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ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED BALLINAGREE WIND FARM

VOLUME 2 - MAIN EIAR

CHAPTER 2 – NEED FOR THE DEVELOPMENT AND ALTERNATIVES CONSIDERED

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2.1 Introduction

The following chapter sets out the need for the proposed development with respect 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 screening process, alternative design philosophies considered, alternative site layouts, the do-nothing alternative, alternative processes and technologies, amongst other things.

2.2 Need for the Proposed Development

The proposed Ballinagree 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 has an estimated Maximum Export Capacity (MEC) of between 118MW an 132MW. The exact MEC will be dependent on the output power of the models available at procurement stage. The project will play a significant role in providing renewable electricity in the Republic of Ireland, accounting for approximately between 2.7% and 3% of the current installed wind energy capacity (Wind Energy Ireland, 2021).

At a strategic level, the need for the 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. The Irish Government published the Climate Action Plan in June 2019 (DoCCAE, 2019) which sets actions to ensure Ireland's 2030 renewable energy targets can be achieved. This is in the context of substantial and continuing failure by Ireland in meeting climate targets to date. These targets have recently been updated in the Climate Action Plan 2021 which has increased the target of renewable energy from 70% as included in the 2019 CAP to 80% by 2030. This target is to be achieved partly by the delivery of 8GW of onshore wind energy.

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 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).

The current Taoiseach Michéal Martin on the launch of the Climate Action and Low Carbon Development (Amendment) Act (2021) 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 (updated in 2021) and more recently, the Climate Action and Low Carbon Development (Amendment) Act 2021.

The CAP sets out actions to cut emissions and make Ireland a zero-carbon economy by 2050. The Climate Action and Low Carbon Development 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.

It is estimated that the capacity of between 118MW and 132MW of electricity from the proposed Ballinagree Wind Farm will result in the net displacement of approximately between 132,414 and 148,125 tonnes of CO_2 per annum, 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 Ballinagree 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 stated that:

> "Climate disruption is already having diverse and wide-ranging impacts on Ireland's environment, society, economic and natural resources. The Climate Action Plan clearly identifies the nature and scale of the challenge." (DoCCAE, 2019)

The proposed Ballinagree Wind Farm will assist in mitigating the effects of climate breakdown and help Ireland achieve its climate neutral economy no later than 2050, to be known as the 'national climate objective', as set out in the Climate Action and Low Carbon Development (Amendment) Act 2021. Furthermore, the Climate Action Plan seeks a total installation of up to 8 GW of onshore wind capacity by 2030, approximately doubling the capacity by 2030. The Ballinagree Wind Farm has the potential to contribute to between 2.95% and 3.3% of the additional capacity (ca. 4 GW) required to achieve this 2030 national target.

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. In July2021, the Commission published the 2030 Climate Target Plan which proposes to raise the EU's ambition on reducing greenhouse gas emissions to at least 55% below 1990 levels by 2030. 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 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:

- Reduce CO2 eq. emissions from the electricity sector by 62-81%;
- Deliver an early and complete phase-out of coal- and peat-fired electricity generation;
- Increase electricity generated from renewable sources to 80%, indicatively comprised of:
    - 5 GW of offshore wind energy
    - 1.5 to 2.5 GW of grid-scale solar energy
    - Up to 8 GW onshore wind energy.

The binding EU targets have been transposed into Irish National Policy in the 2021 Climate Action Plan 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 Ballinagree 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, 2020b) 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 (2021).

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 Ballinagree 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 Ballinagree Wind Farm

In addition to helping Ireland reduce environmentally damaging emissions and helping avoid significant fines from the EU, the Ballinagree 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 Ballinagree 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 GW of onshore wind capacity by 2030 (DoCCAE, 2021). The Ballinagree Wind Farm has potential to contribute to between 2.95% and 3.3% of the additional capacity (ca. 4 GW) required to achieve this 2030 national target, by providing between 118MW and 132MW of renewable electricity. The increase in domestic renewable energy as a result of the proposed Ballinagree 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

This section of the EIAR sets out the alternatives considered throughout the development process of the proposed Ballinagree Wind Farm. 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 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 draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (2017). The draft 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 draft Guidelines note the following with regard to 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 taken into account 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 32% 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 CO2 eq. emissions from the electricity sector by 62-81%;
- Deliver an early and complete phase-out of coal- and peat-fired electricity generation;
- Increase electricity generated from renewable sources to 80%, indicatively comprised of:
    - Up to 8 GW onshore wind energy.

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 Ballinagree Wind Farm project would not go ahead, the development of a renewable energy project is not pursued, and the site remains in use as commercial forestry and agriculture. In the "Do-Nothing" scenario, the prospect of creating sustainable energy through County Cork'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.

The proposed development has the potential to prevent approximately between 132,414 and 148,125 tonnes of CO2 emissions per annum, or between 4,634,490 and 5,184,375 tonnes of CO_2 emissions will be displaced over the proposed thirty five-year lifetime of the wind farm. This would otherwise be released to the atmosphere through the burning of fossil fuels in the "Do-Nothing" scenario. This may 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 2021 – 2030 (EirGrid, 2021), the growth in energy demand for the next ten years on the Island of Ireland will be between 18% and 43%. 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, cease the burning of oil at Tarbert as well as the termination of all peat burning at Bord na Móna's powerplants by 2023.

Under the "Do-Nothing" scenario, the socio-economic benefits associated with the proposed development will be lost. These benefits include between 126 and 188 no. jobs during the construction phase of the project, and between 35 and 47 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 Ballinagree 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-noting' Alternative
Air & Climate	Slight to moderate temporary localised residual impacts arising from fugitive dust emissions. Long-term positive impact on air quality and climate due to avoidance of burning of fossil fuels and the net displacement of between 132,414 and 148,125 of CO2 per annum.	Fossil fuel power stations will be the primary alternative to provide the required quantities of electricity resulting in greenhouse gas 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	Slight negative impact on species and habitat. Non-significant impact on aquatic ecology. Significant positive benefit from proposed biodiversity enhancements.	The biodiversity at the site will remain as is without the proposed enhancements to the site.
Ornithology	Slight negative impact on bird species.	Neutral

Environmental Consideration	Residual Impact of the Proposed Project	'Do-noting' Alternative
Land, Soils, Geology	Imperceptible residual impact following implementation of mitigation measures. Slight residual cumulative effects from the excavation of fill material from local quarries.	Neutral
Hydrology & Water Quality	Non-significant impacts following implementation of mitigation measures.	Neutral
Population & Human Health	Positive impact on recreation and health gain due to provision of additional recreation facilities. Long-term positive economic benefit to local area due to job creation and community benefit fund.	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	Positive impact by offsetting use of fossil fuel. Positive impact due to provision of electricity infrastructure. Slight negative impact to capacity of licenced waste facilities. Slight residual cumulative effects to local quarries due to requirement for fill material.	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. No cumulative impact to capacity of local quarries.
Traffic & Transport	Slight short-term impact due to construction and decommissioning activities.	Neutral
Archaeology & Cultural Heritage	Indirect visual impacts on nearby monuments. No residual impacts envisaged that cannot be reversed following decommissioning.	Neutral
Landscape & Visual	Slight to substantial-moderate visual impact, subject to viewshed as assessed in Chapter 15.	Neutral
Telecoms & Aviation	No Residual Impact expected.	Neutral

2.3.2 Strategic Site Screening

The project Developers, Coillte and Ørsted, continuously examine the lands under their stewardship and otherwise for candidate sites for wind energy development.

In 2014, Coillte's Renewable Energy Development Team undertook a detailed screening process, through Geographical Information Spatial software (GIS), using a number of criteria and stages to assess the potential of a large number of possible sites, on lands within its stewardship (c. 441,000 hectares), suitable to accommodate a wind energy development. The GIS database drew upon a wide array of key spatial datasets such as forestry data, ordnance survey land data, house location data, transport, existing wind energy and grid infrastructure data and environmental data such as ecological designations, landscape designations and wind energy strategy designations available at the time.

The following is a summary of the methodology used in this screening process

Phase 1 - Initial Screening

This stage in the selection process discounted lands that were not available for development under a number of criteria, as follows:

- Committed Lands for other developments
- Millennium Sites (This is a Coillte environmental designation – these sites were planted and managed for provision of a tree for every household in the country as part of the Millennium tree planting project)
- Life Site (This is a Coillte environmental designation – these former forested sites were cleared and are managed for biodiversity)
- Wild Nephin Properties (This is a Coillte designation. Since 2014 these properties have been incorporated into National Parks)
- Farm Partnerships and Leased Lands
- National Parks
- Natura 2000 and Nationally Designated Sites (SAC, SPA, NHA, pNHA)

Coillte also reviewed the relevant local authority's County Development Plan (CDP) and/or Renewable Energy Strategy (RES) provisions and did not proceed with further analysis where the policy context was not supportive of wind farm development. In this regard, areas were not brought forward for further analysis if they were not identified as being at least "open for consideration" for wind farm development.

Lands where the average wind speed at 80 metres above ground level is less than 7 m/s and, therefore, potentially not suitable for a commercially viable wind energy development were also discounted at this stage. In addition, sites with a contiguous area of less than 300 hectares were discounted.

Phase 2 – Grid Constraints

The electricity transmission system is the backbone of the nation's power system, efficiently delivering large amounts of power from where it is generated to where it is needed. As part of the site selection process, it was necessary to consider the potential for grid connection, including in terms of distance to potential connection nodes and the grid capacity at the nodes, in the local area, to accommodate the connection.

Phase 3 – Screening

The next stage of screening out lands from further analysis was due to the presence of the following:

- Sensitive Amenity or Scenic Areas designation in CDPs (at the time of the screening process);
- Tourist areas/sites/trails;
- Lands utilised for other wind farm developments;
- Telecommunications masts and links;

- Sensitive habitat/species of bird;
- Land Ownership title Issues;
- Relatively high residential density in vicinity;
- Unfavourable slopes and ground conditions.

This stage of screening was generally applied using Coillte's in-house expertise and local knowledge, and was subsequently validated externally in terms of the engineering considerations and the likelihood of obtaining a successful grant of planning permission based on industry trends in 2014.

Results of the Screening Process

Sites that emerged from the 2014 site selection process, outlined above, for which Coillte are in the process of preparing separate planning applications, or which Coillte have submitted planning applications for, are:

- Croagh, County Leitrim;
- Carrownagowan, County Clare;
- Glenard, County Donegal;
- Bottlehill (Coom), County Cork;
- Castlebanny, County Kilkenny.

Coillte intend to bring forward all of these landholdings for wind energy development as all were considered by Coillte to be viable sites for a wind energy project. Each are projects in their own right which are subject to EIA. As such a description of the reasonable alternatives studied which are relevant to each project and its specific characteristics, together with an indication of the main reasons for selecting the chosen option with regard to their environmental impacts will be provided in the EIAR accompanying the applications for same.

In 2017 Coillte once again examined the lands under its stewardship for candidate sites for wind energy development using the same site selection process as described above but this time reducing the required contiguous site area from 300ha to 50ha. The proposed site emerged from this process and the process described in Section 2.3.3 below. Other sites which also emerged and for which Coillte are in the process of preparing separate planning applications are:

- Ballinagree (proposed site);
- Croaghaun;
- Gortyrahilly;
- Inchamore;
- Lissinagroagh.

Similar to the sites which emerged in 2014; the sites which emerged in 2017 are projects in their own right which will be subject to EIA.

As such a description of the reasonable alternatives studied which are relevant to each project and its specific characteristics, together with an indication of the main reasons for selecting the chosen option with regards to their environmental impacts will be provided in the EIAR accompanying the applications for same.

The alternative to this would be to bring forward a site that did not pass one or all of the above phases of the screening process. In that instance, there would be the potential for the construction and operation of a wind energy development to have an adverse effect on ecologically designated or sensitive areas and visually sensitive (scenic) or amenity areas. There would also be the potential for greater shadow flicker, noise and traffic impacts if the candidate site was located in an area with a higher number of residential dwellings. In addition, a site with an average wind speed less than 7m/s (at 80m above ground level) and/or not located within practical proximity of existing grid infrastructure and may not be economically viable.

As stated above, Coillte conducted two reviews of its land in recent years in which it examined candidate sites for wind energy development. However, as also stated above Coillte continuously assesses at its lands for wind opportunities and other sites can emerge periodically.

Ørsted regularly undertakes similar screening exercises and identified Ballinagree as a suitable site in a similar manner. The process of engaging with landowners in the area to establish interest in the project was commenced and that resulted in a number of landowners concluding option agreements and the Co-Development Agreement between Ørsted and Coillte to look at the Ballinagree site in further detail and establish the potential for a wind energy project at this location.

2.3.3 Suitability of Candidate Site

The Ballinagree site was further examined in the context of the following elements which are considered decisive in determining viability for a wind farm project:

- Planning Policy
- Designated Sites
- Population Density
- Wind Speed and Grid.

2.3.3.1 County Development Plan Policies and Designations

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' (Draft, EPA, 2017) state that it is important to acknowledge the existence of difficulties and limitations when considering alternatives.

The Draft 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 Draft Guidelines is concerned with the Consideration of Alternatives, which states that:

> "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, 2000-2021) 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. Sites which Coillte identified for potential wind energy developments were screened against policy designations as listed below. Sites were discounted unless they were identified as being at least "open for consideration" for wind farm development.

Key policies of the Cork County Development Plan 2014 (Cork County Council, 2014) which were identified include the following:

- Wind Energy Policy
- Wind Energy Development Designations;
- Sensitive Landscape Designations; and
- Cultural Heritage Sites.

As set out in section 4.6 of this EIAR, the Cork County Development Plan policy supports the development of Wind Energy projects in appropriate areas. The subject site was found to be in an area designated in the Cork County Development Plan as being 'Open to Consideration' for wind energy development.

The site falls within three landscape character types as set out in the Cork County Development Plan Landscape Character Assessment. The southern extent of the proposed wind farm site falls within Landscape Character Type 13a: 'Valleyed Marginal Middleground (Macroom and Environs)'. The landscape value and landscape sensitivity are considered to be high and is considered to be of county importance.

The north eastern extent of the proposed wind farm site falls within Landscape Character Type 14b: 'Fissured Marginal and Forested Rolling Upland (Lyre and Nad)'. The landscape value and landscape sensitivity are considered to be medium and is considered to be of local importance.

The central section of the proposed wind farm site falls within Landscape Character Type 15b: 'Ridged and Peaked Upland'. The landscape value and landscape sensitivity are considered to be medium and is considered to be of County importance.

Three scenic routes (S18, S19 and S20) are in proximity to the proposed wind farm site. Based on the visual assessment as set out in Chapter 15, the significance of visual impacts for the 'Centre of Population', 'Major route' and 'Amenity and Heritage Feature' receptor categories are generally in the mid to low range. Visual impact on 'Designated Scenic Routes' and 'Local Community Views' are considered to be higher, however, these impacts are not considered to be significant. See Chapter 15 for further details on visual impact assessment.

A study of cultural heritage sites was conducted which identified 14 no. archaeological sites in proximity to the proposed wind farm site. Monuments with potential visual alignments in the greater area were also identified. Through desktop and field based inspection, it was concluded that a wind farm could be developed at the Ballinagree site without impacting on existing archaeological sites or their alignments.

2.3.3.2 Designated Sites

It is preferable that wind energy development is not located in an area designated as a Special Area of Conservation (SAC), Special Protected Area (SPA) or Natural Heritage Area (NHA). The Ballinagree Wind Farm site is not located within an SAC or SPA, therefore no direct impacts are predicted on designated European sites as a result of the proposed development. However, the subject site was found to be in proximity to the Mullaghanish to Musheramore Mountains SPA located to the west of the site and a part of the site is also hydrologically connected to the Blackwater River (Cork/Waterford) SAC, located north of the site.

The Boggeragh Mountains NHA is located to the north of the site. 760m of existing access track, which is proposed to be used as part of the construction and operation of the Ballinagree Wind Farm, passes through the NHA. This track has previously been used for the construction of the existing Boggeragh wind farm project (Planning Ref: 011248, 085944, 108067) and is currently used for forestry and agricultural activities. No new works are proposed within the NHA as part of this development with the exception of proposed electrical and communications cabling which will follow the wind farm access tracks and shall be buried within this section of road. The road surface shall also be improved in the form of the placement of compacted granular aggregate on the surface following cable trench reinstatement.

With respect to the conservation objectives for the Natura 2000 sites and Nationally designated site, it is considered that a wind energy project could be developed at the subject site without causing negative impacts to the designated sites through careful design and siting of infrastructure and provision of mitigation measures to prevent hydrological changes and impacts such as increased siltation, nutrient release and/or contaminated run-off through drainage channels and watercourses. Mitigation measures are set out in Chapter 8a: Biodiversity, Chapter 8b: Aquatic Ecology and Chapter 10: Hydrology & Water Quality. A Natura Impact Statement has been prepared for the proposed development which concludes the proposed project will not adversely affect the integrity of any of the European sites concerned.

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, visual impacts, shadow flicker and noise. As discussed in Section 11.3 of this EIAR, the population density of the subject site was found to be below the state average and below the County Cork average, as detailed in Table 2-2 below. The low population density and a lack of dwellings in proximity to the site provides greater capacity for wind energy development at the Ballinagree Site, allowing for a greater number of turbines to be constructed while maintaining appropriate setback distances from dwellings as set out in the Wind Energy Development Guidelines.

Table 2-2: Population Density

Area	Population Density (Persons per square kilometre) CSO 2016
State	67.8
Cork County	55.6
Wind Farm Site	13.7
TDR	27
Grid Route	13.1

2.3.3.4 Other Considerations

Wind Speed

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 due its elevation. Average wind speeds at a height of 100 meters range from 8 to 10.7 meters per second according to SEAI data. This indicates viable values for wind energy development at this location, considering values over 8 meters per second are generally required. The wind resource at the Ballinagree Wind Farm site is illustrated in Figure 2-1.

Transport

The Wind Farm Site is in proximity to 2 no. primary transport routes, the N22 national primary route located approximately 10km to the south at Macroom and the N72 national primary route located approximately 11km to the north. Local roads leading from these primary routes to the site are of good quality and capacity and will require little upgrade to facilitate construction traffic and turbine deliveries.

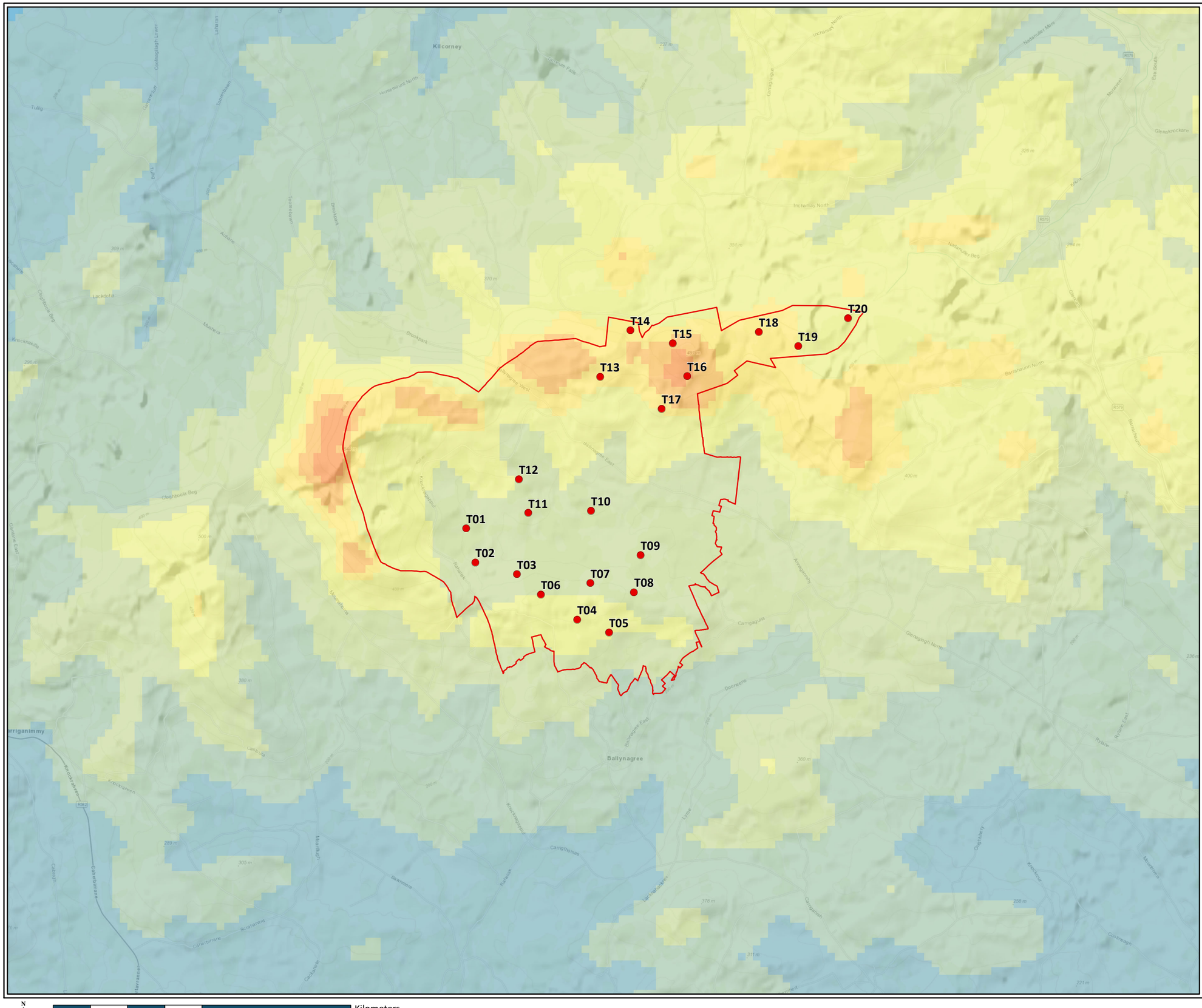
Electricity Grid

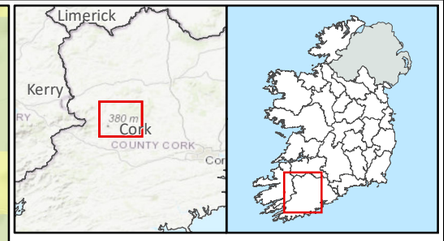
Grid constraints were also considered during the strategic site selection process as detailed in the strategic screening exercise. The Ballinagree site was found to be in proximity to two 110-220kV nodes on the national transmission system, the Clashavoon 110-220kV Substation, within the townland of Aughinida and the Ballyvouskill 110-220kV Substation in the townland of Caherdowney. Capacity at both substations was examined, and potential routes were identified and assessed in order to determine a viable connection from the proposed Ballinagree Wind Farm Site to the national grid. This is further addressed in section 2.3.5.

In summary a strategic screening exercise was undertaken. This resulted in a short list of viable sites as detailed in section 2.3.2. Further detailed considerations including planning policy, proximity to designated sites, population density, wind resource and grid connection capacity were examined for the Ballinagree site indicating that a wind energy development is viable.

While the outcome of the site screening process has identified the site of the current proposal as a suitable location for a wind farm development of the nature proposed, it does not preclude other sites within the Developers' portfolios being brought forward for further consideration in the future.

Path: R:\Map Production\2019\P2114\Workspace\EIAR\P2114_GIS_Fig2-1_WindSpeed_A3.mxd





Legend

- Wind Farm Site
- Turbine Layout

Wind Speed 100m (m/s):

- 4.5 - 6.6
- 6.7 - 7.5
- 7.6 - 8.2
- 8.3 - 9
- 9.1 - 9.7
- 9.8 - 10.2
- 10.3 - 10.6
- 10.7 - 11.2

N W E S

0 1 2 4 Kilometers

TITLE: Wind Speed			
PROJECT: Ballinagree Wind Farm			
FIGURE NO:	2.1		
CLIENT:	Coillte and Ørsted		
SCALE:	1:50000	**REVISION:**	0
DATE:	22/11/2021	**PAGE SIZE:**	A3

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2.3.4 Alternative Layouts and Design

2.3.4.1 Design Philosophy - Mitigation by Design

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) and the Irish Wind Energy Association Best Practice Guidelines (2012). The design process of the project has had regard to the Department of Housing, Planning and Local Government's (DoHPLG) Draft Revised Wind Energy Development Guidelines (2019). The layout and design was an iterative process which followed the constraints-led design approach.

Constraints-led Design Approach

The constraints-led design approach consists of the identification of environmental sensitivities within the project development study area by the design team with a view to identifying suitable areas in which wind turbines may be located. The resulting area is known as the 'developable area'. Lands outside of the developable area are no longer considered for the placement of wind turbines as they are deemed unsuitable.

Following the site screening process and the investigation into the suitability of the Ballinagree site for a wind energy development, as detailed in Sections 2.3.2 and 2.3.3, an initial study area was established. This area is indicated in Figure 2-2 and represents the basis of the constraints-led design approach.

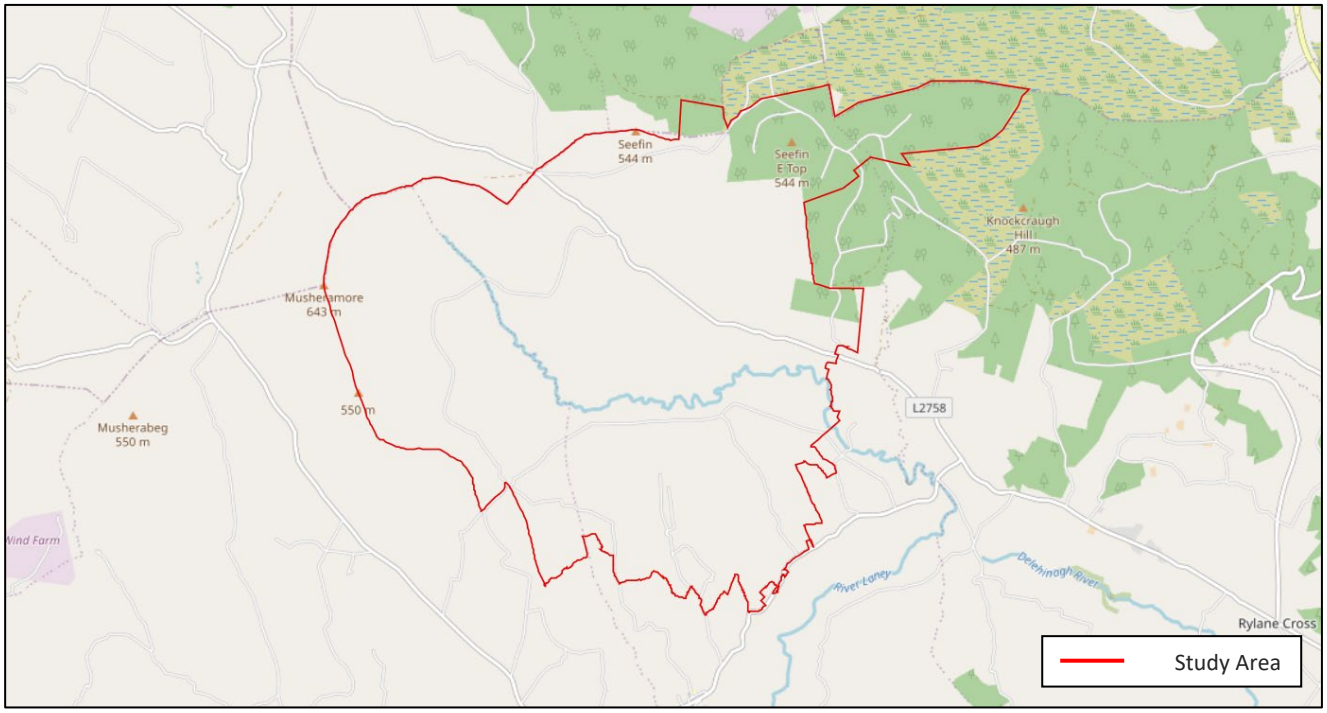

Figure 2-2: Initial 'Study Area'

The first step of the constraints identification process was the gathering of information through detailed desk based assessments, field surveys, and consultation. Through this process, key environmentally sensitive features (also known as sensitive receptors) were mapped and the process of applying design constraints began. Sensitive receptors considered during constraints identification included the following:

- Protected sites such as Special Areas of Conservation, Special Protection Areas or Natural Heritage Areas;
- Hydrological features such as rivers and streams;
- Areas prone to flooding;
- Sensitive ecological habitats;
- Known nesting sites of protected bird species;
- Private dwellings;
- Areas of steep terrain or areas which may be potentially susceptible to landslides;
- Designated sensitive views or scenic routes;
- Places of archaeological or cultural heritage significance.

Once all known environmentally sensitive receptors within the study area were accurately mapped, suitable setback buffers were then applied. The size of the setback buffer is related to the sensitivity of the individual receptor as set out in wind energy design guidelines and scientific best practice. For example, a setback buffer of 750m was applied from nearby dwellings, exceeding the requirements as set out in the Wind Energy Development Guidelines. Figure 2-3 shows the application of this setback buffer which removed a significant quantum of the study area. Any lands within these setback buffers were no longer considered for the placement of wind turbines.

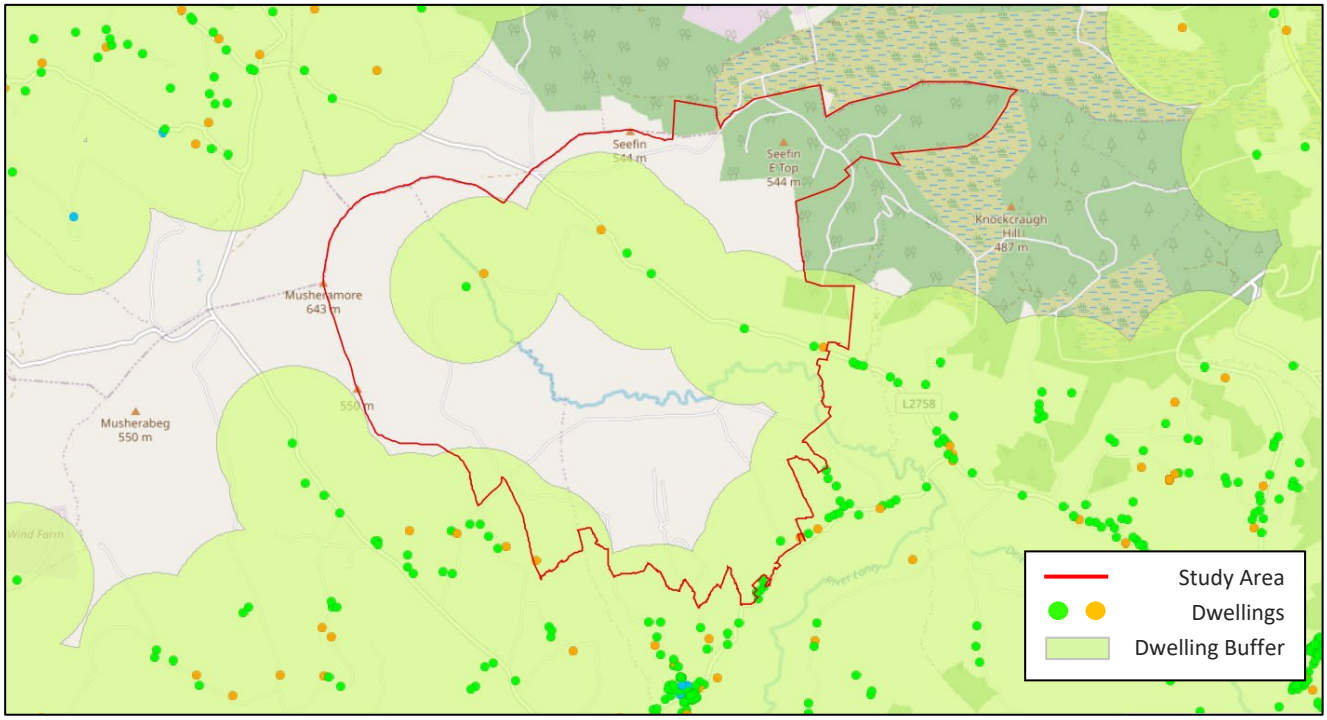

Figure 2-3: 750m Buffer from Dwellings

Setback buffers were then applied to existing tracks, public roads and high voltage electricity lines. A setback distance of 204m was applied to roads. This represents a maximum turbine tip height plus 10%. A setback distance was applied to high voltage (HV) electricity lines. These buffers are illustrated in Figure 2-4 along with the buffer applied to nearby dwellings. A setback distance was also applied between the proposed turbine locations and the proposed on-site substation in line with EirGrid standards.

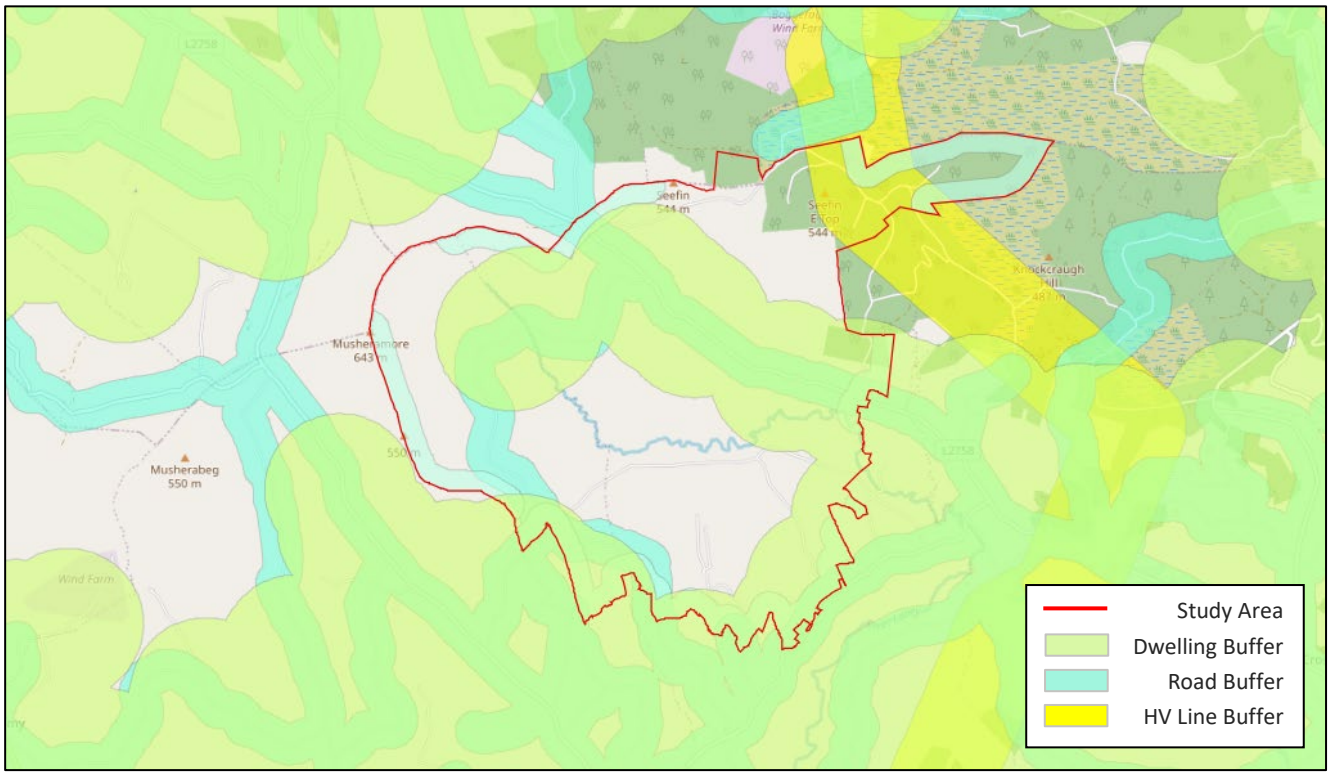

Figure 2-4: Setback Buffers from Roads and High Voltage Electricity Lines

Buffers were then then established for sensitive habitats, including Natura 2000s sites (SPAs and SACs) and nationally designated sites (NHAs). A minimum distance of 100m was applied to these areas to assure major infrastructure such as turbines and hardstandings are not located in proximity to the designated sites. A setback buffer of 50m was initially applied to nearby watercourses. This was subsequently increased to 75m to allow for greater setback between major infrastructure and watercourses, to provide greater protection to water quality.

Archaeological and architectural designations were also identified and mapped. Buffers were applied to zones of notification for each monument as detailed in the Sites and Monuments Record. These range in size depending on the monument. Recommendations from the project archaeologist were also taken into account when determining setback buffers for recorded monuments. Peat stability and slope stability were also taken into account at this stage and areas with steep gradients and areas with potential for peat slippage were discounted from the developable area.

Buffers applied to designated sites, watercourses and recorded monuments are illustrated in Figure 2-5 along with the buffers applied to dwellings, roads and electricity infrastructures.

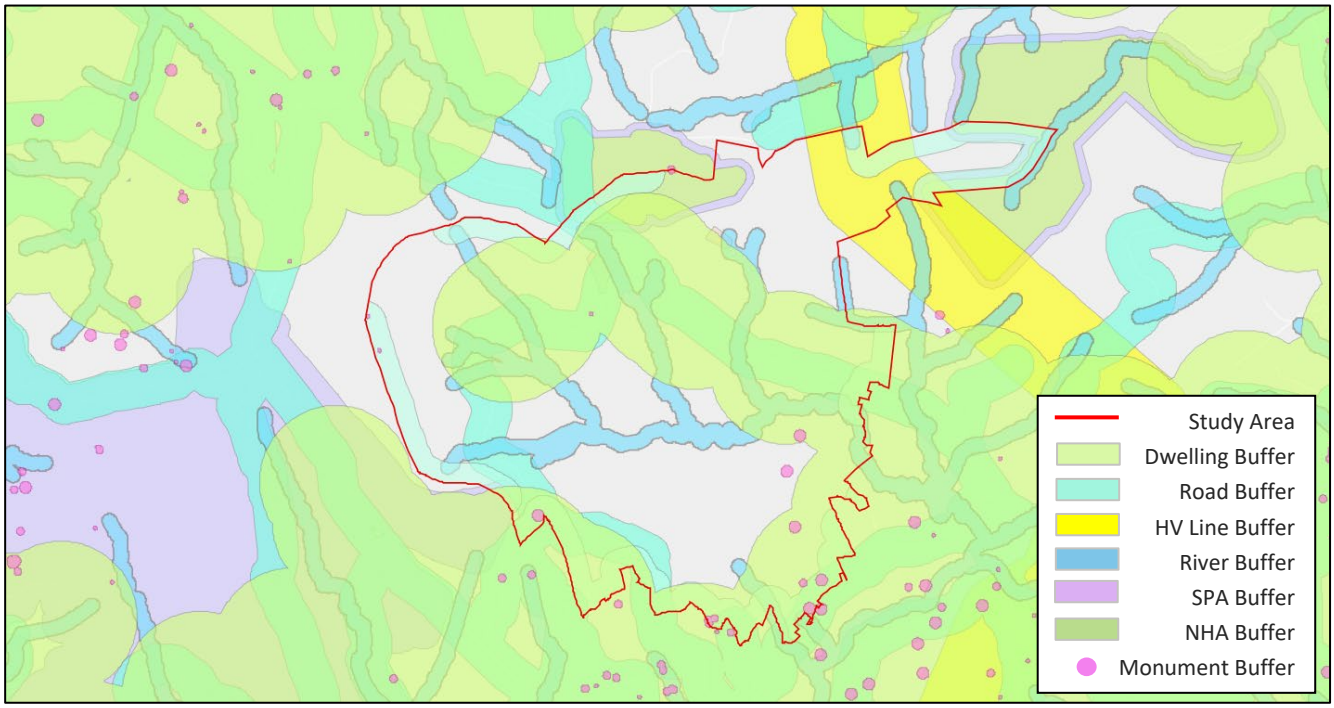

Figure 2-5: Setback Buffers from Designated Sites, Watercourses and Recorded Monuments

Once constraints are layered on top of one another, the true area available for wind energy development begins to become apparent. Following the application of all known constraints, the developable area was mapped. This is the area in which wind turbines can now be considered to be sited. The developable area is considerably smaller in footprint than the original study area as shown in Figure 2-6:

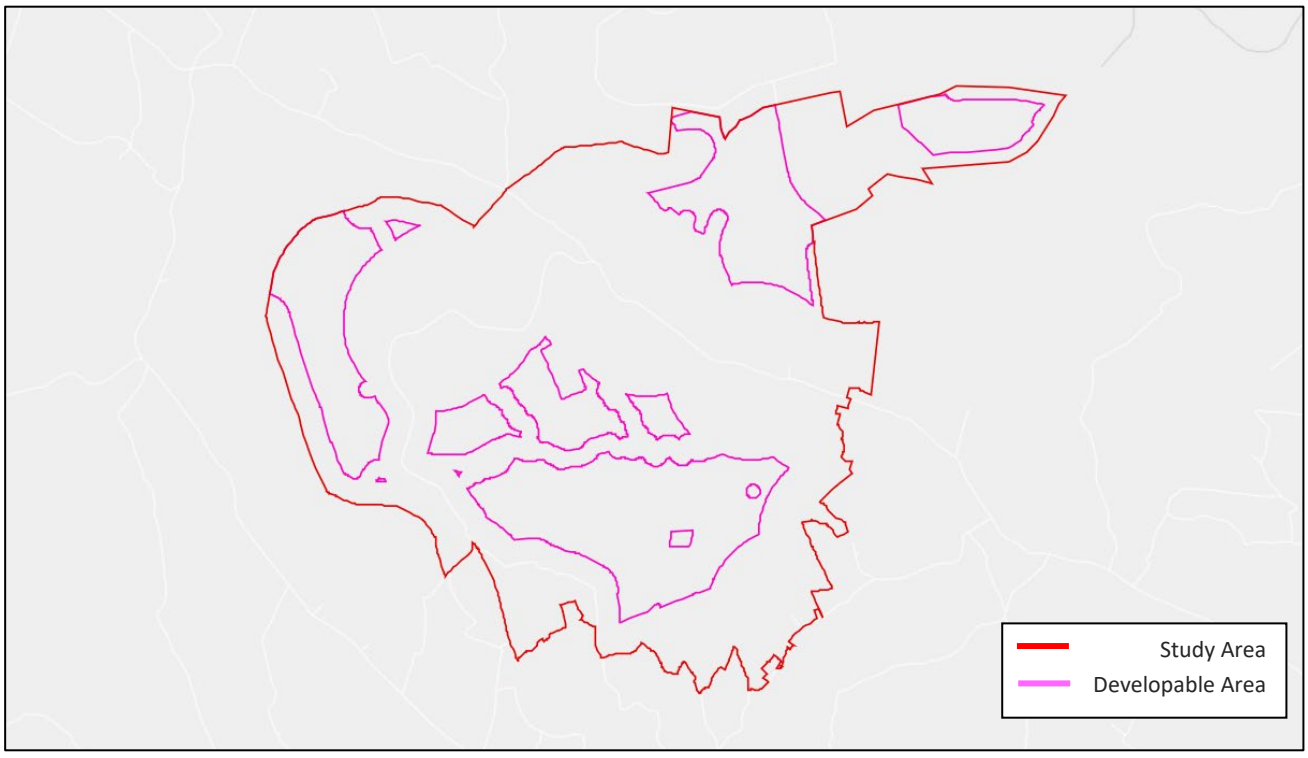

Figure 2-6: Developable Area

This design approach aims to mitigate by design through avoiding all known environmental constraints prior to developing a layout for the project. 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. This demonstrates the avoidance of significant impacts on the receiving environment through mitigation by design.

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

Environmental Consideration	Mitigation by Design Utilised in the Ballinagree Wind Farm Project	Potential Impact if Mitigation by Design is not Included
Residential Amenity	A minimum 750m set back from all inhabited dwellings has been applied, exceeding requirements of the Wind Energy Development Guidelines. This was subsequently increased as the site has capacity for greater setback distances. The closest dwelling is located ca. 800 meters from the nearest proposed turbine. This represents a minimum 4.3x tip height distance to the nearest dwelling.	Potential for impact to residential amenity due to noise, vibration and dust during the construction stage if turbines are located close to dwellings. Further potential impact to residential amenity during operations due to visual impact and noise.
Flora and Fauna	Avoidance of impact on designated sites. avoidance of impact to sensitive species and habitats. Provision of biodiversity enhancement areas.	Potential for impact on designated sites hydrologically connected to the subject site. Potential for habitat loss and disruption due to placement of infrastructure at inappropriate locations. Potential impacts on water quality due to works in proximity to watercourses (aquatic ecology).
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 designated sites and other avifauna identified including Kingfisher and Merlin.
Soils & Geology	Avoid where possible areas of deep peat and steep gradient.	Potential impact on peat stability. Potential for landslide or subsidence.
Hydrology	Minimum 75m set back of infrastructure from rivers and streams where reasonably possible.	Potential impact to the existing hydrological regime. 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. Buffer increased to 75m as a result of siting of turbines.	Potential migration of silt or petrochemicals to watercourses. Potential impact on water quality and aquatic biodiversity.
Noise & Vibration	Ensure compliance with the relevant guideline limits for noise. A 800m setback between the turbines and nearby dwelling	Potential for impact to residential amenity at nearby dwellings due to noise nuisance if turbines are located in proximity.

Environmental Consideration	Mitigation by Design Utilised in the Ballinagree Wind Farm Project	Potential Impact if Mitigation by Design is not Included
	structures has been achieved which will assist in maintaining residential amenity at local dwellings. Further mitigation measures have been set out in Chapter 7 – Noise and Vibration.	
Shadow Flicker	Shadow flicker detection systems to be installed in turbines to avoid shadow flicker at nearby dwellings, in line with the Draft Revised Wind Energy Development Guidelines (2019).	Potential impact on residential amenity due to shadow flicker at nearby dwellings.
Cultural Heritage	Avoidance of impact to known monuments. Avoidance of impact on visual alignments through study of surrounding designated monuments. 100m buffer from the visual path applied.	Potential impact to known monuments. Potential impact to visual alignments of nearby stone circles and stone rows.
Material Assets	Commercial forestry impacted by the proposed development will be replanted at alternative sites. No significant impact expected.	Commercial forestry impacted by the proposed development will be replanted at alternative sites. No significant impact expected.
Landscape & Visual	Buffering of residential receptors in order to maintain setback distance. Use of ridges to screen the proposed turbines from view from scenic routes and settlements.	Potential negative visual impact on sensitive visual receptors and potential impact on residential amenity.

Once the developable area was established, the first design iteration of the project was developed. The developable area was then further refined as additional constraints were identified throughout the environmental impact assessment process.

2.3.4.2 Alternative Scales and Density

Following the establishment of the developable area of the Ballinagree Wind Farm Site, as part the design alternative process a number of different turbine heights were considered before settling on the maximum tip height of 185m as now proposed. The relationship between the turbine height and density (number of turbines) required to achieve a particular output was a key design consideration. (it is important to note that there is considered not to be a material difference between the range selected from a design perspective as confirmed in Chapter 15 Landscape and Visual Impact.

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 2-7, 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, and visually compare the various options available to produce the same amount of renewable electricity.

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. wind turbines at 178.5m tip height. Coole Wind Farm, Co. Westmeath (ABP ref. PL25M.300686) which consists of 13 no. wind turbines of 175m tip height, Derryadd Wind Farm (ABP ref. PA14.303592) which consists of 24 no. wind turbines of 185m tip height and Derrinlough Wind Farm (ABP ref. PA19.306706) which consists of 21 no. wind turbines of 185m tip height.

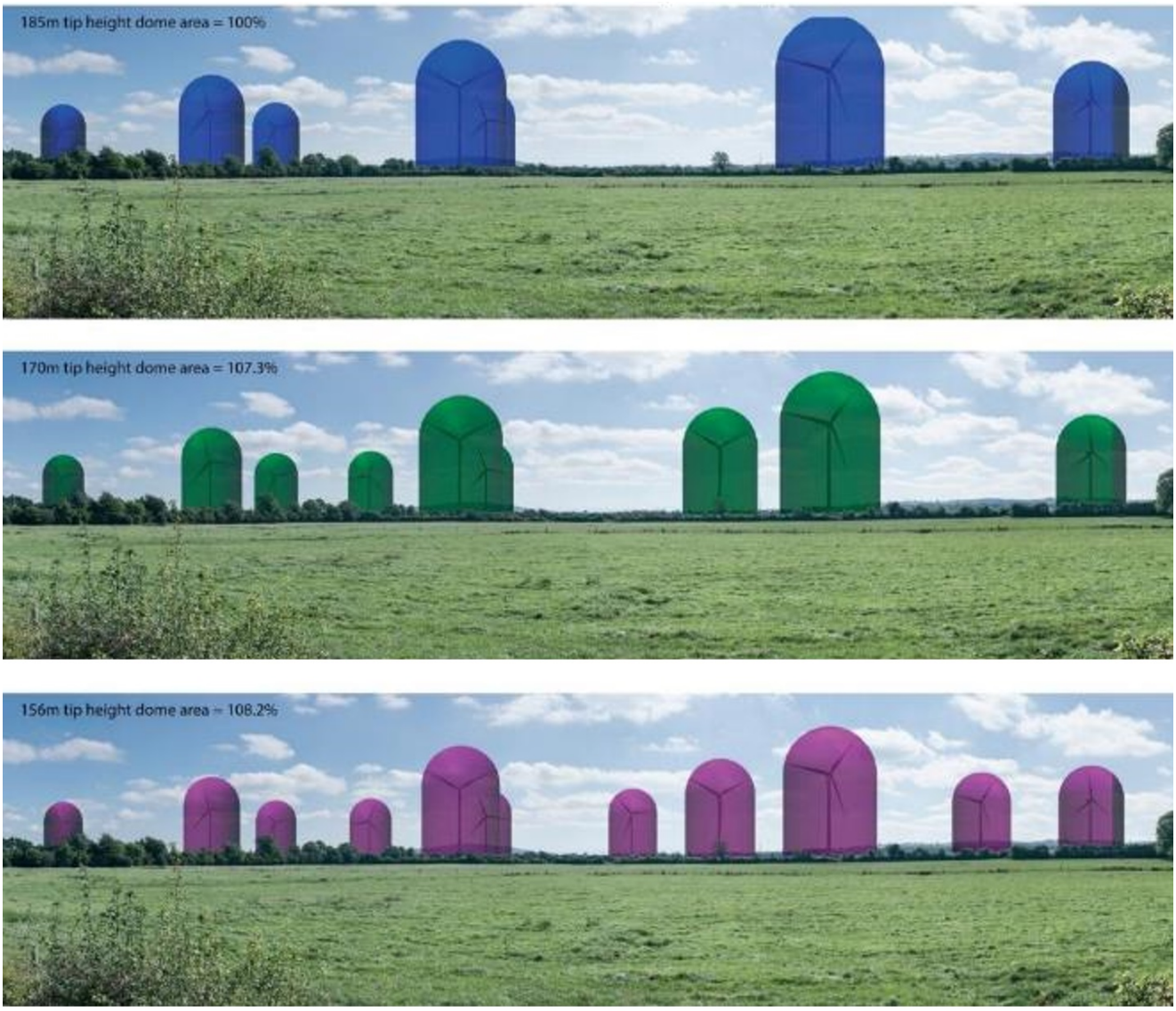

Figure 2-7: Turbine Height versus Density Relationship (Same Power Output for each Example)

Therefore the use of a turbine height with a maximum tip height of 185m was considered at an early stage to be a suitable configuration for this site.

Turbine Dimension Range

Following the selection of the maximum suitable tip height for the project, consideration was given to an appropriate range of turbine dimensions that would allow suitable flexibility at procurement stage. This is necessary because of the rate of change in technology and the length of time required to progress a project from early planning stage to turbine purchase. Different models that are currently available may not be available in a number of years' time and models that are not available now may become available.

The Developer undertook a review of currently available technology and chose a range of dimensions that ensures the best chance of a competitive procurement process for the proposed range of dimensions whilst minimising the difference between max and min dimensions.

The result was the proposed range of dimensions as set out below:

- A tip height range of 179m to 185m;
- A hub height range of 102.5 to 110.5m and
- A rotor diameter range of 149m to 155m.

2.3.4.3 Wind Farm Design Iterations

The design of the proposed Ballinagree 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. The development of the design iterations was influenced by environmental sensitivities identified at the wind farm site such as sensitive habitats, ground conditions including slope stability and the presence of peat, and potential effects of noise on nearby sensitive receptors. 4 no. design iterations were considered including an initial design iteration based on desk-based research and 3 subsequent design iterations which evolved throughout the environmental impact assessment and consultation process.

Initial Design Layout

The initial design iteration consisted of a 24 turbine layout. This comprised of 8 no turbines at the north eastern section of the site and 16 no. turbines in the southern section of the site, including turbines located to the west of the site on the elevated slopes of Musheramore Mountain. The initial layout is illustrated in Figure 2-8 and represents the greatest potential for electricity generation due to the greater number of turbines.

The assessment of this initial layout helped establish the developable area as set out in Section 2.3.4.1. Habitat surveys identified wet heath which was recommended to remain outside of the developable area, therefore reducing the developable area resulting in the removal of turbines. Similarly, identification of peat within the site resulted in the reduction of the developable area and the requirement to move or remove turbines.

Furthermore, following initial visual analysis of the design, the westernmost turbines located on the eastern slopes of Musheramore Mountain were viewed as outliers standing apart from the remainder of the wind farm. The higher elevation of this area meant that T01 was visible from the nearby settlement of Millstreet. It was therefore decided to remove turbines from this elevated area in order to reduce potential visual impact. Furthermore, the westernmost turbines were in closer proximity to the nearby SPA and therefore represented a greater risk to bird species.

Computer generated images of the initial design iteration are presented below in Plate 2-1 and Plate 2-2. Plate 2-1 demonstrates the elevated nature of the westernmost turbines rising above Musheramore Mountain and extending the horizontal visual envelope. Plate 2-2 shows the visibility of a blade above Musheramore Mountain as viewed from the settlement of Millstreen.

Plate 2-1: Initial Design Iteration viewed from the south at Macroom

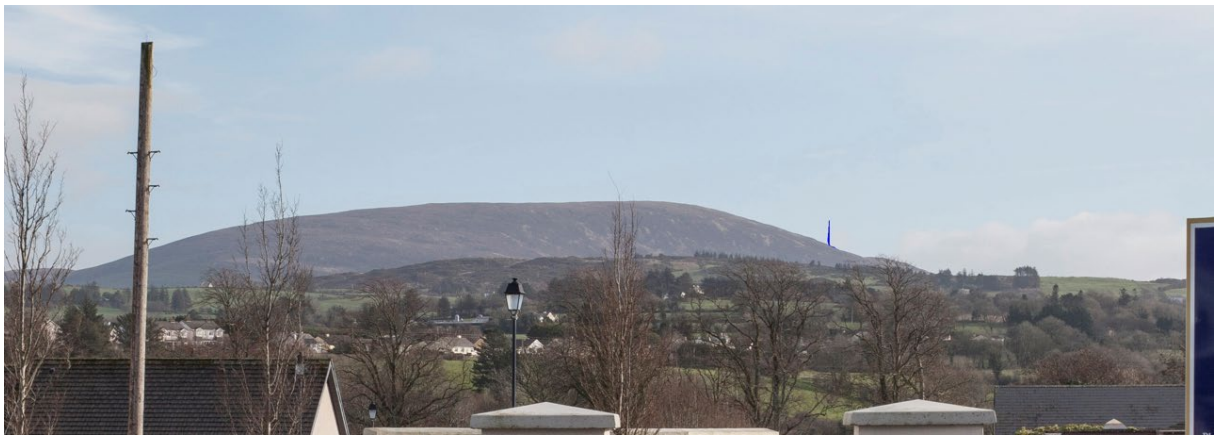

Plate 2-2: Initial Design Iteration viewed eastward from the settlement of Millstreet

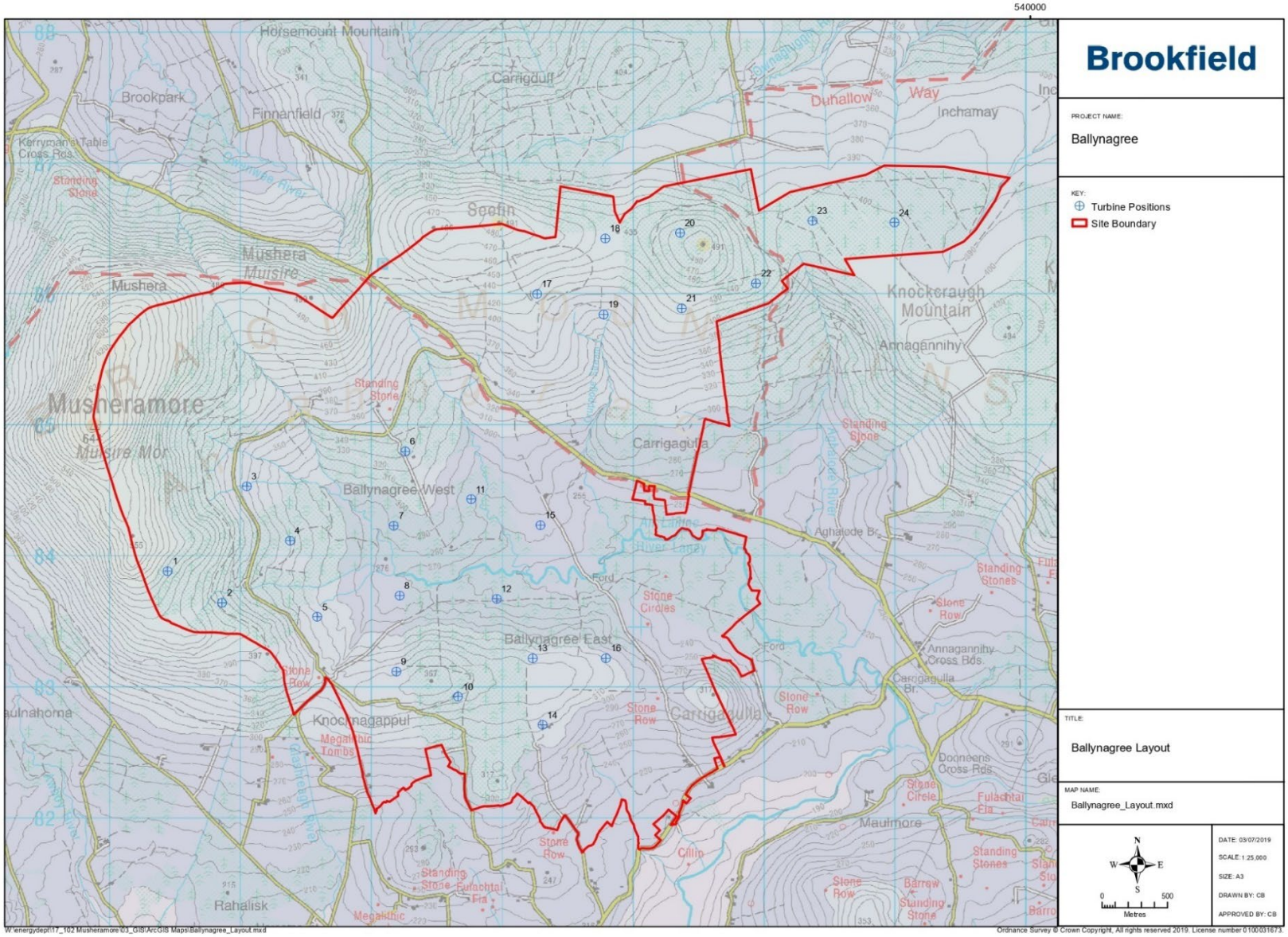

Figure 2-8: Initial Design Layout

Design Iteration 1

Design iteration 1 (DI1) represented a refinement of the initial design iteration, consisting of a 19 no. turbine layout. This refinement resulted from the identification of further constraints from the examination of the initial design iteration as detailed above. DI1 included 8 no turbines in the north eastern cluster and 11 no. turbines in the southern cluster. DI1 is illustrated in Figure 2-9.

The assessment of DI1 indicated the lowest visual presence of all options considered due to the reduction in the overall number of turbines in the southern cluster. Noise predictions carried out for DI1 indicated some potential elevated noise levels at nearby dwellings in exceedance of 30dB. As a result, it was recommended that T06, T07, T08 and T09 were re-sited in the following design iteration in order to maximise the distance between these turbines and the nearest receptors in order to reduce potential effects from noise. The setback distance achieved in DI1 was 750m between turbines and dwellings.

Following site investigation, T03, T13, T15 and T16 were found to be on steep slopes with peaty top soil. These turbines were re-sited for the next design iteration. T08 and T11 were found to be in proximity to existing streams. A decision was then made to increase the setback buffer between turbine locations and stream to 75m to protect water quality during construction. This meant that T08 and T11 require re-siting for the next design iteration to maintain this 75m meter buffer.

Following investigation by archaeologists, T07 was identified as having a potential significant impact on two stone circles due to visual impact on setting. Here T07 was found to be within the visual alignment of the stone circles. Archaeologists recommended to move T07 in order to keep this alignment clear and to maintain this visual alignment for all subsequent design iterations.

DI1 is illustrated in Figure 2-9.

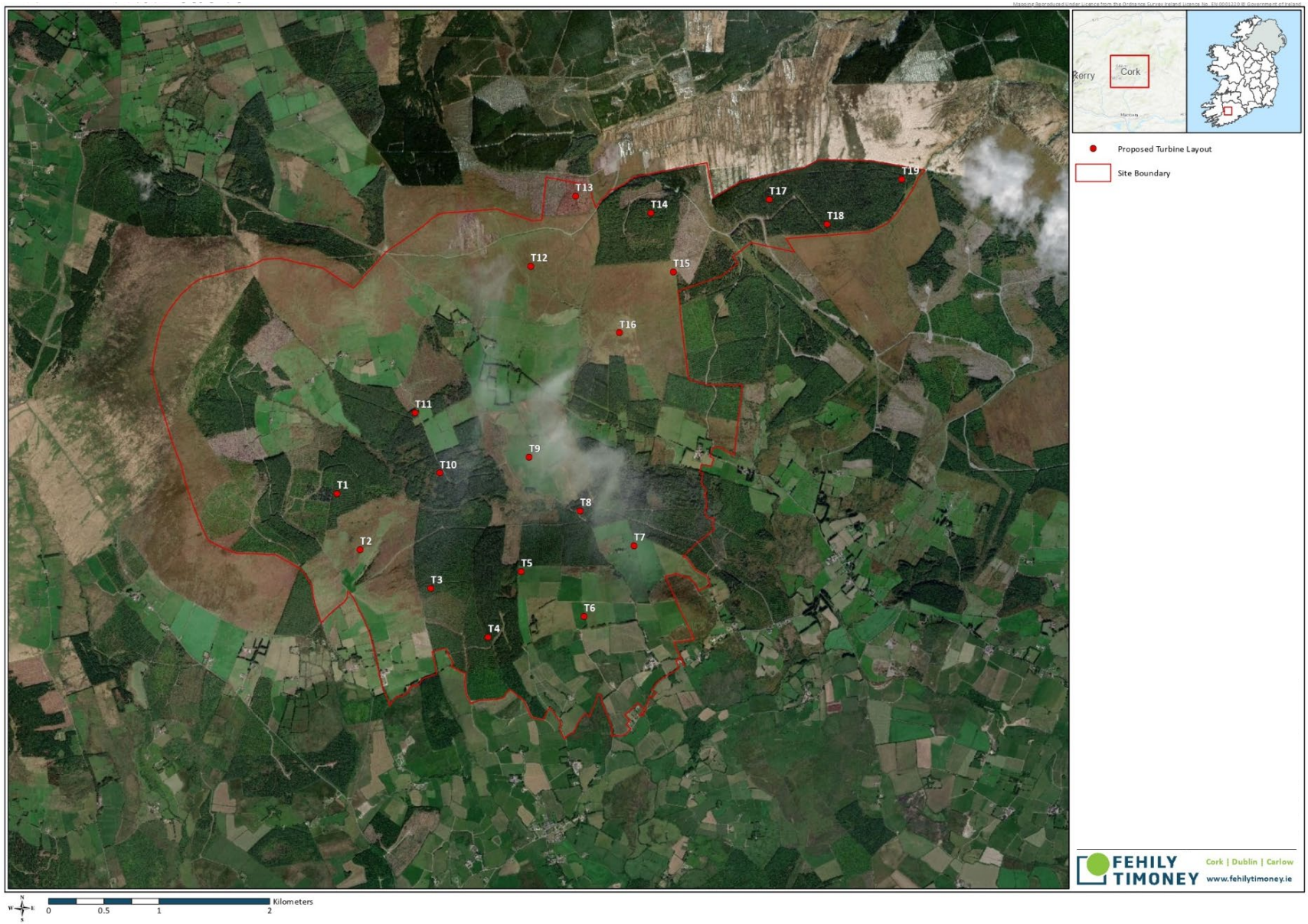

Figure 2-9: Design Iteration 1 (DI1)

Design Iteration 2

Design Iteration 2 (DI2) is an evolution of DI1 which considered the additional constraints identified in the assessment of DI1 and applied this to the buildable area. DI2 consists of a 21 turbine layout, including 8 no turbines in the north eastern cluster and 13 no. turbines in the southern cluster. Following analysis of the constraints and examination of the buildable area, 2 additional turbines were placed in the southern cluster within the buildable area. DI2 also included a preliminary civil design including access roads, turning heads and an on-site substation location. DI2 is illustrated in Figure 2-10.

T02 was moved south eastward to a less sensitive habitat area of acidic grassland and the locations T12, T15 and T16 were slightly tweaked to avoid more sensitive habitat. All major infrastructure was set back 75m from nearby streams, reducing the overall buildable area, in order to reduce potential impact to water quality as a result of construction activities.

Following noise predictions and analysis, T06, T07, T08 and T09 were re-sited to increased setback between the turbines and nearby dwellings. This achieved a minimum 770m buffer between the turbine locations and the nearest dwellings.

DI2 included the movement of T03, T04, T05, T06, T07, T08 and T10 to allow for an uninterrupted clear visual corridor for the visual alignment of the nearby stone circles (recorded monuments). The turbine movements were between 20m and 100m and also considered other sensitivities such as ecology and distance to nearby dwellings when repositioning.

Following the site investigation conducted on DI1, T03, T05, T13, T15 and T16 were relocated to areas of more stable ground conditions away from steep slopes and areas of surface peat. The DI2 layout also allowed for a greater setback between turbines and existing tracks to maintain their use during the operational phase.

During the environmental assessment of the DI2 layout, the on-site substation location was identified partly within a flood zone. This required amendment for the design iteration to follow. Furthermore, the existing access tracks around T05, T06 and T08 were found to pose potential impact from runoff due to their steep gradient. Therefore, an alternative access track layout was designed for the design iteration to follow.

DI2 is illustrated in Figure 2-10.

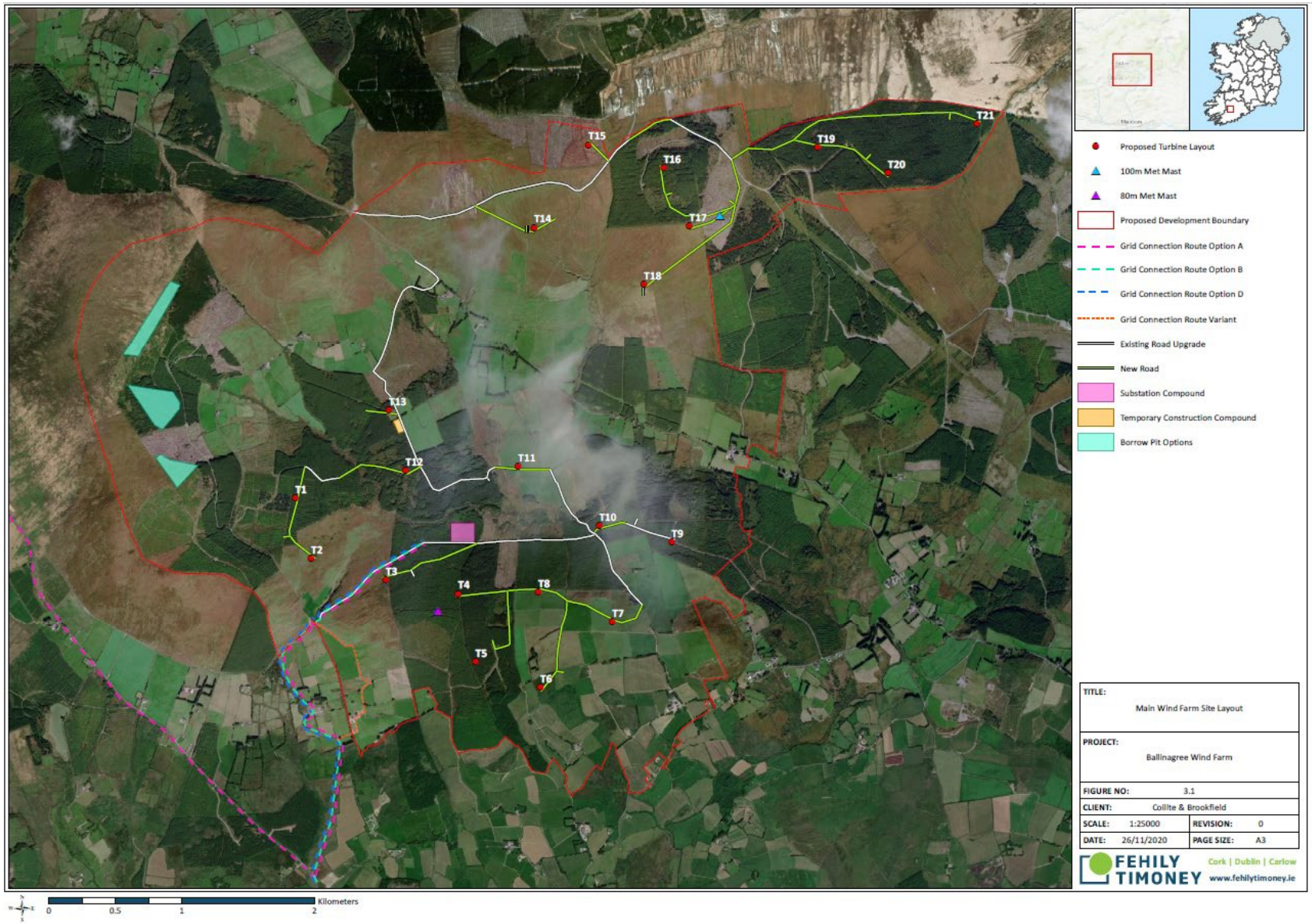

Figure 2-10: Design Iteration 2 (DI2)

Design Iteration 3 (DI3) – The Proposed Development

Design Iteration 3 (DI3) is the layout as proposed for the Ballinagree Wind Farm. This layout represents a culmination of all environmental constraints identified throughout the environmental impact assessment and includes the careful siting of turbines and associated infrastructure to minimise the potential effects on the receiving environment. DI3 is illustrated in Figure 2-11.

DI3 consists of 20 no. wind turbines including 8 no. in the north eastern cluster and 12 no. in the southern cluster. DI3 reduced the number of turbines by one in order to increase the overall setback from nearby dwellings, resulting from interest during community consultation. The minimum setback between turbine locations and nearby dwellings is 809m, increasing 59m from DI1. This reduces the overall potential effects from noise on nearby dwellings during the operational phase. The removal of this turbine from the southern cluster also makes the layout more visually legible when viewed from the south.

DI3 achieves a 75m setback from major infrastructure to streams and rivers. This aims to reduce potential migration of dust to nearby streams during the construction phase of the proposed development which may impact on water quality and aquatic ecology. Furthermore, DI3 includes the movement of the substation location eastward to remove it from a potential flood zone.

DI3 includes the addition of 18.7km of tracks that will be made available for recreation use, using existing and proposed wind farm and forestry tracks. This will include signage, way-markers, a trail head car park and picnic area. DI3 also proposes a Biodiversity Enhancement and Management Plan which will provide ecological benefit to the area of the wind farm site through permanent felling of biodiversity corridors through forestry between open areas and carefully managed farming practices at selected lands in the vicinity of the site.

The layout of the turbines and blades were designed to avoid visual impact on the nearby stone circle monument's visual alignment. The blade tips are set back by a distances of 100m in both directions from the visual alignment allowing for a clear corridor. This is further detailed in Chapter 14 of the EIAR.

DI3 is illustrated in Figure 2-11.

A comparison of potential environmental impacts of the wind farm site design iteration options and the chosen option for the proposed Ballinagree Wind Farm project is detailed in Table 2-4. The proposed option was developed to present the least potential environmental impact through the project philosophy of mitigation by design.

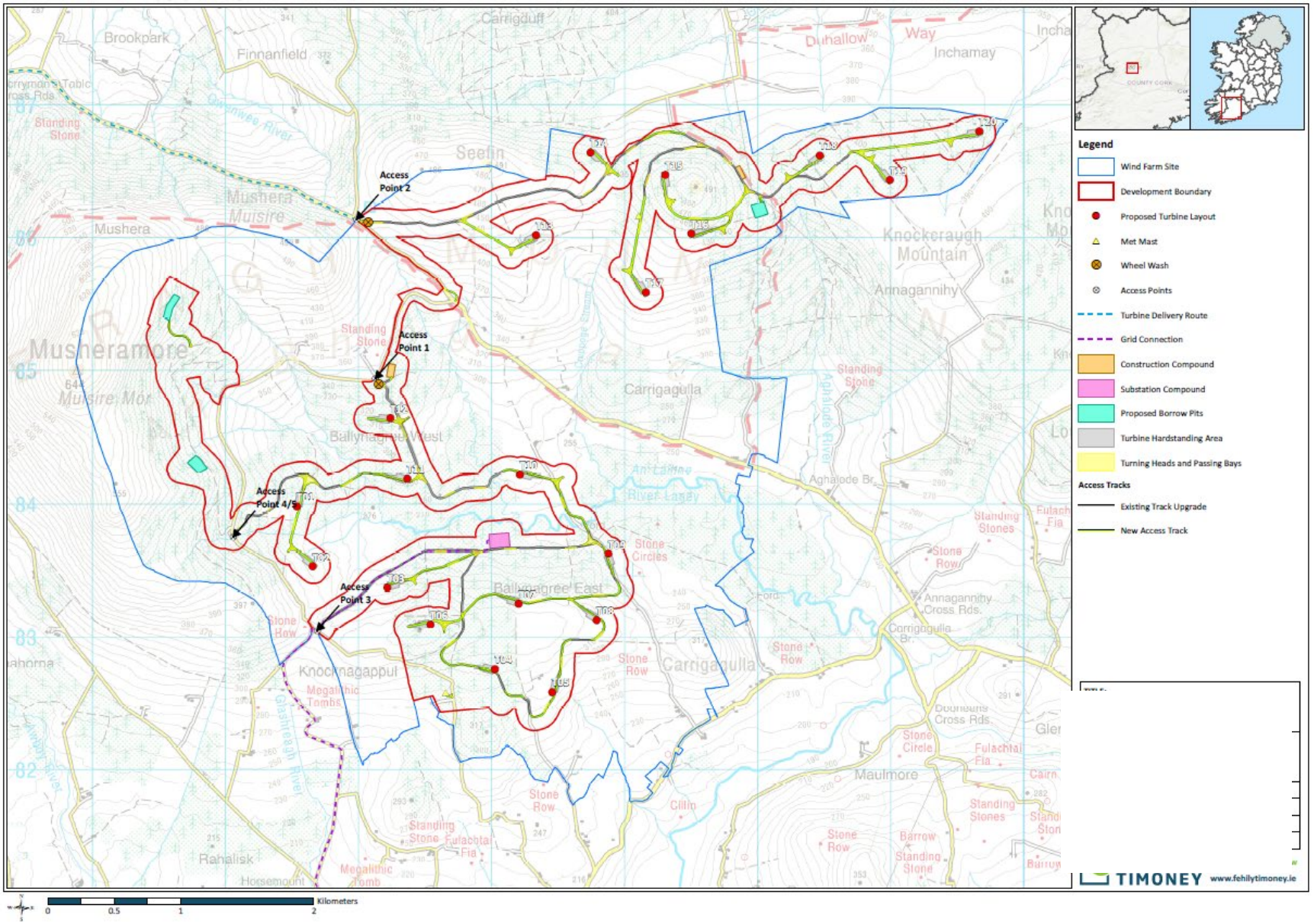

Figure 2-11: Design Iteration 3 - The Proposed Development

Table 2-4: Comparison of Environmental Effects of the Wind Farm Design Iterations

Environmental Consideration	Initial Turbine Layout (24 Turbines, 179 -185m tip)	DI1 (19 Turbines, 179 -185m tip)	DI2 (21 Turbines, 179 -185m tip)	DI3 (20 Turbines, 179 -185m tip) Proposed Layout
Air & Climate	Greatest potential for long-term positive impact to air quality & climate due to greater electricity export capacity associated with more turbines.	Lowest potential for long-term positive impact to air quality & climate due to lowest electricity export capacity associated with least number of turbines.	Slightly less potential for long-term positive impact to air quality & climate due to lower electricity export capacity in comparison to the initial 24 turbine design. Higher potential for fugitive dust emissions due to greater area of construction associated with the greater number of turbines in comparison to DI1 and DI3.	Slight to moderate temporary localised residual impacts arising from fugitive dust emissions. Long-term positive impact on air quality and climate due to avoidance of burning of fossil fuels and the net displacement of between 132,414 and 148,125 of CO_2 per annum.
Noise & Vibration	Greatest potential for potential effects from noise due to the greater number of wind turbines.	Potential moderate impact on dwellings in close proximity to the site due to operational noise. 750m setback distance achieved. Recommendation to maximise distance between turbines and nearby dwellings where possible.	Less potential negative effects associate with noise on nearby dwellings due to greater setback distances applied between turbines and dwellings, in comparison to DI1. 770m setback distance achieved.	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.
Biodiversity	Turbines located in areas of Wet Heath. Greater habitat loss as a result of larger landtake compared to other options due to greater number of turbines.	Turbines located outside of developable area within the desired setback buffer to the nearby NHA (100m). Turbines located in closer proximity to water courses compared to DI3 with greater potential to impact on aquatic ecology during construction.	Turbines located at least 100m from nearby designated sites. Turbines moved slightly into less sensitive habitats in comparison to DI1 and the initial design iteration. Turbines located in closer proximity to water courses compared to DI3 with greater potential to impact on aquatic ecology during construction.	Turbines located at least 100m from nearby designated sites. Slight negative impact on species and habitat. Non-significant impact on aquatic ecology. Significant benefit from proposed biodiversity enhancements.

Environmental Consideration	Initial Turbine Layout (24 Turbines, 179 -185m tip)	DI1 (19 Turbines, 179 -185m tip)	DI2 (21 Turbines, 179 -185m tip)	DI3 (20 Turbines, 179 -185m tip) Proposed Layout
Ornithology	Greater potential of impact on nearby SPA as a result of closer proximity of turbines at the western extent of the site. Greatest potential for collision risk due to greatest number of turbines.	Potential slight negative impact on bird species with least potential for collision risk due to least number of wind turbines.	Slightly greater potential impact on birds as a result of slightly higher potential for collision risk compared to DI1 and DI3 due to greater number of wind turbines.	Potential slight negative impact on bird species.
Land, Soils, Geology	Turbines located in or near areas of peat. Turbines located on sloped ground at western extent of site. Greater potential for slope failure.	Turbines located at steep slope with peaty topsoil. Potential for instability.	Turbines re-sited away from steep slopes and outside of areas identified with peat top-soil.	Imperceptible residual impact following implementation of mitigation measures. Slight residual cumulative effects from the excavation of fill material from local quarries.
Hydrology & Water Quality	T08 located in close proximity to 50m buffer applied from watercourses. Greater potential for impact on water quality.	50m buffers set between major infrastructure and watercourses.	Increased buffer from 50m to 75m between major infrastructure and watercourses. Reduced potential impact to water quality during construction phase due to greater setback. Substation located partly within a potential flood zone.	Non-significant impacts following implementation of mitigation measures. Minimum 75m setback distance between streams and major infrastructure. Substation relocated to the east away from potential flood zone
Population & Human Health	Westernmost turbine visible from the settlement of Millstreet. Greatest potential visual effects on other settlements including the town of Ballinagree due to greater number of turbines.	Setback distance of 750m achieved between turbines and dwellings. Potential elevated effects from noise on nearby residential receptors identified. A number of turbine moves recommended to increase setback distances throughout the site.	Increased setback distance between turbines and dwellings to 770m reducing potential effect from noise and the most proximate dwellings.	Increased minimum setback distance of 809m achieved between turbine locations and nearby dwellings reducing overall potential effects from noise on nearby dwellings. Positive impact on recreation and health gain due to provision of additional recreation facilities.
Material Assets	T22 located in proximity to 110kV powerlines which may cause a potential wake effect. Greatest impact to local quarries due to greatest requirement for imported	T10 and T11 located directly adjacent existing access track. Potential impact on this road. Positive impact by offsetting use of fossil fuel during operation. Similar	Turbines set back from existing access tracks to maintain their use during operation. Positive impact by offsetting use of fossil fuel during operation. Similar slight	Positive impact by offsetting use of fossil fuel. Positive impact due to provision of electricity infrastructure. Slight negative impact to capacity of licensed waste facilities. Slight residual

Environmental Consideration	Initial Turbine Layout (24 Turbines, 179 -185m tip)	DI1 (19 Turbines, 179 -185m tip)	DI2 (21 Turbines, 179 -185m tip)	DI3 (20 Turbines, 179 -185m tip) Proposed Layout
	fill. Greatest positive impact by offsetting use of fossil fuel due to greater potential export capacity compared to other design iterations.	slight residual cumulative effects to local quarries due to requirement of fill material when compared to DI2 and DI3.	residual cumulative effects to local quarries due to requirement of fill material when compared to DI1 and DI3.	cumulative effects to local quarries due to requirement of fill material, similar to DI1 and DI2.
Traffic & Transport	Greater potential short-term impacts on the local road network due to larger amount of construction required and greater number of turbine components requiring transport to the site.	Likely least potential temporary impact on the local road network due to least amount of construction require and least number of turbine components requiring transport to the site. Impact on local access roads at T10 and T11 due to proximity of turbines.	Slightly greater short-term impact due to construction activities compared to DI1 and DI3 due to greater number of turbines.	Slight short-term impact due to construction and decommissioning activities.
Archaeology & Cultural Heritage	Turbine locations set back from recorded monuments. No impact identified at this time.	T07 identified as having a potential significant impact on visual alignment of nearby monuments.	Clear visual corridor achieved for visual alignment of nearby stone circles.	All infrastructure appropriately set back from registered monuments. Indirect visual impacts on nearby monuments. No residual impacts envisaged that cannot be reversed following decommissioning.
Landscape & Visual	Blade of T01 visible from the settlement of Millstreet due to location on elevated slopes of Musheramore Mountain. When viewed from the south, the westernmost turbines considerably extend the vertical and horizontal visual envelope of the scheme and are viewed as outliers.	Slightly less overall visual presence due to less turbines, however, similar visual impact as DI2 and DI3 due to similar visual envelope.	Slightly more visual presence in the southern cluster due when compared to DI1 and DI3 due to greater number of turbines.	Slight to substantial-moderate visual impact, subject to viewshed as assessed in Chapter 15.
Telecoms & Aviation	No likely impacts.	No likely impacts.	No likely impacts.	No Residual Impact expected.

2.3.5 Grid Connection Options

When considering an appropriate substation to connect the proposed Ballinagree Wind Farm to the national grid, all grid infrastructure in the area of the wind farm site was examined. 3 no. high voltage (HV) substations were identified in proximity to the wind farm site with potential for capacity for a 110kV connection. These substations include the Clashavoon 110/220kV substation, located approximately 6km to the south, the Ballyvouskill 110/220kV substation, located approximately 8km to the west, and the Boggeragh Wind Farm 110kV Substation, located approximately 1km to the north. Both underground cable (UGC) and overhead line (OHL) options were examined.

110kV OHLs and 220kV OHLs were also identified for a potential loop-in connection where a new substation would be required to connect to an existing OHL. The Boggeragh to Clashavoon 110kV OHL and the Ballyvouskill to Clashavoon 220kV OHL were examined for a potential loop-in connection. Following the identification of potential connection points, the following route options were identified, labelled A - G and are illustrated in Figure 2-12.

- Option A – UGC to Ballyvouskill Substation;
- Option B – UGC to Clashavoon Substation via Bawnmore;
- Option C - UGC to Clashavoon Substation via Ballinagree Village;
- Option D – UGC to Clashavoon Substation – combination of route A and C;
- Option E – OHL to a loop-in point on the 220kV OHL between Ballyvouskill and Clashavoon;
- Option F – 110kV tail fed UGC to Boggeragh Wind Farm Substation;
- Option G – OHL to a loop-in point on the 110kV Boggeragh WF to Clashavoon OHL.

Each option was examined for potential environmental effects which included potential effects on nearby residential receptors and settlements, designated sites and sensitive habitats, water quality and flooding, material assets such as roads and utility infrastructure, cultural heritage assets and landscape and visuals. Major stream crossings were identified for each route. The technical feasibility of each option was also examined at this stage. Each option is described below, and a comparison of potential environmental effects is presented in Table 2-5.

Option A consists of an UGC to the Ballyvouskill 110/220kV Substation in the townland of Caherdowney. This option is the longest UGC route at 12.6km. It has a similar number of residential properties in proximity as options B-D and a similar number of recorded monuments in proximity. The route passes through an area of 1.4km of peat lands and also passes through 8.8km of the Mullaghanish to Musheramore Mountains SPA. 3 stream crossings were identified along the route. This route consists of mostly narrow roads which would require full closures during construction and installation of the UGC.

Option B consists of an UGC to the Clashavoon 110/220kV Substation in the townland of Aughinida via the Bawnmore area. This option is the third longest UGC at 9.3km. A similar number of recorded monuments are located along the route in comparison to options A-D. The route crosses the Awboy Bridge, a recorded monument (RMP) and also passes two entries on the National Inventory of Architectural Heritage (NIAH), a post box and a regional house. The route avoids settlements and avoids designated sites and sensitive habitats. 8 stream crossings were identified on the route and small section of the route is potentially sensitive to flooding. Roads along this route are wider to allow for single lane closures during construction and installation of the UGC. Following consultation with EirGrid, it was identified that there is currently capacity at this substation.

Option C consists of an UGC to the Clashavoon 110/220kV Substation via the village of Ballinagree. This route is the fourth longest UGC at 7.9km. The route avoids designated sites and sensitive habitats, however, it passes through the village of Balliangree where it is more likely that underground services will be encountered. This route consists of mostly narrow roads which would require full closures during construction and installation of the UGC. The installation works would also cause negative effects on the settlement of Ballinagree during construction phase and also passes the greatest number of dwellings along the route.

Option D consists of an UGC to the Clashavoon 110/220kV Substation. This route combines sections of Option B and Option C. This route is the second longest at 9.8km. The route has 5 stream crossings and a short section within a potential flood sensitive area. This route avoids designated sites, however, a potential hydrological connection to Fresh Water Pearl Muscle habitat was identified. This route consists of mostly narrow roads which would require full closures during construction and installation of the UGC.

Option E consists of an OHL from the wind farm site to a location on the Clashavoon to Ballyvouskill 220kV OHL where a substation would be constructed, and a loop-in connection would be made to the 220kV OHL. This option would require less excavation in the public road compared to Options A-D, but would require landtake for the construction of a substation and associated access. This option would also require a significant amount of above ground infrastructure including OHLs, a new substation and pylons for the loop-in connection adding additional above ground infrastructure which may have a negative impact on residential amenity. This option also has potential to impact on stability of the 220kV line and would require works to be undertaken on the high voltage transmission circuit.

Option F consists of a 110kV tail fed UGC to the Boggeragh Wind Farm Substation in the townland of Crinnaloo South. This is the shortest underground cable route at approximately 1km from the wind farm site. This route is located in an area of peat with potential hydrological connection to the Blackwater SAC, a Fresh Water Pearl Muscle habitat. There are no dwellings in proximity to the route. Following consultation with EirGrid, capacity at the substation was not available without significant infrastructure upgrade.

Option G consists of an OHL from the wind farm site to a location on the Boggeragh to Clashavoon 110kV OHL where a substation would be constructed, and a loop-in connection would be made to the 110kV OHL. This option would require less excavation in the public road compared to Options A-D but would require landtake for the construction of a substation and associated access. There are no dwellings in proximity to the route however, the option would require above ground infrastructure including OHLs, a new substation and pylons on an elevated site. Following consultation with EirGrid, it was determined that capacity on the line is not available without significant network upgrades.

Chosen Option – Option B was chosen as the optimal option as it consists of an underground cable with good road conditions where full road closures will not be required along the full route, reducing impacts on local roads during the construction phase. The route avoids sensitive habitats. The route can be accommodated while avoiding negative effects on the Awbeg Bridge registered monument and also avoiding negative effects on the 2 no. entries on the NIAH.

A total of 13 no. watercourse crossings were identified along the proposed route following detailed site investigation and environmental assessment, including 3 no. bridge crossings, one large culvert crossing, all of which will be crossed using horizontal directional drilling. This methodology will be used to avoid potential impact on water quality during construction works and avoid impact on the Awbeg Bridge recorded monument. As well as having capacity at the Clashavoon Substation, this option was considered to have the least potential negative effects on the receiving environment. Additional watercourse crossings were identified along the Option B route following site investigation. These consisted of unmapped minor culvert and drain crossings which were not identified in the initial grid route study. Therefore, it is likely that additional minor watercourse crossings would have also been identified for other routes if brought forward for detailed assessment.

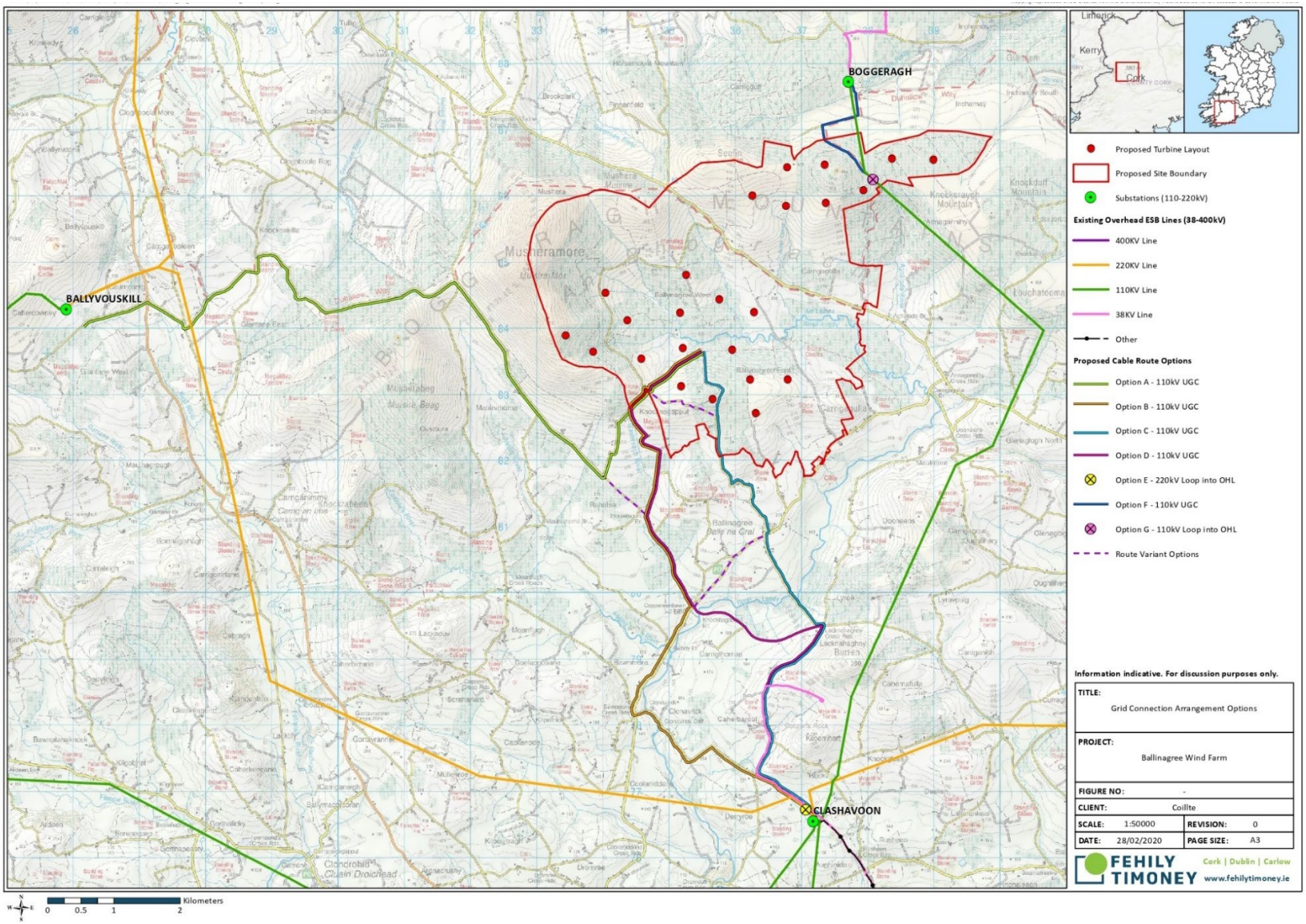

Figure 2-12: Grid Route Options

Table 2-5: Alternative Grid Route Options Considered

Grid Route Option	Air Quality & Climate	Noise & Vibration	Biodiversity	Land and Soils	Water Quality	Population & Human Health	Material Assets incl. Roads	Cultural Heritage	Landscape & Visuals
Option A Ballyvouskill UGC	Potential effects from dust on residential properties during construction. Similar number of residential receptors in proximity to route as other options.	Potential effects from noise on residential properties during construction. Similar number of residential receptors in proximity to route as other options.	8.8km located within Mullaghanish to Musheramore Mountains SPA. Potential hydrological connection to Fresh Water Pearl Muscle habitat.	1.4km of route located in peat area.	3 mapped stream crossings. Avoids flood sensitive areas.	Route avoids settlements.	ESBN cables entering station from both sides of the entrance. Longest route in public road 12.6km. Narrow roads requiring full road closures.	Similar number of recorded monuments in proximity to route as other options B-D.	Route located on scenic route.
Option B Clashavoon UGC	Potential effects from dust on residential properties. Similar number of residential receptors in proximity to route as other options.	Potential effects from noise on residential properties. Similar number of residential receptors in proximity to route as other options.	Route avoids designated sites.	Route avoids areas of peat.	8 mapped stream crossings. Short area of route located within potential flood sensitive area.	Route avoids settlements.	Capacity identified at substation. Third longest route in public road 9.3km. Roads are wider to allow single lane closures.	Route crosses the Awboy Bridge RMP and passes two entries on the NIAH, a post box and regional house.	Short length of route located along scenic route.
Option C Clashavoon UGC	Potential effects from dust on residential properties.	Potential effects from noise on residential properties.	Route avoids designated sites.	Route avoids areas of peat.	3 mapped stream crossings. Route avoids	Route passes through village of Ballinagree. Greater potential for	Capacity identified at substation. Fourth longest route in the	Similar number of recorded monuments in proximity to	Short length of route located along scenic route.

Grid Route Option	Air Quality & Climate	Noise & Vibration	Biodiversity	Land and Soils	Water Quality	Population & Human Health	Material Assets incl. Roads	Cultural Heritage	Landscape & Visuals
	Greatest number of dwellings along route.	Greatest number of dwellings along route.			flood sensitive areas.	disruption to services and traffic.	public road 7.9km. Narrow roads requiring full road closures. High number of service crossings expected in village.	route as other options A-D.	
Option D Clashavoon UGC	Potential effects from dust on residential properties. Similar number of residential receptors in proximity to route as other options.	Potential effects from noise on residential properties. Similar number of residential receptors in proximity to route as other options.	Potential hydrological connection to Fresh Water Pearl Muscle habitat.	Route avoids areas of peat.	5 mapped stream crossings. Short area of route within a potential flood sensitive area.	Route avoids settlements.	Capacity identified at substation. Second longest route in public road 9.8km. Narrow roads requiring full road closures.	Similar number of recorded monuments in proximity to route as other options A-C.	Significant amount of route located along scenic route.
Option E Loop-in 220kV OHL between Ballyvouskill and Clashavoon	Likely less potential for impact on residential dwellings during construction compared to options A-D.	Likely less potential for impact on residential dwellings during construction compared to options A-D..	Number of stream crossing upstream of catchment with potential FWPM or other sensitive aquatic species	Less ground works required along OHL route. Large landtake required for new substation and associated access.	Likely less potential for impact on stream crossings.	Potential impact on residential amenity due to OHL.	New 220kV substation required. Potential impact to stability of 220kV line. Works on HV transmission	Likely avoids recorded monuments.	Above ground infrastructure required including substation, OHL and associated pylons.

Grid Route Option	Air Quality & Climate	Noise & Vibration	Biodiversity	Land and Soils	Water Quality	Population & Human Health	Material Assets incl. Roads	Cultural Heritage	Landscape & Visuals
							circuit required.		
Option F 110kV Tail Fed UGC to Boggeragh WF Substation	No dwellings in proximity to the route.	No dwellings in proximity to the route.	Potential hydrological connection to Fresh Water Pearl Muscle habitat. Hydrological connection to Blackwater SAC.	Route located in peat area, approx. 1km. Significant ground works required at Boggeragh substation.	2 mapped stream crossings.	No dwellings in proximity to the route.	Capacity at substation not available.	Likely avoids recorded monuments.	Overground infrastructure required at the Boggeragh substation.
Option G Loop-in 110kV OHL between Boggeragh WF and Clashavoon	No dwellings in proximity to the route.	No dwellings in proximity to the route.	Potential hydrological connection to Fresh Water Pearl Muscle habitat. Hydrological connection to Blackwater SAC.	Landtake required for substation on elevated site.	Unknown number of stream crossings.	No dwellings in proximity to the route.	Capacity in OHL not available.	Likely avoids recorded monuments.	OHL required. Substation and pylons required on elevated site.

2.3.5.1 Borrow Pits

Three borrow pit options are proposed for potential site won general fill for construction activities. The locations were selected as potential sources of general fill (Class 1 material) for the proposed project using the criteria of no peat deposits, low landslide susceptibility and proximity to existing access tracks and proposed infrastructure. Initially 4 borrow pits were identified at the western extent of the wind farm site as illustrated in Plate 2.3. Following environmental assessment, Option D was identified within a sensitive habitat with mosaic of Wet Heath and pockets of blanket bog with areas of previous peat removal. This borrow pit option was discounted from the proposed development due to environmental sensitivity. Option B was also discounted as it falls within 75m of a nearby watercourse, located directly to the east. A 75m buffer has been applied to provide greater setback between proposed infrastructure and watercourses, to ensure greater protection of water quality.

An alternative borrow pit location was examined at the north east of the site where appropriate material fill was identified. This allows for site won material to be excavated in proximity to both turbine clusters reducing the need to transport fill from one cluster to the other, reducing the need for vehicles to cross the public road and reducing the associate vehicle related emissions. Each borrow pit will provide approximately 30,000m^3 of site won general fill. The proposed borrow pits shall also be reinstated with excavated soil material which will avoid the need to export excess spoil to off-site facilities.

The potential alternative option is to import general fill from a nearby licenced quarry. This has potential to cause additional Heavy Goods Vehicle (HGV) trips between the wind farm site and the appropriate quarry. These HGV movements will also produce vehicle emissions and additional noise and dust associated with vehicle movements. A comparison of environmental effects of general fill material sourcing is presented in Table 2-6.

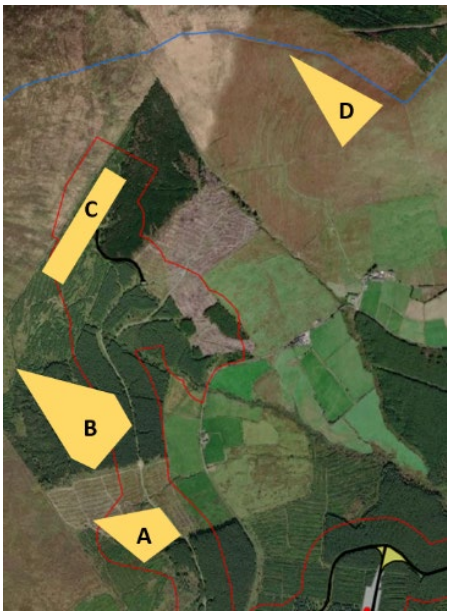

Plate 2-3: Initial Borrow Pit Options (West)

Plate 2-4: Proposed Borrow Pit Options (West)

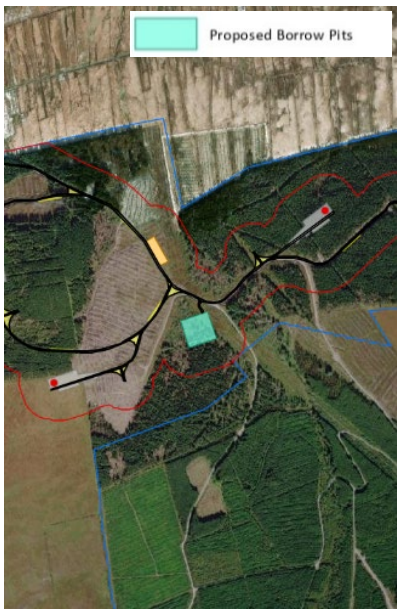

Plate 2-5: Proposed Borrow Pit Option (East)

Table 2-6: Comparison of Environmental Effects of Material Sourcing

Environmental Consideration	On-site Borrow Pits	Imported Material from Quarry
Air & Climate	Reduced emissions associated with heavy goods vehicle transport of material to site and off-site (spoil materials). Potential dust emissions from excavation of borrow pits on -site.	Emissions associated with the transport of materials from nearby quarry to wind farm site. Dust emissions associated with additional HGV journeys.
Noise & Vibration	Reduced noise emissions on the public road associated with the transport of materials to site. Potential noise emissions from the excavation of borrow pits on-site.	Noise emissions associated with the transport of materials from nearby quarry to the wind farm site.
Biodiversity	Potential habitat loss at borrow pit locations. Sensitive habitats avoided.	No loss of habitat on-site.
Ornithology	No likely effect.	No likely effect.
Land, Soils, Geology	Disturbance to soils. Areas of peat avoided. Provision of areas for spoil.	Effect on local quarry resource.
Hydrology & Water Quality	Potential for impact to water quality during excavation. Borrow pits within 75m of watercourses removed from the design. No likely effect.	No likely effect.
Population & Human Health	Appropriate setback from borrow pits to nearby dwellings to avoid effects from noise and dust during excavation.	Potential effects on nearby dwellings as a result of noise and dust emissions associated with additional HGV movements.
Material Assets	Effect on on-site stone resource.	Effect on local quarry resource.
Traffic & Transport	Additional HGV trips not required.	Additional HGV trips required for importation of fill.
Archaeology & Cultural Heritage	No likely effect.	No likely effect.
Landscape & Visual	No likely effect.	No likely effect.
Telecoms & Aviation	No likely effect.	No likely effect.

2.3.5.2 Turbine Delivery Route

Large components associated with the wind farm construction will be transported to site via the identified turbine delivery route (TDR). It is proposed that turbine deliveries shall approach the site from the North via Foynes Port, the N69, the M7, the N21, the N20 through Charleville, Buttevant and Mallow, the N72, the R583 and shall turn left onto the L2758 before the town of Millstreet, approaching the site from the North-West.

Alternative routes were initially examined for the delivery of turbines. Major ports of entry in proximity to the site were considered for the importation of turbine components.

These ports include Ringaskiddy, County Cork, Galway Port and the Port of Foynes, County Limerick. A feasibility study was conducted to identify routes between the site and the major ports of entry. The feasibility study identified Foynes as the optimal choice due to proximity to the site, avoidance of major population centres and avoidance of engineering constraints (tunnels, low bridges, unsuitable roads). Two alternative routes were then examined between the Port of Foynes, County Limerick and the Ballinagree Wind Farm Site. These options are illustrated in Figure 2.13.

Route Option A is the proposed option as described above. This route option was found to be favourable due to the good quality road network between the port and the site, lack of engineering constraints, lack of constraints within major towns and population centres and a lack of environmental sensitivities where accommodation works are required.

Route Option B follows a similar route to Option A, departing Foynes to the east towards Limerick before entering onto the M20 southbound. However, rather than turning south onto the N20 towards Mallow, the route continues south west along the N21, N23 and N22 passing Newcastle West and continuing to Killarney, County Kerry, before entering the R582 regional road to Millstreet. Route Option B was found to be less favourable than Option A for the following reasons:

- Greater distance by road (greater potential for disruption to road users during transport);
- Constraints along N72 identified including a rail bridge crossing, east of Barraduff, County Kerry;
- Larger number of villages and towns encountered (greater potential for disruption to population centres); and
- Larger number of road modifications required (associated potential environmental effects)

For these reasons, Route Option A was found to have less environmental constraints in comparison to Option B, and therefore Option A was chosen as the optimal route for turbine delivery.

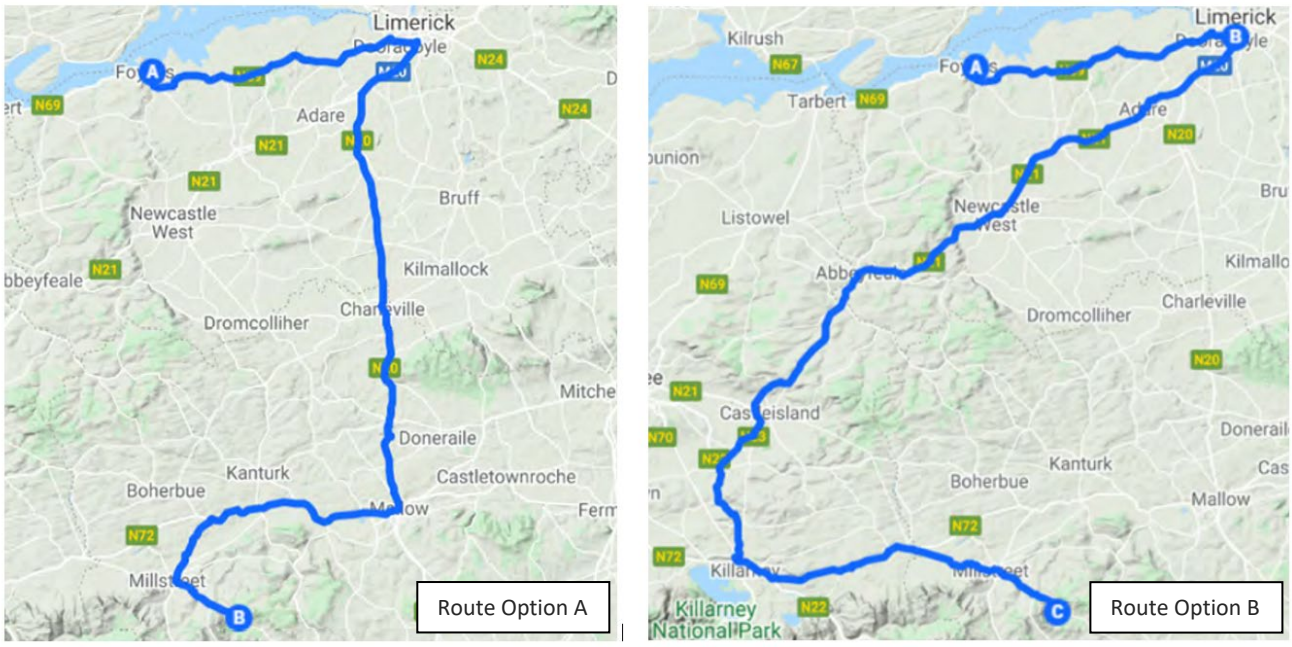

Figure 2-13: Alternative TDRs

2.3.5.3 Turbine Delivery Route -Staging Area

The TDR requires a manoeuvre through the town of Millstreet and an approach to the wind farm site which will require an alternative transport solution for the delivery of large components in order to avoid significant impact on properties along the final stage of the TDR. A blade lifter trailer will be utilised to allow for the transport of the large components along this section of the route. Therefore, it is required to transfer the turbine components onto the blade lifter trailers at a point along the route in order to make the final approach to the site. A large area of approximately 200m x 50m was required for this action. Two locations were identified with the appropriate amount of space to provide a staging area to make this transfer.

The first location, Option A, was identified in the grounds of Drishane castle along the R583 Regional Road, where a large agricultural field was identified with appropriate space. Here the turbine blades can be brought off the R583, transferred on to the blade lifter trailer and continue along the TDR towards Millstreet. The second location, Option B, was identified adjacent the town centre of Millstreet. Here the turbines would pass westward into the town of Millstreet to the identified land holding, the blade would be transferred to the blade lifter trailer, turn around and continue back onto the TDR.

Both options were considered in relation to potential environmental impacts. The most significant potential impact identified for Option A was the presence of Drishane Castle. This site is located adjacent an Architectural Conservation Area and within the curtilage of a Protected Structure and National Monument. Following assessment by a qualified archaeologist, no direct impacts on any buildings or archaeological sites within the property were identified. Option A is illustrated in Figure 2-14.

Option B is located in an agricultural field adjacent Millstreet Town Centre. Although no significant ecological or cultural heritage constraints were identified at this site, a number of residential properties and business are located in close proximity with potential for negative effects from noise and traffic associated with the accommodation works at the site and the transfer of turbine blades. Option B is illustrated in Figure 2-15.

Option A was chosen as the preferred option as it results in less negative impacts to residential amenity and business, and less impacts from additional traffic in the settlement of Millstreet.

Figure 2-14: Staging Area - Option A

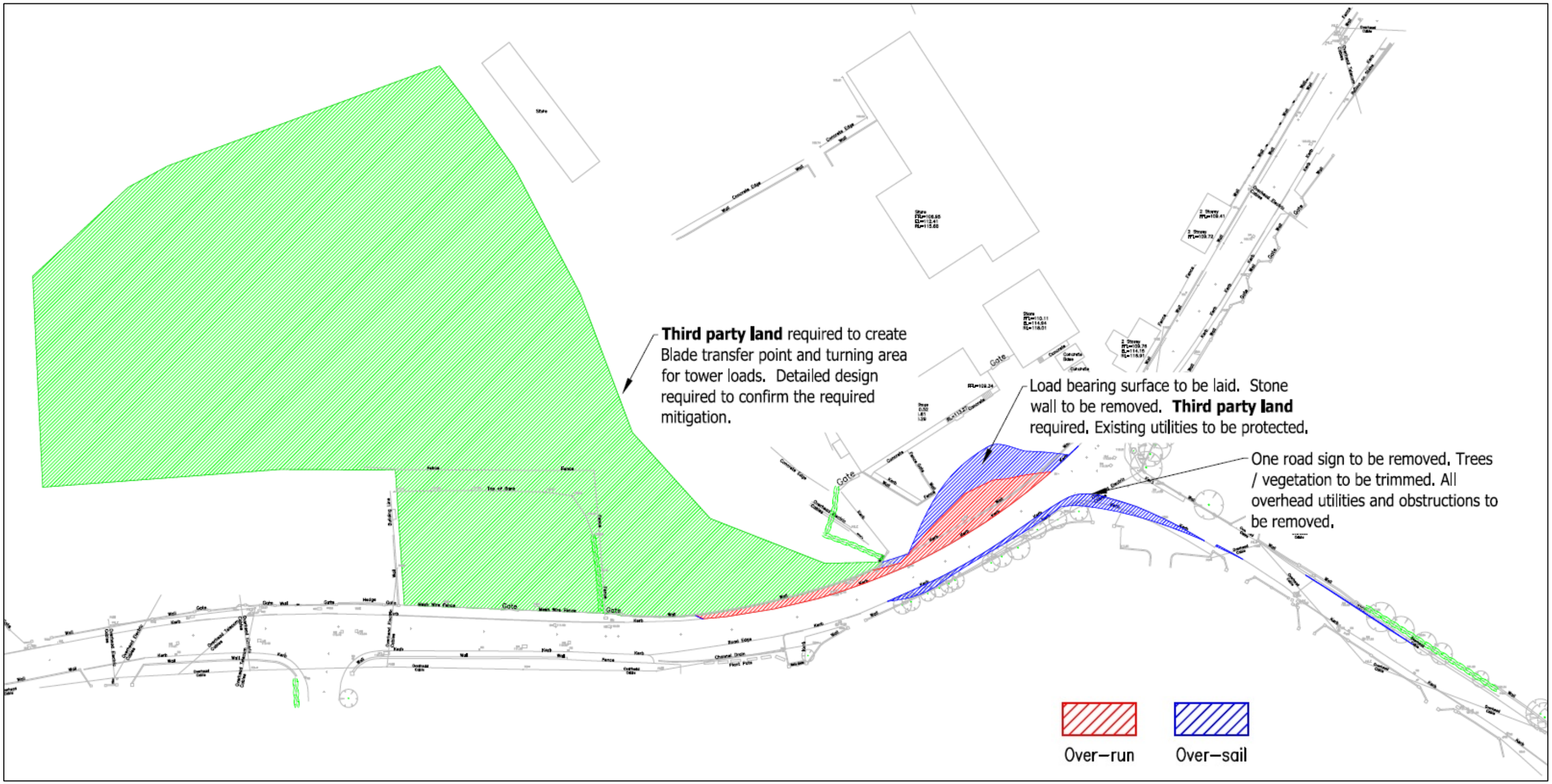

Figure 2-15: Staging Area - Option B

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 Ballinagree Wind Farm. The need for the development is established in Section 2.2 and 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, scales and densities, layouts and design and processes for the development of the Ballinagree 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 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. The constraints led development and the approach to developing the buildable area of the wind farm site is detailed.

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

Alternatives were also considered for other individual elements of the project including material sourcing, the optimal turbine delivery route and the approach to turbine delivery along the chosen route. These elements were arrived at through the avoidance of potential negative environmental effects as detailed in the comparisons provided throughout section 2.3.

The final proposed layout of the Ballinagree 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.

2.5 References

Baringa (2019), Wind for a Euro: Cost-benefit analysis of wind energy in Ireland 2000-2020. Available at: https://www.iwea.com/images/files/baringa-wind-for-a-euro-report-january-2019.pdf

Cork County Council (2014), Cork County Development Plan 2014. Available at: http://corkcocodevplan.com/

Department of Communications, Climate Action & Environment (2015), Climate Action and Low Carbon Development Act. Available at: http://www.irishstatutebook.ie/eli/2015/act/46/enacted/en/pdf

Department of the Environment, Climate and Communication (2021) Climate Action Plan. Available at: https://www.gov.ie/en/publication/6223e-climate-action-plan-2021/

Department of Communications, Climate Action & Environment (2019a), Giving Ireland a Sustainable Future. Press Release for launch of the Climate Action Plan. Available at: https://assets.gov.ie/10217/211e80fb057b423a8233131cc89f57df.pdf

Department of the Environment, Climate and Communication (2021), Climate Action and Low Carbon Development (Amendment) Act 2021. Available at: https://www.irishstatutebook.ie/

EirGrid (2021), All Island Generation Capacity Statement 2021-2030. Available at: https://www.eirgridgroup.com/site-files/library/EirGrid/208281-All-Island-Generation-Capacity-Statement-LR13A.pdf

European Commission (2014), 2030 Climate & Energy Framework. Available at: https://ec.europa.eu/clima/policies/strategies/2030_en

European Commission (2016), Ireland's EU 2030 emissions targets published. Available at: http://ec.europa.eu/ireland/news/ireland-s-eu-2030-emissions-targets-published_en

European Commission (2019), EU Emissions Trading System. Available at: https://ec.europa.eu/clima/policies/ets_en

European Commission (2019), Clean Energy for all Europeans Package. Available at: https://ec.europa.eu/energy/topics/energy-strategy/clean-energy-all-europeans_en

Environmental Protection Agency (2021), What is climate change? Available ONLINE AT: https://www.epa.ie/climate/communicatingclimatescience/whatisclimatechange/

Sustainable Energy Authority of Ireland (SEAI) (2020), Energy in Ireland 2020 Report. Available online at: https://www.seai.ie/publications/Energy-in-Ireland-2020.pdf

SEAI (2020a), Energy Security in Ireland – 2020 Report. Available at: https://www.seai.ie/publications/Energy-Security-in-Ireland-2020-.pdf

SEAI (2020), Renewable Energy in Ireland 2020 Update. Available at: https://www.seai.ie/publications/2020-Renewable-Energy-in-Ireland-Report.pdf

Wind Energy Ireland (2021), Facts & Stats. Available online at: https://windenergyireland.com/about-wind/facts-stats

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