning.

[2] *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>

[3] *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.*

	have a positive effect on human health due to the production of clean renewable energy and the offsetting of emissions (e.g., nitrogen, sulphur dioxide) which are produced from fossil fuel powered sources of electricity.	No potential for glint and glare impacts on sensitive receptors. Based on the assessment included in Chapter 10 and Chapter 11, the Proposed Project will have a long term moderate positive effect on human health due to the production of clean renewable energy and the offsetting of emissions (e.g., nitrogen, sulphur dioxide) which are produced from fossil fuel powered sources of electricity.
Biodiversity (including Birds)	Larger development footprint would result in greater potential habitat loss. No potential for collision risk for birds. Potential for glint and glare impacts 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. The Proposed Project includes for a BMEP, providing a local boost to biodiversity. Please see Appendix 6-4 for details. With the implementation of the mitigation measures described in Chapter 7 Ornithology, the residual effects for collision risk are not significant. No potential for glint and glare impacts on birds.
Land, Soils & Geology	Shallower excavations involved in solar PV array developments would result in reduced volume of spoil to be excavated.	As detailed in the assessment in Chapter 8, there is no loss of peat, topsoil or subsoil as a result of the Proposed Project. Peat, topsoil, and subsoils will be relocated within the Site. No significant effects on peat, topsoil 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.
Water	Shallower excavations involved in solar PV array developments would result in reduced volume of spoil to be excavated, therefore reducing the potential for silt-laden runoff to enter receiving waterbodies.	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.

Air Quality	Increased potential for dust and other noxious emissions due to larger volume of transport movements to and from the Site and larger volume of plant and ground works on site due to the larger footprint.	Reduced potential for dust and other noxious emissions due to smaller volume of plant and ground works on site due to a smaller footprint. As detailed in the assessment in Chapter 10, no significant effects on air quality will occur.
Climate	Reduced capacity factor of solar PV array technology would result in less carbon offset.	Greater capacity factor of wind will result in a higher carbon offset and a shorter carbon payback period. As detailed in the assessment in Chapter 11, over the proposed 35-year lifetime of the Proposed Wind Farm, 1,069,880 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. The addition of an estimated 48.8MW clean energy to the national grid will be a positive contribution to the States renewable energy targets set out in the National Climate Action Plan (CAP25).
Noise & Vibration	Potential for short term noise impacts on nearby sensitive receptors during the construction phase. Larger traffic movements and increased plant on site due to the larger footprint could lead to larger noise and vibration output during the construction phase.	Based on the assessment detailed in Chapter 12 and the mitigation measures proposed, there will be no significant effects on sensitive receptors due to an increase in noise levels from the Proposed Project during the construction and operational phase.
Landscape & Visual	Panelling potentially less visible from surrounding area due to the screening by vegetation and topography.	Greater visibility due to the vertical scale of the proposed turbines. As detailed in the assessment in Chapter 13, the landscape value of the Proposed Wind Farm site is deemed to be of 'Low' value and sensitivity, and the strategic siting of infrastructure will mitigate any potential for landscape and visual effects. Of the 13 no. viewpoints (VPs) assessed 5 no. were deemed not significant, 4 no. were deemed slight, 3 no. were deemed moderate, and 1 no. was deemed significant.
Archaeology, Architectural and Cultural Heritage	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 (Archaeological, Architectural and

		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, there will be some not significant to moderate residual indirect effects on monuments and protected structures. However, in reality the effect will be less severe since the ZTV model does not take natural screening and buildings into consideration which will alleviate if not remove the impact on setting altogether. Archaeological monitoring under licence of the smaller footprint will be implemented during the construction phase.
Material Assets	Potential for greater traffic volumes during construction phase due to the number of solar panels required to achieve the same output. Greater potential for impacts on waste management due to increased plant on site giving rise to increase in hazardous 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 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 incorporating all the mitigation measures will be agreed with the roads authority prior to construction works commencing on site. There will be a positive effect on electricity supply with the provision of an estimated 48.8MW to the national grid and powering of 35,624 Irish households with renewable electricity per year.
Vulnerability of the Project to Major Accidents and Natural Disaster	Larger development footprint would result in a higher risk in relation to major accidents and natural disasters due to increased land disturbance. Lower potential risk in relation to bridge/structural collapse due to the lighter project components required.	As detailed in Chapter 16 the risk of a major accident and/or disaster during the construction of the Proposed Project is considered 'low'. The highest risk scenarios to the Proposed Project (i.e., contamination and fire/explosion) are considered to be unlikely to occur at any phase of the Proposed Project. A detailed risk assessment on potential risks relating to major accidents and natural disasters is provided in Section 16.4.1.6 of Chapter 16 of this EIAR.

While there are positive and negative environmental aspects of both renewable energy development options, neither is likely to have significant adverse effects; however, given the particular suitability of

the Site for wind energy development, the lesser area of land required and the greater positive impact of wind energy generation from a climate and air quality perspective, it was considered the more suitable option and the most efficient method of electricity production with the lesser potential for significant environmental effects.

3.2.5 Alternative Project Design Options

3.2.5.1 Alternative Turbine Numbers and Model

Modern wind turbines have a potential power output in the 4 – 7-megawatt (MW) range. It is proposed to install 8 no. 6.1MW turbines at the Proposed Wind Farm site which will have an estimated installed capacity of 48.8MW. Such a wind farm could also be achieved on the Proposed Wind Farm site by using smaller turbines (for example 2.5 MW machines). However, this would necessitate the installation of over 19 turbines to achieve a similar output. A larger number of smaller turbines would result in the wind farm occupying a greater footprint, with a larger amount of supporting infrastructure being required (i.e., roads etc) and increasing the potential for environmental impacts to occur. The proposed number of turbines takes account of all site constraints and the distances to be maintained between turbines and features such as roads and houses, while maximising the wind energy generating potential of the Proposed Wind Farm. The 8-turbine layout selected for the Proposed Project has the smallest development footprint of the other alternatives considered, while still achieving the optimum output at a more consistent level than would be achievable using different turbines.

The turbine model to be installed on the Proposed Wind Farm site will have an overall ground-to-blade tip height range of 178m – 185m, a rotor diameter range of 149m – 163m, and a hub height range of 101m to 104m. For the purposes of this EIAR a range of turbines within the proposed dimensions has been assessed. The EIAR therefore provides a robust assessment of the turbines that could be considered within the overall development description.

The use of alternative smaller turbines at the Proposed Wind Farm site would not be appropriate as they would fail to make the most efficient use of the wind resource passing over the Proposed Wind Farm site and would potentially require a larger development footprint. This alternative would potentially lead to additional environmental effects.

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

Table 3-3 Comparison of environmental effects when compared to the chosen option (8 wind turbines, higher MW output)

Environmental Considerations	Larger number of smaller turbines	Chosen option of an 8-turbine layout
Population & Human Health (incl. Shadow Flicker)	Greater potential for shadow flicker and noise impacts on nearby sensitive receptors due to the increased number of turbines. However, these can be curtailed to meet threshold criteria. Smaller turbines would be less visually obstructive in the skyline; however, the larger development footprint would spread further across the	There is no potential for significant shadow flicker effects from the proposed turbines. Shadow flicker effects can be mitigated to meet threshold criteria. 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 detailed in Chapter 13, the landscape type and character of the area where the proposed turbines are sited comprises

Environmental Considerations	Larger number of smaller turbines	Chosen option of an 8-turbine layout
	landscape potentially occupying a larger portion of a viewpoint.	modified working landscape types of low sensitivity and can effectively accommodate wind energy development. Of the 13 no. viewpoints (VPs) assessed 5 no. were deemed not significant, 4 no. were deemed slight, 3 no. were deemed moderate, and 1 no. was deemed significant. The number of receptors experiencing these effects is very low as the landscape surrounding the proposed turbines has a significantly low population density. Visual effects will decrease with distance from the proposed turbines. Based on the assessment detailed in Chapter 5 and the mitigation measures proposed, there will be no significant effects on population and human health from shadow flicker and noise and vibration during the construction, operation and decommissioning phases of the Proposed Project.
Biodiversity (including Birds)	Larger development footprint would result in greater potential for 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. As per Chapter 6 of this EIAR, there are no significant long-term negative effects expected on biodiversity receptors. With the implementation of the mitigation measures described in Chapter 7 Ornithology, the residual effects for collision risk are not significant.
Land, Soils, & Geology	Larger development footprint would result in greater volume of spoil to be generated, excavated and sorted. Neutral – Geotechnical investigations followed by careful design would lead to no significant environmental impacts.	As detailed in Chapter 4 and 8, the Proposed Wind Farm has been designed to utilise the existing roads to minimise ground disturbance where possible. 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. Neutral – Geotechnical investigations followed by careful design would lead to no significant environmental impacts.

Environmental Considerations	Larger number of smaller turbines	Chosen option of an 8-turbine layout
		As detailed in the assessment in Chapter 8, no significant effects on peat, topsoil and subsoils will occur.
Water	Neutral – Project design specific drainage design removes the potential for significant environmental effects. Larger development footprint, therefore, increasing the potential for silt-laden runoff to enter receiving waterbodies.	Neutral – Project design specific drainage design removes the potential for significant environmental effects. 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.
Air Quality	Increased potential for vehicle and construction dust emissions due to an increased volume of construction material and turbine component deliveries to the site, giving rise to a reduced air quality locally for the construction phase.	Decreased potential for vehicle emissions and dust emissions due to a decreased volume of construction material and turbine component deliveries to the Site. As detailed in Chapter 10, 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 by during the operational phase.
Climate	Increased potential for vehicle emissions and dust emissions due to an increased volume of construction material and turbine component deliveries to the Site.	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, 1,069,880 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. The addition of an estimated 48.8MW clean energy to the national grid will be a positive contribution to the States renewable energy targets set out in the CAP25.
Noise & Vibration	Potential for increased noise impacts on nearby sensitive receptors due to reduced separation distance between sensitive receptors and turbine locations and additional turbine generators.	Potential for decreased noise levels at nearby sensitive receptors due to increased separation distance between sensitive receptors and turbine locations. Based on the assessment detailed in Chapter 12, there will be no significant

Environmental Considerations	Larger number of smaller turbines	Chosen option of an 8-turbine layout
		effects on sensitive receptors during the construction operational and decommissioning phases from the Proposed Project.
Landscape & Visual	Smaller turbines may be less visually intrusive on the landscape. Equally, a larger number of smaller turbines would be spread over a wider area, taking up a greater portion of a viewpoint	The Proposed Wind Farm is an appropriately designed and suitably scaled project. As detailed in Chapter 13, the landscape type and character of the area where the proposed turbines are sited comprises modified working landscape types of low sensitivity and can effectively accommodate wind energy development. Of the 13 no. viewpoints (VPs) assessed 5 no. were deemed not significant, 4 no. were deemed slight, 3 no. were deemed moderate, and 1 no. was deemed significant.
Archaeology, Architectural and Cultural Heritage	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology. No material difference between the two options for indirect effects on monuments.	No material difference between the two options for indirect effects on monuments. As detailed in the assessment in Chapter 14 (Archaeological, Architectural and 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, there will be some not significant to moderate residual indirect effects on monuments and protected structures. However, in reality the effect will be less severe since the ZTV model does not take natural screening and buildings into consideration which will alleviate if not remove the impact on setting altogether. Archaeological monitoring under licence of the smaller footprint will be implemented during the construction phase.
Material Assets – Traffic and Transport	Potential for greater traffic volumes during construction phase due to larger development footprint and requirement for more construction materials and turbine components.	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 incorporating all the mitigation measures will be agreed with the roads authority

Environmental Considerations	Larger number of smaller turbines	Chosen option of an 8-turbine layout
		prior to construction works commencing on at the Site.
Material Assets- Utilities, Waste Management, Telecommunications and Aviation	No material difference between the two options for gas, water, waste management, telecommunications and aviation.	No material difference between the two options for gas, water, waste management, telecommunications and aviation.
Vulnerability to Major Accidents Natural Disasters	Larger development footprint would result in a higher risk in relation to major accidents and natural disasters due to increased land disturbance and a larger excavation footprint.	As detailed in Chapter 16 the risk of a major accident and/or disaster during the construction of the Proposed Project is considered 'low'. The highest risk scenarios to the Proposed Project (i.e., contamination and fire/explosion) are considered to be unlikely to occur at any phase of the Proposed Project. A detailed risk assessment on potential risks relating to major accidents and natural disasters is provided in Section 16.4.1.6 of Chapter 16 of this EIAR.

For the reasons set out above, the proposal for an 8-no. turbine layout with larger turbine was considered to have the least amount of environmental effects when compared to a larger number of smaller turbines.

3.2.5.2 Alternative Turbine Layout and Development 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 and geotechnical, landscape and archaeological specialists and traffic consultants. The aim being to reduce potential for environmental effects while designing a project capable of being constructed and viable.

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

3.2.5.2.1 *Constraints and Facilitators Mapping*

The design and layout of the Proposed Project follows the recommendations and guidance set out in the Guidelines (DoEHLG, 2006) and the *'Best Practice Guidelines for the Irish Wind Energy Industry'* (Irish Wind Energy Association, 2012).

The Guidelines (DoEHLG, 2006) were the subject of a targeted review. The proposed changes to the assessment of impacts associated with onshore wind energy developments were outlined in the Draft Revised Wind Energy Development Guidelines (hereafter the Draft Guidelines (DoEHLG, 2019). The proposed changes presented in the Draft Guidelines (DoHPLG, 2019) give certain focus on the setback distance from residential properties, along with shadow flicker and noise requirements relative to

sensitive receptors. The consultation on the Draft Guidelines (DoHPLG, 2019) closed on 19th February 2020, but at time of writing, they have not yet been adopted, and the Guidelines (DoEHLG, 2006) remain the relevant guidelines for the purposes of Section 28 of the Act. Please see Section 1.2.2 of Chapter 1 for further information on the wind energy development guidelines.

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 using guidance presented in the Guidelines (DoEHLG, 2006). Should the Draft Guidelines (DoHPLG, 2019) be adopted in advance of a decision being made on this planning application, the Proposed Project will be capable of achieving the requirements of the Draft Guidelines (DoHPLG, 2019) as currently proposed.

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

- **Sensitive Receptors:** a minimum 500m setback from all sensitive receptors achieving the Guidelines (DoEHLG, 2006) recommended setback of 500m;
- **Designated sites:** Natura 2000 sites plus 100-metre buffer;
- **Telecommunications:** Telecommunication Links plus operator specific buffer;
- **Hydrology:** Watercourses plus 50-metre buffer.
- **Archaeology:** Archaeological Sites or Monuments: 30-metre buffer, plus 'Zone of Notification' as required by the National Monuments Service (ROI) There are two recorded monuments within the Proposed Wind Farm site.
- **Habitats and Biodiversity:** Bat roost plus 200m plus blade length buffer. Siting of infrastructure so as to minimise loss of habitats of Local Importance (higher value) and higher. Avoidance of Article 17 Active Raised Bog.

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

- Available lands for development;
- Acceptable wind resource;
- General accessibility of all areas of the site due to existing road infrastructure; and
- Limited extent of constraints.

The inclusion of the constraints on a map of the Proposed Wind Farm site allows for a viable area to be identified. An initial turbine layout is then developed to take account of all the constraints mentioned above and their associated buffer zones and the separation distance required between the turbines. Following the mapping of all known constraints, detailed site investigations were carried out by the project team.

The ecological assessment of the Proposed Wind Farm site encompassed habitat mapping and extensive surveying of birds and other fauna. This assessment, as described in Chapters 6 and 7 of this EIAR on Biodiversity and Ornithology, optimised the decision on the siting of turbines and the carrying out of any development works, such as the construction of roads.

The hydrological and geotechnical investigations of the Proposed Wind Farm site examined the proposed locations for turbines, roads and other components of the Proposed Project, such as the temporary construction compounds. 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 turbine layout for the Proposed Wind Farm site has also been informed by the results of noise assessments, landscape and visual and the separation distance to be maintained between turbines. Thus, the baseline environmental assessment of the Proposed Wind Farm 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.

Raford River Bog NHA

Map Legend

EIAR Site Boundary

Galway Article 17 Habitats 2020

Active Raised Bog

Designated Sites

NHA

NHA 100m Buffer

Water

Watercourse

50m Watercourse Buffer

Cultural Heritage

National Monuments

National Monuments 50m Buffer

Sensitive Receptors

Sensitive Receptors

Minimum 500m Setback from Sensitive Receptors

Material Assets

Irish Rail Railway

Irish Rail 203.5m Buffer

Telecoms Links

Telecoms Buffer

Drawing Title
Constraints and Facilitators

Project Title
Gannow Renewable Energy Development

Drawn By	Checked By
CJ	EC
Project No.	Drawing No.
240323	Figure 3-1
Scale	Date
1:14,000	2025-09-12

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

3.2.5.2.2 *Alternative Proposed Wind Farm Design Iterations*

The final design of the Proposed Wind Farm, including the proposed turbine layout, takes account of all identified site constraints. The layout is based on the results of all site investigations that have been carried out during the EIAR process and the EIA scoping process with statutory and non-statutory consultees. As information regarding the Proposed Wind Farm 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 in which no turbines could be located. The selection of the turbine number and layout has also had regard to wind-take and the separation distance to be maintained between turbines, as well as landscape and visual, noise and shadow flicker impacts. The EIAR and Proposed Wind Farm design process was an iterative process, where findings at each stage of the assessment were used to further refine the design, always with the intention of minimising the potential for environmental impacts.

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

There were a number of reviews by the wind farm design team of the specific locations of 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. Please refer to Figure 3-2 to Figure 3-5 to see the evolution of the turbine layout for the Proposed Wind Farm throughout the design process.

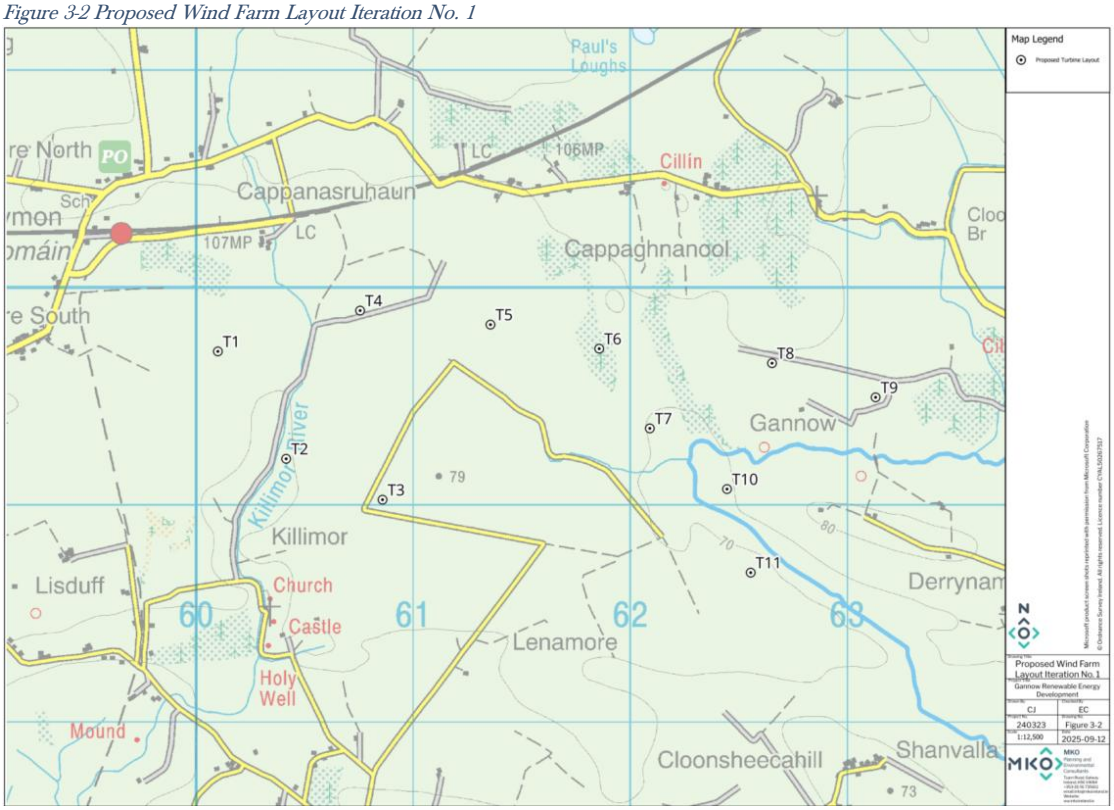
Proposed Wind Farm - Layout Iteration No. 1

Iteration No.1 as shown in Figure 3-2 below is the initial turbine layout which was based on a preliminary constraint mapping exercise and identification of a viable area for turbine siting. A larger viable area for the 11 no. turbine layout was identified within the overall study area during the constraints mapping process. It was determined that it would be more environmental sensitive and efficient to allow for fewer turbines and a larger turbine model within this area.

Upon review of desk-based constraints in relation to the layout, the following amendments were made to the 11-turbine layout:

- T03, T07, and T011 were removed from the turbine layout; turbines underwent renumbering
- Ancillary infrastructure proposed:
  - Turbine foundations and hardstands
  - Proposed roads (new and upgrades to existing)
  - Proposed onsite 110kV substation
  - 1 no. temporary construction compound
  - 1 no. permanent met mast

Figure 3-2 Proposed Wind Farm Layout Iteration No. 1

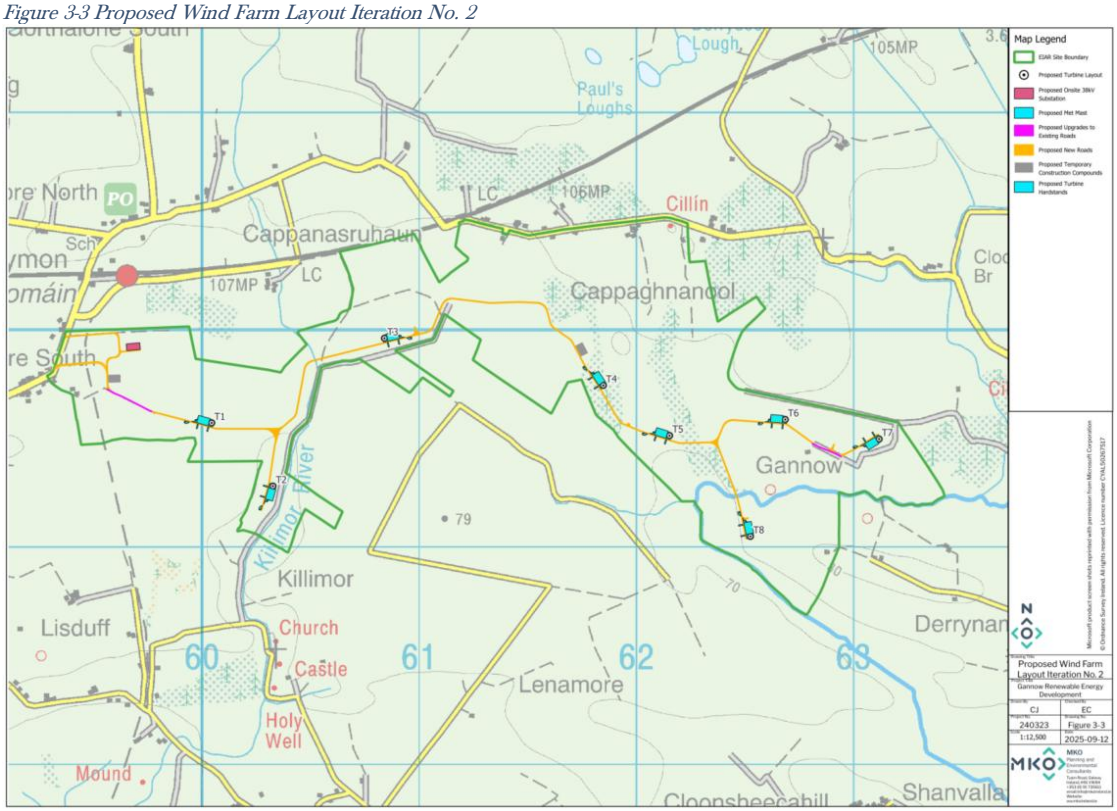


Proposed Wind Farm– Layout Iteration No. 2

Iteration No. 2, which is presented in Figure 3-3 below, comprised 8 no. turbines, hardstands, access roads, a 38kV onsite substation, and 2 temporary construction compounds. Iteration No. 2 is the refined turbine layout which was based on updated constraints mapping exercise and identification of a viable area for siting of turbines, following desktop and in-field review by the design team. Constraints that were considered include relevant setback from dwellings (500m from all dwellings), setback from National Monuments plus 30m buffer, setback from natural watercourses plus 50m buffer, and avoidance of ecologically sensitive and designated habitats.

Layout Iteration No. 2 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 Proposed Wind Farm site.

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



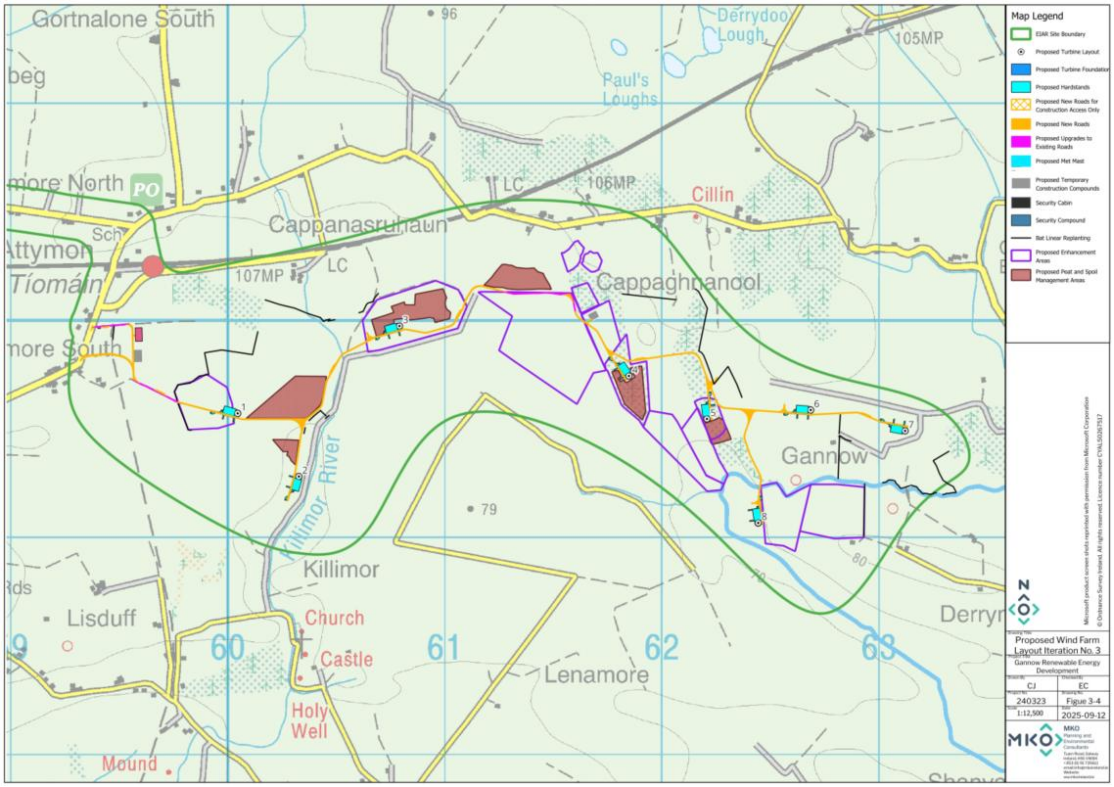
Proposed Wind Farm Layout Iteration No. 3

Iteration No. 3 which is presented in Figure 3-4 below comprised of 8 No. turbines and associated foundations and hardstands, 1 no. meteorological (met) mast options, 2 no. temporary construction compounds, and 1 no. onsite 38kv substation location. Iteration No. 3 was subject to detailed investigations which led to further refinement of the layout. These investigations included habitat mapping, intrusive site investigation surveys, ecological surveying, and hydrological investigations of the proposed layout.

For Iteration No. 3 the following changes were made:

- The position of the 38kV Substation was optimised to align with the internal road network
- Temporary access track for abnormal load delivery was proposed off the L3115 to ensure appropriate turning radii and sight lines for abnormal load delivery
- T03 hardstand orientation was altered to avoid marsh fritillary supporting habitat
- Additional temporary construction compound was proposed
- Met mast proposed within one of the proposed temporary construction compounds
- T05 moved east to avoid sensitive ecological receptors
- T07 hardstand orientation was altered to accommodate the proposed new road realignment
- T08, along with associated hardstands and the road layout, were relocated to the west to avoid marsh fritillary supporting habitat
- The road layout was realigned to avoid sensitive ecological receptors.
- Peat and spoil management areas were proposed
- Biodiversity enhancement areas (inclusive of linear replanting for bats) were proposed

Figure 3-4 Proposed Wind Farm Layout Iteration No. 3



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

Iteration No. 4, as presented in Figure 3-5, comprises 8 no. turbines with a maximum overall ground-to-blade tip height range of 178m – 185m, a rotor diameter range of 149m – 163m, and a hub height range of 101m to 104m, one met mast (30m), 2 no. temporary construction compounds, and one onsite 38kV substation.

Initially, the Applicant considered upgrading and utilising an existing farm access off the L3115 local road to the west of the Site as the site access point for all construction and operational phase activities, with all abnormal load deliveries entering the Site via a temporary access approximately 0.16m south of the existing entrance along the L3115. Upon review, this option was deemed inappropriate from a traffic management perspective. Therefore, a new access point off the L3115 local road was proposed in order access the Proposed Wind Farm site for all vehicles and delivery required in the construction, operation, and decommissioning phase of the Proposed Project.

The internal road layout was also finalised as part of this Proposed Layout Iteration. The proposed new site entrance was redesigned in order to facilitate the ingress of construction traffic off the L3115 Local Road and to facilitate all turbine infrastructure deliveries. This section of road was designed in order to allow construction traffic to exit the L3115 Local Road safely, turning right only into the Proposed Wind Farm, and to safely facilitate the delivery of turbine components. Further detail on the above is included in Section 4.5.1 Chapter 4 of the EIAR.

As part of the final design iteration, enhancement and replanting measures were finalised in order to ensure that the Proposed Project had a positive effect on local biodiversity. Measures such as hedgerow replanting, native woodland replanting, and habitat enhancement for marsh fritillary have been proposed as part of the Proposed Wind Farm, with further details being available in Appendix 6-4 BMEP.

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 Wind Farm layout as presented in Figure 3-5 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.

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

Figure 3-5 Proposed Wind Farm Layout Iteration No. 4 - Final Proposed Wind Farm Layout

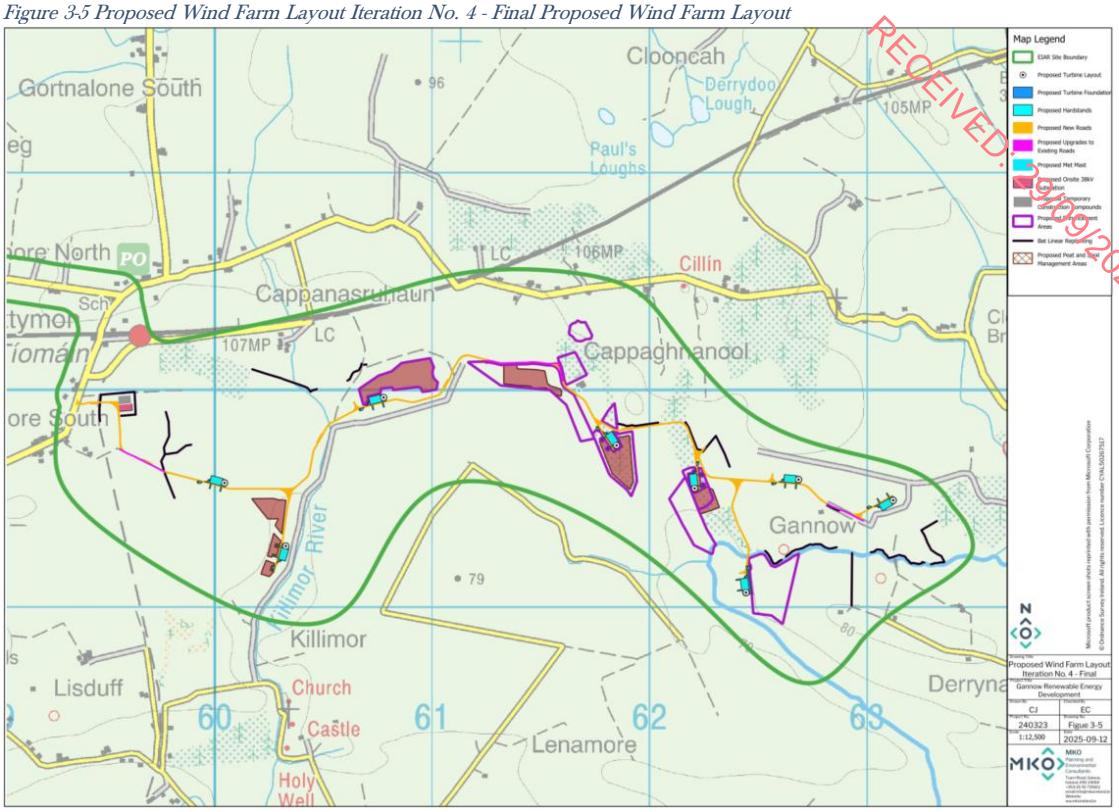


Table 3-4 - Comparison of environmental effects of the Proposed Wind Farm layout when compared to the chosen option.

Environmental Consideration	Initial Proposed Wind Farm Layout Iterations and all associated Infrastructure	Chosen Option of the Final 8 Turbine Layout and all associated infrastructure
Population & Human Health (incl Shadow Flicker)	Likely potential for increased shadow flicker impacts on nearby sensitive receptors due to the increased number of turbines in Proposed Wind Farm Layout Iteration no. 1 (11 turbine layout). Shadow flicker effects would likely be similarly for Proposed Layout Iteration No. 2 and 3 (8 turbine layout).	There is no potential for significant shadow flicker effects from the proposed turbines. Shadow flicker effects can be mitigated to meet threshold criteria. 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 detailed in Chapter 13, the landscape type and character of the area where the proposed turbines are sited comprises modified working landscape types of low sensitivity and can effectively accommodate wind energy development. Of the 13 no. viewpoints (VPs) assessed 5 no. were deemed not significant, 4 no. were deemed slight, 3 no. were deemed moderate, and 1 no. was deemed significant. The number of receptors

Environmental Consideration	Initial Proposed Wind Farm Layout Iterations and all associated Infrastructure	Chosen Option of the Final 8 Turbine Layout and all associated infrastructure
		experiencing these effects is very low as the landscape surrounding the proposed turbines has a significantly low population density. Visual effects will decrease with distance from the proposed 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 and noise and vibration during the construction, operation and decommissioning phases of the Proposed Project.
Biodiversity (including Birds)	Larger development footprint would result in greater potential habitat loss in Proposed Wind Farm Layout Iteration no. 1 (11 turbine layout). Greater potential impact on identified sensitive ecological receptors due to location of infrastructure within designated set-back buffers for marsh fritillary and Article 17 Annex 1 habitat in Proposed Wind Farm Layout Iteration no. 1, 2, and 3	As detailed in Chapter 6 Biodiversity, the development has been designed to avoid or mitigate impacts on biodiversity including bats and downstream aquatic receptors. The Proposed Project includes for a BMEP, providing a local boost to biodiversity. Please see Appendix 6-4 for details. As detailed in Chapter 7, the Collision Risk Assessment (CRA) indicated that the impact of the Proposed Wind Farm on birds corresponds to a **Low - Very Low** effect significance. With the implementation of the mitigation measures described in Chapter 7 Ornithology, the residual effects for collision risk are not significant.
Land, Soils & Geology	Greater potential impact on peat, topsoil, and subsoil due to location of infrastructure for Proposed Wind Farm Layout Iteration no. 1 (11 turbine layout). Potential impact on identified peat, topsoil and subsoils is neutral for Proposed Wind Farm Layout Iteration no. 2 and 3 (8 turbine layout). Larger development footprint would result in greater volume of	As detailed in the assessment in Chapter 8, peat, topsoil and subsoil excavation volumes will be managed within the Proposed Wind Farm, and the residual effects on peat, topsoil and subsoil are not significant. Geotechnical investigations followed by careful design will lead to no significant environmental impacts. Geotechnical investigations followed by careful design would lead to no significant environmental impacts.

Environmental Consideration	Initial Proposed Wind Farm Layout Iterations and all associated Infrastructure	Chosen Option of the Final 8 Turbine Layout and all associated infrastructure
	spoil to be generated, excavated and sorted. Geotechnical investigations followed by careful design would lead to no significant environmental impacts.	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.
Water	Larger footprint would result in a greater potential for silt-laden runoff to enter natural watercourses within and around the site for Proposed Wind Farm Layout Iteration no. 1 (11 turbine layout). Potential for runoff is neutral for Proposed Wind Farm Layout Iteration no. 2 and 3 (8 turbine layout). Increased potential for impacts on groundwater schemes due to the location of infrastructure. Project design specific drainage design removes the potential for significant environmental effects.	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.
Air Quality	Increased potential for impacts on air quality due to an increased vehicles emissions and dust emissions due to an increased volume of material and turbine component deliveries to the site during the construction phase for Proposed Wind Farm Layout Iteration no. 1 (11 turbine layout). Air quality emission effects are neutral for Proposed Wind Farm Layout Iteration no. 2 and 3 (8 turbine layout).	As detailed in Chapter 10, 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 by during the operational phase.
Climate	A larger number of turbines could result in a greater amount of exhaust emissions from construction vehicles and plant and the transport of materials and workers to/from the Site for Proposed Wind Farm Layout Iteration no. 1 (11 turbine layout).	As detailed in the assessment in Chapter 11 Climate, over the proposed 35-year lifetime of the Proposed Wind Farm, 1,069,880 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. The addition of an estimated 48.8MW clean energy to the national grid will be a positive

Environmental Consideration	Initial Proposed Wind Farm Layout Iterations and all associated Infrastructure	Chosen Option of the Final 8 Turbine Layout and all associated infrastructure
	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 (11 turbines). Climate related emission effects (losses and savings) are neutral for Proposed Wind Farm Layout Iteration no. 2 and 3 (8 turbine layout).	contribution to the States renewable energy targets set out in CAP25.
Noise & Vibration	A larger number of turbines could have a greater noise impact for Proposed Wind Farm Layout Iteration no. 1 (11 turbine layout). The noise impacts are neutral for Proposed Wind Farm Layout Iteration no. 2 and 3 (8 turbine layout).	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.
Landscape & Visual	A larger number of turbines could have a greater visual impact for Proposed Wind Farm Layout Iteration no. 1 (11 turbine layout). Greater potential impact on visual receptors due to location of infrastructure within designated set-back buffers for Proposed Wind Farm Layout Iteration no. 1, 2, and 3	The smaller number of proposed turbines layout ensures a setback greatly in excess of the required setback set out in the Guidelines (DoEHLG, 2006). As detailed in Chapter 13, the landscape type and character of the area where the proposed turbines are sited comprises modified working landscape types of low sensitivity and can effectively accommodate wind energy development. Of the 13 no. viewpoints (VPs) assessed 5 no. were deemed not significant, 4 no. were deemed slight, 3 no. were deemed moderate, and 1 no. was deemed significant.
Archaeology, Architectural and Cultural Heritage	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology for Proposed Wind	As detailed in the assessment in Chapter 14 (Archaeological, Architectural and Cultural Heritage), there will be no significant direct or indirect effects on known or unknown

Environmental Consideration	Initial Proposed Wind Farm Layout Iterations and all associated Infrastructure	Chosen Option of the Final 8 Turbine Layout and all associated infrastructure
	Farm Layout Iteration no. 1 (11 turbine layout). Potential views of additional turbines increases the potential for indirect effects on the setting of monuments, as it is more likely that greater numbers of turbines will be seen from monuments for Proposed Wind Farm Layout Iteration no. 1. The cultural heritage impacts are neutral for Proposed Wind Farm Layout Iteration no. 2 and 3 (7 turbine layout).	archaeology and cultural heritage during the construction, and decommissioning phases. During the operational phase, there will be some not significant to moderate residual indirect effects on monuments and protected structures. However, in reality the effect will be less severe since the ZTV model does not take natural screening and buildings into consideration which will alleviate if not remove the impact on setting altogether. Archaeological monitoring under licence will be implemented during the construction phase.
Material Assets – Traffic and Transport	Potential for greater traffic volumes during construction phase due to larger development footprint and requirement for more construction materials and turbine components for Proposed Wind Farm Layout Iteration no. 1. Traffic impacts are neutral for Proposed Wind Farm Layout Iteration no. 2. Use of existing site entrance and proposed temporary site entrance for turbine delivery has the potential for greater traffic impacts on the L3115 local road for Proposed Wind Farm Layout Iteration no. 3.	As detailed in Chapter 15, there will be no significant effect on traffic volumes during the construction phase of the Proposed Project. A detailed Traffic Management Plan incorporating all the mitigation measures will be agreed with the roads authority prior to construction works commencing on site.
Material Assets- Utilities, Waste Management, Telecommunications and Aviation	No material difference between the Proposed Wind Farm layout Iteration no. 1, 2 and 3 for gas, water, waste management, telecommunications and aviation.	No material difference between the Proposed Wind Farm layout Iteration no. 1, 2 and 3 for gas, water, waste management, telecommunications and aviation.
Vulnerability to Major Accidents Natural Disasters	A larger number of turbines could have a greater potential risk relating to major accidents and natural disasters for Proposed	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

Environmental Consideration	Initial Proposed Wind Farm Layout Iterations and all associated Infrastructure	Chosen Option of the Final 8 Turbine Layout and all associated infrastructure
	Wind Farm Layout Iteration no. 1 (11 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. 2 and 3 (8 turbine layout).	risk scenarios to the Proposed Project (i.e., contamination and fire/explosion) are considered to be unlikely to occur at any phase of the Proposed Project. A detailed risk assessment on potential risks relating to major accidents and natural disasters is provided in Section 16.4.1.6 of Chapter 16 of this EIAR.

3.2.5.3 Alternative Road Layout

Access tracks are required onsite in order to enable transport of infrastructure and construction materials within the Proposed Wind Farm and to facilitate the Proposed Grid Connection. Such tracks must be of a gradient and width sufficient to allow safe movement of equipment and vehicles. Approximately 6.6km of new road are required for the Proposed Project along with approximately 2.4km of existing road. Approximately 6km of proposed new road and 0.8km of existing road is located within the Proposed Wind Farm site and will require upgrading/widening to facilitate the movement of abnormal loads through the Proposed Wind Farm site. Approximately 0.5km of proposed new road and 1.6km of existing road is located in private land along the Proposed Grid Connection and will be constructed/upgraded in line with ESB standards.

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 and existing tracks and filtering out the physical and environmental constraints of the Proposed Wind Farm and Proposed Grid Connection and the associated buffers, and utilising the most efficient route between turbines in order to minimise the footprint. Additionally, turning areas were designed and sited for minimum environmental effect along internal roads.

An alternative option to making use of the existing road network where possible within the Proposed Wind Farm would be to construct all new roads, having no regard to existing roads or tracks. This approach was not favoured, as it would require unnecessary disturbance to the Site and create the potential for additional cut and fill material to be used in the construction of new roads.

3.2.5.4 Deliveries of Material from Nearby Quarries

In order to facilitate the construction of the Proposed Project, materials will need to be imported from nearby quarries. The quarries that could potentially provide stone and concrete for the Proposed Project are as follows;

1. *Esker Readymix Quarry – Stone & Concrete*
2. *Cannon Concrete Products Limited - Concrete*
3. *Coshla Quarries – Stone & Concrete*
4. *Roadstone Kilchreest – Stone & Concrete*

The locations of these quarries and Ready-Mix Concrete (RMC) batching plants together with the routes to the Site are shown in Figure 4-26 of Chapter 4. Deliveries of stone and ready-mix concrete for use in construction of the Proposed Wind Farm and Proposed Grid Connection, are discussed in further detail in Chapter 15 of this EIAR.

An initial review of the Proposed Wind Farm site following all site investigation works was carried out to determine if it would be feasible to provide onsite borrow pits as an alternative to sourcing materials from nearby quarries. The use of onsite borrow pits would eliminate the need to transport large volumes of construction material along the local public road network to the Site. However, when considering the characteristics of the Proposed Wind Farm site, including topography, ground conditions, and surface features, it was determined that onsite borrow pits would not be feasible as they would create a larger local impact than the traffic generation associated with deliveries of materials from off-site sources to the Site.

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

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

Environmental Consideration	Obtaining all stone from onsite borrow pits	Chosen Option of obtaining all stone material offsite (Deliveries of Materials from Nearby Quarries)
Population & Human Health	Less potential for impact on residential amenity when compared to quarries, due to vehicular and dust emissions from additional traffic associated with movement of material on and off-site. Potential for increased impact on residential amenity due to increased noise and dust emissions associated with excavation of material at onsite borrow pits.	Potential for increased impact on residential amenity due to increased vehicular and dust emissions from increased traffic movements. 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. Based on the assessment detailed in Chapter 5 and the mitigation measures proposed, there will be no significant effects on residential amenity from the Proposed Project.
Biodiversity (including Bids)	Larger development footprint which would result in larger amounts of habitat loss due to onsite excavations.	No borrow pit exaction therefore no habitat loss. As detailed in Chapter 6, the development has been designed to avoid or mitigate impacts on biodiversity.
Land, Soils & Geology	Potential for increased impact on lands, soils and geology due to excavation of material at onsite borrow pits.	No borrow pit exaction therefore no impact on land, soils and geology. As detailed in the assessment in Chapter 8, no significant effects on peat, topsoil 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.

Environmental Consideration	Obtaining all stone from onsite borrow pits	Chosen Option of obtaining all stone material offsite (Deliveries of Materials from Nearby Quarries)
Water	A drainage plan for onsite borrow pits would be required to be incorporated into project drainage design.	No borrow pit therefore no requirement for drainage from onsite borrow pits to be incorporated into Proposed Project drainage design. As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur.
Air Quality	Potential for less vehicular exhaust emissions and dust emissions if all stone was sourced onsite compared to delivery of stone to the Site. Potential for increased exhaust and dust emissions from excavation activities associated with the extraction of material from an onsite borrow pit.	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. As detailed in the assessment in Chapter 10, no significant effects on air quality will occur.
Climate	Potential for less vehicular exhaust emissions if all stone was sourced onsite compared to delivery of stone to the Site. Potential for increased exhaust emissions from excavation activities associated with the extraction of material from an onsite borrow pit.	Potential for increased greenhouse gas emissions, along the construction haul route, due to increased traffic associated with delivery of material. As detailed in the assessment in Chapter 11, no significant effects on climate will occur. Over the proposed 35-year lifetime of the Proposed Wind Farm, 1,069,880 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation.
Noise & Vibration	Potential for increased noise and vibration impacts on nearby sensitive receptors due to excavation of material from onsite borrow pits. Potential during construction phase of reduced noise and vibration impacts on nearby sensitive receptors due to reduced traffic movements.	Potential during construction phase for reduced noise impacts on nearby sensitive receptors due to the absence of excavation of material from onsite borrow pits. Potential during construction phase for increased noise and vibration impacts on nearby sensitive receptors due to increased traffic movements. Based on the assessment detailed in Chapter 12 and the mitigation measures proposed, there will be no significant effects on sensitive receptors due to an increase in noise levels from the Proposed Project, during the construction phase.

Environmental Consideration	Obtaining all stone from onsite borrow pits	Chosen Option of obtaining all stone material offsite (Deliveries of Materials from Nearby Quarries)
Landscape & Visual	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.	During the construction phase, potential for increased visual effects on nearby residential receptors due to increased HGV traffic delivering construction material from local authorised quarries. No effect on landscape and visual during the operational phase.
Archaeology, Architectural and Cultural Heritage	Larger development footprint, therefore increasing potential for impacts on sub-surface archaeology	No borrow pit excavation onsite, therefore no potential for additional potential impacts on sub surface archaeology. As detailed in the assessment in Chapter 14, the significance of direct effects will be not significant - moderate and no significant direct or indirect impacts on known and unknown subsurface archaeology during the construction, operational and decommissioning phase as a result of obtaining all stone material offsite.
Material Assets	Less potential for impact on public road network and users compared to delivery all stone to the Site which would give rise additional traffic.	Increased potential for impact on public road network compared to the development of an on-site borrow pit however as detailed in Chapter 15 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 incorporating all the mitigation measures will be agreed with the roads authority prior to construction works commencing on site.
Vulnerability of Major Accidents and Natural Disasters	No material difference between the two options.	No material difference between the two options.

3.2.5.5 Alternative Turbine Component Delivery Option

With regard to the selection of a transport or haul route to the Site, alternatives were considered in relation to ports of entry, turbine components, general construction-related traffic, and site access locations.

3.2.5.5.1 *Alternative Ports of Entry*

The ports considered for the port of entry of wind turbine components into Ireland for the Proposed Wind Farm site include, Dublin Port, Shannon-Foynes Port, County Limerick, Cork and the Port of Galway. Shannon Foynes Port is the principal deepwater facility on the Shannon Estuary and caters for dry bulk, break bulk, liquid, and project cargoes. The Port of Galway also offers a roll-on roll-off procedure to facilitate import of wind turbine components. All of the aforementioned ports have been used for the importing of turbine components. As stated, all ports mentioned above have a proven track record in the handling and subsequent transport of large turbine components. The final selection will be driven by commercial, availability and scheduling considerations. There are clear access routes for all four ports utilising the motorway network to the proposed haul route to the Site. For the purpose of this EIAR, the Port of Galway, Co. Galway was selected as the port of entry for the proposed turbines and has been assessed in detail in Chapter 15 of this EIAR.

3.2.5.5.2 *Alternative Component Delivery Route*

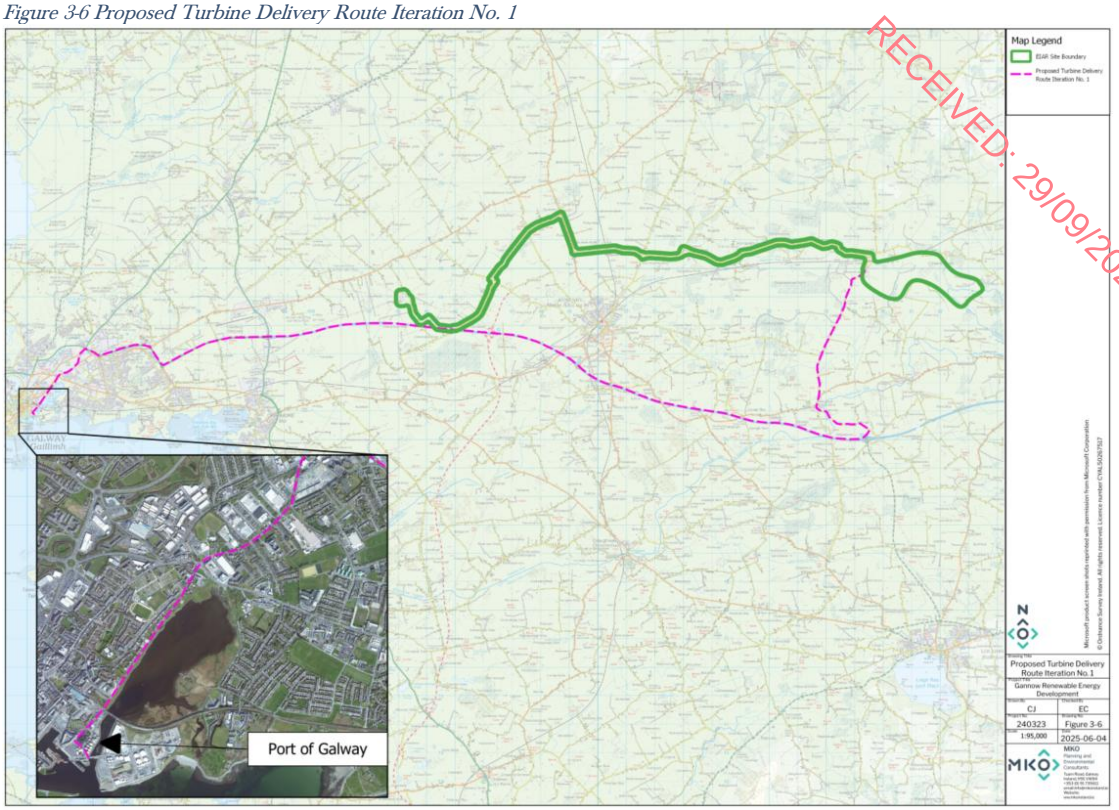
The Site is located approx. 11km northeast of the M6/R348 junction and, as such, delivery of turbine components from this direction were considered as part of the iterative design process for the Proposed Project.

Key considerations in determining the turbine delivery route are road widening requirements, modifications to street furniture, vertical alignment of roads, and structural assessments of road infrastructure due to the abnormal loads of wind turbine components. A desktop analysis was undertaken using identified constraints to identify 3 no. potential routes from the Port of Galway to the Proposed Wind Farm site entrance. Please refer to Figure 3-6 to Figure 3-8 to see the proposed turbine delivery route options for the Proposed Wind Farm.

Proposed Turbine Delivery Route Iteration No. 1

Proposed Turbine Delivery Route Iteration No. 1 involved the delivery of turbine components from the Port of Galway in Co. Galway to the Proposed Wind Farm. The route involved the National Road network (N6) the motorway network (M6), the regional road network (R339, R336, R348), and the local road network (L5048, L5034, L7182, L3115). The turbine delivery route would exit M6 motorway at Junction 16 towards Portumna/Loughrea. After exiting the M6 the turbines will travel northwest for 2.4km along the L7182 local road before turning right onto the R348 regional road. The turbine delivery vehicles will travel north on the R348 regional road for 0.5km before merging onto the L3115 local road and travelling north for approximately 4.9km to the Proposed Wind Farm site entrance. This route was screened out due to the high degree of works that would be required to facilitate a turbine blade transport vehicle.

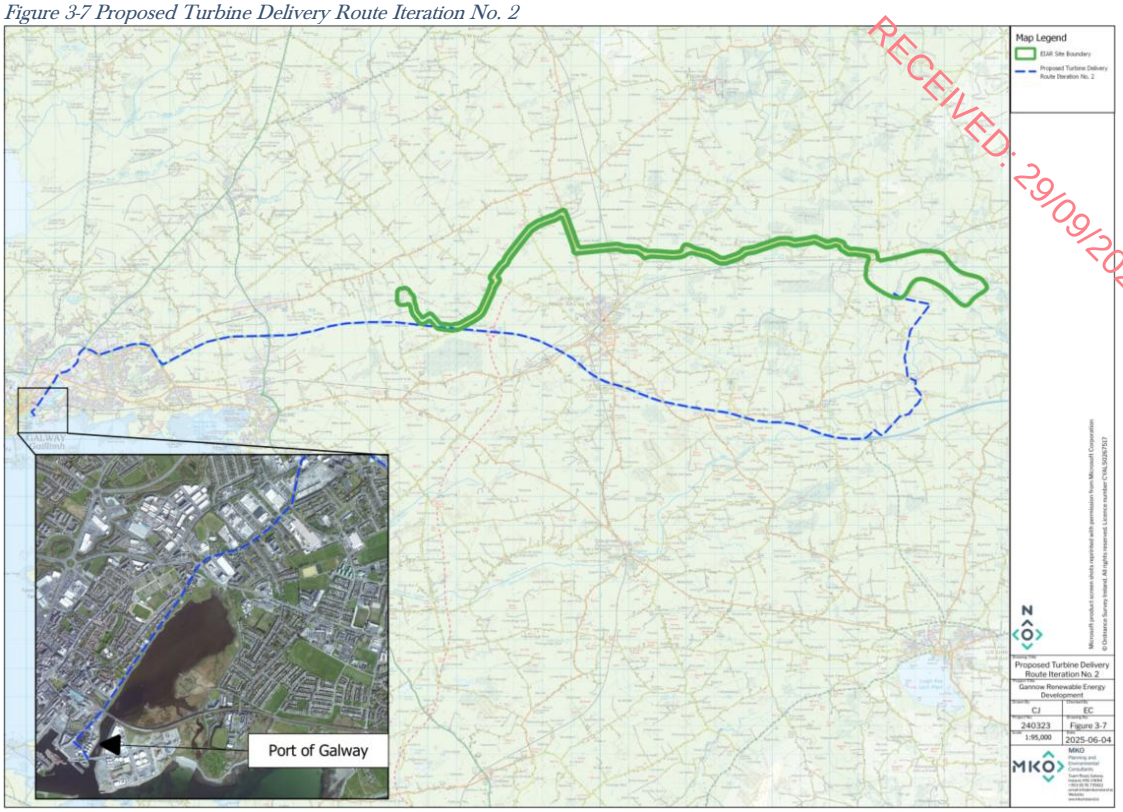
Figure 3-6 Proposed Turbine Delivery Route Iteration No. 1



Proposed Turbine Delivery Route Iteration No. 2

Proposed Turbine Delivery Route Iteration No. 2 involved the delivery of turbine components from the Port of Galway in Co. Galway to the Proposed Wind Farm. The route involved the National Road network (N6) the motorway network (M6), the regional road network (R339, R336, R348), and the local road network (L5048, L5034, L7183, L7184, L7168, L7169). The turbine delivery route would exit M6 motorway at Junction 16 towards Portumna/Loughrea. After exiting the M6 the turbines will travel northeast for 1.5km along the L7183 local road before turning right onto the L7184 local road. The turbines will travel north for 1.8km along the L7184 local road before turning left onto the R348 regional road. The turbine delivery vehicles will travel north on the R438 regional road for 0.3km before turning right onto the L7168 local road. After 1.3km on the L7168, the turbine delivery route would merge onto the L7169 and continue north for 2.5km to the Proposed Wind Farm site. Proposed Turbine Delivery Route Iteration No. 2 would require an additional site entrance to the southwest of the Proposed Wind Farm site. proposed turbine delivery vehicles would utilise the L7169 which traverses through the Proposed Wind Farm site for the delivery of turbine blades and other ancillary infrastructure. turn left into a . This route was screened out due to the high degree of works that would be required to facilitate a turbine blade transport vehicle as well as the requirement for an additional site entrance.

Figure 3-7 Proposed Turbine Delivery Route Iteration No. 2



Proposed Turbine Delivery Route Iteration No. 3 – Final Proposed Turbine Delivery Route

The chosen proposed turbine delivery route will exit off the M6 at Junction 17 towards Athenry/Craughwell. After exiting the M6 the turbines will travel north for 1.3km along the R348 regional road before turning south and traveling in a southeastern direction for 9.2km along the R348 regional road. The turbine delivery vehicles will then turn left onto the L3115 local road and travel north for approximately 5.2km to the proposed site entrance which will facilitate abnormal load delivery (detailed in Section 4.5.1 in Chapter 4).

After review by the Traffic Consultant and subsequent autotrack assessment, it was concluded that this route is the optimal route for delivery of abnormal loads from the Port of Galway to the Proposed Wind Farm. As per the assessment in Chapter 15, the turbine delivery route has been subject to an autotracks assessment which show that significant accommodation works are not required along the delivery route itself, and the proposed new entrance off the L3115 to the west of the Site is sufficient for the delivery of abnormal loads.

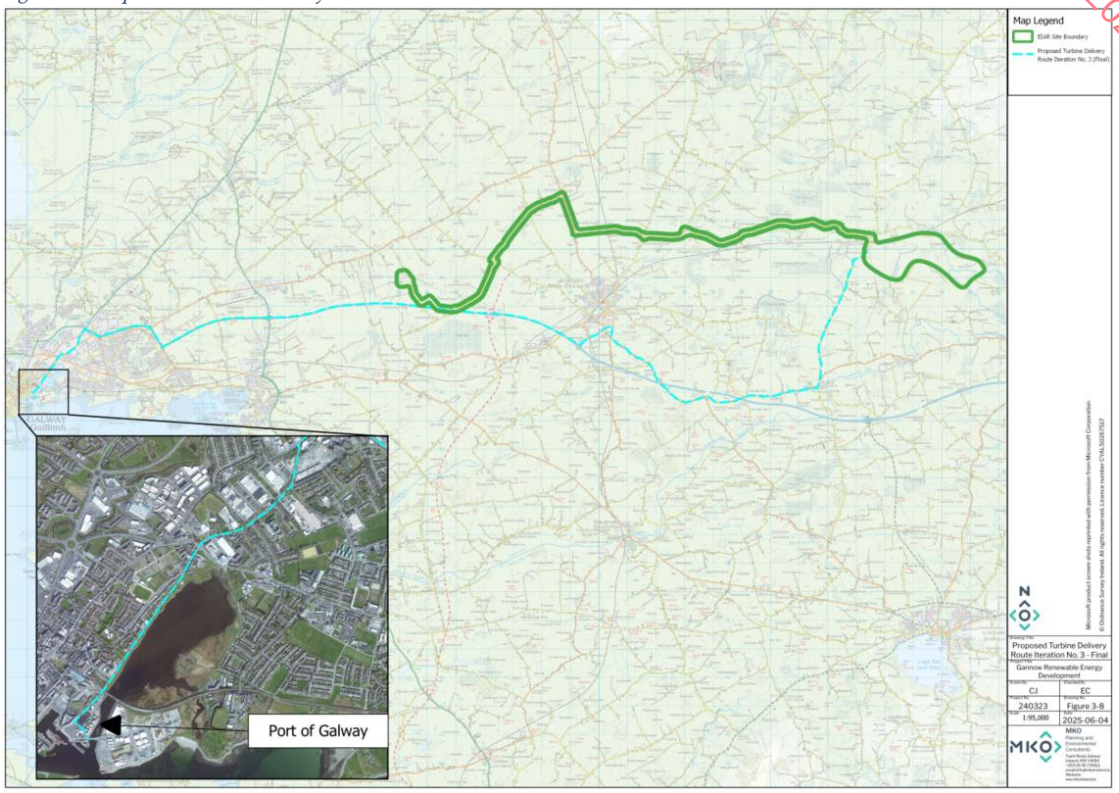
All construction traffic will use designated haul routes only, as agreed with the local authority. An alternative to this would be to allow for more direct access to the Site using multiple approach routes; however, this is more likely to give rise to additional traffic and road impacts.

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

It should be noted that all component deliveries (abnormal loads) will be undertaken as described in the Traffic Management Plan which will be submitted and agreed with the local authorities and roads authorities upon consent of this application. All component deliveries will be subject to garda escort.

All manoeuvres around junctions and into site entrances will be supervised by a qualified team of turbine delivery experts. The proposed new site entrance will be widened to facilitate the delivery of abnormal loads, after the construction phase this entrance will be reduced in size and gated for security and will be used as an operational phase entrance. However, should replacement components be required, this entrance will be temporarily widened to facilitate such works. Please see Section 15.1 of Chapter 15 Material Assets for further details.

Figure 3-8 Proposed Turbine Delivery Route Iteration No. 3 - Final



A comparison of the potential environmental effects of the proposed turbine delivery routes, when compared against the chosen option, is presented in Table 3-6 below.

Table 3-6 Comparison of environmental effects when compared against the chosen option (Turbine Delivery Routes)

Environmental Consideration	Proposed Turbine Delivery Route Iteration No. 1 and 2	Proposed Turbine Delivery Route Iteration No. 3 (Chosen Option)
Population and Human Health	Greater potential for impacts on human health from Proposed Turbine Delivery Route Iteration No. 1 and Proposed Turbine Delivery Route Iteration No. 2 as more accommodation works would be required along the route, giving rise to more vehicular emissions, dust emissions, noise and traffic disruption when compared to Proposed Turbine Delivery Route Iteration No. 3.	Less potential for impacts on human health as fewer accommodation works would be required along the route, giving rise to less vehicular emissions, dust emissions, noise and traffic disruption when compared to Proposed Turbine Delivery Route Iteration No. 1 and Proposed Turbine Delivery Route Iteration No. 2.
Biodiversity (including Birds)	Neutral	Neutral

Land, Soils and Geology	Neutral	Neutral
Water	Neutral	Neutral
Air Quality	Greater potential for impacts on air quality as more accommodation works would be required along the route giving rise to more vehicular and dust emissions when compared to Proposed Turbine Delivery Route Iteration No. 3.	Less potential for impacts on air quality as fewer accommodation works would be required along the route giving rise to less vehicular and dust emissions when compared to Proposed Turbine Delivery Route Iteration No. 1 and Proposed Turbine Delivery Route Iteration No. 2.
Climate	Greater potential for impacts on climate as more accommodation works would be required along the route giving rise to more vehicular emissions when compared to Proposed Turbine Delivery Route Iteration No. 3.	Less potential for impacts on climate as fewer accommodation works would be required along the route giving rise to less vehicular emissions when compared to Proposed Turbine Delivery Route Iteration No. 1 and Proposed Turbine Delivery Route Iteration No. 2.
Noise and Vibration	Greater potential for impacts in relation noise and vibration as more accommodation works would be required along the route giving rise to more noise emissions and potential vibration when compared to Proposed Turbine Delivery Route Iteration No. 3.	Less potential for impacts in relation noise and vibration as fewer accommodation works would be required along the route giving rise to less noise emissions and potential vibration when compared to Proposed Turbine Delivery Route Iteration No. 1 and Proposed Turbine Delivery Route Iteration No. 2.
Archaeology, Architectural and Cultural Heritage	Greater potential for impacts on unrecorded, sub-surface archaeology due to more accommodation works being required, and therefore excavations, along this route when compared to Proposed Turbine Delivery Route Iteration No. 3.	Less potential for impacts on unrecorded, sub-surface archaeology due to fewer accommodation works being required, and therefore excavations, along this route when compared to Proposed Turbine Delivery Route Iteration No. 1 and Proposed Turbine Delivery Route Iteration No. 2.
Landscape and Visual	Neutral	Neutral
Material Assets	Greater potential for impacts in relation to traffic as more accommodation works required which could give rise to traffic disruption when compared to Proposed Turbine Delivery Route Iteration No. 3.	Less potential for impacts in relation to traffic as fewer accommodation works required which could give rise to traffic disruption when compared to Proposed Turbine Delivery Route Iteration No. 1 and Proposed Turbine Delivery Route Iteration No. 2.
Major Accidents and Natural Disasters	Greater potential for impacts in relation to major accidents and natural disasters as more accommodation works are required	Less potential for impacts in relation to major accidents and natural disasters as fewer accommodation works are required when compared to Proposed

	which could give rise to a larger degree of land disturbance when compared to Proposed Turbine Delivery Route Iteration No. 3.	Turbine Delivery Route Iteration No. 1 and Proposed Turbine Delivery Route Iteration No. 2.

For the reasons set out above, the chosen turbine delivery route was determined to have the least amount of environmental effects when compared to other proposed routes.

3.2.5.5.3 *Alternative Site Access Points*

Abnormal Load Entrances

As detailed in Section 3.2.5.2.2 above, 2 no. site entrances were assessed as part of the iterative design process: a separate entrance along the L3115 local road for abnormal loads with all other Heavy Goods Vehicles (HGVs) and construction phase vehicles using an existing farm entrance 0.16km north, also along the L3115 local road.

Upon review by the traffic and transport subconsultant, this option was deemed inappropriate from a traffic management perspective. Therefore, a new access point off the L3115 local road was proposed in order to access the Proposed Wind Farm for all vehicles and delivery required in the construction, operation, and decommissioning phase of the Proposed Project, inclusive of abnormal loads.

An autotrack assessment confirmed the suitability of the proposed new site access off the L3115 for all HGVs, construction traffic vehicles, and abnormal load entry with minimal land take requirements and minimal environmental impacts. As noted above, an alternative to this was to have a separate entrance for abnormal load delivery and have all other construction traffic, inclusive of concrete deliveries, utilise the existing site entrance on the L3115. However, due to inadequate sightlines, this option was ruled out.

General Construction and Operation

There are a number of existing access points to the Proposed Wind Farm. These comprise private farm access points off the L3115, L3118, L3118-3, and the L7169. An initial review of these existing locations was carried out to identify the most suitable locations for wind farm construction and operation site entrances.

The existing farm entrances off the L3118, L31183, and L7169 was deemed unsuitable for construction traffic due to the lack of adequate sightlines and significant areas of land take that would be required.

The existing farm entrance along the L3115 was deemed unsuitable for construction phase traffic and abnormal load delivery due to the lack of adequate sightlines.

Therefore, a new construction site entrance off the L3115 which has achieved the necessary sightlines is proposed for general construction (inclusive of abnormal load delivery) and operational access and was considered suitable as an operational entrance for maintenance staff.

3.2.5.6 Alternative Design of Ancillary Structures

The ancillary structures required for the Proposed Project include the substation, meteorological mast, underground electrical cabling, and temporary construction compounds. The siting of these structures have been summarised in Section 3.2.5 above and further detailed below.

3.2.5.6.1 Alternative Internal Site Cabling Route

The internal 20kV/33kV underground cabling route will follow the internal road network throughout the Proposed Wind Farm, connecting all 8 no. turbines to the proposed onsite 38kV substation. While this means that a longer cabling route will be needed, it was considered the more environmentally prudent option. The alternative to this would be to lay the cables 'as the crow flies' between the turbines and the onsite 38kV substation, however, this would lead to a greater environmental disturbance and a greater volume of peat and spoil generated.

3.2.5.6.2 Alternative Meteorological Mast Location

The meteorological mast is located in the northern section of the Site within a proposed temporary construction compound. As shown in Figure 3-4 above, the proposed met mast was originally sited along a proposed new road between turbines T04 and T05. As the design of the Proposed Wind Farm progressed, and the internal road layout was updated to facilitate the findings of multi-disciplinary surveys, the location of the met mast was moved approximately 0.5km northwest.

While other locations to situate the proposed met mast within the Proposed Wind Farm site were examined, the above location was deemed to be most suitable due to the low ecological value of the habitat and its location within a proposed temporary construction compound, thereby reducing the overall footprint of the Proposed Wind Farm site.

3.2.5.6.3 Alternative Temporary Construction Compounds Location

The temporary construction compounds will be used for the storage of all construction materials, turbine components, staff facilities and car-parking areas for staff and visitors. The use of two temporary construction compounds was deemed preferable to the alternative of a single large compound. Principally, it will result in shorter distances for traffic movements within the Site during construction. As the Proposed Project layout became more defined, the temporary construction compounds were sited to facilitate the most efficient flow of construction processes within the Site, with an additional compound being added in at the later stage of design (please see Section 3.2.5.2.2 above – Proposed Wind Farm Layout Iteration no. 3).

The temporary construction compounds are located strategically within each section of the Site to facilitate the construction of the various infrastructure components and to avoid sensitive habitats and other onsite constraints as identified in Section 3.2.5.2.1 above. As a result, vehicle emissions and the potential for dust arising will be reduced and the proposed 2 no. temporary construction compounds will have no impact on sensitive ecological habitat or other identified onsite constraints.

3.2.5.6.4 Alternative Substation Location

The proposed onsite 38kV substation is located in the western portion of the Proposed Wind Farm and is sited within an agricultural grassland field. This grassland is of low ecological value and proposed enhancement measures will facilitate screening from sensitive receptors. There are no sensitive receptors located within 215m of the proposed onsite 38kV substation.

The proposed onsite 38kV substation is located strategically within the Proposed Wind Farm site, providing proximity to the public road network in which the Proposed Grid Connection underground cabling route is primarily located. The proposed onsite substation was redesigned/reorientated in relation to the internal road network updates (please see Section 3.2.5.2.2 above) to ensure alignment with the internal road network.

This location 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 Proposed Wind Farm to the national grid, and the

existing ground conditions. Please see Section 3.2.5.2.2 above for further information on the evolution of the substation design.

3.2.6 Alternative Grid Connection Design Options

3.2.6.1 Alternative Grid Connection Cabling Route Options

The Proposed Wind Farm will connect to the national grid via underground electrical cabling, located primarily within the public road corridor, with 3 no. small sections passing through private agricultural land and private track. The power from the proposed onsite 38kV substation will be transmitted to the existing Cashla 220kV substation, via a 38kV underground electrical cabling route, measuring approximately 21.8km in length.

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.21.8km underground cabling route would be to construct an approx. 16.3km overhead line from the proposed onsite 38kV substation to the existing Cashla 220kV substation or approx. 5.8km of overhead line from the proposed onsite 38kV substation to the existing 110kV overhead line south of the Proposed Wind Farm site. 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 primarily follow the route of existing public roads, thereby minimising the amount of ground disturbance required.

The chosen underground electrical cabling route will follow a mix of existing public roads and new/existing track across private land, thereby minimising the use of public roads, 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.

Additionally, consideration was given to installation of the grid connection within private lands adjacent to the public road network, however, the existing Cashla 220kV substation is located 16.3km west of the Proposed Wind Farm site, as the crow flies. It was considered that this was not a feasible option, due to the likely need for constructing at least 16.3km of new road across private lands to facilitate the construction and operation of the underground cabling.

The Megawatt (MW) output of the Proposed Wind Farm is such that it needs to connect to 110kV substation at a minimum, however it can also connect into 220kV substations. There are 5 no. existing electricity substation located within 25km of the Proposed Wind Farm site, namely:

- Cashla 220kV Substation
- Tynagh 220kV Substation
- Somerset 110kV Substation
- Cloon 110kV Substation

Initial grid studies, undertaken by the Applicant, identified the existing Cashla 220kV substation or the existing Somerset 110kV substation as potential candidates to serve as the connection node for the Proposed Project. An underground grid connection cabling route to the existing Cashla 220kV Substation and existing Somerset 110kV substation was considered and assessed to identify the most viable option. Please refer to Figure 3-10 to Figure 3-13 below to see the evolution of the underground grid connection route throughout the design process; i.e., taking into account the findings of the site investigations and baseline assessments.

3.2.6.1.1 *Proposed Grid Connection Underground Cabling Route – Somerset Substation*

Proposed Grid Connection to Somerset

An alternative option was examined to connect the Proposed Wind Farm to the existing Somerset 110kV substation showed the underground cabling route approaching the existing Somerset 110kV substation from the north. This route was entirely located within the public road network, as shown in Figure 3-9 below. This route was approximately 34.8km long (13km longer than the final chosen grid route option – i.e., Proposed Grid Connection underground cabling route iteration No. 4) and involved the crossing of 16 no. mapped watercourses, the Irish Rail railway at 2 no. locations, the M6 motorway via an overpass, and 1 no. gas line. The route travels along local and regional roads from the Proposed Wind Farm before approaching the existing Somerset 110kV substation from the north. After further review, it was determined that due to the length of the route there is an increased number of watercourse crossings and interactions with the Irish Rail Galway-Dublin Line and gas lines, it would be more appropriate to seek out a route that was shorter in length and did not interact with watercourses and existing infrastructure to the extent identified in the underground cable route to the existing Somerset 110kV substation. Further to advice from Grid Technical Experts, it was deemed that Cashla 220kV was the most viable option to connect the Proposed Wind Farm to the national grid. As this was the most suitable route to the existing Somerset 110kV substation, the use of this substation for the connection of the Proposed Wind Farm to the national grid was not progressed for assessment.

Proposed Wind Farm site

Existing Somerset 110kV Substation

Kilconnell
Cill Chonaill

BALLINASLOE
Béal Átha na Sluaighe

Aughrim
Eachroim

Map Legend

- Proposed Wind Farm site
- Grid Connection to Somerset 110kV Substation
- Existing Somerset 110kV Substation

Drawing Title: Grid Connection to Somerset 110kV Substation

Project Title: Gannow Renewable Energy Development

Drawn By	Checked By
CJ	EC
Project No.	**Drawing No.**
240323	Figure 3-9
Scale	**Date**
1:75,000	2025-06-04

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

3.2.6.1.2 *Proposed Grid Connection– Cashla Substation*

Proposed Grid Connection Iteration No. 1

With a route to Cashla being identified as the preferred port of connection for the Proposed Project, a route was identified approaching the existing Cashla 220kV substation from the north. This route is entirely located within the public road network, as shown in Figure 3-10 below. This route was approximately 22km long (0.2km longer than the final chosen grid route option – i.e., Proposed Grid Connection underground cabling route iteration No. 4) and involved the crossing of 4 no. mapped EPA watercourses, the Irish Rail Galway-Dublin rail line at 1 no. location, the crossing of a historic railway no longer in use, the M17 motorway at 1 no locations (via horizontal directional drilling (HDD)), and 1 no. gas line. The route travels along local and regional roads from the Proposed Wind Farm before approaching the existing Cashla 220kV substation from the north.

During detailed review it was identified that a planning application for the grid connection infrastructure to connect the approved solar PV energy development in Ballymoneen & Grange East Co. Galway (Pl Ref 20/961 & 22/61105) to the existing Cashla 220kV Substation has been granted by Galway County Council. The granted route overlapped with the Proposed Grid Connection underground cabling route Iteration No. 1 for approximately 3.7km. In ensuring the underground cabling route from the Proposed Wind Farm took into account the capacity of the local road network from other permitted or proposed projects, it was determined that it would be more appropriate to assess and apply for a underground cabling route that approached the existing Cashla 220kV substation from the south, therefore, avoiding any overlap with the grid connection infrastructure from the Ballymoneen Solar Farm and BESS 110kV Grid Connection.

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Proposed Wind Farm site

Existing Cashla 220kV Substation

Map Legend

- Proposed Wind Farm site
- Proposed Grid Connection Iteration No. 1
- Existing Cashla 220kV Substation

Drawing Title: Proposed Grid Connection Layout Iteration No. 1

Project Title: Gannow Renewable Energy Development

Drawn By	Checked By
CJ	EC
Project No.	Drawing No.
240323	Figure 3-10
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MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website:
ww.mkoireland.ie

Proposed Grid Connection Iteration No. 2

An alternative option examined to connect the Proposed Wind Farm to the existing Cashla 220kV substation showed the underground cabling route approaching the existing Cashla 220kV substation from the south. This route was entirely located within the public road network, as shown in Figure 3-11 below. This route was approximately 24.3km long (2.5km longer than the final chosen grid route option – i.e., Proposed Grid Connection underground cabling route iteration No. 4) and involved the crossing of 5 no. mapped watercourses, Irish Rail railways at 1 no. location, the M6 motorway at 2 no locations (via an underpass at 1 no. location and an overpass at 1 no. location), the M17 motorway via an underpass, and 1 no. gas line. The route travels along local and regional roads from the Proposed Wind Farm before approaching the existing Cashla 220kV substation from the north.

After further review, it was determined that while the existing Cashla 220kV is the most suitable substation option to connect the Proposed Wind Farm. It would be more appropriate to seek a shorter route into Cashla 220kV when approaching from the south, due to the proximity of the route to Athenry, the number of motorway crossings and the length of the route.

Map Legend

- Proposed Wind Farm Point
- Proposed Grid Connection Iteration No. 2
- Existing Cashla 220kV Substation

Drawing Title: Proposed Grid Connection Layout Iteration No. 2

Project Title: Gannow Renewable Energy Development

Drawn By	Checked By
CJ	EC
Project No.	Drawing No.
240323	Figure 3-11
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MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website:
www.mkoireland.ie

Proposed Grid Connection Iteration No. 3

Proposed Grid Connection iteration No. 3 comprised three alternative routes (A, B, and C) that were issued out to the wider team for assessment.

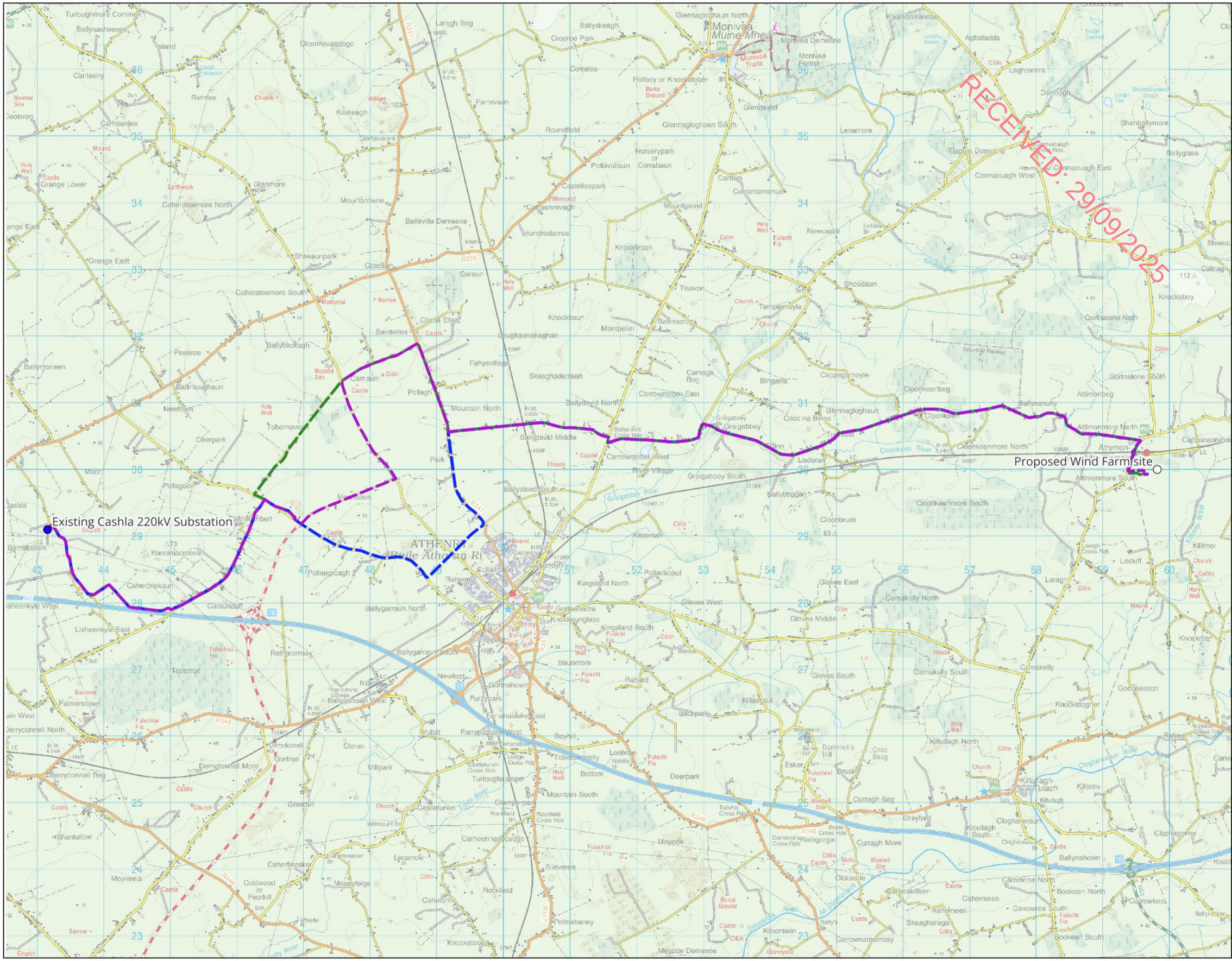
Proposed Grid Connection Layout Iteration 3A measured approximately 22.5km in length and travelled along local and regional roads from the proposed onsite 38kV substation and utilised a section of private lands. This route travels in close proximity to Athenry and involves the crossing of the Irish Rail Galway-Dublin rail line, the crossing of a historic railway no longer in use, the M17 motorway via HDD, 1 no gas line which requires HDD and runs parallel to 1 no. Gas Networks telecommunications duct for approximately 2.8km. Furthermore, the route will cross 4 no. EPA mapped watercourses. The route will approach the existing Cashla 220kV substation from the south as there are no other permitted or proposed projects at the time of writing of this EIAR that follow this route.

It was determined that, based on the findings of the multi-disciplinary site visits, it would be appropriate to identify an underground cable route to the existing Cashla 220kV substation that was shorter in overall length to minimise impacts on the public road network, did not interact with the GNI telecommunications duct for 2.8km, and did not traverse in proximity to Athenry.

Proposed Grid Connection Layout Iteration 3B measured approximately 23.6km in length and travelled along local and regional roads from the proposed onsite 38kV substation and is entirely located within the public road network. This route involves the crossing of the Irish Rail Galway-Dublin rail line, the crossing of a historic railway no longer in use, the M17 motorway via HDD, 1 no gas line which requires HDD, and runs parallel to 1 no. Gas Networks telecommunications duct for approximately 0.7km. Furthermore, the route will cross 4 no. EPA mapped watercourses. The route will approach the existing Cashla 220kV substation from the south as there are no other permitted or proposed projects at the time of writing of this EIAR that follow this route.

It was determined that, based on the findings of the multi-disciplinary site visits, it would be appropriate to identify an underground cable route to the existing Cashla 220kV substation that was shorter in overall length to minimise impacts on the public road network, did not require HDD under the M17 motorway and did not interact with the GNI telecommunications duct for 0.7km.

Proposed Grid Connection Layout Iteration 3C measured approximately 21.8km in length and travelled along local and regional roads, as well as 3 no. sections of private land/existing track, from the proposed onsite 38kV substation to the existing Cashla 220kV substation. Proposed Grid Connection Layout Iteration 3C involves 10 no. identified watercourse crossings along the route (no. of which are EPA mapped watercourses). Proposed Grid Connection Layout Iteration 3C includes for 1 no. interaction with the Irish Rail Galway-Dublin rail line, 1 no. interaction with a historic rail line no longer in use, the crossing of the M17 motorway via the local road which traverses beneath the motorway, and the GNI network at 2 no. locations (1 no. crossing of a high-pressure pipeline and 1 no. interaction with the GNI telecommunications duct (approximately 0.15km)). As Proposed Grid Connection Layout Iteration 3C is the shortest identified route, has the least potential impact on the surrounding road network due to the use of private land/existing track, and minimal interaction with existing built services, this route was progressed as the final Proposed Grid Connection option. Please see further details on the final Proposed Grid Connection layout below.



Map Legend

- Proposed Wind Farm site
- Proposed Grid Connection Iteration 3A
- Proposed Grid Connection Iteration 3B
- Proposed Grid Connection Iteration 3C
- Existing Cashla 220kV Substation

Drawing Title: Proposed Grid Connection Layout Iteration No. 3

Project Title: Gannow Renewable Energy Development

Drawn By	Checked By
CJ	EC

Project No.	Drawing No.
240323	Figure 3-12

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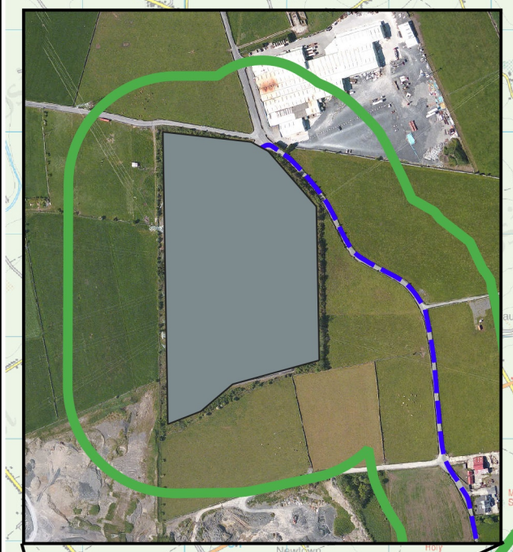
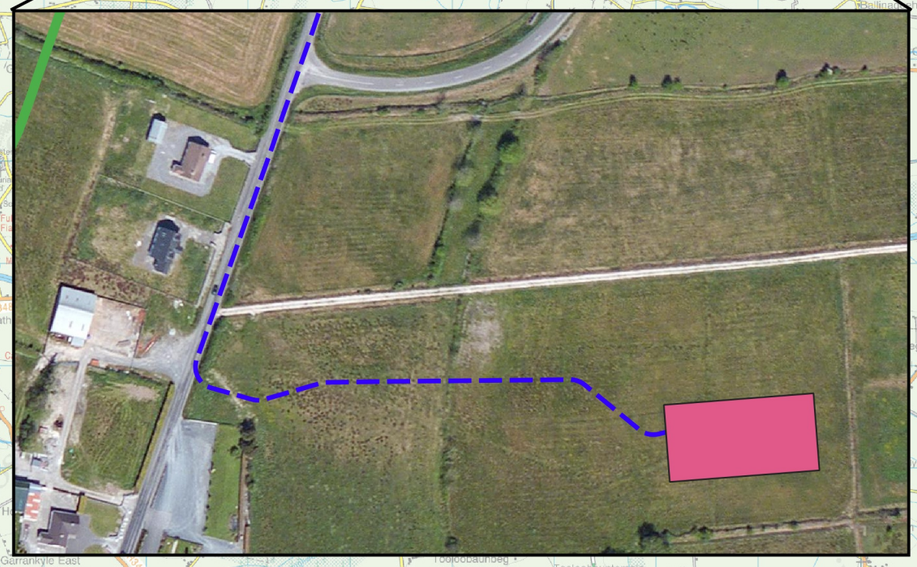
MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website:
www.mkoireland.ie

Proposed Grid Connection Iteration No. 4 – Final Proposed Grid Connection Layout

The final Proposed Grid Connection measures approximately 21.8km in length, and travels from the Proposed Wind Farm roads before turning right out of the proposed new site entrance and travelling north on the L3115 for approximately 0.5km before turning left onto the L7152 south of the Attyvaun National School. The underground electrical cabling route will travel west on the L7152 for approximately 7km before turning left and travelling west on the L3111 for 1.6km where it turns right and travels north on the L3107 for 0.1km and then turns left and travels west on the L7126 for approximately 2.4km. The underground electrical cabling route will then turn right onto the R347 for approximately 1.4km. The underground cabling route will then turn left off the R347 onto the L7122 and travel for approximately 1.3km before entering private land. The underground electrical cabling will travel through private land for 0.6km before exiting onto the L31030 and travelling in a southwest direction for 1.5km. the route will then turn left onto the L3103 for 0.1km and then turn right onto the L7108. On the L7108, the route will stay to the left when the road splits after 0.2km and travel for 2km to the second section of private land. After 1.5km the underground electrical cabling route will exit private land and turn right onto the L7109 and travel north for 1.5km before entering the existing Cashla 220kV substation from the south.

This Proposed Grid Connection underground cabling route involves 10 no. identified watercourse crossings along the Proposed Grid Connection underground cabling route. Of the identified watercourse crossings, 4 no. crossing are referenced on EPA/OSI mapping. This was considered to be the most environmentally prudent and practical option for a grid connection as it was a one of the shortest routes assessed. The Proposed Grid Connection will include 1 no. interaction with the Irish Rail Galway-Dublin rail line, 1 no. interaction with a historic rail line no longer in use, the crossing of the M17 motorway via the local road which traverses beneath the motorway, and the GNI network at 2 no. locations (1 no. crossing of a high-pressure pipeline and 1 no. crossing of a telecommunications duct.





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Map Legend

- EIAR Site Boundary
- Proposed Onsite 38kV Substation
- Cashla 220kV Substation
- Proposed Grid Connection Iteration No. 4 (Final)

Drawing Title
Proposed Grid Connection Layout Iteration No. 4 - Final

Project Title
Gannow Renewable Energy Development

Drawn By	Checked By
CJ	EC
Project No.	Drawing No.
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MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website:
ww.mkoireland.ie

Table 3-7 Comparison of environmental effects when compared against the chosen option (Grid Connection)

Environmental Consideration	Proposed Grid Connection Layout Iteration 1	Proposed Grid Connection Layout Iteration 2	Proposed Grid Connection Layout Iteration 3	Proposed Grid Connection Layout Iteration 4 (Chosen Option)
Population & Human Health	Potential for temporary visual impact for a longer construction phase considering the longer route for Proposed Grid Connection Layout Iteration 1 (22km), 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 Layout Iteration 2 (24.3km), 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 Layout Iteration 3A (22.5km) and Proposed Grid Connection Layout Iteration 3B (23.6), 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 routes for both Proposed Grid Connection Layout Iteration 3A and Proposed Grid Connection Layout Iteration 3B, from plant machinery onsite during construction phase. No difference between Proposed Grid Connection Layout Iteration 3C and the chosen option.	Potential for temporary visual impact for a shorter construction phase considering the shorter route (21.8km), from presence of plant machinery onsite during the construction period when compared against Proposed Grid Connection Layout Iteration 1, Proposed Grid Connection Layout Iteration 2, Proposed Grid Connection Layout Iteration 3A, and Proposed Grid Connection Layout Iteration 3B. Potential for temporary noise and dust impacts for a shorter construction phase considering the shorter route, from plant machinery onsite during construction phase Proposed Grid Connection Layout Iteration 1, Proposed Grid Connection Layout Iteration 2, and Proposed Grid Connection Layout Iteration 3A, and Proposed Grid Connection Layout Iteration 3B. No difference between Proposed Grid Connection Layout Iteration 3C and the chosen option.

Environmental Consideration	Proposed Grid Connection Layout Iteration 1	Proposed Grid Connection Layout Iteration 2	Proposed Grid Connection Layout Iteration 3	Proposed Grid Connection Layout Iteration 4 (Chosen Option)
Biodiversity (including Birds)	Low potential for impact on sensitive ecological receptors during the construction phase as Proposed Grid Connection Layout Iteration 1 does not pass through any designated site or habitat of ecological importance.	Low potential for impact on sensitive ecological receptors during the construction phase as Proposed Grid Connection Layout Iteration 2 does not pass through any designated site or habitat of ecological importance.	Low potential for impact on sensitive ecological receptors during the construction phase as Proposed Grid Connection Layout Iteration 3A and Proposed Grid Connection Layout Iteration 3B do not pass through any designated site or habitat of ecological importance. No difference between Proposed Grid Connection Layout Iteration 3C and the chosen option.	Low potential for impact on sensitive ecological receptors during the construction phase. No difference between Proposed Grid Connection Layout Iteration 3C and the chosen option. As detailed in Chapter 6, the Proposed Grid Connection underground cabling route does not pass through any designated site or habitat of ecological importance. Therefore, as detailed in the Natura Impact Statement no adverse impacts on the SAC are anticipated.
Land, Soils, & Geology	Greater volume of earthworks required due to longer route (22km). This underground cabling route option is entirely proposed within the public road corridor.	Greater volume of earthworks required due to longer route (approximately 24.3km). This underground cabling route option is entirely proposed within the public road corridor.	Lower volume of earthworks required due to the shorter route of Proposed Grid Connection Layout Iteration 3A (22.5km). This underground cabling route option is entirely proposed within the public road corridor. Greater volume of earthworks required due to the longer route of Proposed Grid Connection Layout Iteration 3B (approximately 23.6km). This underground cabling route	Lower volume of earthworks required due to shorter route (approximately 21.8km) as compared to Proposed Grid Connection Layout Iteration 1, Proposed Grid Connection Layout Iteration 2, Proposed Grid Connection Layout Iteration 3A, and Proposed Grid Connection Layout Iteration 3B. The Proposed Grid Connection underground cabling route measures approximately 21.8km in length and is located primarily within the curtilage of the

Environmental Consideration	Proposed Grid Connection Layout Iteration 1	Proposed Grid Connection Layout Iteration 2	Proposed Grid Connection Layout Iteration 3	Proposed Grid Connection Layout Iteration 4 (Chosen Option)
			option is entirely proposed within the public road corridor. No difference between Proposed Grid Connection Layout Iteration 3C and the chosen option.	public road corridor with three sections (approximately 0.2km, 0.6km and 1.5km) being located within private land. As detailed in the assessment in Chapter 8, no significant effects on land, soils or geology will occur. No difference between Proposed Grid Connection Layout Iteration 3C and the chosen option. 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.
Water	Neutral – Proposed Grid Connection Layout Iteration 1 cross 4 no. EPA mapped watercourses.	Greater potential for impacts on hydrology due to the proposed 5 no. EPA mapped watercourse crossings.	Neutral – both Proposed Grid Connection Layout Iteration 3A and Proposed Grid Connection Layout Iteration 3B cross 4 no. EPA mapped watercourses. No difference between Proposed Grid Connection Layout Iteration 3C and the chosen option.	Lower potential for impacts on hydrology as compared to Proposed Grid Connection Layout Iteration 2 due to the Proposed Grid Connection crossing 4 no. EPA mapped watercourses. There are no instream works proposed as part of the crossing methodologies for any of these watercourse crossings. Effects are neutral for the Proposed Grid Connection when compared to Proposed Grid Connection Layout Iteration 1,

Environmental Consideration	Proposed Grid Connection Layout Iteration 1	Proposed Grid Connection Layout Iteration 2	Proposed Grid Connection Layout Iteration 3	Proposed Grid Connection Layout Iteration 4 (Chosen Option)
				Proposed Grid Connection Layout Iteration 3A and Proposed Grid Connection Layout Iteration 3B. No difference between Proposed Grid Connection Layout Iteration 3C and the chosen option. As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur.
Air Quality	As a result of the longer route (approximately 22km), this option has a greater potential for effects from dust, and vehicle emissions during construction.	As a result of the longer route (approximately 24.3km) this option has a greater potential for effects from dust, and vehicle emissions during construction.	As a result of the longer route, Proposed Grid Connection Layout Iteration 3A (approximately 22.5km) and Proposed Grid Connection Layout Iteration 3B have a greater potential for effects from dust, and vehicle emissions during the construction phase. No difference between Proposed Grid Connection Layout Iteration 3C and the chosen option.	As a result of the shorter route the Proposed Grid Connection (approximately 21.8km), has a lower potential for effects from dust, and vehicle emissions during the construction phase as compared to Proposed Grid Connection Layout Iteration 1, Proposed Grid Connection Layout Iteration 2, Proposed Grid Connection Layout Iteration 3A, and Proposed Grid Connection Layout Iteration 3B. No difference between Proposed Grid Connection Layout Iteration 3C and the chosen option. As detailed in Chapter 10, no significant effects on air quality will occur.

Environmental Consideration	Proposed Grid Connection Layout Iteration 1	Proposed Grid Connection Layout Iteration 2	Proposed Grid Connection Layout Iteration 3	Proposed Grid Connection Layout Iteration 4 (Chosen Option)
Climate	As a result of the longer route (approximately 22km), this option has a greater potential to result in increased vehicle emissions during the construction phase.	As a result of the longer route (approximately 24.3), this option has a greater potential to result in increased vehicle emissions during the construction phase.	As a result of the longer route of Proposed Grid Connection Layout Iteration 3A (approximately 22.5km) and Proposed Grid Connection Layout 3B (approximately 23.6), have a greater potential to result in increased vehicle emissions during the construction phase. No difference between Proposed Grid Connection Layout Iteration 3C and the chosen option.	As a result of the shorter route the Proposed Grid Connection (approximately 21.8km), has a lower potential for vehicle emissions during the construction phase as compared to Proposed Grid Connection Layout Iteration 1, Proposed Grid Connection Layout Iteration 2, Proposed Grid Connection Layout Iteration 3A, and Proposed Grid Connection Layout Iteration 3B. No difference between Proposed Grid Connection Layout Iteration 3C and the chosen option. As detailed in Chapter 11, no significant effects on climate will occur.
Noise & Vibration	Greater potential for noise and vibration impacts on nearby sensitive receptors during the construction phase due to the longer route (22km) However, this option does not pass through any villages or settlements and therefore would impact on fewer sensitive receptors.	Greater potential for noise and vibration impacts on nearby sensitive receptors during the construction phase due to the longer route (24.3km) This option is located on the outskirts of Athenry and therefore would have an impact on local sensitive receptors.	Greater potential for noise and vibration impacts from Proposed Grid Connection Layout Iteration 3A (22.5km) and Proposed Grid Connection Layout Iteration 3B (23.6km) on nearby sensitive receptors during the construction phase due to the longer route. Proposed Grid Connection Layout Iteration 3A is located on the	Lower potential for noise and vibration impacts from the Proposed Grid Connection on nearby sensitive receptors during the construction phase due to the shorter route (21.8km as compared Proposed Grid Connection Layout Iteration 1, Proposed Grid Connection Layout Iteration 2, Proposed Grid Connection Layout Iteration 3A, and Proposed Grid Connection Layout Iteration 3B.

Environmental Consideration	Proposed Grid Connection Layout Iteration 1	Proposed Grid Connection Layout Iteration 2	Proposed Grid Connection Layout Iteration 3	Proposed Grid Connection Layout Iteration 4 (Chosen Option)
			outskirts of Athenry and therefore would have an impact on local sensitive receptors. Proposed Grid Connection Layout Iteration 3A B does not pass through any villages or settlements and therefore would impact on fewer sensitive receptors. No difference between Proposed Grid Connection Layout Iteration 3C and the chosen option.	This option does not pass through any villages or settlements and therefore would impact on fewer sensitive receptors. No difference between Proposed Grid Connection Layout Iteration 3C and the chosen option. As detailed in Chapter 12, no significant effects on noise and vibration will occur.
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.	Neutral – there is no material difference of environmental effect between all options considered. As detailed in Chapter 13, no significant effects on landscape and visual will occur as a result of the Proposed Grid Connection during the construction, operational and decommissioning phases of the Proposed Project.
Archaeology, Architectural and Cultural Heritage	Lower potential effect for impacts on cultural heritage or archaeology due to all infrastructure being proposed	Lower potential effect for impacts on cultural heritage or archaeology due to all infrastructure being proposed	Lower potential effect for impacts on cultural heritage or archaeology due to all infrastructure being proposed within the curtilage of the public road network.	Greater potential for impacts on cultural heritage or archaeology for the Proposed Grid Connection Layout, as compared to Proposed Grid Connection Layout Iteration 1, Proposed Grid Connection Layout

Environmental Consideration	Proposed Grid Connection Layout Iteration 1	Proposed Grid Connection Layout Iteration 2	Proposed Grid Connection Layout Iteration 3	Proposed Grid Connection Layout Iteration 4 (Chosen Option)
	within the curtilage of the public road network. No material difference of environmental effect between Proposed Grid Connection Layout Iteration 2 and Proposed Grid Connection Layout Iteration 3A, and Proposed Grid Connection Layout Iteration 3B.	within the curtilage of the public road network. No material difference of environmental effect between Proposed Grid Connection Layout Iteration 1, and Proposed Grid Connection Layout Iteration 3A, and Proposed Grid Connection Layout Iteration 3B.	No material difference of environmental effect between Proposed Grid Connection Layout Iteration 1 Proposed Grid Connection Layout Iteration 2 and Proposed Grid Connection Layout Iteration 3A, and Proposed Grid Connection Layout Iteration 3B. No difference between Proposed Grid Connection Layout Iteration 3C and the chosen option.	Iteration 2, Proposed Grid Connection Layout Iteration 3A, and Proposed Grid Connection Layout Iteration 3B, due to the route proposed utilising approximately of private land (0.5km of which is agricultural land and 1.6km is existing track); therefore, greater potential to impact on undiscovered subsurface features if present. No difference between Proposed Grid Connection Layout Iteration 3C and the chosen option. As detailed in Chapter 14, no significant effects on cultural heritage & archaeology will occur as a result of the Proposed Grid Connection during the construction, operational and decommissioning phases of the Proposed Project.
Material Assets	Proposed Grid Connection Layout Iteration 1 measured approximately 22km in length and is located primarily in the public road corridor. The route follows local roads for approximately 13.1km of its extent and regional roads for approximately 8.9km.	Proposed Grid Connection Layout Iteration 2 measured approximately 24.3km in length and is located primarily in the road corridor. The route follows local roads for approximately 16.4km of its extent and regional roads for approximately 7.9km.	Proposed Grid Connection Layout Iteration 3A measured approximately 22.5km in length and is located primarily in the public road corridor. The route follows local roads for approximately 20.9km of its extent and regional roads for approximately 1.6km.	The Proposed Grid Connection measures approximately 21.8km in length, and is located primarily in the road corridor, with 2.1km of the route utilising private track and fields (0.5km of the route in private land is located within existing agricultural field and 1.6km of the route in private land is located within existing track). The route follows local roads for approximately

Environmental Consideration	Proposed Grid Connection Layout Iteration 1	Proposed Grid Connection Layout Iteration 2	Proposed Grid Connection Layout Iteration 3	Proposed Grid Connection Layout Iteration 4 (Chosen Option)
	This would likely result in greater traffic volumes considering the level of traffic using local roads and regional roads, and due to the longer length (approximately 22km) of the route.	This would likely result in greater traffic impacts considering the level of traffic using local roads and regional roads, and due to the longer length (approximately 24.3km) of the route.	This would likely result in greater traffic impacts considering the level of traffic using local roads and regional roads, and due to the longer length (approximately 22.5km) of the route. Proposed Grid Connection Layout Iteration 3B measured approximately 23.6km in length and is located primarily in the public road corridor. The route follows local roads for approximately 22.2km of its extent and regional roads for approximately 1.4km. This would likely result in greater traffic impacts considering the level of traffic using local roads and regional roads, and due to the longer length (approximately 23.6km) of the route. No difference between Proposed Grid Connection Layout Iteration 3C and the chosen option.	20.4km of its extent and regional roads for approximately 1.4km. The Proposed Grid Connection would result in smaller traffic volumes than Proposed Grid Connection Layout Iteration 1, Proposed Grid Connection Layout Iteration 2, Proposed Grid Connection Layout Iteration 3A, and Proposed Grid Connection Layout Iteration 3B. No difference between Proposed Grid Connection Layout Iteration 3C and the chosen option. All construction of the underground cable will be undertaken as described in the Traffic Management Plan which will be submitted and agreed with the local authorities and roads authorities upon consent of this application. As detailed in Chapter 15, no significant effects on traffic will occur.

3.2.7 Alternative Mitigation Measures

Mitigation by avoidance has been a key aspect of the Proposed Project's evolution through the selection and design process. Avoidance of the most ecologically sensitive areas and geotechnically unstable areas of the Site limits the potential for environmental effects. As noted above, the layout aims to avoid any environmentally sensitive areas. Where loss of habitat occurs in the Site, this has been mitigated with the proposal of habitat enhancement and improved habitat connectivity with hedgerow replanting on the Proposed Wind Farm.

It is proposed to replant approximately 3,521m of hedgerow within the Proposed Wind Farm in order to replace the hedgerow which is proposed to be removed in order to facilitate the Proposed Project. The replanting of hedgerow was deemed necessary in order to replace the habitat, which is being lost, however additional enhancement measures have been put in place to ensure a net gain of biodiversity on the Site, including the planting of a 1.9ha of native woodland in addition to the 3,521m of hedgerow planting noted previously. These replanting and enhancement measures will have a long-term slight positive effect on biodiversity. Further detail on this biodiversity enhancement can be found in Chapter 6 of this EIAR and Appendix 6-4 BMEP.

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.

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