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ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED FAHY BEG WIND FARM, CO. CLARE

VOLUME 2 – MAIN EIAR

CHAPTER 2 – SITE SELECTION & ALTERNATIVES CONSIDERED

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2.1 Introduction

The following chapter sets out the need for the proposed development having regard to climate change, national policy and national renewable energy targets. Following the establishment of the need for the proposed development, the chapter details the reasonable alternatives 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. It describes the site selection process, alternative design philosophies considered, alternative site layouts, the do-nothing alternative and alternative processes, amongst other things.

2.2 Need for the Proposed Development

The proposed Fahy Beg Wind Farm is necessary to produce renewable energy for the Irish national grid in order to transition Ireland to a low carbon economy. The proposed wind farm will play a role in providing renewable electricity in the Republic of Ireland, where in November 2021, the Irish Government published a Climate Action Plan (CAP) which sets out an objective to more than double Ireland's onshore wind energy capacity to 8.2GW by 2030 in order to meet new renewable energy targets and reduce emissions (Climate Action Plan, 2021).

At a strategic level, the need for the Fahy Beg Project is supported by International, European, and National environmental and energy commitments and policies. In Chapter 4 of this EIAR, a detailed analysis of these commitments and policies is outlined. This is in the context of substantial and continuing failure by Ireland in meeting climate targets to date.

The Climate Action Plan (2021) provides a framework for delivering the Government's target of a 51% reduction (relative to 2018) in greenhouse gas (GHG) emissions by 2030. CAP21 follows the Climate Act 2021, which commits Ireland to a legally binding target of net zero greenhouse gas emissions no later than 2050, and a reduction of 51% by 2030, with the CAP 2021 stating:

> '*This plan sets a roadmap for taking decisive action to halve our emissions by 2030 and reach net zero no later than 2050, as we committed to in the Programme for Government. The science is indisputable and the effects of climate change are already clear. Extreme weather events are becoming more frequent with devastating consequences. Climate change is here and is already impacting our world, with risks to global security including food supplies. Ireland is also at risk of more frequent storms and flooding. We know we must act, and by acting now we can build a cleaner greener economy and society, which creates opportunities for us all. Implementation of the Climate Action Plan will create jobs, new economic opportunities and protect people and the planet. By delivering on this plan, we will secure the future for our children and grandchildren. It's our chance to make the right choice*'.

2.2.1 Climate Change

The scientific community and governments across the world are in agreement that the global climate is changing. This is due to human activities which have significantly contributed to natural climate change through our emissions of greenhouse gases. This interference is resulting in increased air and ocean temperatures, drought, melting ice and snow, rising sea levels, increased rainfall, flooding and other influences (EPA, 2021).

On the launch of the Climate Action and Low Carbon Development (Amendment) Act (2021), the current Taoiseach Michéal Martin, remarked that:

> *"The impact of our actions on the planet is undeniable. The science is undisputed. Climate change is happening. And we must act." (Government of Ireland, 2020)*

In this regard, the Government of Ireland enacted the Climate Action Plan (CAP) in June 2019 and more recently, the Climate Action and Low Carbon Development (Amendment) Act 2021. The current CAP 21 sets out actions to cut emissions and make Ireland a zero-carbon economy by 2050. The Climate Action and Low Carbon Development (Amendment) Act 2021 will establish a legally binding framework with clear targets and commitments set in law, and ensure the necessary structures and processes are embedded on a statutory basis to ensure Ireland achieves its national, EU and international climate goals and obligations in the near and long term through a process of carbon budgeting, with the Irish government committed to "*reducing emissions by an average 7% per annum by 2030*."

It is estimated that the proposed wind farm will have an estimated Export Capacity ranging from 31.2 – 38.4 MW depending on final turbine technology installed. Turbines of the exact same make, model and dimensions can have different power outputs depending on the capacity of the electrical generator installed in the turbine nacelle. The exact rating and design of the proposed turbine will be subject to a competitive procurement process that will only commence if the project receives consent. The above range has been fully assessed in the Air and Climate chapter with respect to emissions calculations.

A rated capacity of 31.2 MW used below (represents the worst case in terms of generation capacity) to calculate the power output of the proposed wind farm, as it is the minimum renewable generation the project will contribute towards the national targets.

Assuming an installed capacity of 31.2 MW, the proposed wind farm has the potential to produce approximately 95,659 MWh (megawatt hours) of electricity per year. This results in a positive impact by removing the GHG emissions that would have otherwise been part of the output of traditional energy generation through the burning of fossil fuels and pear etc. Impacts to climate can have the potential to affect human health and the environment, as detailed in Chapter 6: Air and Climate.

Greenhouse gases and other emissions from fossil fuels give rise to global warming, acid rain and air pollution. Fossil fuels still dominate Ireland's electricity production. The proposed Fahy Beg Wind Farm will provide renewable energy to the national grid with minimal impact on the environment, offsetting the need for burning of fossil fuels. This is necessary to meet the challenges of future climate change.

The Department of Communications, Climate Action and Environment (DCCAE) is currently examining the potential for diversifying Ireland's renewable technology mix in the post-2020 period, the Department recognises that:

> "*as a proven and cost effective technology, onshore wind will remain part of Ireland's generation portfolio out to 2030 and will help to meet Ireland's contribution to the binding EU-wide 2030 renewable energy target*".

The proposed Fahy Beg Wind Farm will assist in mitigating the effects of climate breakdown and help Ireland achieve its climate neutral economy by no later than 2050, within the '*National Climate Objectives'*, as set out in the Climate Action and Low Carbon Development (Amendment) Act 2021. Furthermore, the Climate Action Plan seeks a total installation of 8.2 GW of onshore wind capacity by 2030.

2.2.2 EU Renewable Energy Targets and National Policy

As further detailed in Chapter 4 of this EIAR, Ireland has adopted binding agreements to reduce dependency on fossil fuels and increase energy production from sustainable sources, creating a requirement for the nation to transition to a low carbon economy.

This is supported by the latest Programme for Government (2020) '*Our Shared Future*' which presents strong climate governance in rapidly reducing climate change in order to protect and improve public health and quality of life. The government are committed to rapid decarbonisation of the energy sector with an aim of providing the necessary actions to deliver national renewable electricity targets.

The 2030 Climate and Energy Framework (European Commission, 2014) adopted by the EU sets out a framework for the long-term perspective beyond 2020 targets. The 2030 Climate and Energy Framework sets out three key targets for the year 2030:

- At least 40% cuts in greenhouse gas emissions (from 1990 levels);
- At least 32% share of renewable energy;
- At least 32.5% improvement in energy efficiency.

Further to this the European Commission in 2016 published its 2030 emissions targets break down for each Member State. While the overall EU target is a reduction of 40% on 1990 greenhouse gas emissions by 2030, every Member State negotiates an individual target. Ireland will have to reduce its emissions by 30% relative to its 2005 emissions.

The 2050 "*Roadmap for a competitive low-carbon Europe*" (European Commission, 2011) suggests that by 2050, the EU should cut greenhouse gas emissions to 80% below 1990 levels. This would require 40% emissions cuts by 2030 and 60% by 2040. This is in line with EU leaders' commitment to reducing emissions by 80-95% by 2050. Ireland is likely to face equivalent mandatory targets from the EU.

Ireland has adopted these targets into the Climate Action Plan (2021) which includes a target to increase electricity generated from renewable sources to 80% by 2030. This will require more than doubling Ireland's production of electricity from renewable sources, which stood at 36.5% in 2019 (SEAI, 2020). The 2030 target sets out the pathway to the goal of net zero greenhouse gas emissions by 2050.

To achieve 80% renewable energy production by 2030, substantial new development will be required. The CAP sets out targets as follows which rely heavily on wind energy technology:

- Electricity must reduce emissions somewhere between 62% and 81%, a difference of 19%.
- *Increasing the share of electricity demand generated from renewable sources to up to 80% where achievable and cost effective, without compromising security of electricity supply.*
- *Expand and reinforce the grid – through the addition of lines, substations, and new technologies.*

The binding EU targets have been transposed into Irish National Policy in the 2021 Climate Action Plan (CAP21) which focuses a large amount of future electricity production on the wind energy sector. This demonstrates the significance of wind energy in the Irish energy context and highlights the need for the proposed Fahy Beg Wind Farm in reaching both EU and national renewable energy targets.

2.2.3 Energy Security

Secure supplies of energy are essential for Ireland's economy and for maintaining safe and comfortable living conditions. Energy import dependency is a significant indicator of the country's energy security. Ireland is one of the most energy import-dependent countries in the European Union, importing 67% of its fuel in 2018 at an estimated cost of €5 billion (SEAI, 2020a). The largest share of energy imports in 2018 was oil, accounted for 73% of total energy imports, natural gas 17%, coal 8.2% and renewables 1.4%. Import dependency increased to 69% in 2019 (SEAI, 2020).

Price volatility of fossil fuels may increase as carbon prices escalate in the future. The cost of carbon credits is included in all electricity trade, and the price of electricity generated by coal is particularly vulnerable due to the high carbon emissions per unit of electricity generated. Coal still generates a significant amount of Ireland's electricity with 7% of electricity produced by coal in 2018 (SEAI, 2020) down from 18.3% in 2017 (SEAI, 2018). However, the previous programme for government called for a review of options to replace coal with low carbon alternatives within a decade as reflected in the CAP (2019). As a result, coal accounted for 2% of net imports in 2019, while gas imports have increased due the decline in production of the Corrib gas field, and oil imports have remained steady (SEAI, 2020).

The Energy White Paper, Ireland's Transition to a Low Carbon Energy Future 2015-2030 (DoCENR, 2015) sets out a framework to guide policy and actions that the government intends to take in the energy sector. The paper notes that "There will be substantial increases in the cost of carbon in the short and medium term, through the EU Emissions Trading Scheme". The electricity produced by the proposed Fahy Beg Wind Farm will reduce dependence on imported fossil fuels and add to financial autonomy and energy stability in Ireland, further emphasising the need for the proposed development.

Furthermore, the EU have rewritten the energy policy framework in the Clean Energy for all Europeans Package (2019). Member states must meet new commitments to improve energy efficiency and the take-up of renewables in their energy mix by 2030. For example, the new rules on the electricity market, which have been adopted, will make it easier for renewable energy to be integrated into the grid, encourage more inter-connections and cross-border trade, and ensure that the market provides reliable signals for future investment. This EU policy framework encourages energy security for all EU member states, emphasising a need for renewable energy and a move away from fossil fuels.

2.2.4 Competitiveness of Wind Energy and Economic Benefits of the Fahy Beg Wind Farm

In addition to helping Ireland reduce environmentally damaging emissions and helping avoid significant fines from the EU, the Fahy Beg Wind Farm will also contribute positively to the national and regional economy.

SEAI, in its report Energy in Ireland (SEAI, 2020), indicated that in 2019 wind energy:

- Generated 32% of all electricity;
- Avoided 3.9 million tonnes of CO^2 emissions; and
- Avoided approximately €260 million in fossil fuel imports.

Additionally, a report published by Barringa in January 2019 states that:

> *"Our analysis indicates that the deployment of 4.1 GW of wind generation capacity in Ireland between 2000 and 2020 will result in a total net cost to consumers, over 20 years, of €0.1bn (€63 million to be exact), which equates to a cost of less than €1 per person per year."* (Baringa, 2019).

Notwithstanding the above financial costs and benefits, the Barringa report outlines that wind generation in Ireland avoids:

> *"33 million tonnes of power sector CO2 emissions. The total carbon emissions from electricity generation in 2017 was 11.7 Mt, so a saving of 33 Mt is equivalent to almost 3 years of total carbon emissions in the electricity sector today. 137 TWh of fossil fuel consumption at a saving of €2.7bn. In comparison, Ireland consumed 44 TWh (3814 ktoe) of fossil fuels for electricity generation in 2017, so a saving of 137 TWh is equivalent to 3 years of current fossil fuel consumption for electricity generation."*

In conclusion, the need for the Fahy Beg Wind Farm development is a result of the need for action to fight against climate change by reducing consumption of fossil fuels. Ireland has accepted this need in entering into binding renewable energy targets with the European Union with an overall aim to become carbon neutral by 2050. The government has indicated that wind energy will play a key role in providing renewable electricity to the national grid. This will comprise of an increase of 8.2GW of onshore wind capacity by 2030 (DoCCAE, 2019). The increase in domestic renewable energy of between 31.2MW and 38.2MW of renewable electricity as a result of the Fahy Beg Wind Farm will also assist Ireland in improving resilience in energy security by reducing the requirement for import of fossil fuels.

2.3 Alternatives Considered

The requirement in relation to alternatives in the EIA process is set out in Directive 2011/92/EU, amended by Directive 2014/52/EU, in Article 5 (1)(d), which states that an EIAR should include:

> *"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.*

This section has particular regard to the environmental considerations which influenced the selection of alternatives and details the evolution of the proposed project through alternatives considered, indicating the main reasons for selecting the chosen option taking into account the effects of the proposed project on the receiving environment and considering the comparison of environmental effects of each alternative.

The alternatives considered have been described in line with the Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (2022). The Guidelines state that:

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

Furthermore, the Guidelines note the following regarding high level plans and strategies which may influence or pre-determine decisions in the development process:

> *"Higher level alternatives may already have been addressed during the strategic environmental assessment of relevant strategies or plans. Assessment at that level is likely to have taken account of environmental considerations associated. Thus, these prior assessments of strategic alternatives may be considered and referred to in the EIAR."*

The section also details non-environmental factors of the development process where they are relevant to the evolution of the proposed project.

2.3.1 Do-Nothing Alternative

As set out in section 2.2.2, Ireland has binding targets set by the EU. Ireland is obliged to ensure that 80% of the total energy consumed in heating, electricity and transport is generated from renewable resources by 2030 and reduce its greenhouse gas emissions by 40% by 2030, relative to its 1990 levels, with an overall objective of carbon neutrality by 2050. This is in order to help reduce the nation's CO2 emissions and to promote the use of indigenous renewable sources of energy. These targets have been incorporated into national policy in the Climate Action Plan (2021) which aims to:

- Reduce emissions somewhere between 62% and 81%, a difference of 19%.
- Increasing the share of electricity demand generated from renewable sources to up to 80% where achievable and cost effective, without compromising security of electricity supply.
- Expand and reinforce the grid – through the addition of lines, substations, and new technologies.

Furthermore, the Climate Action and Low Carbon Development (Amendment) Act 2021 will act to reduce 51% emissions over a ten year period to 2030, in line with the programme for Government which commits to a 7% average yearly reduction in overall greenhouse gas emissions over the next decade, and to achieving net zero emissions by 2050.

Under the "Do-Nothing" scenario, the Fahy Beg Wind Farm project would not go ahead, the development of a renewable energy project is not pursued, and the site remains in use as agriculture and forestry.

In the "Do-Nothing" scenario, the prospect of creating sustainable energy through County Clare's wind energy resource would be lost at this site.

The nation's ability to produce sustainable energy and reduce greenhouse gas emissions to meet EU targets and National targets, as set out above, would be stifled. This may result in the nation incurring significant financial penalties from the EU if targets are not achieved, and result in continued global warming and impact upon the intention to "pursue efforts" to limit warming as agreed to in the Paris Agreement (2015). This will result in continued negative impacts to air quality and climate.

According to EirGrid Group's All-island Generation Capacity Statement 2020 – 2029 (Eirgrid, 2020), the growth in energy demand for the next ten years on the Island of Ireland will be between 17% and 41%. In the 'Do-nothing' scenario, importation of fossil fuels to maintain growing energy supply will continue and Ireland's energy security will remain vulnerable. A "Do-nothing" scenario would contribute to strain on existing energy infrastructure and may impact on economic growth if energy demand cannot be met. This may be exacerbated by the government's plans to cease the burning of coal at Moneypoint as well as the termination of all peat burning at Bord na Móna's powerplants in 2020.

Under the "Do-Nothing" scenario, the socio-economic benefits associated with the proposed development will be lost. These benefits include between 64 and 78 no. jobs during the construction phase of the project, and between 20 and 26 long-term jobs once operational. Furthermore, under the "Do-Nothing" scenario the local community will not benefit economically from the community benefit fund associated with the project which could be used to improve physical and social infrastructure in the area of the wind farm site.

In the "Do-Nothing" scenario, the potential environmental impacts of the proposed development as set out throughout this EIAR will not occur.

Table 2-1 sets out the potential impacts of the 'do-nothing scenario' compared to the residual impacts associated with the Fahy Beg Wind Farm Project in relation to the various environmental topics covered in the individual chapters of this EIAR. Refer to each respective chapter for full details of residual impacts:

Table 2-1: Comparison of Potential Residual Environmental Effects - Project vs. 'Do-Nothing'

Environmental Consideration	Residual Impact of the Proposed Project	'Do-nothing' Alternative
Air & Climate	Slight to moderate temporary localised residual impacts arising from fugitive dust emissions which will be temporary in nature and result in slight to moderate residual impacts. There will be no permanent residual impacts due to the decommissioning phase. During operations, the proposed wind farm will result in the avoidance of emissions from fossil fuel generators which is a positive effect on air quality.	Fossil fuel power stations will likely be the primary alternative to provide the required quantities of electricity resulting in greenhouse gas emissions and other air pollutant emissions.
Noise & Vibration	Non-significant to slight temporary noise impacts associated with construction activities. Temporary moderate impact along the grid route at certain dwellings during construction. Long-term slight to moderate negative impact on the dwellings closest to the project as a result of the operational phase.	Neutral
Biodiversity	It is envisaged that there will be no significant, negative effects as a result of the proposed project following the implementation of appropriate mitigation measures. There will be long-term positive effects on the existing environment as a result of proposed biodiversity enhancement measures which will be implemented as part of the project.	Neutral
Land, Soils, Geology	No significant, negative effects are envisaged.	Neutral
Hydrology & Water Quality	The residual and cumulative impacts of the proposed development are overall Not significant. This will be achieved with the proposed mitigation measures.	Neutral

Environmental Consideration	Residual Impact of the Proposed Project	'Do-nothing' Alternative
Population & Human Health	Impact to the population in the area of the Wind Farm Site in terms of changes to population trends will be imperceptible. There will be a slight positive effect with respect to employment, with temporary slight positive economic effect from income spent by construction workers in the local area. There will be a long-term slight to significant positive socio-economic benefit to local area due to job creation and community benefit fund will provide a significant long-term, positive impact.	No economic benefit for the local area due to no provision of community benefit fund. No employment opportunities as a result of the construction operation and decommissioning of the project. No positive benefit to recreation facilities.
Material Assets	Long-term slight positive residual impact on non-renewable resources by offsetting the use of fossil fuels in electricity generation. Slight positive residual impact on electricity infrastructure in the area of the wind farm site. Slight negative impact to capacity of licenced waste facilities.	No offset to fossil fuel use. No provision of additional electricity infrastructure in the local area. No slight negative impact to capacity of licenced waste facilities.
Traffic & Transport	No residual impacts envisaged	Neutral
Archaeology & Cultural Heritage	No residual impacts envisaged that cannot be reversed following decommissioning, with continued preservation of the recorded and potential cultural heritage resource	Neutral
Landscape & Visual	The proposed project's residual landscape impact is considered to be Moderate within the site and its immediate context, reducing to Moderate-slight beyond approximately 2km and will not result in significant visual impacts.	Neutral
Telecoms & Aviation	No residual impacts envisaged	Neutral

2.3.2 Project Site Selection Process

The following details the RWE Renewables Ireland Ltd. project screening and project selection process.

The process of site screening and project selection is undertaken in house by our team of developers. The development team is made up of planners, engineers, project managers and environmental scientists ensuring that a holistic approach is undertaken during the screening and project selection process. RWE recognises the complexities associated with the development of renewable energy sites and has developed a large database of information that allows the company to identify and screen potential sites.

Sites selected for the development of a wind farm must be suitable for consideration under a number of key criteria. The criteria includes:

- Available wind resource;
- Environmental constraints including low potential for impact on Natura 2000 sites;
- Population density
- Proximity to dwellings;
- Planning Policy;
- Reasonable access to the national electricity grid;
- Archaeological features;
- Landscape and visual constraints.

In addition to the criteria noted above acute attention is paid to the wind energy guidelines, local development plans, past wind farm planning applications and any planning case law that is published in relation to renewable/ energy projects.

The key policy, planning and environmental considerations for the selection of a potential wind farm site include:

- Site location relative to the local County Councils Wind Energy Strategy classification of areas considered suitable for wind farm development;
- Low population density;
- Protection of visual amenity;
- Located outside of areas designated for protection of ecological species and habitats;
- Access to the national electricity grid within a viable distance;
- Sufficient area of unconstrained land that could potentially accommodate wind farm development and turbine spacing requirements.

These criteria are explained further below:

2.3.3 Fahy Beg Wind Farm – Project Suitability

The Fahy Beg Wind Farm site was identified for potential development following a detailed desktop screening appraisal, firstly at national level and then at reginal and county level of all available sites which met the criteria referenced in 2.3.2 above. Following the screening exercise, the top ranking sites were selected to progress with further detailed site-specific screening appraisals to determine initial feasibility for a planning application. The process of further review and refinement resulted in the Fahy Beg project being selected as an optimal site to progress to the next stage of feasibility assessment and early development work.

The proposed Fahy Beg Wind Farm sits in an area with suitable unconstrained land and a high available wind resource. The site is in an area designated in the Clare County Development Plan, Wind Energy Strategy 2017-2023 as "Open to Consideration" for wind farm development. The proposed Fahy Beg Wind Farm does not contain areas designated as European Protected Natura 2000 sites. Low population density allows for appropriate setback distance from residential housing. The wind farm also has reasonable access to the National Electricity Grid which is located a viable distance from the proposed Fahy Beg site.

2.3.3.1 Planning Policy

The Department of Housing, Planning and Local Government's Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (2018) and the Environmental Protection Agency document 'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (EPA, 2022) state that it is important to acknowledge the existence of difficulties and limitations when considering alternatives.

Section 2.4.1 '*Anticipating, Avoiding And Mitigating Significant Effects'* within the Guidelines state:

> *"Alternatives may be identified at many levels and stages during the evolution of a project, from project concepts and site locations, through site layouts, technologies or operational plans and on to mitigation and monitoring measures. The alternatives that are typically available for consideration at the earlier stages in the evolution of a project generally represent the greatest potential for avoidance of adverse effects."*

Section 3.4 of the Guidelines is concerned with the Consideration of Alternatives, where Section 3.4.1 states:

> *"Higher level alternative may already have been addressed during the strategic environmental assessment of strategies or plans. Assessment at that level is likely to have taken account of environmental considerations associated for example with the cumulative impact of the area zoned for industry on a sensitive landscape. Note also that plan-level/higher-level assessments may have set out project level objective or other mitigation that the project and its EIAR should be cognisant of. So, at EIA level this prior assessment of strategic alternatives informs the EIAR"*

Development Plans and Regional Plans provide a strategic framework and policy context for all planning decisions. The Planning and Development Act 2000, as amended (Government of Ireland, 2000-2019) reinforces the role of the Development Plan as the primary strategic statement on land-use planning at city, town and county levels, and provides a clear defined context for the formulation and content of planning applications.

Key Policy Objectives of the Clare County Development Plan (2017-2023) include the following:

Development Plan Objective: Settled Landscapes

- "*Conformity with all other relevant provisions of the Plan and the availability and protection of resources:*
    - *Selection of appropriate sites in the first instance within this landscape, together with consideration of the details of siting and design which are directed towards minimising visual impacts;*
    - *Regard being given to avoiding intrusions on scenic routes and on ridges or shorelines. Developments*
- *in these areas will be required to demonstrate:*
    - *That the site has been selected to avoid visually prominent locations;*
    - *That the site layouts avail of existing topography and vegetation to reduce visibility from scenic routes,*
- *walking trails, water bodies, public amenities and roads;*
    - *That design for buildings and structures reduce visual impact through careful choice of forms, finishes and colours, and that any site works seek to reduce visual impact*."

With respect to County Development Plan designations, the subject site was considered feasible for wind energy development. Further to this, Key Policy Objectives of the Draft Clare County Development Plan (2023-2029) also include the following:

CDP 14.2 Development Plan Objective: *Settled Landscapes* -

"*permit development in areas designated as 'settled landscapes' to sustain and enhance quality of life and residential amenity and promote economic activity subject to:*

- *Conformity with all other relevant provisions of the Plan and the availability and protection of resources;*
- *Selection of appropriate sites in the first instance within this landscape, together with consideration of the details of siting and design which are directed towards minimising visual impacts;*
- *Regard being had to the need to avoid intrusion on scenic routes and on ridges or shorelines. Developments in these areas will be required to demonstrate:-*
- *That the site has been selected to avoid visual prominence.*
- *That the site layouts avail of existing topography and vegetation to reduce visibility from scenic routes, walking trails, water bodies, public amenities and roads.*
- *That design of buildings and structures reduces visual impact through careful choice of forms, finishes and colours, and that any site works seek to reduce visual impact*."

As set out in Section 4.6 of this EIAR, the current Clare County Development Plan 2017-2023 and Draft Clare County Development Plan 2023-2029 supports the development of Wind Energy projects in appropriate areas. The subject site was found to be in an area designated in the current Clare County Development Plan 2017-2023 as being entirely within the landscape character type of '*Settled Landscape*' as set out in the Current and Draft Clare County Development Plan. The entire site falls within the landscape character type of '*Settled Landscape*' as set out in the Clare County Development Plan 2017-2023, there are no significant landscape features or scenic routes in proximity to the proposed wind farm site.

A study of cultural heritage sites was conducted which identified no major constraints with respect to architectural heritage or protected monuments within the site, with one example within the surrounding study area. This comprises Glenomera House (RPS 427) which is a derelict, single storey house of early 20th century date and is located 560m outside the west end of the Site boundary. There are no Protected Structures located within the 100m corridor centred on the GCR route, with one example (RPS 172: Saint Thomas's Church, Bridgetown) located within the environs of a TDR work area (node ref. 32). Therefore, in respect to current County Development Plan designations, the subject site was considered feasible for wind energy development.

2.3.3.2 Natura 2000 Sites

It is preferable that wind energy development is not located within, or hydrologically connected to, an area designated as a Special Area of Conservation (SAC), Special Protected Area (SPA) or Natural Heritage Area (NHA). The proposed Fahy Beg Wind Farm site is split between two river catchments. The eastern side of the site area is located in the Lower River Shannon catchment and the western side is located in the Shannon Estuary North catchment. The eastern part of the site is located in the Shannon (lower) sub-catchment and the western part is located in the Owenogarney sub-catchment.

There are two streams running through the site from north to south. These streams are the Black (O'Briensbridge) stream and the Fahy (Clare) stream. Both streams flow in a south-easterly direction and flow into the River Shannon which is designated as a Special Area of Conservation (Lower River Shannon SAC – Site Code: 002165). The Broadford Stream is located to the west of the site and is hydrologically connected to the Doon Lough Natural Heritage Area.

2.3.3.3 Population Density

Areas with low housing density are preferable for wind energy development so as to minimise potential disturbance to residential amenity which may be caused as a result of construction activities, as well as visual impacts, shadow flicker and noise during the operational phase. The population density recorded within the State, County Clare and the Study Area during the 2006, 2011 and 2016 Census are set out in table 2-2, below.

Census figures for the period covering 2006 to 2016 show the Study Area has a low population density which is due to a widely dispersed rural settlement pattern of one off dwellings. This low population density is in contrast to the State-wide and County-wide population densities which show higher population densities for similar sized surface areas, with the state population density approximately 3 times that of the study area for the same period. The 2016 census figures show the population density for the Grid Connection Route (GCR) and Turbine Delivery Route (TDR) are significantly higher than the state and county figures for both Clare and Tipperary. The higher census figure for 2016 in relation to the GCR and TDR can be attributed to a growth in the population of the settlements which are situated on the route or in proximity to the GCR and TDR such as Killaloe and Ballina.

Table 2-2: Population Density between 2006 – 2016 (Persons per square kilometre)

Area	Population Density (Persons per square kilometre) 2006	Population Density (Persons per square kilometre) 2011	Population Density (Persons per square kilometre) 2016
State	60.3	65.3	67.8
Clare County	32.2	34	34.4
Tipperary County	34.7	36.9	37.1
Main Wind Farm site	16	16.1	26.1
GCR	19	19.1	147.4
TDR	22.8	22.9	69.6

2.3.3.4 Other Considerations

Wind speed was assessed at the site in order to determine if wind energy development would be feasible. Wind speed analysis is available from the Sustainable Energy Authority of Ireland (SEAI). Wind speed at the subject site is above average. Average wind speeds at the Fahy Beg wind farm site were recorded by Lidar, and this recorded wind speeds of 7.4 m/s. This indicates viable values for wind energy development at this location, considering values of 3-5 meters per second are required for turbines to start operating. The wind resource at the Fahy Beg Wind Farm site is illustrated in Figure 2-1.

Pell Frischmann (PF) were commissioned by Fehily Timoney (FT) to undertake a study to determine the optimal delivery route for wind turbine Abnormal Indivisible Loads (AIL) associated with the construction and development of Fahy Beg Wind Farm. The Route Survey Review (RSR) has been prepared to help inform the EIAR on the issues associated with the development of the site with regard to off-site transport and access for AIL traffic and includes a detailed swept path analysis (SPA). A copy of this report is contained in Appendix 13-1.

Access to the site is primarily via the existing Bridgetown to Broadford R-466 Regional road, which passes to the south west of the site, with direct entry to the proposed wind farm site via an existing quarry. All large loads including turbine towers, turbine blades and trucks with materials will only be permitted to enter via the quarry access while light goods vehicles (LGV) such as vans and jeeps will be permitted to enter the site from the Fahymore Local Road. Further details of the proposed site access from the wider road network are further outlined in Chapter 3 and further detailed in Chapter 13 of this EIAR.

Grid constraints were also reviewed during the strategic site selection process which was commissioned by RWE Renewables Ireland Ltd. in 2018, and carried out by MullanGrid Consulting. This focused on critical elements of the grids viability and identified potential constraints for the Ardnacrusha 110kV Substation and surrounding grid network. The study focused on the following key areas:

- Local network and generation;
- Connection method and costs;
- Ongoing grid factors;
- Potential constraints and curtailment.

The review showed the proposed Fahy Beg wind farm site was in proximity to the Ardnacrusha 110kV Substation on the national transmission system, located c. 10.7km from the site entrance by public road. Capacity at the substation was examined, and potential routes were identified and assessed in order to determine a viable connection from the proposed Fahy Beg Wind Farm Site to the national grid. The study identified several potentially feasible grid connection arrangement options.

In April 2022, TLI Group prepared a feasibility study for a potential 38kV grid connection to Ardnacrusha 110kV Substation on behalf or RWE Renewables Ireland Ltd. This report can be found in Appendix 3.3 of the EIAR. They study identified and assessed three potential route options from the wind farm site to the Ardnacrusha 110kV Substation examining key technical and environmental constraints including:

- Challenging ground conditions;
- Existing infrastructure;
- Land use;
- Watercourse crossings;
- Sharp bends;
- Protected sites (SAC/NHA);
- Other known grid connection applications;

The preferred route identified in the study is the proposed grid connection route presented in the EIAR and included as part of the planning application for Fahy Beg Wind Farm.

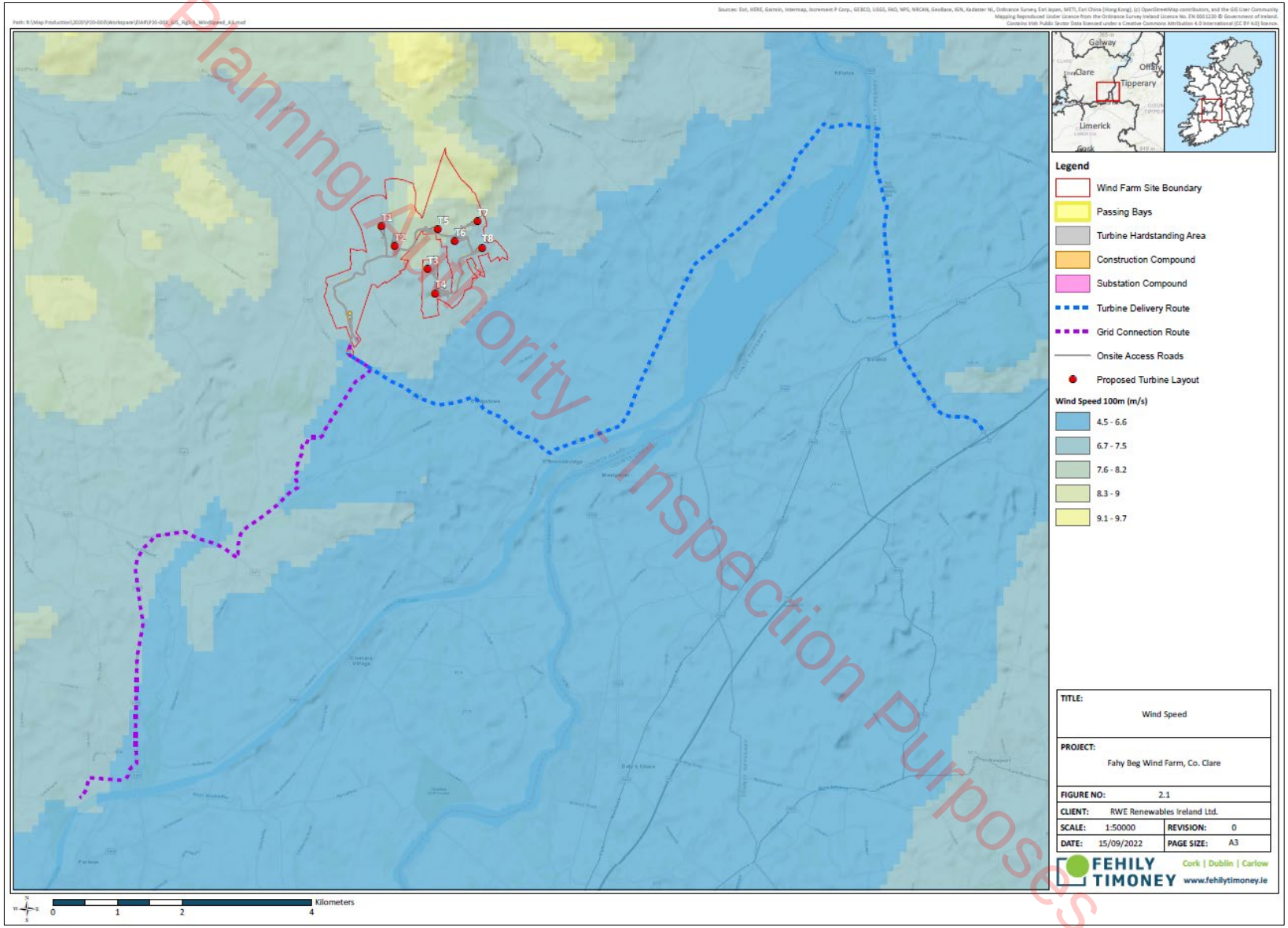

Figure 2-1: Wind Speed at the Fahy Beg Wind Farm

2.3.4 Alternative Layouts

Alternative layouts for the proposed wind farm were developed in an iterative design process which aimed to avoid environmental sensitivities, minimise potential environmental impacts both on and off site and to maximise the wind potential on site. The design has been carried out in accordance with industry guidelines and best practice, namely the Department of Environment, Heritage and Local Government's (DoEHLG) Wind Energy Development Guidelines (2006) (WEDG 2006), The Department of Housing, Planning and Local Government's (DoHPLG), and the Irish Wind Energy Association Best Practice Guidelines (2012). The design process of the project has had regard to the *Draft Revised Wind Energy Development Guidelines* (2019) (DWEDG 2019) in relation to the siting and design of the wind farm. In terms of mitigation, incorporating a scheme of mitigation could be implemented using turbine control software to cease turbine operation during periods when shadow flicker is predicted. If this mitigation strategy is adopted, then zero shadow flicker would occur (allowing for a short time for the rotor to come to a stop) within 10 rotor diameters of the wind farm. As such, the proposed development would meet the requirements of both WEDG 2006 and the draft WEDG 2019.

The layout and design was an iterative process which took account of such criteria as:

Locations – This includes discussion of the overall project site selection process for the Fahy Beg Wind Farm on a national, regional and local scale. It includes details of project site selection which outlines the criteria used to determine project site suitability for wind energy development including:

- Wind resource;
- Proximity to residential dwellings;
- Land Zoning in County Development Plans;
- Established and Future Land-Use;
- Ecological Conservation Designations;
- Landscape Designations; and
- Access

Access – Details of the criteria used to select the network of access tracks that will provide access from the public road network to the project site (and to each turbine within the site) in addition to those that will provide internal connections (as an alternative to using public roads) between turbines is outlined. This includes information on the availability of existing track, suitable ground conditions, terrain, local road infrastructure etc.

Connection to the National Grid – Details of the criteria used to select the proposed grid connection route are provided. This includes an assessment of alternative grid connection route options.

Constraints and environmental sensitivities were first identified, and buffers applied in order to determine appropriate areas within the site to accommodate development. Consideration of the environmental sensitivities of the site included an analysis of the criteria listed above. This constraints exercise resulted in a developable area being defined. A comparison of environmental effects of following this design approach and not following it, i.e. applying mitigation by design versus a design which does not consider the various environmental factors of the receiving environment is presented in Table 2-3 below.

Table 2-3: Comparison of Potential Residual Environmental Effects - Mitigation by Design and Potential Impacts

Environmental Consideration	Mitigation by Design Utilised in the Fahy Beg Wind Farm Project	Potential Impact if Mitigation by Design is not Included
Residential Amenity	The Draft Revised Guidelines outlines a minimum 500m or 4 times tip height set back. Following completion of layout optimisation, a separation distance of 720m was achieved from the closest dwelling to a turbine tower.	Potential for impact to residential amenity due to noise, vibration and dust during the construction stage. Further potential impact to residential amenity during operations due to visual impact and noise if an appropriate setback distance is not applied.
Flora and Fauna	Avoidance of designated sites and mitigation designed to avoid potential impacts on species and habitats.	Potential for impact on designated sites hydrologically connected to the subject site. Potential for habitat loss and disruption due to impacts on water quality.
Ornithology	Avoidance of designated sites. Any hedgerow trimming or removal to be completed outside of the bird breeding season.	Potential impact to avifauna associated with the construction phase including possible deterioration of habitats and disturbance or displacement of birds.
Soils & Geology	Avoid infrastructure at steep gradients and at areas of unsuitable ground conditions.	Potential for landslide or subsidence if design does not consider gradient and ground conditions at proposed infrastructure locations.
Hydrology	Minimum 50m set back of infrastructure from rivers and streams where reasonably possible. Adaptation of design to existing hydrological regime (streams and drainage channels)	Potential impact to the existing hydrological regime if streams are diverted. Potential for runoff to directly discharge to streams.
Water Quality	Minimum 50m set back from significant rivers and streams and appropriate mitigation designed to avoid siltation during construction. Clear-span bridge and horizontal direction drilling to be used at stream crossings to avoid in-stream works.	Potential migration of silt or petrochemicals to watercourses. Potential impact on water quality and aquatic biodiversity. Potential impact on designated sites downstream.
Noise & Vibration	With mitigation measures, cumulative operational noise levels from the proposed wind farm and adjacent wind farms meet the daytime and night-time noise limit derived using the Wind Energy Development Guidelines 2006 which is not considered to be a significant impact.	Potential for impact to residential amenity at nearby dwellings due to noise nuisance if appropriate setback between turbines and dwellings is not applied.

Environmental Consideration	Mitigation by Design Utilised in the Fahy Beg Wind Farm Project	Potential Impact if Mitigation by Design is not Included
Shadow Flicker	Shadow Flicker mitigation measures could be implemented using turbine control software to cease turbine operation during periods when shadow flicker is predicted. If this mitigation strategy is adopted, then zero shadow flicker would occur (allowing for a short time for the rotor to come to a stop) within 10 rotor diameters of the wind farm. As such, the proposed development would meet the requirements of both WEDG 2006 and the draft WEDG 2019.	Potential impact on residential amenity due to shadow flicker at nearby dwellings if control measures are not applied.
Cultural Heritage	Design takes cognisance of nearby recorded monuments and avoids them and their zone of influence where possible.	Potential impact on cultural heritage assets if infrastructure is placed in proximity.
Material Assets	Forestry within the proposed wind farm site was originally planted as a commercial crop and will be felled and replanted in the coming years should the wind farm project proceed or not. Furthermore, it will be a condition of the felling licence that an equivalent area of land required to be felled shall be replanted as per Forest Service Felling and Reforestation Policy.	The extent of felling required to be licensed for the purpose the wind farm project can only be determined once planning permission for the windfarm project has been granted. Thus, the application for the licence can, in practical terms, only be made once planning permission has been granted and the area of trees to be felled confirmed.
Landscape & Visual	Buffering of residential receptors in order to maintain setback distance. Design consideration of sensitive visual receptors in the greater area.	Potential negative visual impact on sensitive visual receptors and potential impact on residential amenity if not considered in the design of the wind farm.

2.3.5 Alternative Scales and Design

Initially, following the establishment of the developable area of the Fahy Beg Wind Farm Site, and as part of the design alternative process a number of different turbine heights were considered. The relationship between the turbine height and density (number of turbines) required to achieve a particular output was a key design consideration.

Several case studies and land surveys have highlighted that when given an option people tend to prefer a scenario of fewer larger turbines. One such study commissioned by Bord Fáilte (now Fáilte Ireland) in 2008 found that:

> *"In terms of the size and composition of wind farms, tourists tended to prefer farms containing fewer turbines. If both produced the same amount of electricity, tourists also preferred wind farms containing a small group of large turbines (55%) to a large group of smaller turbines (18%)."*

There is a balance to be struck between the visual and spatial dominance of turbines and the clutter and the frequency of turbines within a view as both of these effects contribute towards the magnitude of visual impact. This is illustrated in Figure 2-2, which compares a similar energy yield across three turbine heights within the same view. This is intended only as an illustrative diagram to show the balancing relationship between turbine height and density.

On the basis of these factors and through design stage analysis, consideration was given to the approach that the slightly increased sense of visual dominance imparted by taller turbines is preferable to the reduced level of permeability and increased visual clutter associated with a greater number of shorter turbines required to achieve the same output. Moreover, the perceived visual dominance of taller turbines is further offset by increased setback distances from residential receptors. In this regard, alternative turbine outputs were considered correlating to alternative turbine heights.

The consideration to provide fewer, larger turbines with greater power output is in line with industry trends. This option increases energy efficiency, improving the energy output to the national grid per turbine, thus reducing the cost of energy for the consumer. The use of less turbines also reduces the impact on the receiving environment with less land-take required to accommodate the wind farm and less associated construction works as detailed above. Recent permitted wind farm applications in Ireland tend towards larger/taller turbines (i.e., the larger turbine tip heights that are available on the market in Ireland). Examples of recent consented wind farms which include larger/taller turbines are the Ardderroo Wind Farm, Co. Galway (ABP ref. PL07 .303086) which consists of 25 no. turbines at 178.5m tip height, the Coole Wind Farm, Co. Westmeath (ABP ref. PL25M.300686) which consists of 13 no. wind turbines of 175m tip height and Barnesmore Windfarm, Co Donegal (ABP ref. PL14 .306303) which consists of 13 turbines with tip height up to 180m.

This approach to design is examined further in the context of the alternative layouts considered for the Fahy Beg Wind Farm in the following section.

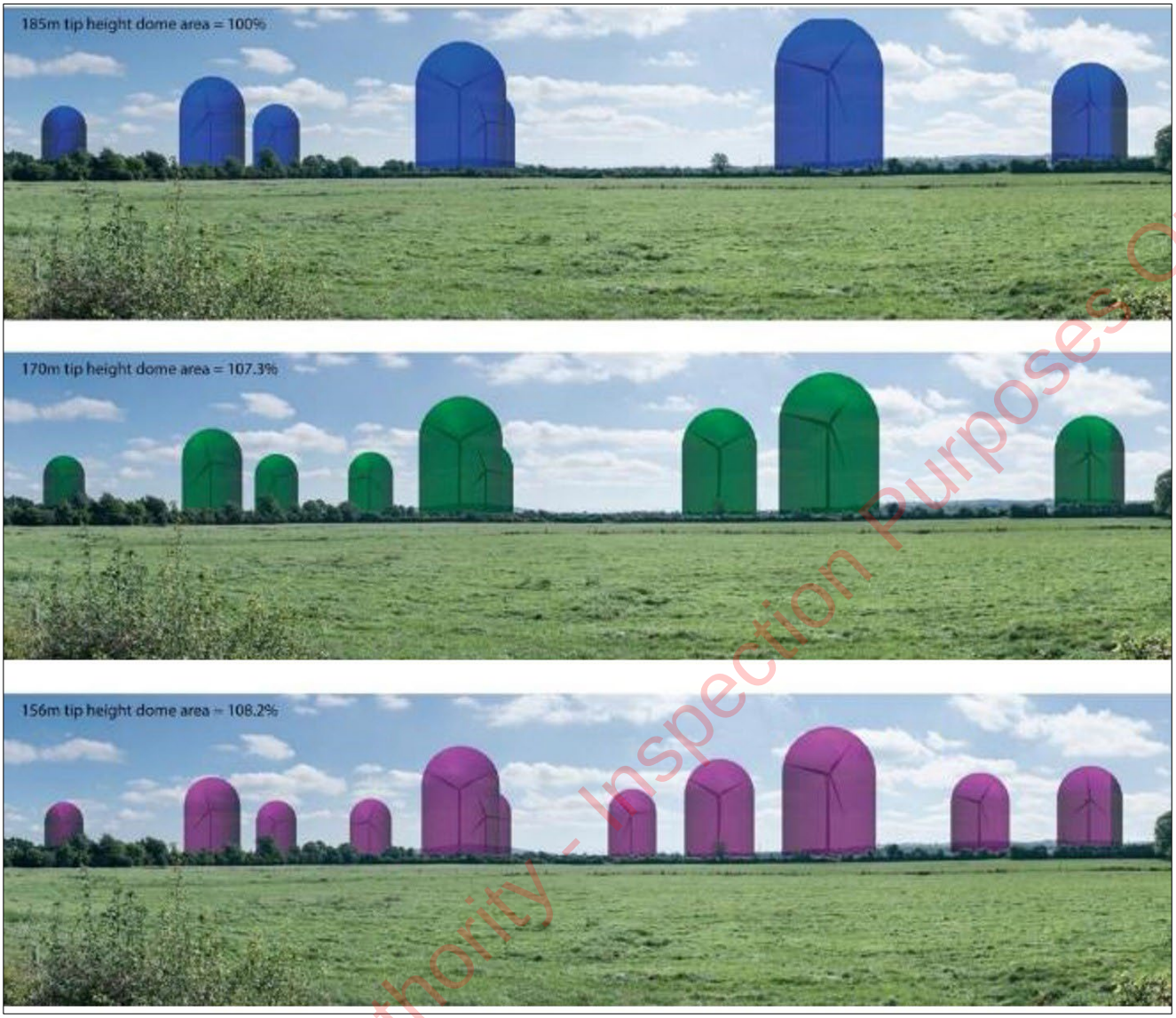

Figure 2-2: Turbine Height versus Density Relationship (Same Power Output for each Example)

2.3.5.1 Wind Farm Design Iterations

The design of the proposed Fahy Beg Wind Farm was an iterative process which considered a range of alternative designs throughout the evolution of the project. The design iterations were influenced by potential environmental effects identified throughout the environmental assessment, leading to the evolution of the developable area of the project and the establishment of the final design as proposed. 3 no. design iterations were considered throughout the progression of the project, shown in Table 2-4, below.

Table 2-4: Alternative Wind Farm Design Options

Layout No.	No. of Wind Turbines	Tip Height (m)	Rotor Diameter (m)	Total Approx. Installed Capacity (MW)
Preliminary Design Option (June 2020)	8	170	131	31.2
Preliminary Design Option (January 2021)	6	180	150	27
Design Iteration 1 (February 2021)	8	180	136	34.4
Design Iteration 2 (August 2021)	8	180	136	34.4
Design Iteration 3 (May 2022)	8	169 to 176.5	131 to 138	38.4

An initial design within the developable area of the wind farm site consisted of 8 no. wind turbines. This represented the maximum volume developable at the site and was considered with respect to environmental impacts and land availability. The turbine height considered for this initial layout was 170 m tip height with 131 m rotor diameter. This design achieved the desired megawatt (MW) output for the project at approximately 31.2 MW.

Following the development of several preliminary layout options between June 2020 and January 2021, an alternative preliminary layout option was brought forward which included fewer turbines (6 no.) but with a combination of larger turbine rotor diameter and tip heights to that of the initial preliminary layout.

The 6-turbine option reduced the loss of habitat by proving less hardstanding areas than the initial 8-turbine layout. However, this design included the use of turbines with a similar power output to the initial design resulting in a significantly lower overall site generation output. Coupled with the potential for greater visual impact associated with the larger turbines for this particular site it was decided not to bring this option forward to Design Iteration 1.

Design Iteration 1 (DI1) consisted of 8 no. turbines with a tip height of 180m and a turbine rotor diameter of 136m. DI1 also consisted of 4no.underground grid connection route options from the proposed wind farms site to the existing Ardnacrusha 110kV substation. This Design Iteration is shown in Figure 2-3 below.

A key constraint on the turbine layout was the presence of an existing 400kV overhead power line to the north of the site. Following extensive consultation between RWE and Eirgrid, an appropriate minimum setback between the northernmost turbines and the overhead line was agreed and incorporated into the development of Design Iteration 2.

Design Iteration 3, which constituted the frozen layout, consisted of 8 no. turbines with a tip height ranging from 169m to 176.5m, a hub height ranging from 102.5 to 110m and a rotor diameter ranging from 131m to 138m. Design iteration 3 also incorporates the internal civils layout comprising of onsite access tracks, hard standings and associated ancillary infrastructure as described in Chapter 3. Each chapter of this EIAR has fully assessed the full spectrum of different scenarios within this range in turbine specification and the ultimate final turbine selection will fall within the parameters of this range.

Micro siting of turbine positions from DI2 locations took place following the completion of detailed site walkover surveys and site investigations. T1 was moved south east to avoid the potential for interaction between earthworks and third party property boundaries and associated hedgerows. T3 was moved due east to facilitate access to the turbine from the west to comply with turbine manufacturer access requirements and to reduce the amount of earthworks required. T6 was moved south east to avoid the removal of hedgerow. T8 was moved due east to ensure no works would take place within 50m of the existing watercourse to the west.

A comparison of potential environmental impacts of the wind farm site layout iterations is detailed in Table 2-5. The proposed option was developed to present the least potential environmental impact through the project philosophy of mitigation by design.

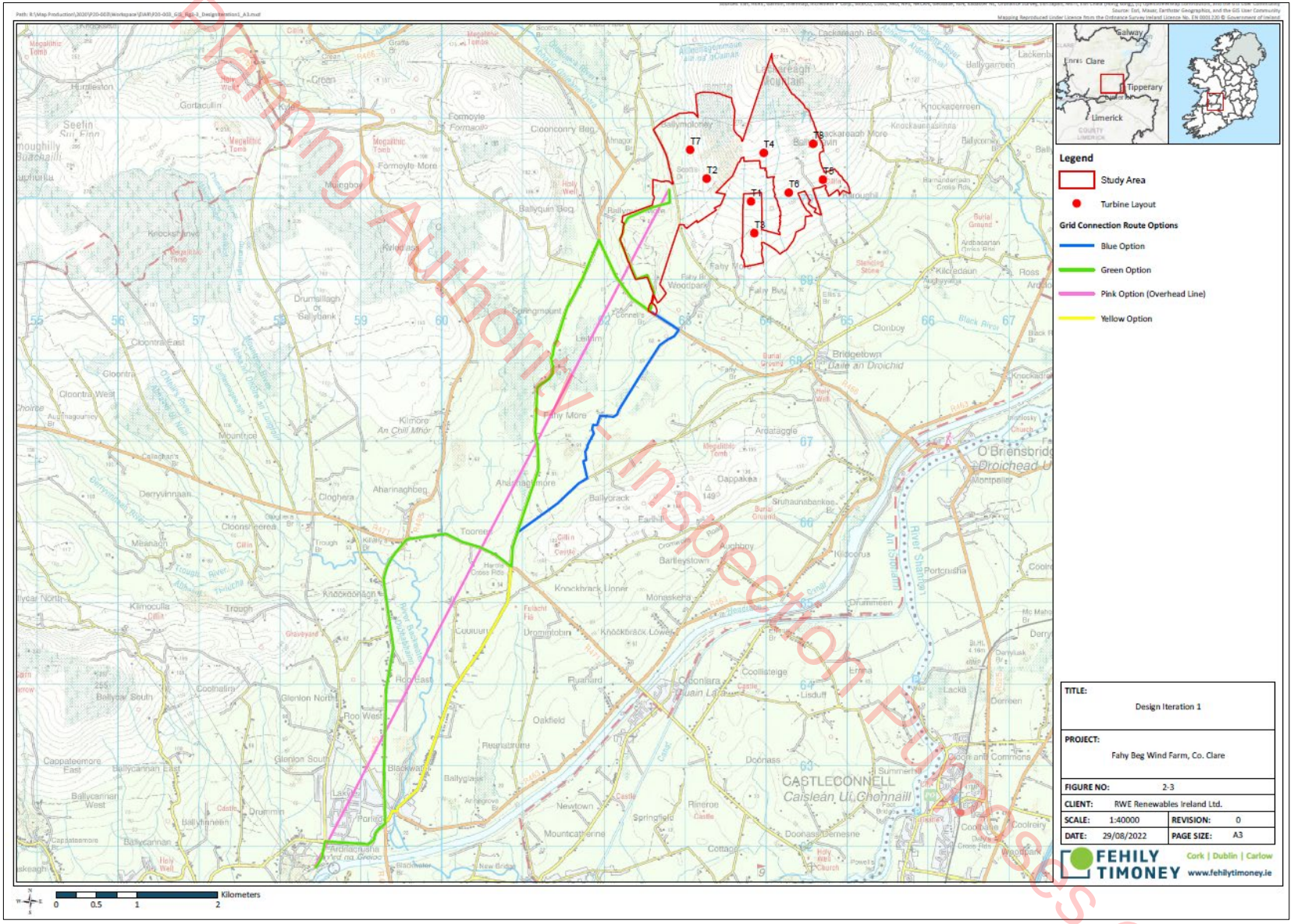

Figure 2-3: Design Iteration 1

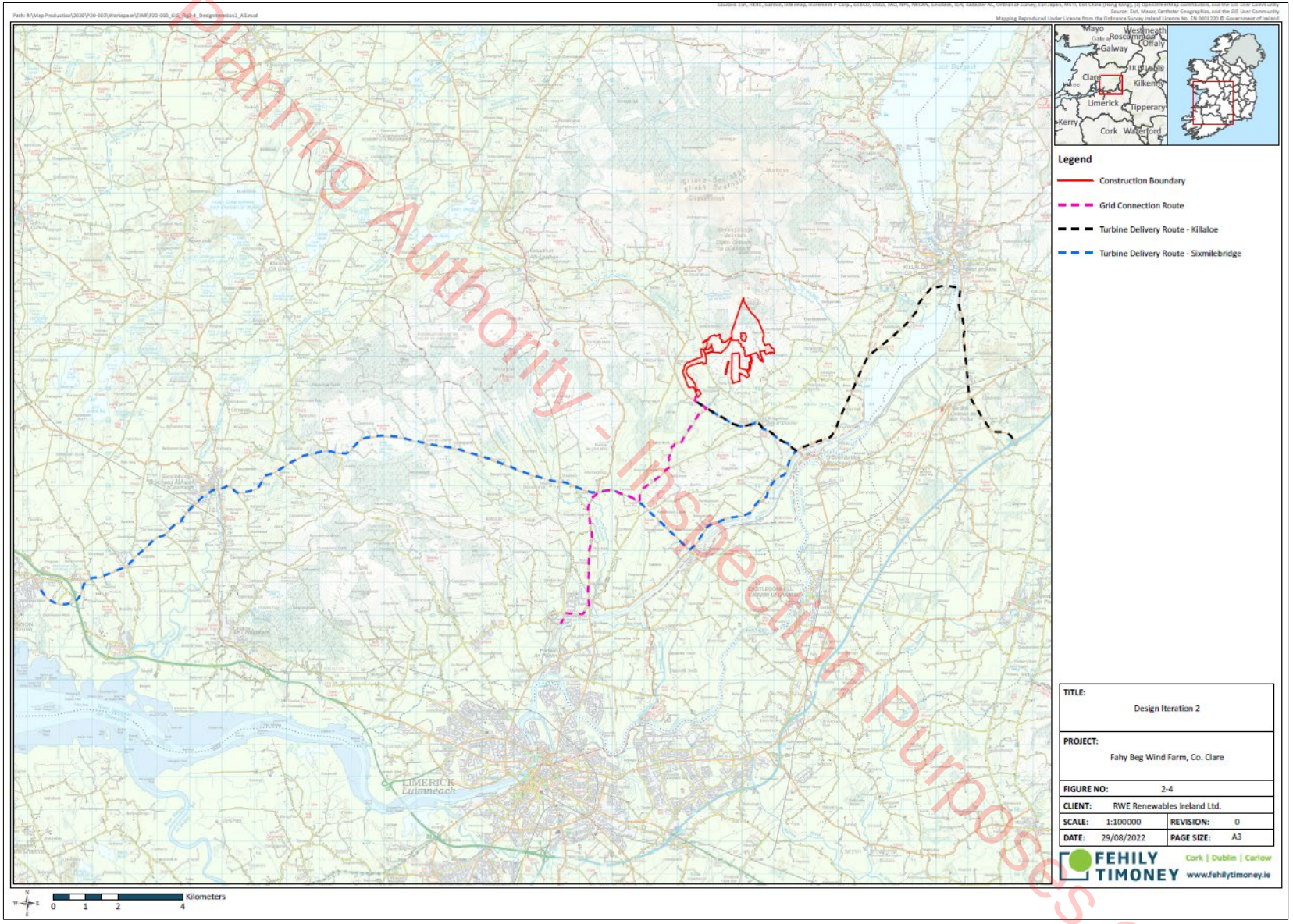

Figure 2-4: Design Iteration 2

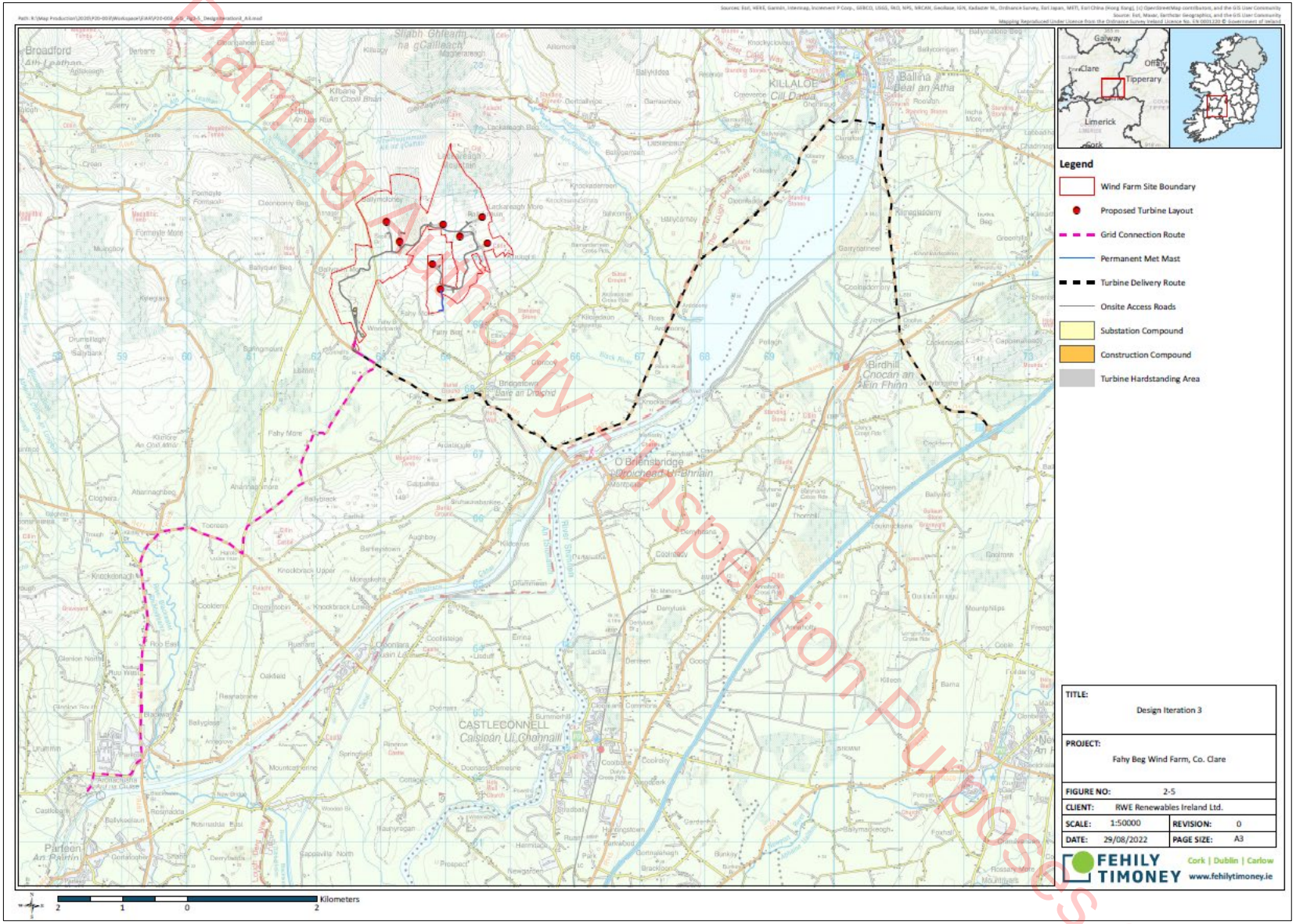

Figure 2-5: Design Iteration 3

Table 2-5: Comparison of Potential Residual Environmental Effects of the Wind Farm Design Iterations

Environmental Consideration	Preliminary Design Option (8 no. WTG's, 170 m Tip Ht, 131 m Rotor Dia.)	Preliminary Design Option (6 no. WTG's, 180 m Tip Ht, 150 m Rotor Dia.)	Design Iteration 1 (8 no. WTG's, 180 m Tip Ht, 136 m Rotor Dia.)	Design Iteration 2 (8 no. WTG's, 180 m Tip Ht, 136 m Rotor Dia.)	Design Iteration 3 (8 no. WTG's, 169 m to 176.5 m Tip Ht, 131 m to 138 m Rotor Dia.)
Air & Climate	Slightly greater impact during construction due to greater CO2 emissions due to greater number of turbines. Slightly greater potential for dust emissions due to larger area of excavation. Long-term positive impact on air quality due to production of clean renewable electricity.	Slightly reduced long-term positive impacts on air quality and climate due to reduced power output. Long-term positive impact on air quality and climate due to production of clean renewable electricity.	Long-term positive impact on air quality and climate due to production of clean renewable electricity.	Long-term positive impact on air quality due to production of clean renewable electricity.	Long-term positive impact on air quality due to production of clean renewable electricity.
Noise & Vibration	Potential for greater noise impact on nearby sensitive receptors due to slightly lower hub height in comparison with other design options.	Potential for greater noise impact on nearby sensitive receptors due to greater number of turbines. Potential for greater noise impact on nearby sensitive receptors due to larger rotor diameter and associated hub height in comparison with other design options.	Design achieves appropriate setback distances. 4x tip height setback achieved. Slight to moderate significance of impact, with dwellings closest to the project.	Design achieves appropriate setback distances. 4x tip height setback achieved. Slight to moderate significance of impact, with dwellings closest to the project.	Design achieves appropriate setback distances. 4x tip height setback achieved. Slight to moderate significance of impact, with dwellings closest to the project.

Environmental Consideration	Preliminary Design Option (8 no. WTG's, 170 m Tip Ht, 131 m Rotor Dia.)	Preliminary Design Option (6 no. WTG's, 180 m Tip Ht, 150 m Rotor Dia.)	Design Iteration 1 (8 no. WTG's, 180 m Tip Ht, 136 m Rotor Dia.)	Design Iteration 2 (8 no. WTG's, 180 m Tip Ht, 136 m Rotor Dia.)	Design Iteration 3 (8 no. WTG's, 169 m to 176.5 m Tip Ht, 131 m to 138 m Rotor Dia.)
Biodiversity	Greater habitat loss due to greater area of hardstanding's. Greater potential of collision risk due to greater number of turbine blades.	Greater potential of collision risk due to increased rotor diameter. Reduced potential of collision risk due to smaller number of turbines.	Greater habitat loss due to greater area of hardstanding's. Reduced potential of collision risk due to smaller rotor diameter compared with 150m rotor option.	Greater habitat loss due to greater area of hardstanding's. Reduced potential of collision risk due to smaller rotor diameter compared with 150m rotor option.	Greater habitat loss due to greater area of hardstanding's. Reduced potential of collision risk due to smaller rotor diameter compared with 150m rotor option.
Land, Soils, Geology	Larger area of excavation and soil disturbance required due to greater number of turbines.	No significant residual impact following implementation of mitigation measures.	No significant residual impact following implementation of mitigation measures.	No significant residual impact following implementation of mitigation measures.	No significant residual impact following implementation of mitigation measures.
Hydrology & Water Quality	Turbines located within 50m of existing watercourses. Potential for impact on water quality at this point.	Turbines located within 50m of existing watercourses. Potential for impact on water quality at this point.	No turbines located within 50m of existing watercourses. No-significant residual impacts following mitigation.	No turbines located within 50m of existing watercourses. No-significant residual impacts following mitigation.	No turbines located within 50m of existing watercourses. No-significant residual impacts following mitigation.
Population & Human Health	Slightly greater potential for impact on residential amenity due to greater visual envelope and heightened noise as a result of the greater number of turbines.	Slightly greater potential for impact on residential amenity due to greater visual envelope and heightened noise as a result of the larger rotor diameter and associated hub height associated with the turbines.	Design achieves appropriate setback distances. 4x tip height setback achieved. Slight to moderate significance of impact, with dwellings closest to the project.	Design achieves appropriate setback distances. 4x tip height setback achieved. Slight to moderate significance of impact, with dwellings closest to the project.	Design achieves appropriate setback distances. 4x tip height setback achieved. Slight to moderate significance of impact, with dwellings closest to the project.
Material Assets	Similar potential impacts following mitigation.	Similar potential impacts following mitigation.	Similar potential impacts following mitigation.	Similar potential impacts following mitigation.	Similar potential impacts following mitigation.

Environmental Consideration	Preliminary Design Option (8 no. WTG's, 170 m Tip Ht, 131 m Rotor Dia.)	Preliminary Design Option (6 no. WTG's, 180 m Tip Ht, 150 m Rotor Dia.)	Design Iteration 1 (8 no. WTG's, 180 m Tip Ht, 136 m Rotor Dia.)	Design Iteration 2 (8 no. WTG's, 180 m Tip Ht, 136 m Rotor Dia.)	Design Iteration 3 (8 no. WTG's, 169 m to 176.5 m Tip Ht, 131 m to 138 m Rotor Dia.)
Traffic & Transport	Similar potential impacts following mitigation.	Similar potential impacts following mitigation.	Similar potential impacts following mitigation.	Similar potential impacts following mitigation.	Similar potential impacts following mitigation.
Archaeology & Cultural Heritage	No expected impact to existing cultural heritage feature within the site through avoidance.	No expected impact to existing cultural heritage feature within the site through avoidance.	No expected impact to existing cultural heritage feature within the site through avoidance.	No expected impact to existing cultural heritage feature within the site through avoidance.	No expected impact to existing cultural heritage feature within the site through avoidance.
Landscape & Visual	Greater potential visual impact associated with greater number of turbines.	Slightly reduced potential visual impact associated with smaller number of turbines however coupled with slightly increased potential impact associated with larger rotor diameter and tip height.	Similar potential impacts following mitigation.	Similar potential impacts following mitigation.	Similar potential impacts following mitigation.
Telecoms & Aviation	No expected impact.	No expected impact.	No expected impact.	No expected impact.	No expected impact.

The final design iteration was chosen to take forward for the proposed project as it strikes a balance between energy production capacity and avoidance of environmental sensitivities. The chosen option provides for the greatest amount of energy production while avoiding potential significant impacts on the receiving environment and achieving appropriate setback from dwellings and sensitive environmental receptors.

2.3.5.2 Grid Connection

When considering an appropriate substation to connect the proposed Fahy Beg Wind Farm to the national grid, substations in proximity to the site were identified and a feasibility study was carried out to identify which substation was the most appropriate from an environmental impact perspective, with the most suitable appearing to be the Ardnacrusha 110kV Substation, located approximately 10 km to the south west of the wind farm site boundary.

A Grid Connection High Level Review for a potential wind farm project was commissioned by RWE Renewables Ireland Lt. in 2018 and carried out by MullanGrid Consulting. This focused on critical elements of the grids viability and identified any potential constraints at the Ardnacrusha 110kV Substation and surrounding grid network. The study focused on the following key areas:

- Local network and generation;
- Connection method and costs;
- Ongoing grid factors;
- Potential constraints and curtailment.

The review showed the proposed Fahy Beg wind farm site was in proximity to the Ardnacrusha 110kV Substation on the national transmission system, located c. 10.7km from the site entrance by public road. Capacity at the substation was examined, and potential routes were identified and assessed in order to determine a viable connection from the proposed Fahy Beg Wind Farm Site to the national grid. The study identified several potentially feasible grid connection arrangement options.

In April 2022, TLI Group prepared a feasibility study for a potential 38kV grid connection to Ardnacrusha 110kV Substation on behalf or RWE Renewables Ireland Ltd. This report can be found in Appendix 3.3 of the EIAR. The study identified and assessed three potential route options from the wind farm site to the Ardnacrusha 110kV Substation examining key technical and environmental constraints including:

- Challenging ground conditions;
- Existing infrastructure;
- Land use;
- Watercourse crossings;
- Sharp bends;
- Protected sites (SAC/NHA);
- Other known grid connection applications.

A desktop analysis was carried out using the study area constraints map to identify potential grid routes between the Wind farm site and Ardnacrusha Substation. The study area map combined data from numerous sources including OSI mapping available, aerial imagery, protected areas, river networks, ESB network data, architectural heritage, monuments data, etc. The granting of planning permission on 29th September 2022 for a wind farm to the north of Fahy Beg, at Carrownagowan, may potentially allow the sharing of the same proposed grid route to the Ardnacrusha 110kV Substation. This was also considered as part of the study.

The study examined three potential route options:

- Route Option A – Preferred route, which is 10.7km in length.
- Route Option B – Alternative route heading north up R466 before joining preferred route of option A on the R471. 11.7km in length.
- Route Option C – Alternative route heading southeast from quarry entrance, turning on to local road heading south before joining R463 crossing bridge at Garraunboy, which is 10.7km in length.

The proposed routes were analysed and altered based on the site conditions to select the most feasible route corridors available, as shown in Table 2-6 and Table 2-7, below:

Table 2-6: Legend For Colour Coded Assessments

Legend	Colour	Comparison with other routes
Low Potential Impact		Most Preferable
Medium Potential Impact		Acceptable
High Potential Impact		Least Preferable

Table 2-7: Route Option Comparison Summary Table

Assessment Criteria	Option A	Option B		Option C	
Length	10.7km		11.7km		10.7km	
Bridge Crossings (Possible HDD)	4		3		3	
Watercourse/Culvert Crossings	3		3		2	
Challenging ground conditions	2		0		1	
Sharp Bends	4		5		5	
SAC/NHA area	0		1		0	
Other grid connection applications in area	0		1		0	

Route Option A was identified as the most feasible. Route Option C was considered to be not feasible due to potential difficulties associated with crossing the river Blackwater at Garraunboy and potential associated impacts, in particular disruption to traffic flows within the town as well as the presence of existing services on the bridge and lack of suitable locations to carry out horizontal directional drilling (HDD) works. The various options are shown in Figure 2.6, below:

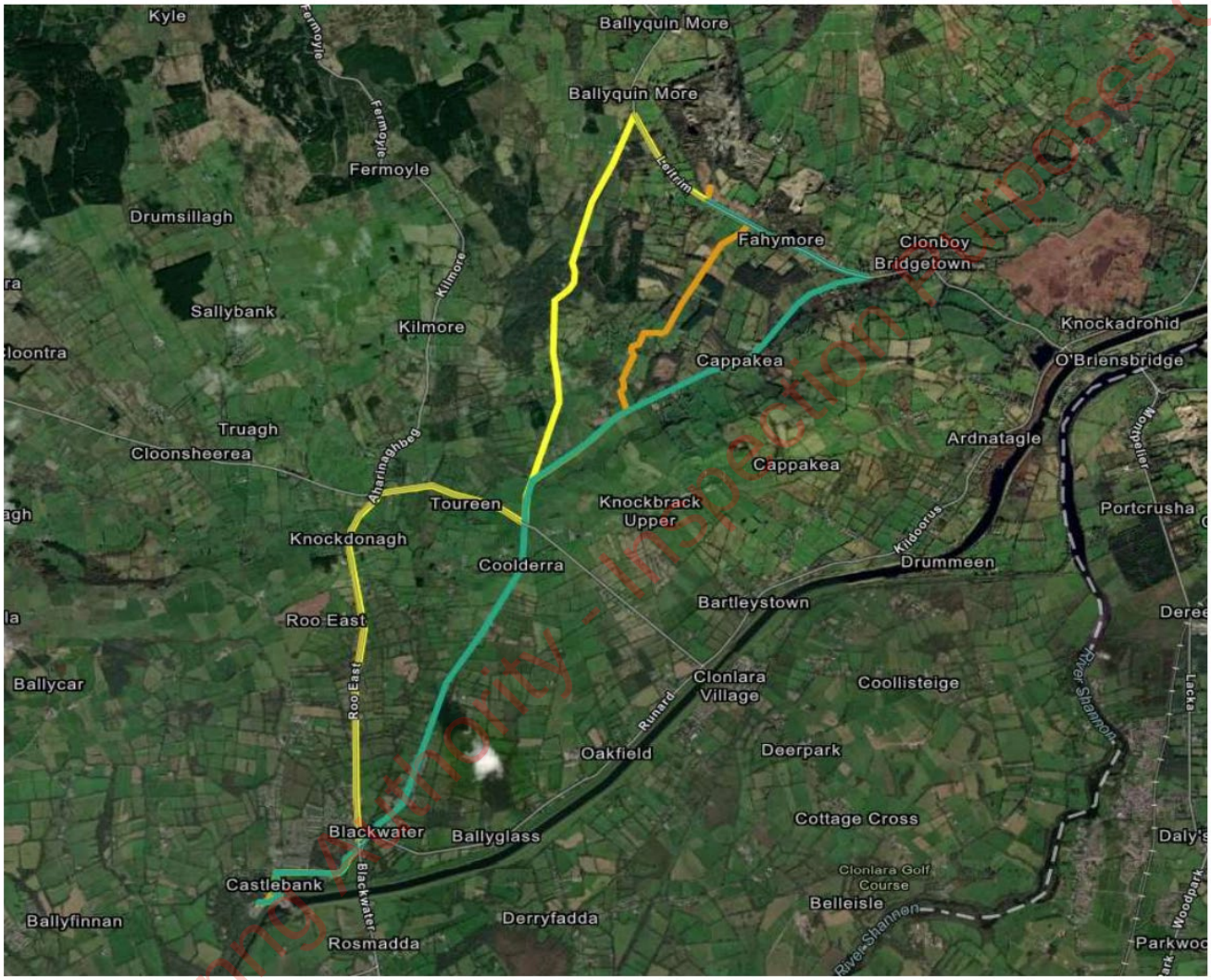

Figure 2-6: Fahy Beg Wind Farm Grid Connection Options

Turbine Delivery Route

Pell Frischmann (PF) were commissioned by Fehily Timoney (FT) to undertake a study to determine the optimal delivery route for wind turbine Abnormal Indivisible Loads (AIL) associated with the construction and development of Fahy Beg Wind Farm. The Route Survey Review (RSR) has been prepared to help inform the EIAR on the issues associated with the development of the site with regard to off-site transport and access for AIL traffic and includes a detailed swept path analysis (SPA). A copy of this report is contained in Appendix 13-1.

Access to the site is primarily via the existing Bridgetown to Broadford R-466 Regional road, which passes to the south west of the site, with direct entry to the proposed wind farm site via an existing quarry. All large loads including turbine towers, turbine blades and trucks with materials will only be permitted to enter via the quarry access while light goods vehicles (LGV) such as vans and jeeps will be permitted to enter the site from the Fahymore Local Road. Further details of the proposed site access from the wider road network, is detailed in Chapter 3 and further detailed in Chapter 13 of this EIAR.

Alternative Turbine Delivery Routes

The proposed Turbine Delivery Route (TDR) utilises the under construction Killaloe Bypass and is described as follows:

- Loads will depart Foynes Port and turn left onto the N69 travelling east;
- Join the eastbound N18 at Junction 2, Limerick and continue east onto the M7;
- Depart the M7 at Junction 27 and continue north on the R494 towards Killaloe;
- Turn left onto the proposed bypass and utilise the new Shannon River crossing before turning left onto the R463 travelling southbound;
- Continue south on the R463 before turning right onto the R466;
- Loads will continue north on the R466 to the proposed site entrance.

An alternative route approaching from the west has also been examined in detail. The alternative access route to site is described as follows:

- Loads will exit the port of Foynes and turn left onto the N69 travelling east;
- Due to the known height restriction of 4.65m through Limerick Tunnel, it is proposed that high loads such as towers will continue straight through the Dock Road roundabouts on the N69 east towards Limerick;
- Loads would then turn left at the roundabout onto the R527 before turning left onto the R445 and re-joining the N18 north of the tunnel;
- Blade loads would turn left at Dock Roundabout and continue through the Limerick Tunnel on the N18.
- Hauliers to ensure that their vehicle setup will safely meet the tunnel height restriction;
- All loads will continue north on the N18 to the N18 / R471 junction where they would depart left and then south and east on the R471;
- Loads would continue east on the R471 to north west of Cloonlara where they would turn left onto the R463; and
- Loads would continue north east on the R463 to O'Briensbridge Cross where they would turn left onto the R466 and continue north west to the proposed site entrance.

This route is presented in Figure 2-7 below.

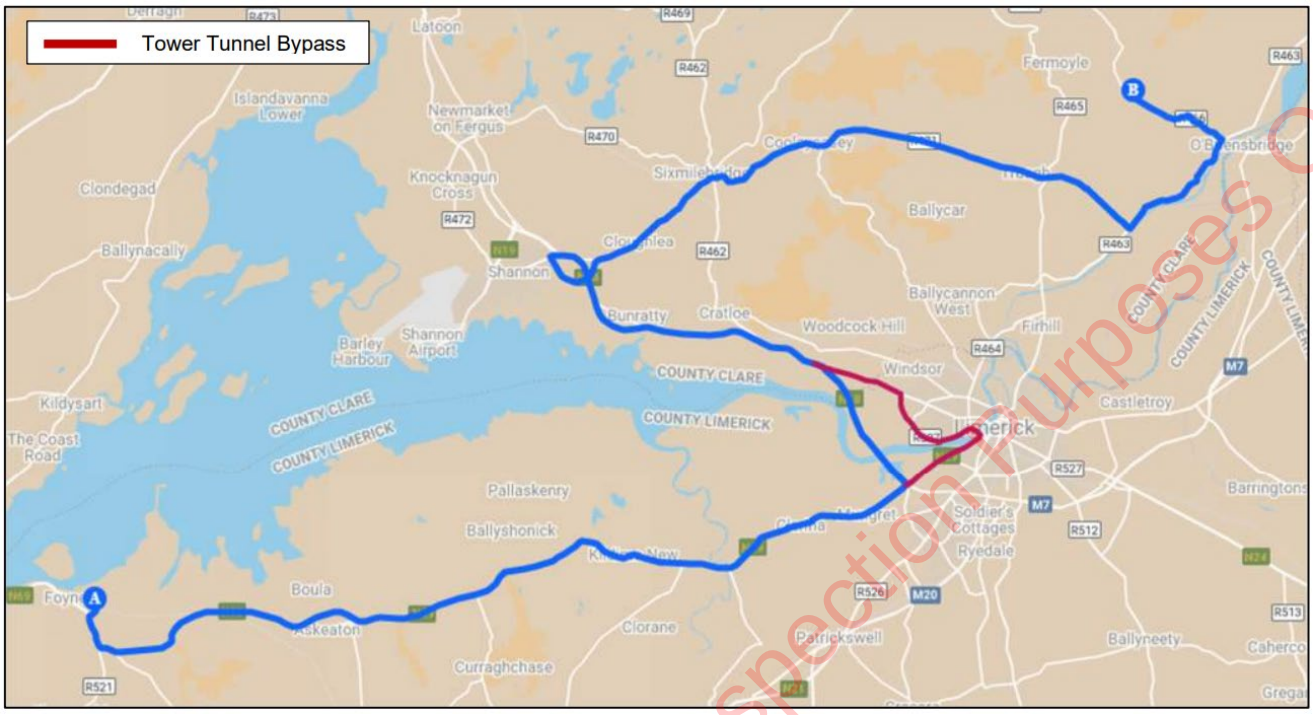

Figure 2-7: Alternative TDR through Sixmilebridge

This route was deemed undesirable due to relatively large amount of temporary offsite accommodation works that would be required in comparison with the preferred route. A key pinch point along this route was also the village of Sixmilebridge.

Alternative Onsite Substation Locations

Several locations were considered for the positioning of the onsite substation. The topography within the main wind farm site was considered to be unsuitable and would result in a potentially significant amount of earthworks to form the compound hard standing.

The quarry site was deemed to be more suitable for the siting of the proposed onsite substation due to the low lying nature of the topography and significant existing screening provided by existing treelines. Several locations within the quarry site were considered for the positioning of the onsite substation.

Figures 2-8 and 2-9 show alternative onsite substation locations that were considered throughout the design iteration process.

The onsite substation location shown in Figure 2-8 was deemed unsuitable due to the existing topography in that part of the site. The onsite substation location shown in Figure 2-9 was deemed unsuitable following intrusive site investigation works which show the presence of unsuitable ground conditions. Additional site investigation works were carried out to confirm suitable ground conditions for the final preferred onsite substation location depicted in Design Iteration 3.

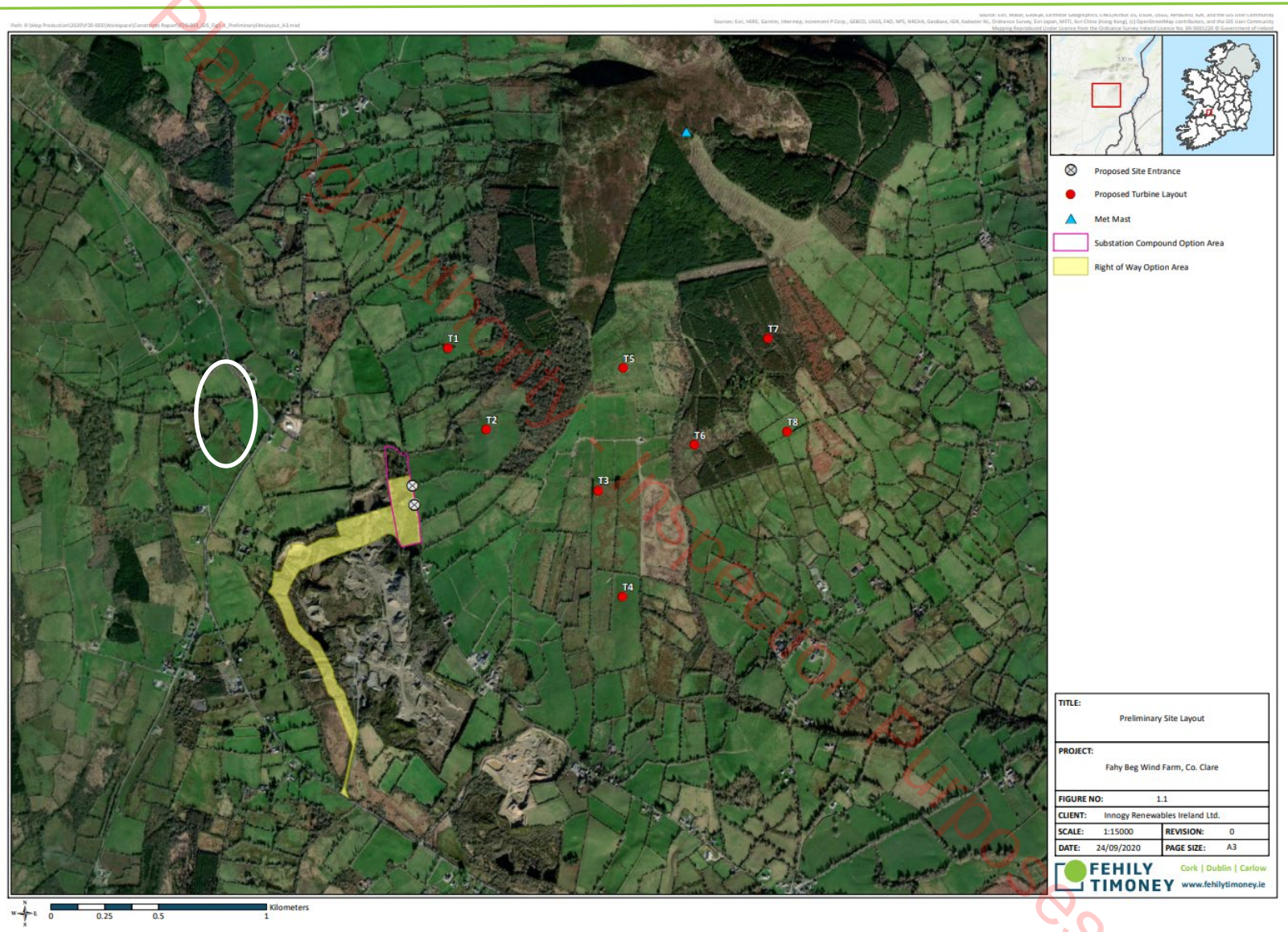

Figure 2-8: Preliminary Layout - Onsite Substation Location (September 2020)

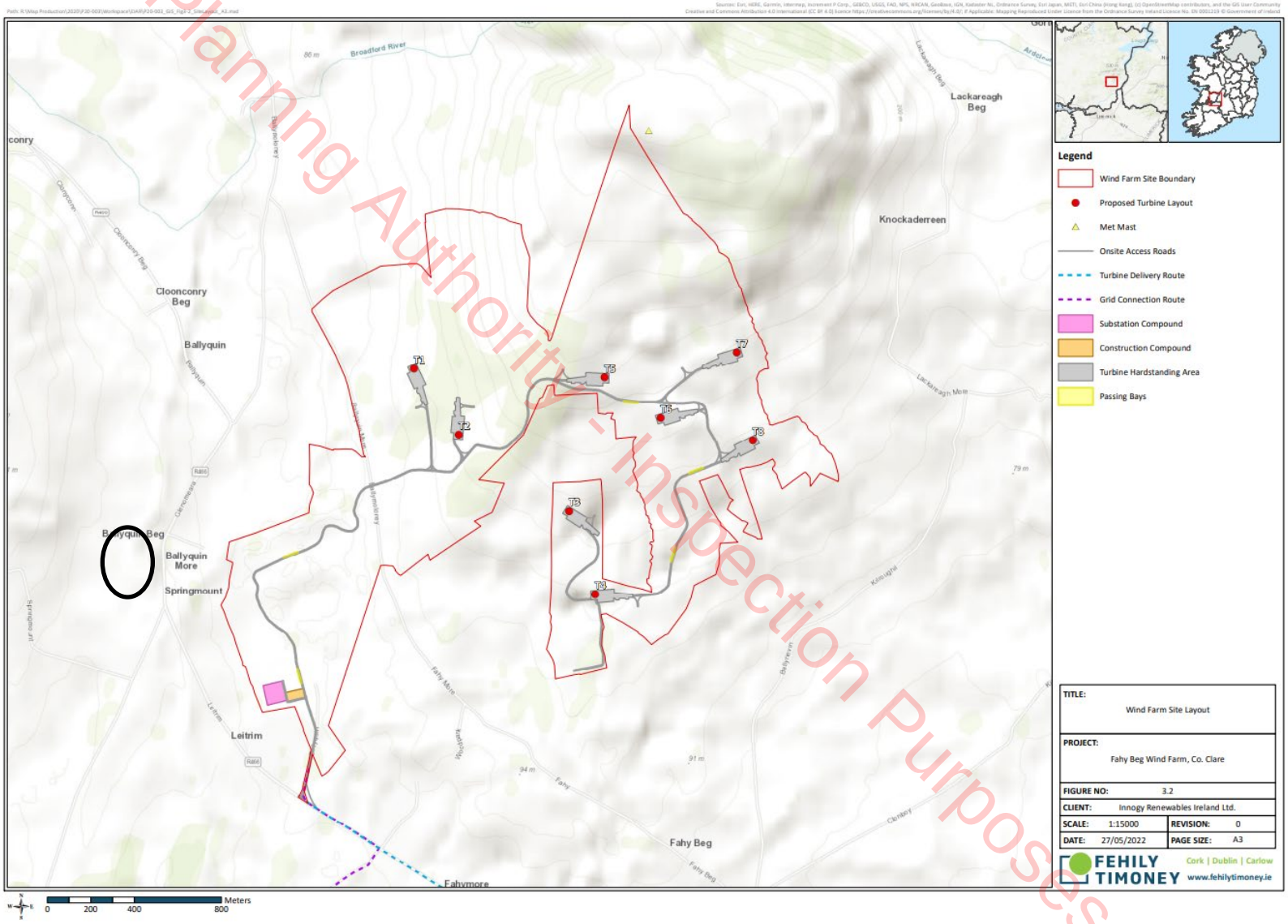

Figure 2-9 : Design Iteration 2 - Layout Onsite Substation Location (May 2022)

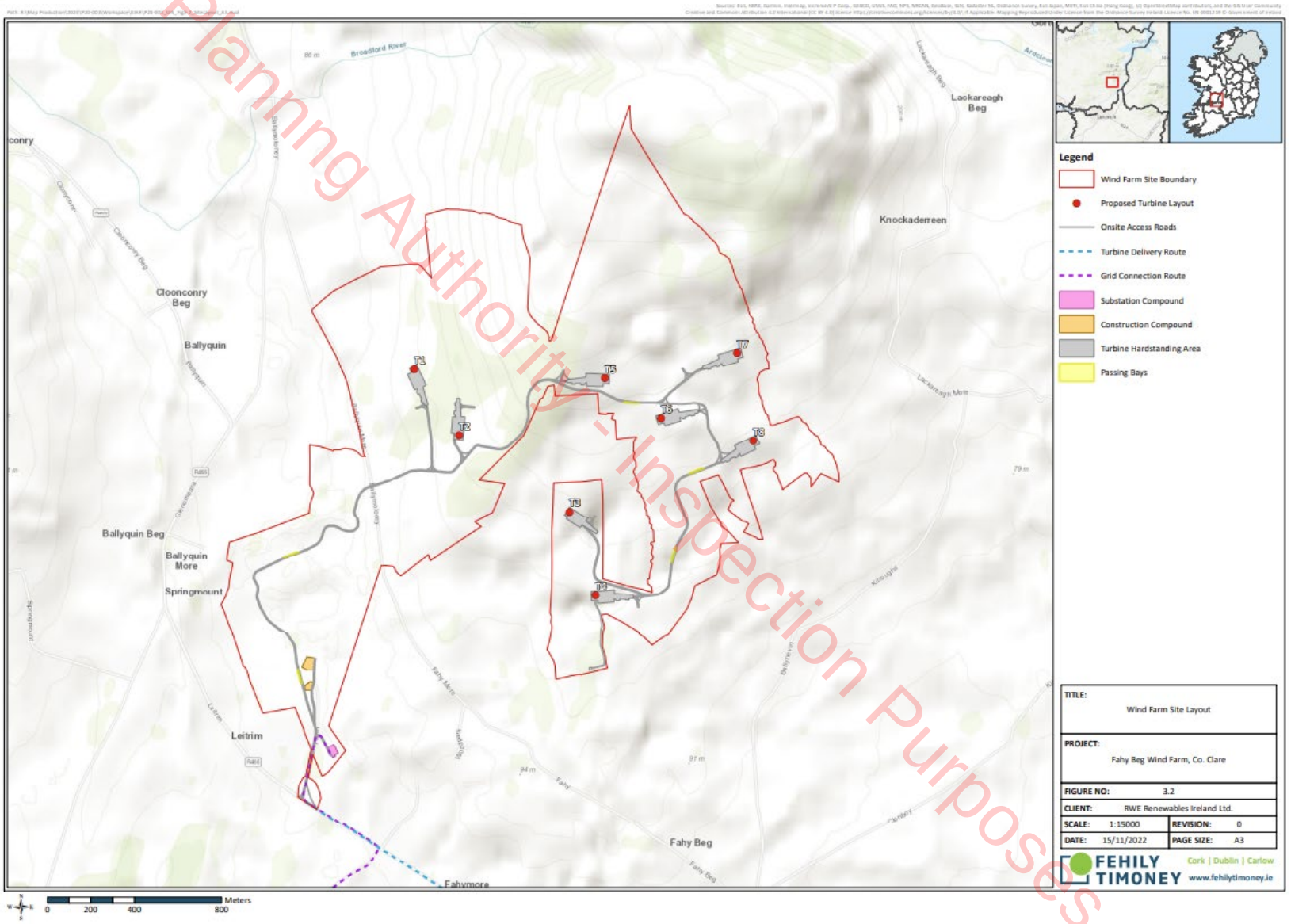

Figure 2-10: Design Iteration 3 - Layout Onsite Substation Location (November 2022)

2.3.5.3 Operational Life

Both a 30-year and 35-year operational life was considered for the proposed project. A comparison of potential residual effects for either scenario is presented in Table 2-8 below.

Permission is being sought for a 35-year operational period from the date of full operational commissioning of the wind farm, with permission for the onsite substation sought in perpetuity given that the substation could form part of the national electricity network. Therefore, the substation will be retained as a permanent structure and will not be removed.

35 years is the anticipated minimum useful lifespan of wind turbines which are being produced for the market today. The lifespan of wind turbines has been increasing steadily in recent years and allowing this duration will improve the overall carbon balance of the development, therefore maximising the amount of fossil fuel usage that will be offset by the wind farm. Leaving the wind turbines in-situ until the end of their useful lifespan would be optimum from an environmental viewpoint, particularly in relation to carbon savings.

Furthermore, it should be noted that section 7.2 of the Planning Guidelines 2006 states for the following:

'The inclusion of a condition which limits the life span of a wind energy development should be avoided, except in exceptional circumstances'
Assuming the proposed development has an installed capacity of 31.2 MW, the proposed wind farm has the potential to produce approximately 95,659 MWh (megawatt hours) of electricity per year

A 35-year operational life will also have a positive impact on material assets by extending the offsetting of the use of fossil fuels for electricity production and increasing the amount of renewable electricity being supplied to the national grid, as required by EU and national renewable energy targets. This will also benefit Ireland's energy security for a longer period.

Potential negative impacts of a 35-year period of consent relate to residual short-term visual impact and short-term noise impacts on nearby residential receptors which are not considered significant. There are no impacts envisaged at the Grid Route (grid route and substation are to remain in place) or TDR during this period. It is therefore considered that a 35- year operational life will provide greater overall benefits, as described in Table 2-8, below:

Table 2-8: Potential Residual Environmental Impacts For 35 Year Operation Life

Environmental Consideration	35-Year Operation Life	30-Year Operation Life
Air & Climate	Long-term positive impact on air quality and climate due to offset of CO2 emissions from fossil fuels. Additional 5-year offset to CO2 emissions.	Long-term positive impact on air quality and climate due to offset of CO2 emissions from fossil fuels.
Noise & Vibration	Long-term slight to moderate impact on nearby dwellings as a result of the operational noise. Short-term additional period of slight to moderate impact on these receptors.	Long-term slight to moderate impact on nearby dwellings as a result of the operational noise.

Environmental Consideration	35-Year Operation Life	30-Year Operation Life
Biodiversity	Imperceptible and reversible impacts during operational phase. Slightly longer duration of imperceptible impact.	Imperceptible and reversible impacts during operational phase.
Ornithology	Slight-imperceptible reversible impact on bird species during operational phase. Slightly longer duration of slight-imperceptible impact.	Slight-imperceptible reversible impact on bird species during operational phase.
Land, Soils, Geology	No residual impact envisaged.	No residual impact envisaged.
Hydrology & Water Quality	No residual impact envisaged.	No residual impact envisaged.
Population & Human Health	Long-term slight to moderate impact on nearby dwellings as a result of the operational noise. Short-term additional period of noise at nearby dwellings.	Long-term slight to moderate impact on nearby dwellings as a result of the operational noise
Material Assets	Long-term positive impact by offsetting use of fossil fuel. Greater offset due to additional period of operational phase.	Long-term positive impact by offsetting use of fossil fuel.
Traffic & Transport	Imperceptible effect.	Imperceptible effect.
Archaeology & Cultural Heritage	Indirect, imperceptible to moderate, negative impacts on the wider settings of a number of archaeological sites within the environs of the Site following mitigation, these impacts will be reversed following the decommissioning phase.	Indirect, imperceptible to moderate, negative impacts on the wider settings of a number of archaeological sites within the environs of the Site following mitigation, these impacts will be reversed following the decommissioning phase
Landscape & Visual	Slight to moderate visual impact, subject to viewshed as assessed in Chapter 15. Additional short-term visual impact as a result of extended operational life.	Slight to moderate visual impact, subject to viewshed as assessed in Chapter 15.
Telecoms & Aviation	No potential impact envisaged.	No potential impact envisaged.

2.4 Conclusion

This chapter of the EIAR has described the need for the development and the reasonable alternatives considered throughout the development process for the proposed Fahy Beg Wind Farm. The need for the development is established in Section 2.2 and it centres on providing renewable electricity to the Irish national grid, in line with European and national policy objectives, and the need to meet EU Renewable Energy targets and national targets as set out in the Climate Action Plan (2021).

A description of the reasonable alternatives in terms of project design philosophies, technology, size and scale for the development of the Fahy Beg Wind Farm project is detailed in Section 2.3.

This section sets out the evolution of the proposed development and the alternatives considered. The section details the strategic site screening process i.e., the high-level considerations in finding a suitable site for a renewable energy project.

The assessment of the suitability of the candidate site then considers the proposed site in terms of policy and other environmental constraints. A variety of wind turbine sizes and arrangements were considered and a comparison of potential environmental effects of the alternatives was provided.

The alternative layouts of the proposed development were established through the project philosophy of mitigation by design. Alternative density and scales were considered, and the potential environmental impacts of various alternative turbine scales and numbers were compared. The alternative grid connection options were examined, and the optimal option was chosen as a result of environmental assessment.

Alternatives were also considered for other individual elements of the project including the proposed on-site substation and the proposed operational life of the project. These elements were arrived at through the avoidance of potential environmental impacts as detailed in the comparisons provided throughout section 2.3.

The final proposed layout of the Fahy Beg Wind Farm as assessed throughout this EIAR is thought to be the optimal design which minimises impacts on the receiving environment, while providing significant renewable electricity to the national grid, in line with national energy and climate policy.

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