Planning and Environmental Consultants

Environmental Impact Assessment Report

Briskalagh Renewable Energy Development, Co. Kilkenny

Chapter 3 – Consideration of Reasonable Alternatives

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3. SITE SELECTION AND REASONABLE ALTERNATIVES

3.1 Introduction

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

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

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

As detailed in Section 1.1.1 in Chapter 1, for the purposes of this EIAR, the various project components are described using the following references: the 'Proposed Project', the 'Proposed Wind Farm', the 'Proposed Grid Connection', the 'Site' and the 'Proposed Wind Farm site'. This section of the EIAR contains a description of the reasonable alternatives that were studied by the developer, which are relevant to the Proposed Project and its specific characteristics, in terms of site location and other renewable energy technologies as well as site layout incorporating size and scale of the Proposed Project, connection to the national grid and transport route options to the Site. This section also outlines the design considerations in relation to the Proposed Wind Farm and 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
    - Alternative Construction Compound Option
    - Alternative Borrow Pit Option
    - Alternative Site Access Points
    - Alternative Turbine Component Delivery Option
        - Alternative Port of Entry
        - Alternative Component Delivery Route
    - Alternative Design of Ancillary Structures
        - Alternative Meteorological Mast Location
- 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 Wind Farm, 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. Pastoral agriculture, small-scale private forestry and public road corridor (approx. 23km for the Proposed Grid Connection underground cabling route) would continue. 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 create a riparian buffer zone comprising native species adjacent the Tullaroan stream within the Proposed Wind Farm site, increase the ecological condition of approximately 3,640m of existing hedgerow and to plant approximately 270m of new native hedgerow. Please see Appendix 6-4 Biodiversity Management and Enhancement Plan for details.

As such, on the basis of the positive environmental effects arising from the 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 this site are presented in Table 3-1 below.

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

Environmental Consideration	Do-Nothing Alternative	Chosen Option of developing a renewable energy project
Population & Human Health	No increase in local employment and no long-term financial contributions towards the local community. 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.

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 32,703 homes with clean renewable electricity	As detailed in Ch 12, residual effects from Noise and Vibration are predominantly not significant 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, there will be no significant residual Landscape & Visual effects. The proposed turbine locations adhere to the recommended 500m set back distance in the Guidelines and also the 4 times tip height set-back distance (for non-involved sensitive receptors) set out in the draft Guidelines for the purpose of protecting visual amenity. As detailed in the assessment in Chapter 10, the overall impact will be a Long-term Moderate Positive Impact on air quality.
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 development has been designed to avoid or mitigate impacts on biodiversity including bats and downstream aquatic receptors. The Proposed Project includes for a biodiversity net gain proposal providing a local boost to biodiversity and water quality. 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.
Land, Soils & Geology	Neutral	As detailed in the assessment in Chapter 8, there is no net loss

Environmental Consideration	Do-Nothing Alternative	Chosen Option of developing a renewable energy project
		of topsoil or subsoil as a result of the Proposed Project. Topsoil and subsoil will be relocated within the Site. Geotechnical investigations followed by careful design will lead to no significant environmental impacts.
Hydrology and Hydrogeology	Neutral	As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur.
Air Quality	Neutral. 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	Neutral. 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 2023.	As detailed in the assessment in Chapter 11 Climate, over the proposed 35-year lifetime of the Proposed Wind Farm, 31,578 tonnes of carbon dioxide per annum will be displaced from traditional carbon-based electricity generation. Over the proposed 35-year lifetime of the development, therefore, 1,105,230 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. The addition of an estimated 49MW clean energy to the national grid will be a positive contribution to the States renewable energy targets set out in the Climate Action Plan 2023.
Noise & Vibration	No potential for noise impacts on nearby sensitive receptors.	Based on the assessment detailed in Chapter 12 and the mitigation measures proposed, there will be no significant effects on sensitive receptors due to an increase in noise levels from the Proposed

Environmental Consideration	Do-Nothing Alternative	Chosen Option of developing a renewable energy project
		Project during the construction and operational phase.
Cultural Heritage & Archaeology	No potential for impacts on unrecorded, subsurface archaeology.	As detailed in Chapter 14, 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 operation phase, there will be some slight 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.
Landscape & Visual	Neutral. No potential for effects on visual amenity due to the construction and operation of turbines.	As detailed in the assessment in Chapter 13, the residual effects on the surrounding landscape and designations are not significant, with just a residual effect of moderate significance being on the Site itself due to the magnitude of change from agriculture to renewable energy and agriculture.
Material Assets	Neutral	As detailed in Chapter 15 Material Assets, there will be no significant effects on traffic and transport during the construction 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 demonstrated in Chapter 16, the risk of a major accident and/or disaster during the

Environmental Consideration	Do-Nothing Alternative	Chosen Option of developing a renewable energy project
		construction of the Proposed Project is considered 'low' in accordance with the 'Guide to Risk Assessment in Major Emergency Management' (DoEHLG, 2010). The Proposed Project will be designed and built in accordance with current best practice and, as such, mitigation against the risk of major accidents and/or disasters will be embedded through the design. With the implementation of all mitigation and monitoring measures detailed in the EIAR, there will not be significant residual effects associated with the construction, operation and decommissioning of the Proposed Project,

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 wind farm site is influenced by a number of factors, while wind speeds, the area of suitable or available land, proximity to a grid connection point and planning policy are all very important, a wind farm project must be commercially viable/competitive, as otherwise it will never attract the necessary project finance required to build it.

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, Briskalagh Ltd is associated with Enerco Energy Ltd. which is an Irish-owned Cork-based company with extensive experience in renewable energy and is responsible for several projects throughout Ireland. By Q3 2024, Enerco associated companies had over 875 Megawatts (MW) of wind generating capacity in commercial operation or

under construction, with a further 400MW of projects at various stages of development 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; located outside of 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.

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 Proposed Wind Farm is not located within any area designated for ecological protection. The Proposed Grid Connection underground cabling route crosses the River Nore SPA, and the River Barrow and River Nore SAC in the townland of Moatpark, Co Kilkenny. At this location, the proposed underground cabling route will cross the river via horizontal direction drilling, with the drilling commencing within the public road corridor, and finishing in agricultural land, outside of the European designated sites. The Proposed Grid Connection underground cabling route also crosses the River Nore/Abbeyleix Woods Complex proposed Natural Heritage Area (pNHA) at this location. One of the drilling pits required for directional drilling is located within the boundary of the pNHA, although it is located within agricultural grassland.

The nearest Natura 2000 site to the Proposed Wind Farm, i.e. Special Area of Conservation (SAC) or Special Protection Area (SPA) is the River Barrow and River Nore SAC, which is located approximately 3.2km to the west. River Barrow and River Nore SAC has many qualifying interests relating to both freshwater and terrestrial habitats and species.

The next nearest national designated site, i.e. Natural Heritage Area (NHA) or proposed Natural Heritage Area (pNHA), is Ballykeefe Wood pNHA, which is located approximately 1.6km southeast of the Proposed Project at its nearest point.

3.2.3.1.2 Article 17 Annex I Habitat

In addition to the above, there is no Article 17 Annex I habitat recorded within or adjacent to the application site. Comprehensive multi season site surveys have confirmed that there is no Annex I habitat within the Site. Habitats within the Site are predominantly improved agricultural grassland and are of a low ecological value. Please see Chapter 6 Biodiversity for further details regarding habitats within the Site.

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, regional and national roads from the Proposed Wind Farm to the existing Ballyragget 110kV substation, in the townland of Moatpark, near Ballyragget, Co. Kilkenny. 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 as described in the Population and Human Health section of this EIAR is 22.49 persons per square kilometre, as described in Chapter 5 of this EIAR. This is significantly lower than the average national population density of 71.47 persons per square kilometre. The proposed turbine positions achieve the recommended setbacks in both the Guidelines and the draft Guidelines.

The nearest settlement to the proposed turbines is Kilmanagh, located approximately 1.2km south of T07 and is classified as a rural node in the settlement hierarchy of the KCDP.

3.2.3.1.5 Site Scale

The Site, covering a total of 1,000 hectares, comprises mix of agri-pastural land, private forestry, one-off housing and public road corridor and has an elevation range of 60m AOD to 245m AOD. The adjacent land use predominantly comprises the same. The Proposed Wind Farm site benefits from

existing farm tracks (approx. 6,400m). The Proposed Wind Farm site is easily accessible via farm entrances off the L-1009 to the south, the L-5024 to the north, and the L-5023 to the west. As discussed above, the Site comprises habitats of low ecological value and the recommended setback distance to sensitive receptors is achieved.

As such, with its proximity to grid, accessibility, low ecological value habitats and achievable setbacks from sensitive receptors, the Site affords a largescale area that is sufficiently unconstrained to accommodate a 7-turbine wind farm development. The constraints and facilitators mapping process is outlined in Section 3.2.5.2.1.

3.2.3.1.6 *Summary*

From the review of the criteria set out above, the Site is considered a suitable location for the provision of a renewable energy development of the scale proposed. The Proposed Wind Farm is located on agricultural land which allows the site to take advantage of the existing access roads (some of which will be upgraded) and highlights the suitability of the Proposed Wind Farm as it can make sustainable use of established items of infrastructure. The Proposed Wind Farm site is not located within or adjacent to EU or National protected areas, nor does it contain any EU designated Annex I Habitat. The Proposed Wind Farm site is located primarily on agri-pastoral lands, of low ecological value, within a rural setting. Required setbacks from sensitive receptors, as set out above are achievable. The Proposed Grid Connection underground cabling route crosses the River Nore SPA, and the River Barrow and River Nore SAC in Ballyragget. At this location, the proposed underground cabling route will cross the river via horizontal direction drilling, with the drilling commencing within a field of improved agricultural grassland located within the SAC, and finishing in agricultural land, outside of the SAC.

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 located primarily within the public road corridor and does not directly interact with any environmental designations. The 38kV underground electrical cabling route overlaps with the River Nore SPA, and the River Barrow and River Nore SAC when crossing the River Nore. However, there are no instream works proposed as part of the Proposed Grid Connection underground cabling route construction, so no significant impacts have been identified

Factoring all required environmental constraints into the project design, a site of considerable scale, with an estimated installed capacity of 49MW, and potential to power approximately 32,703 Irish households with renewable energy and displace 31,578 tonnes of carbon dioxide per annum (1,105,230tonnes over the 35-year operational life), the Site is considered appropriate for wind energy development and represents a positive contribution to National and EU climate action targets.

3.2.4 Alternative Renewable Energy Technologies

The Proposed Project will be located in a site where 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 to source 80% of our electricity from renewable energy by 2030. It is not a case of 'either' 'or'. The Climate Action Plan 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.

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 under the Climate Action Plan 2023 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 an associated company of Enerco Ltd, an Irish owned developer with extensive experience in the design, construction and operation of onshore wind energy developments throughout Ireland, with projects currently operating or in construction in Counties Cork, Kerry, Limerick, Clare, Galway, Mayo and Donegal. By Q3 2024, Enerco and its associated companies had over 875 Megawatts (MW) of onshore wind generating capacity under construction or in commercial operation, with a further 400MW of projects at various stages in its portfolio to assist in meeting Ireland's onshore renewable energy targets. The Applicant is committed to playing a key role in helping the State achieve its CAP24 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 and 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. 49MW), 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 1,000ha and the permanent footprint of the Proposed Project measures approximately 8.75ha, which represents approximately 0.875% of the Site. A solar PV array of the scale necessary to provide the same electricity output would require a footprint of approx. 78.4 hectares[1] or 7.84% 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 and Ornithology (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.

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

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 49MW 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.	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. No potential for glint and glare impacts on sensitive receptors.
Biodiversity (including Birds)	Larger development footprint would result in greater potential habitat loss. No potential for collision risk for birds.	Smaller development footprint would result in a smaller habitat loss. As detailed in Chapter 6 Biodiversity, the development has been designed to avoid or mitigate impacts on biodiversity including bats and downstream aquatic receptors. With the implementation of the mitigation measures described in Chapter 7 Ornithology, the residual effects for collision risk are not significant.
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 topsoil or subsoil as a result of the Proposed Project. Topsoil and subsoil will be

		relocated within the Site. No significant effects on soils and subsoils will occur.
Hydrology & Hydrogeology	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 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.
Climate	Reduced capacity factor of solar PV array technology would result in less carbon offset	Greater capacity factor resulting in a shorter carbon payback period. As detailed in the assessment in Chapter 11 Air and Climate, over the proposed 35-year lifetime of the Proposed Wind Farm, 1,105,230 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. The addition of an estimated 49MW clean energy to the national grid will be a positive contribution to the States renewable energy targets set out in the Climate Action Plan 2023.
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.
Cultural Heritage & Archaeology	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.	Smaller development footprint would decrease the potential for impacts on unrecorded, subsurface archaeology. As detailed in Chapter 13, there will be no significant direct or indirect effects on known or unknown archaeology and cultural heritage during the construction, operation and decommissioning phases.

		Archaeological monitoring under licence of the smaller footprint will be implemented during the construction phase.
Landscape & Visual	Panelling potentially less visible from surrounding area due to the screening by vegetation and topography.	Greater visibility due to the vertical scale of the proposed turbines. As detailed in the assessment in Chapter 14, the landscape value of the Proposed Wind Farm is deemed to be of 'Low' value and sensitivity and the strategic siting of infrastructure will mitigate any potential for significant landscape and visual effects.
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, there will be short term negative imperceptible to slight impact on traffic volumes during the construction phase of the Proposed Project. A detailed Traffic Management Plan incorporating all the mitigation measures will be agreed with the roads authority prior to construction works commencing on site. There will be a positive effect on electricity supply with the provision of an estimated 49MW to the national grid and powering of 32,703 Irish households with renewable electricity per year.

For the reasons set out above, the proposal for a wind energy development at the Proposed Wind Farm was considered to be 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 4.5 – 7 megawatt (MW) range. It is proposed to install 7 no. 7MW turbines at the Proposed Wind Farm which will have an estimated installed capacity of 49 MW. 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 within the Proposed Wind Farm site, with a larger amount of supporting infrastructure being required (i.e., roads etc) and increasing the potential for environmental impacts to occur. The proposed number of turbines takes account of all site constraints and the distances to be maintained between turbines and features such as roads and houses, while

maximising the wind energy potential of the Proposed Wind Farm. The 7-turbine layout selected for the Proposed 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 will have an overall ground to blade tip height of 185m; a rotor diameter 163m; and a hub height of 103.5 metres. The use of alternative smaller turbines at the Proposed Wind Farm would not be appropriate as they would fail to make the most efficient use of the wind resource passing over the Proposed Wind Farm and would potentially require a larger development footprint. This alternative would potentially lead to additional environmental effects.

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

Table 3-3 Comparison of environmental effects when compared to the chosen option (7 wind turbines, higher MW output)

Environmental Considerations	Larger number of smaller turbines	Chosen option of a 7-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 landscape potentially occupying a larger portion of a viewpoint.	Decreased potential for shadow flicker due to greater setbacks from houses, greater separation between turbines thus reducing aggregated shadow flicker time. There is no potential for significant noise and vibration effects from the proposed turbines. Furthermore, noise emissions can be curtailed to meet threshold criteria. Fewer turbines may occupy a smaller portion of a viewpoint. Based on the assessment detailed in Chapter 5 and the mitigation measures proposed, there will be no significant effects on population and human health from shadow flicker, noise and vibration and visual amenity during the construction, operation and decommissioning phases of the Proposed Project
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.

Environmental Considerations	Larger number of smaller turbines	Chosen option of a 7-turbine layout
		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.	Smaller footprint would result in smaller volume of soils to be excavated and managed. 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 spoil management proposals discussed in Chapter 4 sets out the optimal treatment for spoil 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. As detailed in the assessment in Chapter 8, no significant effects on soils and subsoils will occur.
Hydrology and Hydrogeology	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.	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

Environmental Considerations	Larger number of smaller turbines	Chosen option of a 7-turbine layout
		be a Long-term Moderate Positive Impact on air quality by during the operational phase.
Climate	There would be an 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, 1,105,230 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. The addition of an estimated 49MW clean energy to the national grid will be a positive contribution to the States renewable energy targets set out in the Climate Action Plan 2023.
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 effects on sensitive receptors during the construction operational and decommissioning phases from the Proposed Project.
Cultural Heritage & Archaeology	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology. No material difference between the two options for indirect effects on monuments.	Smaller development footprint would decrease the potential for impacts on unrecorded, subsurface archaeology. No material difference between the two options for indirect effects on monuments. As detailed in the assessment in Chapter 14, there will be no significant direct or indirect effects on known or unknown archaeology and cultural heritage during the construction, operation and decommissioning phases. Archaeological monitoring under licence of the smaller footprint will

Environmental Considerations	Larger number of smaller turbines	Chosen option of a 7-turbine layout
		be implemented during the construction phase.
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	Fewer but larger turbine models would be more visually obstructive in the skyline but may occupy a narrower portion of the viewpoint.
Material Assets – Traffic and Transport	Potential for greater traffic volumes during construction phase due to larger development footprint and requirement for more construction materials and turbine components.	Potential for smaller traffic volumes during the construction phase due to a smaller development footprint and requirement for fewer construction materials and turbine components. As detailed in Chapter 15, there will be short term negative imperceptible to slight impact on traffic volumes during the construction phase of the Proposed Project. A detailed Traffic Management Plan incorporating all the mitigation measures will be agreed with the roads authority prior to construction works commencing on site.
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	No material difference between the two options.	No material difference between the two options.

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, 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 to the Proposed Wind Farm layout. The design process has also taken account of the recommendations and comments of the relevant statutory and non-statutory organisations, the local community and local authorities as detailed in Chapter 2 of the EIAR,

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 guidelines set out in the Guidelines and the *'Best Practice Guidelines for the Irish Wind Energy Industry'* (Irish Wind Energy Association, 2012).

The Guidelines were the subject of a targeted review. The proposed changes to the assessment of impacts associated with onshore wind energy developments were outlined in the draft Guidelines. A consultation process in relation to the draft Guidelines closed on 19th February 2020. The proposed changes presented in the draft Guidelines give certain focus on the setback distance from residential properties (four times the proposed maximum tip height), along with shadow flicker and noise requirements relative to sensitive receptors. At time of writing, the draft Guidelines have not yet been adopted and the Climate Action Plan 2024 states that new draft wind energy guidelines are intended to be adopted in 2024. The relevant guidelines for the purposes of section 28 of the Act, remain those issued in 2006, the 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. Should the draft Guidelines 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 as currently proposed.

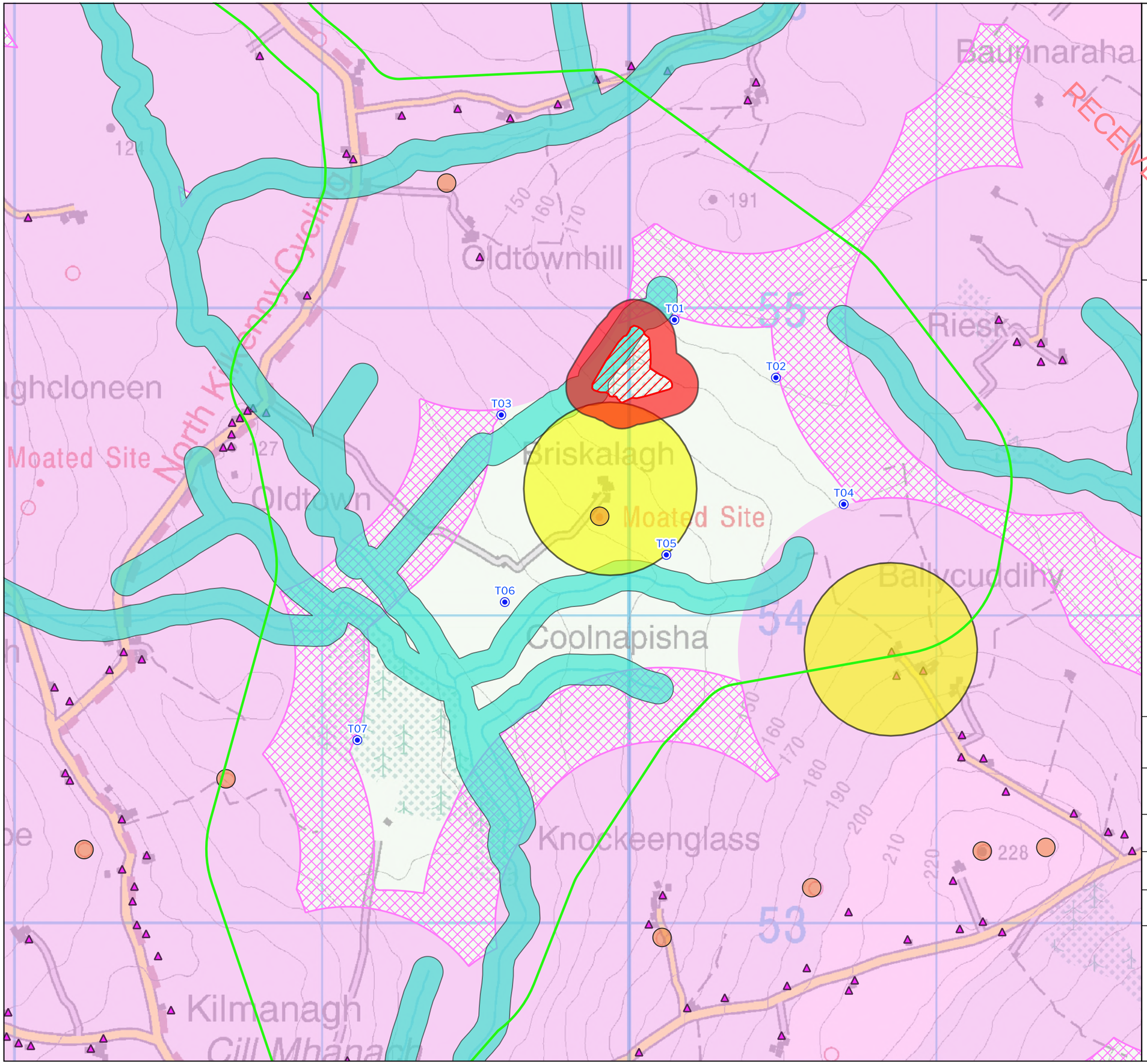
The constraints map for the Proposed Wind Farm, as shown in Figure 3-1, was produced following a desk study of all site constraints. Figure 3-1 encompasses the following constraints and associated buffers:

- **Sensitive Receptors:** a minimum 740-metre setback from third party sensitive receptors and a minimum 500m setback from sensitive receptors involved in the Proposed Project (achieving the Guidelines recommended setback of 500m and 4 x tip height separation distance from third party sensitive receptors in line with the draft Guidelines).
- **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 EIAR Site Boundary.
- **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.

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

- Available lands for development;
- Acceptable wind resource;
- Opportunity to win construction materials on site, minimising the potential for additional traffic (and associated environmental impacts) and cost generation by acquiring all materials offsite;
- Existing access points and general accessibility of all areas of the site due to existing road infrastructure; and
- Limited extent of constraints.

The inclusion of the constraints on a map of the 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.



Map Legend

- EIAR Site Boundary
- Proposed Turbine Locations
- Dwellings
- 500m Dwelling Buffer
- 740m 3rd Party Dwelling Buffer
- 50m Watercourse Buffer
- 30m Recorded Arcahelogical Sites or Monuments Buffer
- Woodland of Local Importance (Higher Value)
- 85m Woodland Buffer
- 281.5m Bat Roost Buffer

Drawing Title
Physical and Environmental Constraints

Project Title
Briskalagh Renewable Energy Development

Drawn By	Checked By
MC	EMC
Project No.	Drawing No.
230502	Figure 3-1
Scale	Date
1:12,000	2024-10-04

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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 construction compound. 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.

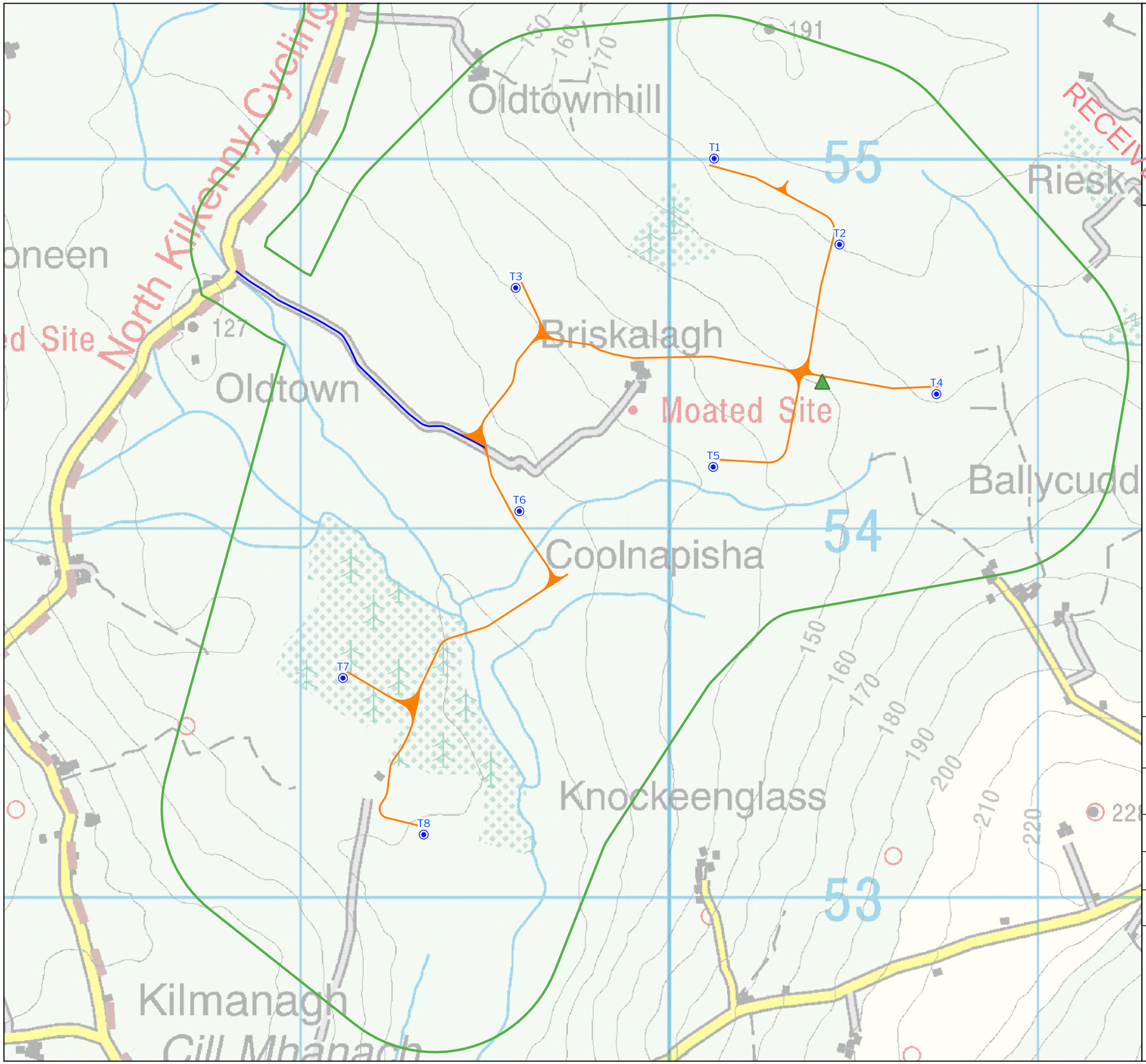
The turbine layout for the Proposed Wind Farm has also been informed by the results of noise assessments, landscape and visual and the separation distance to be maintained between turbines. Thus, the baseline environmental assessment of the Proposed Wind Farm site and wind farm design was an iterative 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.

3.2.5.2.2 Alternative Turbine Layout Iterations

The final proposed turbine layout takes account of all site constraints and the distances to be maintained between turbines and from houses, roads, etc. The layout is based on the results of all site investigations that have been carried out during the EIAR process 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 site 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 site layout. The initial constraints study identified a significant viable area within the overall study area of the Proposed Wind Farm site. Please refer to Figure 3-2, Figure 3-3, Figure 3-4, and Figure 3-5 to see the evolution of the turbine layout for the Proposed Wind Farm.



RECEIVED: 03/01/2025

Map Legend

- EIAR Site Boundary
- Proposed Turbine Locations
- Proposed Met Mast
- Proposed New Road
- Existing Road to be Upgraded
- Proposed Hardstand

Drawing Title
Proposed Layout Iterations - Option 1

Project Title
Briskalagh Renewable Energy Development

Drawn By	Checked By
MC	EMC
Project No.	Drawing No.
230502	Figure 3-2
Scale	Date
1:10,000	2024-10-04

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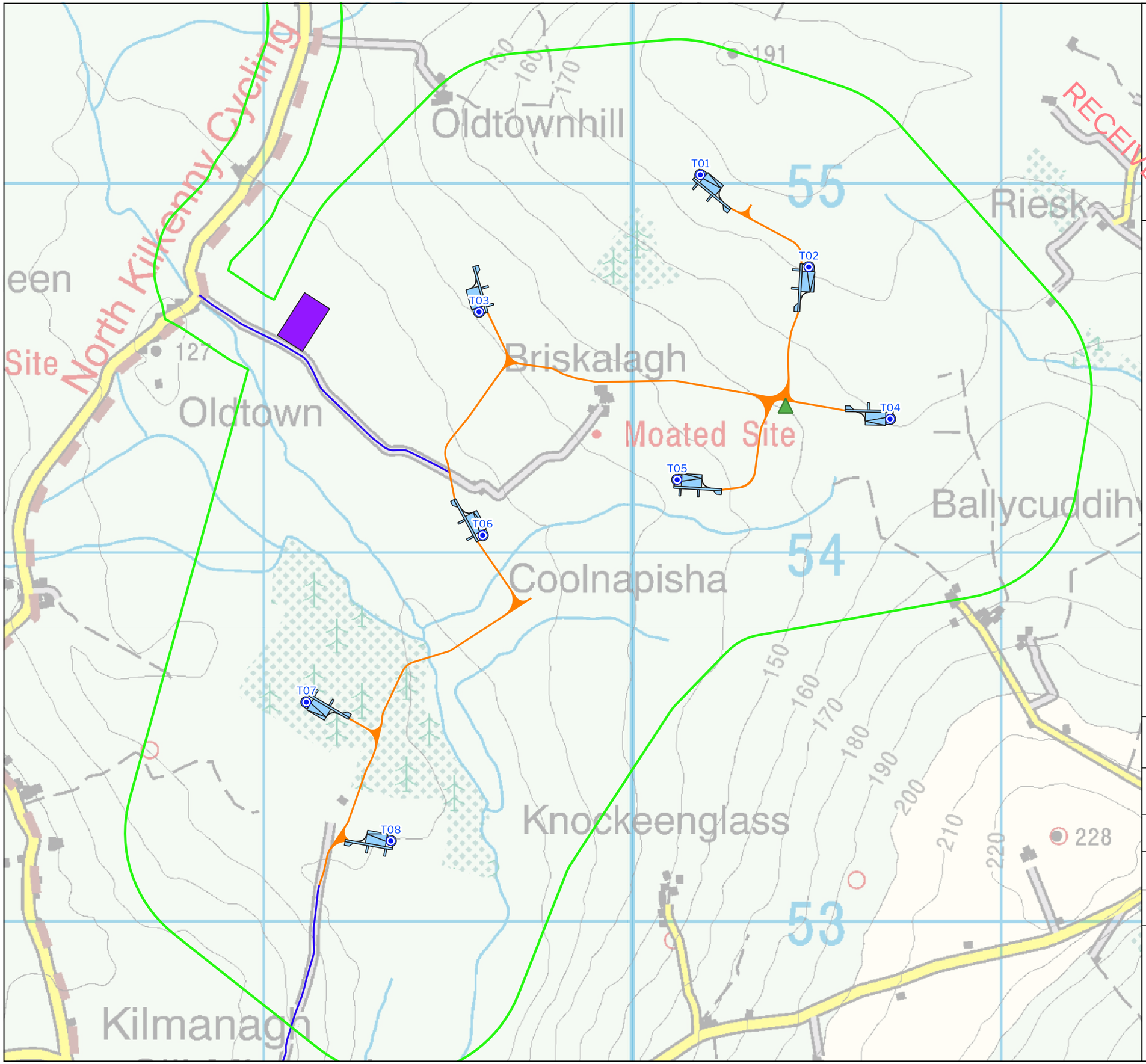
Proposed Layout Iterations - Option 1

Iteration Option.1 as shown above in Figure 3-2 shows an early stage proposed layout for the Proposed Wind Farm.
As can be seen in the figure above, this layout comprised of 8 no. turbines and was determined on the basis of a desk study. The proposed entrance to the Proposed Wind Farm came from the west of T03 and T06, originating off the L5023.

Initially, the Applicant considered upgrading and utilising the existing farm access off the L5023 local road to the west of the Site as the site entrance for turbine component delivery during construction, and as site access during the operational phase. On review, this option was deemed inappropriate from a traffic management perspective. Therefore, an alternative construction access was proposed off the L1009 in order access the Proposed Wind Farm site.

Upon review of desk-based constraints in relation to the layout, the following amendments were made to the 8-turbine layout:

- T01 – Moved slightly to accommodate a bat felling buffer from an area of woodland;
- T02 – Moved slightly to accommodate a bat felling buffer from a hedgerow;
- T03 – Associated hardstand orientation altered to avoid hedgerow loss and to avoid locating the hardstand within a watercourse buffer;
- T04 – Moved slightly to accommodate a bat felling buffer from a hedgerow;
- T05 – Moved slightly to accommodate a bat felling buffer from a hedgerow, and associated hardstand orientation altered to avoid hedgerow loss, also moved to adhere to a bat roost set back;
- T08 – Moved slightly to accommodate a bat felling buffer from a hedgerow;
- Additional site access road added from the L1009 to the south to facilitate construction traffic.



Map Legend

- EIAR Site Boundary
- Proposed Turbine Locations
- Proposed Met Mast
- Proposed New Road
- Existing Road to be Upgraded
- Proposed Hardstand
- Proposed On Site Substation

Drawing Title
Proposed Layout Iterations - Option 2

Project Title
Briskalagh Renewable Energy Development

Drawn By	Checked By
MC	EMC
Project No.	Drawing No.
230502	Figure 3-3
Scale	Date
1:10,000	2024-08-21

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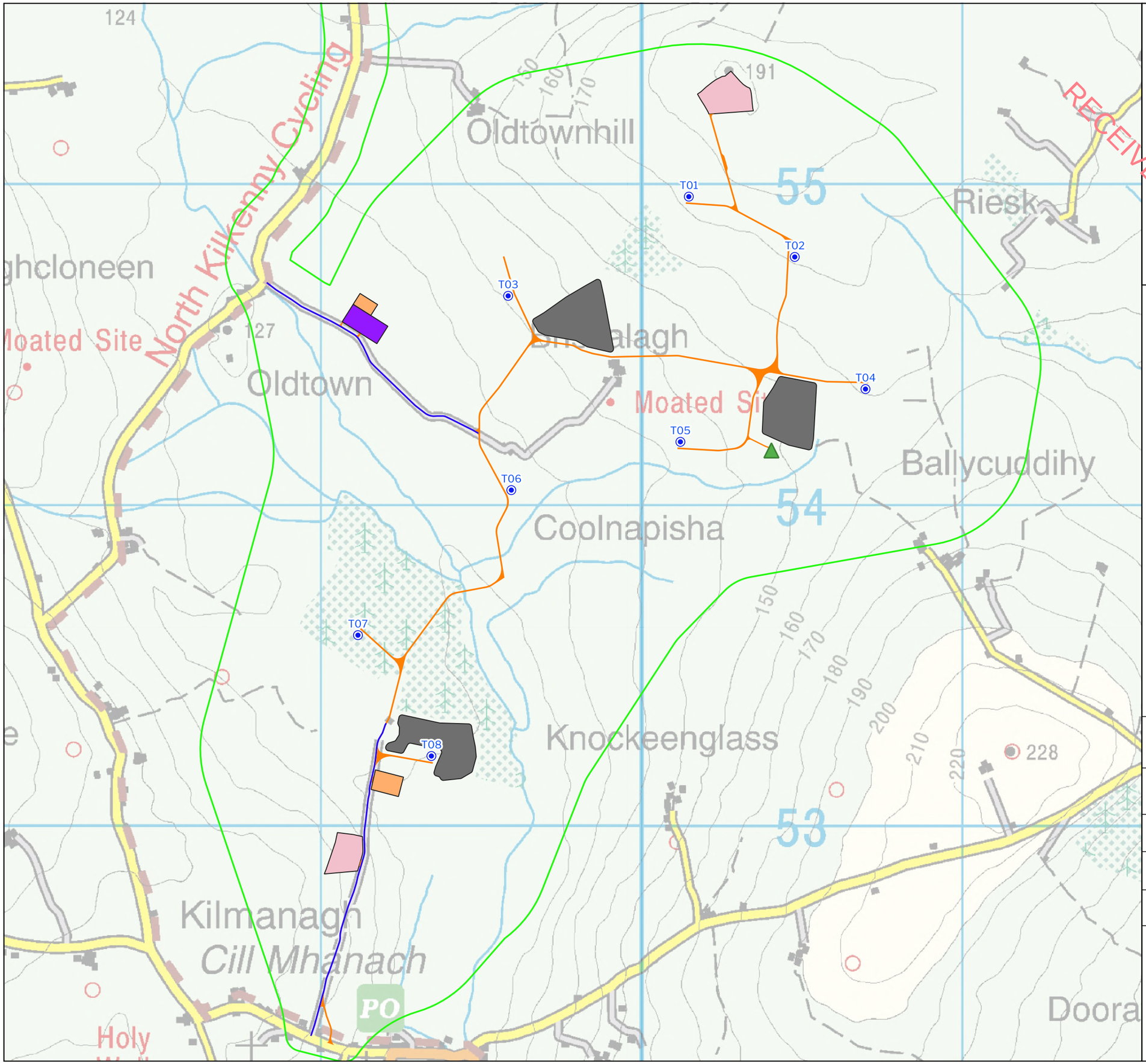
Proposed Layout Iterations - Option 2

Iteration Option 2, which is presented in Figure 3-3 above, comprised of 8 no. turbines, hardstands, access roads, met mast, and onsite substation. 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 review by the design team. Constraints that were considered include relevant setback from dwellings (500m from all dwellings, 740m for third-party dwellings in the case of the Proposed Project), setback from National Monuments plus 30m 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.



Map Legend

- EIAR Site Boundary
- Proposed Turbine Locations
- Proposed Met Mast
- Proposed New Road
- Existing Road to be Upgraded
- Proposed Borrow Pit
- Proposed Spoil Management Area
- Proposed Temporary Construction Compound
- Proposed Hardstand
- Proposed On-Site Substation

Drawing Title
Proposed Layout Iterations - Option 3

Project Title
Briskalagh Renewable Energy Development

Drawn By	Checked By
MC	EMC
Project No.	Drawing No.
230502	Figure 3-4
Scale	Date
1:11,500	2024-10-04

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Proposed Layout Iterations - Option 3

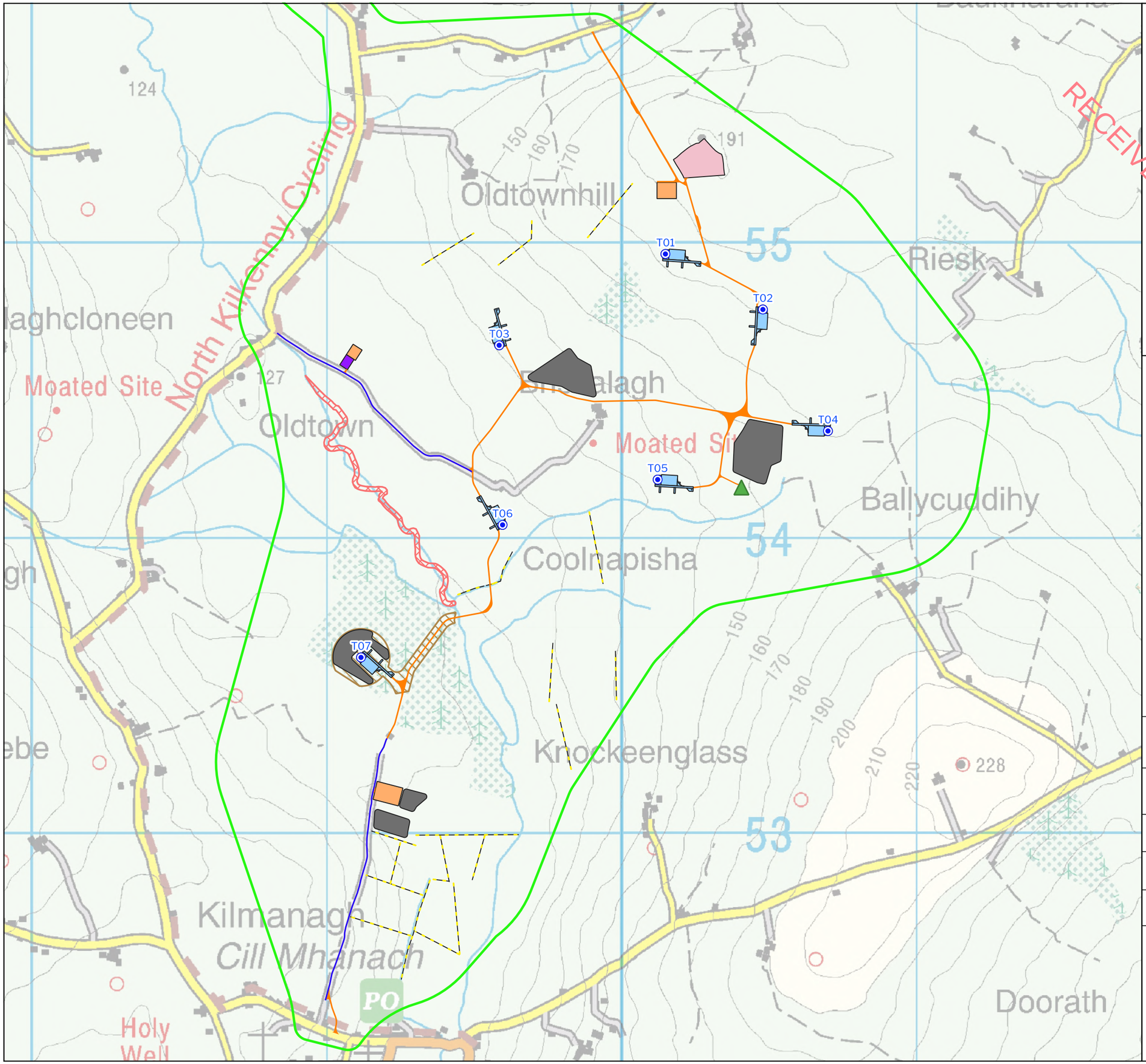
Proposed Layout Iteration Option 3 which is presented in Figure 3-4 comprises of 8 no. turbines, hardstands, onsite 110kV substation and associated construction compound (part of the Proposed Grid Connection), construction compound, meteorological mast, access roads, borrow pits, spoil management areas. The layout in Iteration No. 3 included two proposed borrow pit locations which were provisionally sited based on desk studies and site walkover surveys. These locations were then presented to the project team for detailed investigations and assessment, along with the newly proposed spoil management areas. These investigations included intrusive site investigation surveys, ecological surveying, and hydrological investigations of the proposed site layout.

The detailed ground investigation works and further hydrological investigations resulted in the southern borrow pit being removed from the next iteration of the proposed layout.

Turbine T01 was microsited to ensure that it adhered to the relevant setback from dwellings (500m from all dwellings, 740m for third-party dwellings in the case of the Proposed Project) and maintain the bat felling buffer from an area of woodland.

The proposed onsite 110kV substation was reoriented in Iteration No. 3, as compared to Iteration Number 2 (Figure 3-3 above), this was the result of an initial hydrological site walkover survey at this location, to move the proposed substation away from a watercourse located within the adjoining field to the west.

A proposed temporary turbine component delivery entrance was also included in Iteration No. 3. This temporary construction phase entrance proposed to the south of the Site was included to facilitate turbine component delivery and was subject to autotrack assessment to identify the turning area required, as described in Chapter 15, Section 15.2 of the Traffic and Transport Assessment.



Map Legend

- EIAR Site Boundary
- Proposed Turbine Locations
- Proposed Met Mast
- Proposed Hardstand
- Existing Road to be Upgraded
- Proposed New Road
- Proposed Borrow Pit
- Proposed Spoil Management Area
- Proposed Temporary Construction Compound
- Proposed Riparian Buffer
- Proposed Felling Area
- Proposed Hedgerow Planting and Enhancement Measures
- Proposed On Site Substation

Drawing Title
Proposed Layout Iterations - Option 4 (Final Proposed Wind Farm Site Layout)

Project Title
Briskalagh Renewable Energy Development

Drawn By	Checked By
MC	EMC
Project No. 230502	Drawing No. Figure 3-5
Scale 1:12,500	Date 2024-10-04

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Proposed Layout Iterations Option 4 - Final Proposed Wind Farm Site Layout

Iteration Option 4, as presented in Figure 3-5, comprises 7 no. turbines with a maximum overall ground-to-blade tip height of 185 metres, rotor diameter of 163 metres, hub height of 103.5 metres, one met mast, three construction compounds, one borrow pit, spoil management areas, a riparian planting area along the Tullaroan Stream, hedgerow planting and enhancement areas, one onsite 38kV substation and grid connection underground cabling route which is further detailed in Section 3.2.6.

The revisions to the layout were found to have a positive effect on the environmental, ecological and hydrological elements of the Site when compared to the other options considered.

As part of the final design iteration, turbine T08, which had featured in the previous iterations, was removed from the layout following a thorough analysis of photomontage visualisations and continued consultation with the local community. T08 was the closest turbine to the Kilmanagh settlement (designated a rural node), located c.860m from the nearest sensitive receptor in the settlement, and its removal from the layout results in an increased setback that significantly exceeds the requirements set out in the Guidelines and draft Guidelines. The closest proposed turbine to the settlement of Kilmanagh is now turbine T07, located c.1.2km from the nearest sensitive receptor in the settlement. Plate 3-1 and Plate 3-2, below, show a comparative visualisation of the proposed turbine layout with and without turbine T08 from VP11 located immediately east of the settlement of Kilmanagh.

Plate 3-1 Viewpoint 11 Layout Iteration 3 (T08 included)

Plate 3-2 *Viewpoint 11 Layout Iteration 4 (T08 removed) The proposed onsite substation was reduced from 110kV to 38kV which requires a smaller compound footprint, this is included in the final iteration of the layout.*

As part of the final design iteration, enhancement and replanting measures were developed in order to ensure that the Proposed Project had a positive effect on local biodiversity. Measures such as hedgerow

replanting and riparian planting along the Tullaroan Stream have been proposed as part of the Proposed Wind Farm, with further details being available in Appendix 6-4 Biodiversity Management and Enhancement Plan.

The proposed spoil management areas were also reduced in size in order to ensure that they do not encroach on any hydrological buffers.

The internal road layout was also finalised as part of this Proposed Layout Iteration. As can be seen in Figure 3-5 above, a northern Site entrance and temporary construction compound were included in order to facilitate the construction of the proposed borrow pit and to reduce the level of construction traffic passing through Kilmanagh to the south, with only deliveries of turbine component and concrete for turbine foundations utilising the southern entrance off the L1009. Further detail on the above is included in Chapter 4 of the EIAR.

The final proposed turbine 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.

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

Environmental Consideration	Initial Turbine Layout Iterations and all associated Infrastructure	Chosen Option of the Final 7 Turbine Layout and all associated infrastructure
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.	Decreased potential for shadow flicker due to greater setbacks from houses, greater separation between turbines thus reducing aggregated shadow flicker time. There is no potential for significant noise and vibration effects from the proposed turbines. Furthermore, noise emissions can be curtailed to meet threshold criteria. Fewer turbines may occupy a smaller portion of a viewpoint. Based on the assessment detailed in Chapter 5 and the mitigation measures proposed, there will be no significant effects on population and human health from shadow flicker, noise and vibration and visual amenity during the construction, operation and decommissioning phases of the Proposed Project.
Biodiversity & Ornithology	Greater potential impact on identified sensitive ecological receptors due to location of infrastructure within designated setback buffers (i.e. identified bat roost and habitats identified as key ecological receptors.) Larger development footprint would result in greater potential for habitat loss. With the implementation of the mitigation measures described in Chapter 7 Ornithology, the residual effects for collision risk for the original turbine layout would not be significant.	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 Habitat Enhancement proposal, 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.
Land, Soils & Geology	Larger development footprint would result in greater volume	As detailed in the assessment in Chapter 8, no significant effects on soils and subsoils will occur

Environmental Consideration	Initial Turbine Layout Iterations and all associated Infrastructure	Chosen Option of the Final 7 Turbine Layout and all associated infrastructure
	of spoil to be generated, excavated and sorted. Geotechnical investigations followed by careful design would lead to no significant environmental impacts.	during the construction, operation or decommissioning phases. Geotechnical investigations followed by careful design would lead to no significant environmental impacts.
Hydrology & Hydrogeology	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. Groundwater loggers were also placed onsite for a period of seven months in order to determine the characteristics of the groundwater levels and flow in the area surrounding the Site.
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, mitigation measures implemented would ensure that no significant effects on air quality would arise.	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	There would be an 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, 1,105,230 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. The addition of an estimated 49MW

Environmental Consideration	Initial Turbine Layout Iterations and all associated Infrastructure	Chosen Option of the Final 7 Turbine Layout and all associated infrastructure
		clean energy to the national grid will be a positive contribution to the States renewable energy targets set out in the Climate Action Plan 2023. The chosen option will result in slight decrease in carbon displacement given the removal of a turbine.
Noise & Vibration	Potential for increased noise impacts on nearby sensitive receptors due to reduced separation distance between sensitive receptors and turbine locations and an additional turbine generator.	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 would be spread over a wider area, taking up a greater portion of a viewpoint, with a turbine located closer, and thus appearing more visually prominent, to the rural node of Kilmanagh. The initial layout adhered to the relevant setback from dwellings (500m from all dwellings, 740m for third-party dwellings and in the case of the Proposed Project).	The smaller number of proposed turbines layout ensures a setback greatly in excess of the required setback set out in the draft Guidelines. The closest proposed turbine to the settlement of Kilmanagh is now turbine T07, located c.1.2km from the nearest sensitive receptor in the settlement. The final layout adheres to the relevant setback from dwellings (500m from all dwellings, 740m for third-party dwellings and in the case of the Proposed Project).
Cultural Heritage & Archaeology	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology. Potential views of additional turbines increases the potential for indirect effects on the setting of monuments, as it is more likely that greater	Smaller development footprint would decrease the potential for impacts on unrecorded, subsurface archaeology. Removal of T08 slightly reduces the potential for indirect effects on the setting of monuments, as it is less likely

Environmental Consideration	Initial Turbine Layout Iterations and all associated Infrastructure	Chosen Option of the Final 7 Turbine Layout and all associated infrastructure
	numbers of turbines will be seen from monuments.	that turbines will be seen from monuments. As detailed in the assessment in Chapter 14, there will be no significant direct or indirect effects on known or unknown archaeology and cultural heritage during the construction, operation and decommissioning phases. Archaeological monitoring 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 larger development footprint and requirement for more construction materials and turbine components. Use of a western site entrance for the majority of construction traffic has the potential for greater traffic impacts on the rural node of Kilmanagh. No material difference between the two options for gas, water, telecommunications and aviation. Potential for increased waste volumes produced compared to the chosen option.	Potential for smaller traffic volumes during the construction phase due to a smaller development footprint and requirement for fewer construction materials and turbine components. Use of the northern site entrance for the majority of construction traffic ensures that lower traffic impacts on the rural node of Kilmanagh As detailed in Chapter 15, there will be short term negative imperceptible to slight impact on traffic volumes during the construction phase of the Proposed Project. A detailed Traffic Management Plan incorporating all the mitigation measures will be agreed with the roads authority prior to construction works commencing on site. No material difference between the two options for gas, water, telecommunications and aviation. There will be less waste management required in the chosen option
Vulnerability to Major Accidents Natural Disasters	No material difference between the two options	No material difference between the two options

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. Such tracks must be of a gradient and width sufficient to allow safe movement of equipment and vehicles. Approximately 6km of new internal tracks are required for the Proposed Project along with approximately 1.8km of existing farm tracks, which is currently used by the landowners in their daily farming activities. These tracks will be utilised where possible; however, some require upgrading/widening to facilitate the movement of abnormal loads through the Proposed Wind Farm site.

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

For the final design iteration, an additional northern Site entrance was included in order to facilitate the construction of the proposed borrow pit and to reduce the level of construction traffic passing through Kilmanagh to the south. Further detail on the above is included in Chapter 15 of the EIAR.

An alternative option to making maximum use of the existing road network within the Proposed Wind Farm would be to construct a new road network, having no regard to existing roads or tracks. This approach was not favoured, as it would require unnecessary disturbance to the Site and create the potential for additional cut and fill material to be used in the construction of new road networks. Please see Table 3-5 for a comparison of environmental effects when compared against the chosen option.

Table 3-5 Comparison of environmental effects when compared against the chosen option (maximising the use of the existing road network)

Environmental Consideration	New Road Network	Use and Upgrade/Resurface of Existing Site Tracks/Local Roads
Population & Human Health	Potential for increased impacts on residential amenity due to increased disturbance during the construction stage.	The road upgrades will have potentially less of an impact on population and human health.
Biodiversity & Ornithology	Larger development footprint would result in greater habitat loss compared to the chosen option.	Smaller development footprint will result in a smaller habitat loss.
Land, Soils & Geology	Larger development footprint would result in greater volumes of spoil to be excavated and stored. Larger volume of stone required for road construction. No material difference between the two options for geotechnical/stability.	Smaller development footprint which leads to a reduction in spoil volumes to be excavated. No material difference between the two options for geotechnical/stability.
Hydrology and Hydrogeology	No material difference between the two options.	No material difference between the two options.

Environmental Consideration	New Road Network	Use and Upgrade/Resurface of Existing Site Tracks/Local Roads
Air Quality	More ground disturbance, potential for greater emissions due to more plant on site and longer construction phase would result in increased dust and other emissions.	Less ground disturbance therefore potential for fewer emissions due to fewer plant on site and shorter construction phase.
Climate	No material difference between the two options.	No material difference between the two options.
Noise & Vibration	Potential for increased noise impacts on nearby sensitive receptors during the construction of the new roads.	Potential for less noise impacts on nearby sensitive receptors during the construction of the road upgrades.
Cultural Heritage & Archaeology	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.	Smaller development footprint would decrease the potential for impacts on unrecorded, subsurface archaeology.
Landscape & Visual	There is potential for increased temporary visual impacts for sensitive receptors due to the presence of additional plant on site during the construction phase to excavate and construct a new road layout.	There will be a slight reduction in potential for visual impacts during the construction phase due to the decreased presence of plant on site.
Material Assets	Potential for greater traffic movements on site during construction phase due to larger development footprint. Greater potential for impacts on waste management due to increased plant on site giving rise to increase in hazardous waste materials. No material difference between the two options in potential for impact on gas, water, telecommunications aviation assets.	Smaller development footprint results in a reduced construction traffic movements on site due to smaller development footprint. No material difference between the two options in potential for impact on gas, water, telecommunications aviation assets.
Vulnerability to Major Accidents Natural Disasters	No material difference between the two options.	No material difference between the two options.

3.2.5.4 Alternative Borrow Pit Option

The use of an onsite borrow pit represents an efficient use of existing onsite resources and reduces the need to transport large volumes of construction stone materials along the local public road network to the Site. The use of an onsite resource, that would only be developed for the Proposed Wind Farm, reduces the use of off-site existing quarry material assets.

A review of potential construction phase borrow pit locations was carried out by geotechnical experts, Hydro Environmental Services and Danu Energy Consulting Ltd. Site surveys were undertaken and existing GIS data and environmental constraints were also considered, namely aerial photography, soil and subsoil cover, biodiversity (habitats), on site drainage, proximity to the existing and proposed internal road network, and proximity to sensitive receptors.

Arising from this process, 2 no. test pit locations were selected near at the north of Site (north of T01) and to the south (south of T07). Trial pits were undertaken at these locations to determine a potential suitable location for a borrow pit. The findings of the geological site investigations concluded in the identification of 1 no. borrow pit (15,272m^2) within the Site with a potential of providing 70,000m^3 of construction stone material for the Proposed Project. Please see Figure 4-1 for borrow pit location and Figure 4-15 for cross section details. The extraction of material from the borrow pit will be during the construction phase of the Proposed Project only and will be a temporary operation carried out over a short period of time. Rock breaking and blasting are potential methods of extracting material from the borrow pit. Processing and crushing of stone material will also be required at the borrow pit to achieve the grading requirements for use in construction. The estimated maximum volume to be extracted from the borrow pit for the Proposed Project is up to 70,000m^3. The final volumes to be removed from the borrow pit will be confirmed at the time of construction and following detailed pre-construction site investigation works. In addition to the material to be extracted from the borrow pit, it is anticipated that engineering fill and higher quality, surfacing granular fill and sand will be sourced from local, authorised quarries. There are approx. 19 no. licenced quarries located within 20 km of the Site which have been selected for the purposes of assessment throughout this EIAR. The locations of these quarries are shown in Figure 4-28.

An alternative to using an on-site borrow pit was the option of sourcing all stone and materials from a licensed quarry or quarries in the vicinity of the Site. The movement of the volume of material required for the construction of a 7 no. turbine wind farm would result in a significant increase in construction traffic and heavy loads, in combination with a potential for an increase in noise and dust emissions along the haul routes and was therefore considered a less preferable option. The cost of importing the required volume of crushed stone was also a factor in choosing to obtain stone from an on-site borrow pit.

A comparison of the potential environmental effects when comparing the sourcing of all stone from local, off-site quarries against the chosen option (majority from on-site borrow pit) is presented in Table 3-6 below.

Table 3-6 Comparison of environmental effects of sourcing all materials off site when compared against the chosen option – onsite borrow pit and offsite quarries.

Environmental Consideration	Sourcing all stone from local, off-site quarries	Use of onsite borrow pit along with offsite quarries
Population & Human Health	Potential for increased vehicular, noise and dust emissions from increased traffic movements, due to the volume of rock to be transported to the site along the public road network, which could	Lower dust and noise emissions, and traffic volumes due to reduced requirement for daily HGV presence on site during the construction phase. Temporary dust and noise emissions related to borrow pit extraction however,

Environmental Consideration	Sourcing all stone from local, off-site quarries	Use of onsite borrow pit along with offsite quarries
	be a nuisance to local residents along the haul route.	due to vegetation screening and distance from sensitive receptors, the residual effects are not significant.
Biodiversity & Ornithology	Reduced habitat loss and ground disturbance for flora, fauna and birds.	Increase in habitat loss due to borrow pit footprint however, as assessed in the Biodiversity chapter, this is habitat of low ecological value which is comprises the majoring of the site and surrounding landscape. Furthermore, the borrow pit will be left to naturally revegetate post construction. The Proposed Project includes for a biodiversity net gain proposal providing a local boost to biodiversity and water quality. Please see Appendix 6-4 for details. Reduction in requirement for spoil placement areas. No material difference between the two options in relation to geotechnical and stability concerns. Geotechnical investigations followed by careful design would lead to no significant environmental impacts.
Land, Soils & Geology	Slight reduction in spoil to be excavated, however, additional spoil placement areas would be required as an on-site borrow pit would not be available for the placement of excavated spoil. No material difference between the two options in relation to geotechnical and stability concerns. Geotechnical investigations followed by careful design would lead to no significant environmental impacts.	Reduction in requirement for spoil placement areas. No material difference between the two options in relation to geotechnical and stability concerns. Geotechnical investigations followed by careful design would lead to no significant environmental impacts.
Hydrology and Hydrogeology	No material difference between the two options.	No material difference between the two options.
Air Quality	Potential for increased vehicular and dust emissions from increased traffic movements within the site, due to the volume of rock to be imported.	More ground disturbance due to onsite borrow pit which can give rise to dust emissions however, lower traffic volumes arriving and departing site per day and reduced onsite traffic volumes therefore

Environmental Consideration	Sourcing all stone from local, off-site quarries	Use of onsite borrow pit along with offsite quarries
		reducing dust and noxious emissions overall.
Climate	No material difference between the two options.	No material difference between the two options.
Noise & Vibration	Increased potential for noise and vibration effects on local sensitive receptors due to arrival and departure of heavy goods vehicles during the construction phase and reduced potential for noise and vibration effects on local sensitive receptors due to no breaking or crushing of materials won from onsite borrow pit.	Potential for less noise impacts on nearby sensitive receptors during the construction of the road upgrades.
Cultural Heritage & Archaeology	Slightly smaller development footprint would reduce the potential for impacts on unrecorded, subsurface archaeology.	Slightly larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.
Landscape & Visual	Reduced landscape and visual effects temporarily as no open rock face would be visible from certain viewpoints. Increased visual impact due to frequent arrival and departure of HGVs to and from the Site.	Potential for increased landscape and visual effects temporarily due to open rock face which may be visible from certain viewpoints. However, there would be a reduced HGV presence on site and on the local road network as a portion of the materials will be won onsite. Furthermore, the borrow pit will be reinstated onsite once exhausted.
Material Assets	Significantly higher HGV traffic volumes on the public road network during construction phase due to the volume of crushed stone required to be transported to the site and empty HGVs leaving the site. No material difference between the two options in potential for impact on waste management, telecoms, aviation, electricity, water or gas.	Reduced volume of HGVs traffic volumes on the public road network during construction as a considerable portion of materials will be won on site. Decreased potential for noise, dust and emissions due to the reduced volumes of HGV traffic on the roads. No material difference between the two options in potential for impact on waste management, telecoms, aviation, electricity, water or gas.
Vulnerability to Major Accidents 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 include Belview Port, County Waterford, 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 five ports utilising the motorway network to the proposed haul route to the site. Regardless of which port is chosen, the components will approach the Site via the M9 to the east. For the purpose of this EIAR, the Belview Port, County Waterford 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. 14.4km east of the M8/R693 junction and, as such, delivery of turbine components from this direction were considered as part of the iterative design process for the Proposed Project. The alternative delivery route exited Junction 4 on the M8, following the R693 east for 5.7km, before turbine right onto the L-1815 in Woodsgift. The route continues along the L1815 and L1816 before turning right onto the L1008 and continuing for 3.6km, passing through the settlement of Tullaroan. To the south of Tullaroan, the route joins the L5023, following this road for 2.2km before using an existing farm access point to the west of the Site in the townland of Oldtown to enter the Site itself. After review by the Traffic Consultant and subsequent autotrack assessment, it was concluded that this route would require substantial accommodating works along the route, to facilitate the delivery of abnormal loads to the Site. In particular, it was determined that it would be difficult to achieve the required sightlines if the existing western Site entrance was to be used to facilitate the delivery of turbine components, particularly considering the nature of this Site entrance as located on a bend in the road, close to a bridge crossing the Tullaroan Stream, therefore limiting the potential for accommodation works at the Site entrance.

Therefore, the optimal delivery route is considered as the one that utilises the M9, N10, N76, R695, and L1009, which has been subject to autotracks assessment and shows that accommodation works are not required along the delivery route itself, and with the construction of a temporary abnormal load entrance off the L1009.

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 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.

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 abnormal load entrance will be temporary in nature, over a short period of the construction phase only. The abnormal load entrance will be reinstated after all abnormal loads have been delivered to site. However, should replacement components be required, this entrance will be temporarily reopened to facilitate such works. Please see section 15.1 Material Assets - Traffic and Transport for further details.

3.2.5.5.3 *Alternative Site Access Points*

Abnormal Load Entrances

Following an autotracks assessment of the turbine delivery route, it was concluded that a separate entrance for abnormal loads and concrete deliveries would be constructed at the Site with all other Heavy Goods Vehicles (HGVs) and construction phase vehicles using a separate entrance to the north of the Site. The abnormal load entrance will be temporary in nature and will be reinstated once all turbine components are delivered. This approach has been selected to facilitate the delivery of components off the L1009 and to allow the use of the optimal turbine component delivery route that utilises the M9, N10, N76, and R695, and at the same time avoids and reduces any impacts that may occur on traffic flow within Kilmanagh. An autotracks assessment confirmed the suitability of the southern boundary for abnormal load entry with minimal landtake requirements and minimal environmental impacts. As noted above, an alternative to this was to take the abnormal loads up the L5023 into existing farm entrances located west of the Site or via a new general construction access point. However, due to the necessary land take requirements, and inadequate sightlines, this option was ruled out.

General Construction and Operation

There are a number of existing access points to the Site. These comprise private farm access points off the L5024, the L5023, the L10103 and the L1009. 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 L10103 to the east of the Site was deemed unsuitable for construction traffic due to the lack of adequate sightlines and the steep slope of this existing road.

The existing farm entrance on the L1009 was ruled out as a construction phase entrance due to the requirement to bring construction traffic past residential properties within Kilmanagh giving rise to potential dust, noise and traffic impacts.

Therefore, a new construction site entrance off the L5024 which has achieved the necessary sightlines is proposed for general construction and operational access, and was considered suitable as an operational entrance for maintenance staff, ESBN (for substation access) and for continued farm access.

3.2.5.6 Alternative Design of Ancillary Structures

The ancillary structures required for the Proposed Project include underground electrical cabling and an on-site meteorological mast.

3.2.5.6.1 *Alternative Internal Site Cabling Route*

The internal 33kV underground cabling route will follow the internal road network throughout the Site, connecting all 7 no. turbines to the 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 spoil created.

3.2.5.6.2 *Alternative Meteorological Mast Location*

The meteorological mast is located at the northeast of the Proposed Wind Farm. The met mast is located in an agricultural field, which was shown to be an area of low ecological value. As shown in Figure 3-3 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 proposed spoil management areas were determined, the location of the met mast was moved approximately 225m south, in order to accommodate the proposed spoil management area.

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.

3.2.6 Alternative Grid Connection Design Options

3.2.6.1 Alternative Substation Location

The proposed onsite 38kV substation is located in the western portion of the Proposed Wind Farm site and is sited within an agricultural grassland field. This grassland is of low ecological value and is screened from sensitive receptors by vegetation from the west. To the east and south, sensitive receptors are located greater than 1km from the proposed substation. From the west and north, there are sensitive receptors located approximately 250m-350m from the proposed substation. However, there is substantial screening provided by intervening vegetation in this direction.

This location was deemed to be suitable due to the habitats it is located on, the available natural screening, its proximity to sensitive receptors and the existing ground conditions.

3.2.6.2 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 some small sections passing through private agricultural land. Underground electrical cables will transmit the power output from each wind turbine to the proposed onsite 38kV substation, and from there to the existing Ballyragget 110kV substation, via an underground electrical cabling route, measuring approximately 23km 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.23km underground cabling route would be to construct an approx. 18km overhead line from the proposed onsite substation to the existing 110kV Ballyragget substation. While overhead lines are less expensive and allow for easier repairs when required, underground cabling will have no visual impact. For this reason, it was considered that underground cabling would be a preferable alternative to overhead lines. The Guidelines 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 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 Ballyragget substation is located 18.2km north of the Proposed Wind Farm, as the crow flies. It was considered that this was not a feasible option, due to the likely need for constructing at least 18.2km 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 a 110kV substation. There are 4 no. existing 110kV electricity substation located within 25km of the Proposed Wind Farm, namely:

- Ballyragget 110kV Substation
- Kilkenny 110kV Substation
- Thurles 110kV Substation
- Lisheen 110kV Substation

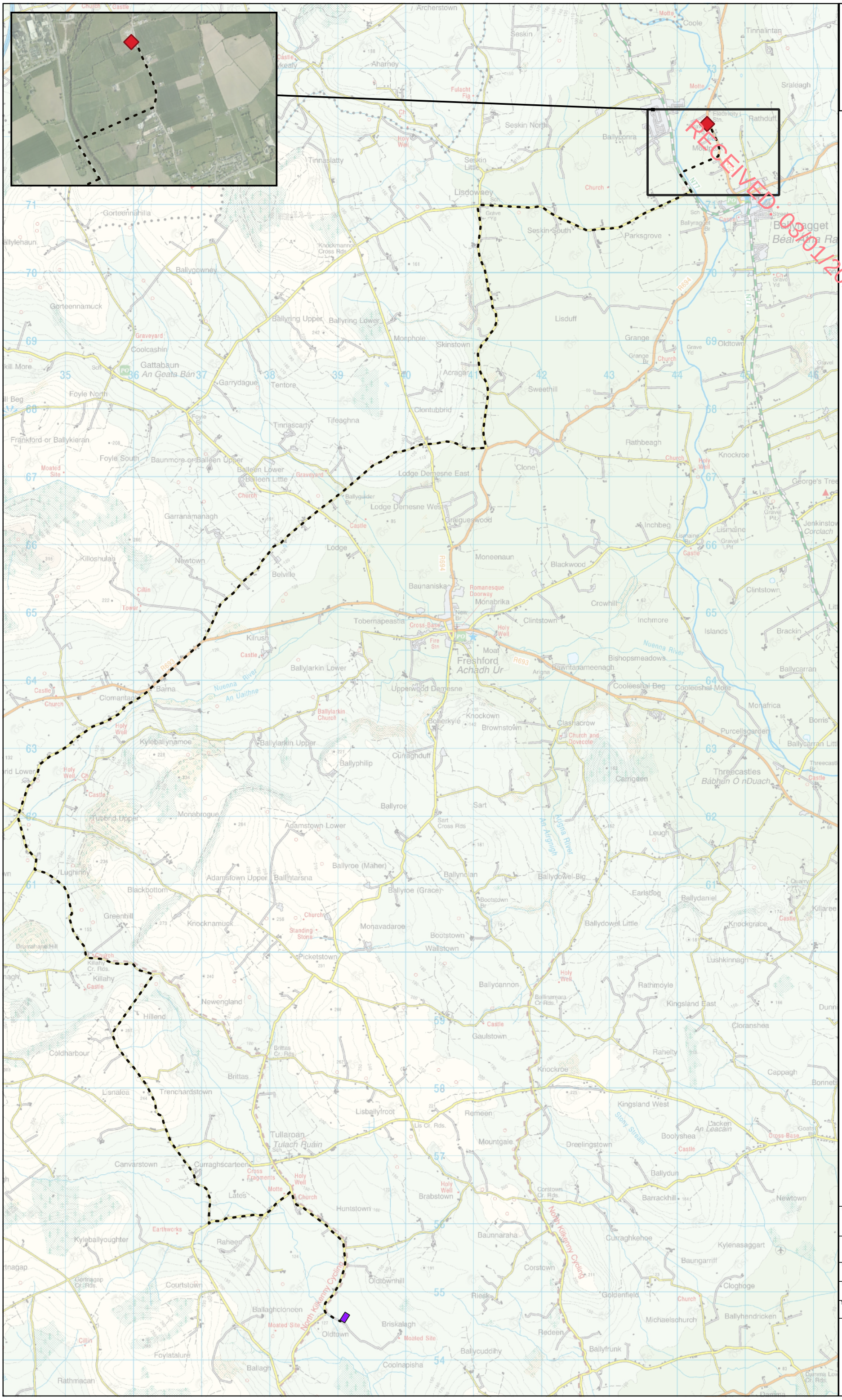
Initial grid studies, undertaken by the Applicant, identified Ballyragget 110kV substation as the optimum connection node for the Proposed Project. An underground grid connection cabling route to Ballyragget 110kV Substation was considered and assessed to identify whether it was a viable option. This assessment outlines a number of routes from the Proposed Wind Farm to Ballyragget 110kV substation, which were considered during the iterative design process.

The Proposed Grid Connection to Ballyragget 110kV substation and the proposed underground electrical cabling route has been revised and refined to take account of the findings of the site investigations and baseline assessments, which have brought the design from its initial option as presented in Figure 3-6 to the current layout as presented in Figure 3-8.

3.2.6.2.1 *Proposed Grid Connection Underground Cabling Route Option No. 1*

An alternative option examined to connect the Proposed Wind Farm to Ballyragget 110kV substation from the south, primarily following local roads, as shown in Figure 3-6 below. This route was approximately 29.6km long (6.8km longer than the final chosen grid route option) and involved the crossing of 11 no. mapped watercourses. The route travels along local road from the Proposed Wind Farm site until reaching the N77 outside Ballyragget. It then travels along an approximately 325m stretch of the N77, before crossing the River Nore via direction drilling and passing through private agricultural land and joining the R432 for an approximately 500m stretch before reaching the Ballyragget 110kV substation.

It was determined, based on the above, that it would be appropriate to seek out a shorter alternative underground cabling route.



Drawing Title
Proposed Grid Connection
Underground Cable Route Option 1

Project Title
Briskalagh Renewable Energy Development

Drawn By	Checked By
MC	EMC
Project No.	Drawing No.
230502	Figure 3-6
Scale	Date
1:50,000	09.09.2024

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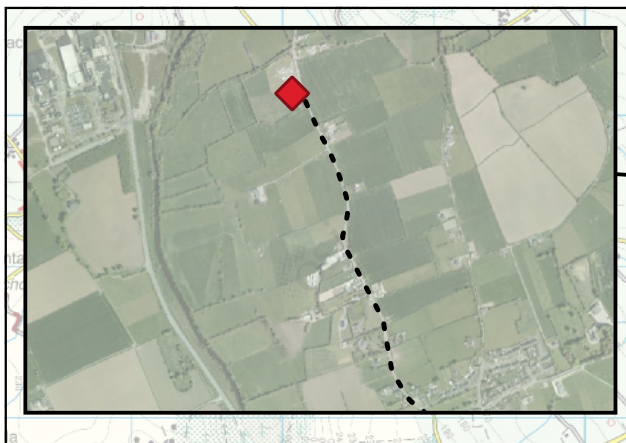
3.2.6.2.2 *Proposed Grid Connection Underground Cabling Route Iteration No. 2*

A second alternative option examined to connect the Proposed Wind Farm to Ballyragget 110kV substation from the south, measuring approximately 23km in length, and travels from the Proposed Wind Farm site roads before merging onto the L5023 travelling north along the local road network before reaching Freshford. From Freshford it followed the R694 and travels north towards Ballyragget. The route then crosses the River Nore via directional drilling under the Ballyragget Old Bridge, emerging onto the N77 and travelling along this road for an approximately 380m stretch. The route then turns left onto the R432, travelling along this road until reaching the Ballyragget 110kV substation.

This proposed underground cabling route involves 13 no. identified watercourse crossings along the Proposed Grid Connection underground cabling route. 10 no. watercourse crossings are referenced on EPA/OSI mapping. An additional 3 no. watercourse crossings were identified during surveys of the underground cabling route.

It was determined, based on consultation with Kilkenny County Council, and cultural heritage constraints identified within Ballyragget, that it would be appropriate to seek an alternative route that avoided passing through Ballyragget.



Map Legend

- Proposed On Site Substation
- Proposed Grid Connection Route
- Existing 110kV Ballyragget Substation

Drawing Title: Underground Cable Route Option 2

Project Title: Briskalagh Renewable Energy Development

Drawn By	Checked By
MC	EMC
Project No.	Drawing No.
230502	Figure 3-7
Scale	Date
1:50,000	09.09.2024

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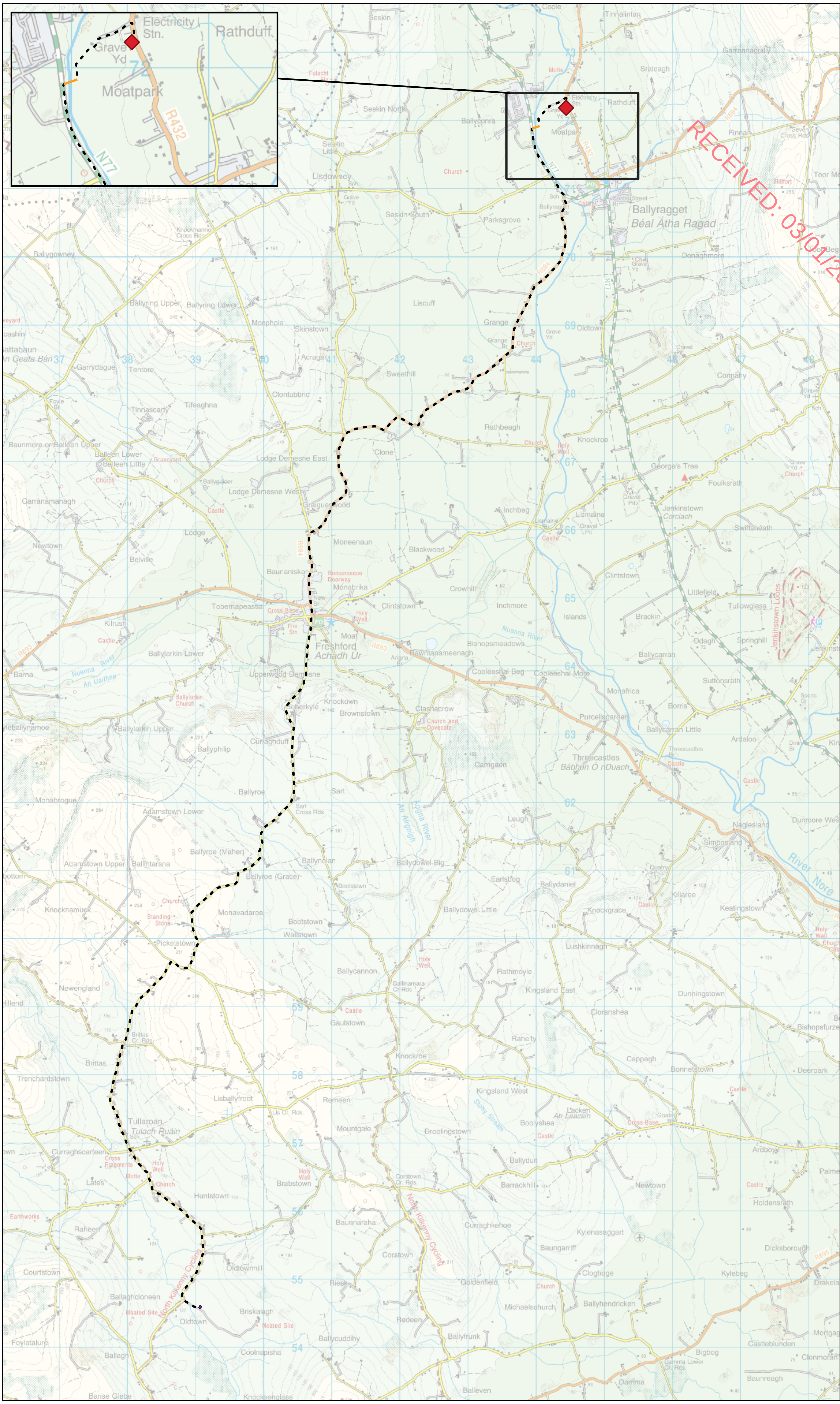
3.2.6.2.3 *Proposed Grid Connection Underground Cabling Route Iteration No. 3 – Final Proposed Underground Cable Route*

The final Proposed Grid Connection underground cabling route measures approximately 23km in length, and travels from the Proposed Wind Farm site roads before merging onto the L5023 travelling north along the local road network before reaching Freshford. From Freshford it follows the R694 and travels north towards Ballyragget. The route then crosses the River Nore via directional drilling from the N77, emerging into agricultural fields, and travelling through these for an approx. 660m stretch. The route then turns onto the R432, travelling along this road until reaching the Ballyragget 110kV substation.

This Proposed Grid Connection underground cabling route involves 13 no. identified watercourse crossings along the Proposed Grid Connection underground cabling route. 10 no. watercourse crossings are referenced on EPA/OSI mapping. An additional 3 no. watercourse crossings were identified during surveys of the underground cabling route. This was considered to be the most environmentally prudent and practical option for a grid connection as it was a considerably shorter length of route (6.8km shorter than underground cabling route option 1), and avoided the potential cultural heritage receptors identified within Ballyragget (see option 2 above).



Map Legend

- Proposed On Site Substation
- Proposed Grid Connection Route
- Proposed Horizontal Directional Drilling
- Existing 110kV Ballyragget Substation

Drawing Title
Underground Cable Route Option 3
(Final Proposed Underground Cable Route)

Project Title
Briskalagh Renewable Energy Development

Drawn By	Checked By
MC	EMC
Project No.	Drawing No.
230502	Figure 3-8
Scale	Date
1:50,000	09.09.2024

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Environmental Consideration	Option 1 – Ballyragget 110kV Substation via route option 1	Option 2 – Ballyragget 110kV Substation via route option 2	Grid Route Option 3 (Chosen Option) – Ballyragget 110kV Substation via shorter route
Population & Human Health	Potential for temporary visual impact for a longer construction phase considering the longer route, 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 shorter construction phase considering the shorter route, from presence of plant machinery onsite during the construction period. Potential for temporary noise and dust impacts for a shorter construction phase considering the shorter route, from plant machinery onsite during construction phase.	Potential for temporary visual impact for a shorter construction phase considering the shorter route, from presence of plant machinery onsite during the construction period. Potential for temporary noise and dust impacts for a shorter construction phase considering the shorter route, from plant machinery onsite during construction phase.
Biodiversity (including Birds)	Low potential for impact on sensitive ecological receptors during the construction phase. As detailed in Chapter 6, the Proposed Grid Connection underground cabling route passes through 1 no. mapped SAC (River Barrow and River Nore SAC) and 1 no. mapped SPA (River Nore SPA). However, no instream works are proposed as part of the crossing methodology for this SAC and SPA. Therefore, as detailed in the Natura Impact Statement no adverse impacts on the SAC are anticipated.	Low potential for impact on sensitive ecological receptors during the construction phase. As detailed in Chapter 6, the Proposed Grid Connection underground cabling route passes through 1 no. mapped SAC (River Barrow and River Nore SAC) and 1 no. mapped SPA (River Nore SPA). However, no instream works are proposed as part of the crossing methodology for this SAC and SPA. Therefore, as detailed in the Natura Impact Statement no adverse impacts on the SAC are anticipated.	Low potential for impact on sensitive ecological receptors during the construction phase. As detailed in Chapter 6, the Proposed Grid Connection underground cabling route passes through 1 no. mapped SAC (River Barrow and River Nore SAC) and 1 no. mapped SPA (River Nore SPA). However, no instream works are proposed as part of the crossing methodology for this SAC and SPA. 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. This underground cabling route option is proposed to be located primarily within the public road corridor, with an approximately 550m stretch passing through private agricultural land.	Lower volume of earthworks required due to shorter route. The Proposed Grid Connection underground cabling route will be primarily located within the public road carriageway. This option does not pass through any agricultural field, instead opting to pass through the town of	Lower volume of earthworks required due to shorter route. The Proposed Grid Connection underground cabling route will be primarily located within the public road carriageway, with a c. 660m stretch over a farm track and agricultural fields adjacent to the 110kV Ballyragget substation. As detailed in the assessment in

Environmental Consideration	Option 1 – Ballyragget 110kV Substation via route option 1	Option 2 – Ballyragget 110kV Substation via route option 2	Grid Route Option 3 (Chosen Option) – Ballyragget 110kV Substation via shorter route
		Ballyragget before connecting with the Ballyragget substation.	Chapter 8, no significant effects on land, soils or geology will occur.
Hydrology and Hydrogeology	Option 1 has 11 no. EPA mapped watercourse crossings, and. There are no instream works proposed as part of the crossing methodologies for any of these watercourse crossings.	Option 2 has 10 no. EPA mapped watercourses. An additional 3 no. watercourse crossings were identified during surveys of the underground cabling route. There are no instream works proposed as part of the crossing methodologies for any of these watercourse crossings.	Option 3 has 10 no. EPA mapped watercourses. An additional 3 no. watercourse crossings were identified during surveys of the underground cabling route. There are no instream works proposed as part of the crossing methodologies for any of these watercourse crossings 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, this option has a greater potential for effects from dust, and vehicle emissions during construction.	As a result of the shorter route, this option has a lower potential for effects from dust, and vehicle emissions during construction	As a result of the shorter route than Option 1, this option has a lower potential for effects from dust, and vehicle emissions during construction. As detailed in Chapter 11, no significant effects on air quality will occur.
Climate	This option would result in increased vehicle emissions during construction given the longer route.	This option would result in reduced vehicle emissions, compared to Option 1 during construction given the reduced length	As a result of the shorter route, this option would result in decreased vehicle emissions, compared to Option 1, during construction.
Noise & Vibration	All options would have similar noise and vibration emissions during construction.	All options would have similar noise and vibration emissions during construction. However, this option does pass through three villages and therefore would potentially impact	All options would have similar noise and vibration emissions during construction. However, this option does pass through two villages and therefore would potentially impact

Environmental Consideration	Option 1 – Ballyragget 110kV Substation via route option 1	Option 2 – Ballyragget 110kV Substation via route option 2	Grid Route Option 3 (Chosen Option) – Ballyragget 110kV Substation via shorter route
	However, this option does not pass through any villages or settlements and therefore would impact on fewer sensitive receptors.	more sensitive receptors when compared to Option 1 and 3.	more sensitive receptors when compared to Option 1 but less than Option 2.
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.
Cultural Heritage & Archaeology	There is no material difference in the possibility of impacting recorded monuments. There is a decreased potential of impacting undiscovered sub surface features compared to the chosen option given the Grid Connection does not pass through any agricultural field.	There is no material difference in the possibility of impacting recorded monuments. There is a decreased potential of impacting undiscovered sub surface features compared to the chosen option given the Grid Connection does not pass through any agricultural field.	There is no material difference in the possibility of impacting recorded monuments. There is an increased potential of impacting undiscovered sub surface features when constructing the underground grid connection cable through the agricultural fields adjacent to the existing Ballyragget 110kV substation. As detailed in Chapter 12, no significant effects on cultural heritage or archaeology will occur.
Material Assets	Grid Connection Route Option 1 measured approximately 29.6km in length and is located primarily in the road corridor. The route follows local roads for approximately 28.2km of its extent, regional roads for approximately 500m, and the N77 national road for approximately 325m. This would likely result in reduced traffic impacts compared to Option 2	Grid Connection Route Option 2 measures approximately 23km in length and is located primarily in the public road corridor. The route follows local roads for approximately 12.3km of its extent, regional roads for approximately 8.78km, and the N77 national road for approximately 800m. This would likely result in increased traffic impacts compared to Option 1	Grid Connection Route Option 3 measures approximately 23km in length, and travels from the Proposed Wind Farm site roads before merging onto the L5023 travelling north along the local road network before reaching Freshford. From Freshford it follows the R694 and travels north towards Ballyragget. The route then crosses the River Nore via directional drilling from the N77, emerging into agricultural fields and its

Environmental Consideration	Option 1 – Ballyragget 110kV Substation via route option 1	Option 2 – Ballyragget 110kV Substation via route option 2	Grid Route Option 3 (Chosen Option) – Ballyragget 110kV Substation via shorter route
	considering the level of traffic using local roads compared to regional, or higher, roads.	considering greater length of route travelling along regional and national roads.	associated pre-existing farm track, and travelling through these for an approx. 660m stretch. The route then turns onto the R432, travelling along this road until reaching the Ballyragget 110kV substation. This would likely result in increased traffic impacts compared to Option 1 considering greater length of route travelling along regional and national roads but slightly less than Option 2. 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 create a riparian buffer zone comprising native species adjacent the Tullaroan stream within the Proposed Wind Farm site, increase the ecological condition of approximately 3,640m of existing hedgerow and to plant approximately 270m of new native hedgerow. Please see Appendix 6-4 Biodiversity Management and Enhancement Plan for details.

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 riparian buffer zone in the form of hedgerows along both sides of a 1.1km segment of the Tullaroan Stream within the Proposed Wind Farm site in addition to the enhancement of existing hedgerow and planting of new hedgerow noted previously. These replanting and enhancement measures will have a long-term slight positive effect on biodiversity.

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.