3. CONSIDERATION OF REASONABLE ALTERNATIVES

3.1 Introduction

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

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

Annex IV of the EIA Directive states that the information provided in an Environmental Impact Assessment Report (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 of the EIAR contains a description of the reasonable alternatives that were studied by the developer, which are relevant to the proposed project and its specific characteristics, in terms of site location and other renewable energy technologies as well as site layout incorporating size and scale of the project, connection to the national grid and transport route options to the site. This section also outlines the design considerations in relation to the wind farm, including the associated substation, construction compounds and borrow pits. It provides an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.

The consideration of alternatives is an effective means of avoiding environmental impacts. As set out in the '*Guidelines on The Information to be Contained in Environmental Impact Assessment Reports' (Environmental Protection Agency, 2022),* the presentation and consideration of reasonable alternatives investigated is an important part of the overall EIA process.

Hierarchy

EIA is concerned with projects. The EPA 2022 Guidelines document states that Strategic Environmental Assessment (SEA), a higher tier form of environmental assessment that examines plans and programmes, examining the same factors as EIA but at a higher decision making level, e.g. the higher level alternatives and effects of the plan or programme on environmental factors. SEA also considers strategic measures to avoid, reduce or mitigate likely effects, which may also be relevant during EIA scoping. The extent to which higher level considerations have already been assessed do not need to be assessed again in the EIAR so as to reduce the amount of cumulative effects that need to be considered in an EIAR.

Non-environmental Factors

EIA is focused on the potential significant environmental effects of the Proposed Development that influence consideration of alternatives. However, other non-environmental factors may have equal or overriding importance to the developer of a project, for example project economics, land availability, engineering feasibility or planning considerations.

Site-specific Issues

The EPA guidelines state that the consideration of alternatives also needs to be set within the parameters of the availability of the land, i.e., the site may be the only suitable land available to the developer, or the need for the project to accommodate demands or opportunities that are site-specific. Such considerations should be on the basis of alternatives within a site, for example design and layout.

3.2 Methodology

The EU Guidance Document (EU, 2017) on the preparation of EIAR outlines the requirements of the EIA Directive and states that, in order to address the assessment of reasonable alternatives,

"*put simply, the Developer needs to provide:*

- *A description of the reasonable alternatives studied; and*
- *An indication of the main reasons for selecting the chosen option with regards to their environmental impacts.*"

There is limited European and National guidance on what constitutes a 'reasonable alternative' however the EU Guidance Document (EU, 2017) states that reasonable alternatives "*must be relevant to the proposed project and its specific characteristics, and resources should only be spent assessing these alternatives*".

The guidance also acknowledges that "*the selection of alternatives is limited in terms of feasibility. On the one hand, an alternative should not be ruled out simply because it would cause inconvenience or cost to the Developer. At the same time, if an alternative is very expensive or technically or legally difficult, it would be unreasonable to consider it to be a feasible alternative*".

The current EPA Guidelines (EPA, 2022) 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 is deciding on the selected option. A detailed assessment (or 'mini-EIA') of each alternative is not required.*"

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

- 'Do Nothing' Alternative;
- Alternative Locations;
- Alternative Technologies;
- Alternative Project Designs including:
    - Alternative turbine number and model options
    - Alternative turbine layout and design options
    - Alternative substation and grid connection options
    - Alternative met mast options
    - Alternative Locations for temporary infrastructure: compounds and borrow pits
    - Alternative delivery routes and site access options for wind turbine components
- Alternative Mitigation Measures.

Each of these is addressed in the following sections.

When considering a wind farm development, given the intrinsic link between layout and design, the two will be considered together in this chapter.

3.3 Consideration of Alternatives

3.3.1 'Do-Nothing' Option

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

An alternative land-use option to the development of a renewable energy project at the Proposed Development site would be to leave the site as it is, with no changes made to existing land-use practices. In implementing this 'Do-Nothing' alternative, the site would continue to be managed under the requirements of the relevant IPC licence and therefore the ongoing site management and environmental monitoring, peat stockpile removal (due to be completed by 2024), and wind measurement would continue. In addition, if the Proposed Development were not to proceed, the implementation of peatland rehabilitation plans as required under IPC License would occur. Likewise, the Peatland Climate Action Scheme (an enhanced form of peatland rehabilitation in selected adjacent bogs, please see Chapter 1 and https://www.bnmpcas.ie/ for details) would continue to be implemented. These land uses and activities will also continue if the Proposed Development does proceed.

In implementing the 'Do-Nothing' alternative, however, the opportunity to capture a significant part of County Meath and Westmeath's renewable energy resource would be missed at this time, as would the opportunity to contribute to meeting Government and EU 2030 targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions. The opportunity to generate local employment, development contributions, and rates would also be forgone. Also, the proposed amenity access points and associated carparks would not be constructed as part of the Proposed Development and therefore this recreational opportunity would be lost.

A comparison of the potential environmental effects of the 'Do-Nothing' Alternative (that a wind farm is not developed) when compared against the Proposed Development at this site are presented in Table 3-1 below.

Table 3-1 Comparison of environmental effects of the 'Do-nothing' with the Proposed Development

Environmental Consideration	Do Nothing Alternative (existing land uses continue)
Population & Human Health (incl. Shadow Flicker)	No increase in local employment and no long-term financial contributions towards the local community. No potential for shadow flicker to affect sensitive receptors.
Biodiversity & Ornithology	No habitat loss
Land, Soils & Geology	No excavation of large volumes of peat and spoil
Geotechnical/Peat Stability	No potential for peat slippage. The Proposed Development site is located on a relatively flat-lying site. The flat topography/nature of the terrain on site reflects the low risk of peat failure.
Water (Hydrology & Hydrogeology)	Neutral - minor maintenance and minor repairs to the drainage network (where required) are part of proposed IPC Licence works

Environmental Consideration	Do Nothing Alternative (existing land uses continue)
Air & Climate	Slight improvement on air quality due to the implementation of the draft Cutaway Bog Decommissioning and Rehabilitation Plans. See Appendix 6-6. However, it would not provide the opportunity for a greater overall improvement in air quality or reduction of greenhouse gasses. Implementation of the rehab plans alone would not assist in achieving the renewable energy targets set out in the Climate Action Plan.
Noise & Vibration	No potential for noise impacts on nearby sensitive receptors.
Landscape & Visual	Landscape and visual impacts avoided.
Cultural Heritage & Archaeology	No potential for impacts on unrecorded, subsurface archaeology. No impacts on railway infrastructure
Material Assets	Construction traffic avoided

3.3.2 Alternative Locations

Bord na Móna owns circa 80,000 hectares of land, primarily in the midlands of Ireland. An assessment of potential future uses of this landbank was published by Bord na Móna in 2011 in a document entitled 'Strategic Framework for the Future Use of Peatlands'. This report clearly identified the potential for the development of renewable energy (in particular wind energy) and other developments on Bord na Móna lands.

The Project Ireland 2040 National Planning Framework identifies a range of Key future planning and development and place-making policy priorities for the Eastern and Midland Region that includes:

> *"Harnessing the potential of the region in renewable energy terms across the technological spectrum from wind and solar to biomass and, where applicable, wave energy, focusing in particular on the extensive tracts of publicly owned peat extraction areas in order to enable a managed transition of the local economies of such areas in gaining the economic benefits of greener energy."*

Consequently, when considering suitable locations for the Proposed Development, the assessment was confined to lands within the Bord na Móna landholding only as these lands have been identified in a national and regional context as being suitable for this type of development. An examination of sites outside of this landholding was not included as part of the process.

The assessment carried out for the determination of a suitable location for the Proposed Development was a two-stage process. The first stage comprised the identification of a number of candidate sites while the second stage comprised a site-specific assessment. Each of these stages are described in the following sections.

3.3.2.1 Selection of Candidate Sites

In order to identify candidate sites i.e., sites considered suitable for wind energy development, Bord na Móna conducted a technical review of lands which are either cut away or cutover. This involved desk studies and on-site surveys of the landbank. Known constraints were then applied across the landbank. The constraints applied were derived from various industry and regulatory guidelines, available Geographical Information Systems (GIS) datasets and on-site surveys (carried out as part of the peat extraction activity), and included the following:

- Planning Policy Context;
- Proximity to Sensitive Receptors;
- Peat Depths;
- Suitable wind speeds;
- Proximity to the national electricity grid; and
- Proximity to Designated sites and onsite Environmental Sensitivities.

The assessment process was used to generate a list of potential sites for further consideration. Ten sites were identified as having a higher potential for wind energy development and these were then brought forward for site-specific assessment, as detailed below.

3.3.2.2 Site Specific Assessments

The site-specific assessments were conducted by the Bord na Móna Powergen wind energy development team with input from other in-house experts where required e.g., the Bord na Móna Works Management, Central Engineering, Construction, Ecology, and Land and Property teams. The aim of the site-specific assessments was to gauge the sites with the best potential to deliver a successful wind farm project by the end of this decade, i.e., 2025 - 2030. The goal was to select a project to bring forward, for which preliminary engineering designs and a planning application could be prepared.

The site-specific assessment of the candidate sites was guided by the 2013 '*Methodology for Local Authority Renewable Energy Strategies*' report from the Sustainable Energy Authority of Ireland (SEAI). For the site-specific assessment of candidate sites, a number of criteria were chosen which not only covered the broad range of issues which can arise in wind farm development but also allowed for direct comparison of the candidate sites to each other to determine their relative suitability for wind farm development.

The site-specific selection criteria and an outline of the basis for assessment for each criterion are listed in Table 3-2. The criteria can be regarded as either a constraint to the Proposed Development or a facilitator for the Proposed Development. For example, the level of flooding at the site may reduce the available 'buildable' area or the lack of flooding may highlight the suitability of the site. The environmental effect of significant flooding may arise due to a requirement for deeper and more extensive drainage leading to potential downstream surface water impacts. In the case of Bord na Móna lands the existing onsite drainage is a facilitator to the project as surface water is already managed in accordance with the EPA administrated IPC licence.

Following selection of the criteria an assessment of each site was carried out under each criterion. Greater emphasis was given to key criteria such as environmental sensitivity, grid access/capacity, County Development Plans/zoning, and proximity to houses as these are considered in the industry as critical to the suitability of individual sites for development. Following the assessment, the most suitable site (within the short list of suitable sites) was selected for wind energy development.

3.3.2.3 Site Selection Results

The findings of the site-specific assessment process, which included a comparison of the site selection criteria and potential environmental effects is provided in Table 3-3.

Of the sites assessed, Ballivor was selected as a site with relatively low potential for environmental effects similar to a number of the other sites on the list that met the relevant criteria. Due to , for instance, the close proximity of potential grid connection (and resulting environmental and project viability benefits), it was deemed that Ballivor should be progressed for detailed assessment and planning consideration.

It is noteworthy that the process described in the preceding paragraphs is not a one-off assessment of the entire Bord na Móna landholding in terms of its suitability for renewable energy developments. The site selection process is revisited in its entirety for each individual project and the criteria updated to suit the technology type proposed and to take account of any changes that have occurred (i.e., policy, legislative, environmental, etc.) since the previous site selection process was conducted.

Table 3-2: Site-specific Selection Criteria and Basis for Assessment

Criterion	Basis for Assessment	Potential Environmental Effect
Grid Access/ Capacity	Grid Access/Capacity means potential of the National Grid to accommodate future projects on the network. The proximity of the project to suitable grid nodes (i.e., those with spare capacity) should facilitate the selection of a project for a viable grid connection offer.	**Direct:** Land, Soil and Geology, Hydrology and Hydrogeology, Biodiversity. **Indirect:** Noise and Vibration, Population and Human Health.
Wind Resource Assessment	The available wind resource (i.e., wind speed) directly translates into how much electrical output is available from the site.	**Direct:** Air Quality and Climate. **Indirect:** Air Quality and Climate.
County Development Plans (CDP) and Zoning	County Development Plans typically indicate the areas of a county which are deemed preferred, open to consideration and not suitable for wind farm development.	**Direct:** Landscape and Visual, Cultural Heritage, Biodiversity.
Proximity to Houses	Proximity to houses refers to how close the wind turbines are to residences.	**Direct:** Population and Human Health, Noise and Vibration, Shadow Flicker. **Indirect:** Landscape and Visual.
Environmental Sensitivity	Environmental Sensitivity is the ecological sensitivity of the site based on proximity to sensitive areas within or around the site.	**Direct:** Biodiversity. **Indirect:** Hydrology and Hydrogeology.
Landscape Capacity/ Cumulative Impact	This refers to the landscape's capacity to absorb wind farm developments.	**Direct:** Landscape and Visual. **Indirect:** Cultural Heritage.
Aviation	Airspace control and use to be considered. For the assessment, the criterion examines proximity of the site to local and regional airports (including Casement Aerodrome), proximity to National Motorway network, parachute zone, Military Operating Areas, etc.	**Direct:** Telecommunications, Aviation and Electromagnetic Frequency.

Criterion	Basis for Assessment	Potential Environmental Effect
Land Use	Internal Bord na Móna consideration relating to the residual peat depth on-site, peat harvesting plans and alternative uses for each bog.	**Direct:** Cultural Heritage, Land, Soils and Geology, Hydrology and Hydrogeology, Biodiversity.
Communications Infrastructure	Telecoms masts and signals in the vicinity and across the sites to be considered.	**Direct:** Telecommunications, Aviation and Electromagnetic Frequency.
Flood Plain Analysis	Flood Plain Analysis assesses the wind farm's location in terms of historical flooding data. It also considers if the site is pumped, or gravity drained.	**Direct:** Hydrology and Hydrogeology. **Indirect:** Traffic and Transportation.
Supporting Infrastructure	Proximity to national and regional road network Sites with better road access require less modifications or upgrade to the local infrastructure to facilitate construction or delivery of turbine components to site.	**Direct:** Traffic and Transportation. **Indirect:** Noise and Vibration, Air Quality and Climate.

Table 3-3: Site-specific Selection Criteria findings and associated potential effects

Candidate Sites	Grid Access/ Capacity	Wind Resource Assessment	CDP and Zoning	Proximity to Houses	Environmental Sensitivity	Landscape Capacity/ Cumulative Impact	Aviation	Land Use	Communications Infrastructure	Flood Plain Analysis	Supporting Infrastructure
Proposed Ballivor Wind Farm Site	110kV network runs through centre of Ballivor bog group. Potential available capacity.	The Irish Wind Atlas outlines that wind speeds in midlands bog groups are typically between 7 – 8 m/s. Therefore, this criterion is neutral across all sites.	Site within a 'Low Capacity' Area for wind energy development- Westmeath County Development 2021-2027. The plan specifies cutaway peatland for this type of development.	This criterion is neutral with respect to the outlined environmental effects as BnM wind farms are generally designed for turbine setback distance of 750m or greater.	No Natura areas within the site, low level of Natura sites in the vicinity, mixture of low, medium and high value habitats within the site (excluding Lisclogher west).	Bracklyn Wind Farm (Planning Ref: PA25M.311565) is consented and is adjacent to the Proposed Development site. The consented Yellow River Wind Farm (Co. Offaly, Planning Ref: PA0332) is over 15km southwest and consented Drehid Wind Farm (Planning Ref: 306500-20) is over 16km southeast of the Proposed Development site. There is one consented single wind turbine at Dryderstown (Planning Ref: 122054), approx. 3.6km northwest of the site.	The site is at a significant distance from local and regional airports as well as the main motorway network.	Significant areas (>75%) of the site have low levels of peat. There are some areas dedicated to Biodiversity on the site. E.g., Lisclogher West	There are 12 links that pass through the site.	The site is not pumped. It has no recognised flood point in the local area	The site has access to the R159 regional road and other local roads.
Littleton	110 kV network runs to the west of the site but there is a lack of available capacity.	The Irish Wind Atlas outlines that wind speeds in midlands bog groups are typically between 7 – 8 m/s. Therefore, this criterion is neutral across all sites.	In an area, open for consideration	This criterion is neutral with respect to the outlined environmental effects as BnM wind farms are generally designed for turbine setback distance of 750m or greater.	No Natura areas within the site, Low to medium number of Natura sites in the wider area, mixture of low, medium and high value habitat within the site	There are nine windfarm sites (either constructed or consented) within 20km of the site.	The site is at a significant distance from local and regional airports. It is located in proximity to the main motorway network.	Significant areas (>75%) of the site have low levels of peat. There is a low level of commercial forestry at the site.	There are a number of masts on the mountains to the east	The site is pumped. It has no recognised flood point in the local area.	The site has restricted access to the regional roads but is in close proximity to the M8.
Ballydermot 1,2,3	110kV network runs to the west and south of Ballydermot bog. Potential available capacity.	The Irish Wind Atlas outlines that wind speeds in midlands bog groups are typically between 7 – 8 m/s. Therefore, this criterion is neutral across all sites.	Site falls across Co. Offaly and Co. Kildare. Offaly area is categorised as "Open for Consideration" for wind energy. Kildare area is categorised as a Medium Risk area for wind.	This criterion is neutral with respect to the outlined environmental effects as BnM wind farms are generally designed for turbine setback distance of 750m or greater.	No Natura areas within the site, one nature site adjacent to the site boundary, low level of Natura sites in the surrounds, mixture of low, medium and high value habitats within the site	There are 7 windfarm sites (either constructed, consented or proposed) within 20km of the site.	The eastern part of the site is in within 5km of Clonbulloge Airfield. Casement Aerodrome is approximately 30km east of the site.	Significant areas (>75%) of the site have low levels of peat. There is a low level of commercial forestry at the site.	There are a maximum of 7 links crossing the site.	The site is pumped. It has no recognised flood point in the local area.	The site has access to the regional and national road network.

Candidate Sites	Grid Access/ Capacity	Wind Resource Assessment	CDP and Zoning	Proximity to Houses	Environmental Sensitivity	Landscape Capacity/ Cumulative Impact	Aviation	Land Use	Communications Infrastructure	Flood Plain Analysis	Supporting Infrastructure
Clorhane 1,2 (Blackwater)	Site is in close proximity to existing grid infrastructure at Shannonbridge with good available grid capacity. A number of 110kV lines run close to the site.	The Irish Wind Atlas outlines that wind speeds in midlands bog groups are typically between 7 – 8 m/s. Therefore, this criterion is neutral across all sites.	Partially in preferred area, partially within buffered area from Clonmacnoise	This criterion is neutral with respect to the outlined environmental effects as BnM wind farms are generally designed for turbine setback distance of 750m or greater.	No Natura areas within the site, high density of Natura sites in the local area, close proximity to the River Shannon, large areas of high value habitat within the site.	There are three windfarm sites (either constructed or consented) within 20km of the site. This site is also located near Clonmacnoise.	The site is at a significant distance from local and regional airports as well as the main motorway network.	Significant areas (>75%) of the site have low levels of peat. There is a low level of commercial forestry at the site and also some areas of biodiversity.	There are a number of masts located in Shannonbridge.	The site is pumped. It has 7 recognised flood points in the local area.	The site has access to the R357 and R444 regional roads.
Coolnamona	110kV network runs to the north of Coolnamona bog but there is poor available capacity.	The Irish Wind Atlas outlines that wind speeds in midlands bog groups are typically between 7 – 8 m/s. Therefore, this criterion is neutral across all sites.	Completely within preferred area	This criterion is neutral with respect to the outlined environmental effects as BnM wind farms are generally designed for turbine setback distance of 750m or greater.	No Natura sites within the site, medium level of Natura sites in the wider area (reasonable proximity to Slieve Bloom SPA). Mainly low with some medium value habitat within the site.	There are two windfarm sites (consented) within 20km of the site.	The site is at a significant distance from local and regional airports. It is located in close proximity to the M7.	Large areas of the site have medium to high levels of peat. There are no other significant uses at the site.	There are two masts adjacent to the site.	The site is not pumped It has no recognised flood point in the local area	The site has access to the regional road R445 and is adjacent to the M7.
Lemanaghan	Site is within reasonable proximity to existing grid infrastructure at Shannonbridge with good available grid capacity.	The Irish Wind Atlas outlines that wind speeds in midlands bog groups are typically between 7 – 8 m/s. Therefore, this criterion is neutral across all sites.	Predominantly within area open for consideration	This criterion is neutral with respect to the outlined environmental effects as BnM wind farms are generally designed for turbine setback distance of 750m or greater.	No Natura areas in the site, low number of Natura sites in the wider area, Mainly low value habitat on the site	There are four windfarm sites (either constructed or consented) within 20km of the site.	The site is at a significant distance from local and regional airports as well as the main motorway network.	A significant portion of the site has medium levels of peat. There are no other significant uses at the site.	There is a mast at Cor Hill with potential links through the site.	The site is pumped. It has 1 recognised flood point in the local area.	The site has direct access to the N62
Derryarkin	Site is within reasonable proximity to existing 110 kV grid infrastructure with potential available grid capacity.	The Irish Wind Atlas outlines that wind speeds in midlands bog groups are typically between 7 – 8 m/s. Therefore, this criterion is neutral across all sites.	Within High risk for Westmeath, low risk area for Offaly.	This criterion is neutral with respect to the outlined environmental effects as BnM wind farms are generally designed for turbine setback distance of 750m or greater.	No Natura areas in the site, low to medium number of Natura sites in the wider area, Mixture of low, moderate and high value habitat on the site	There are four windfarm sites (either constructed or consented) within 20km of the site.	The site is at a significant distance from local and regional airports. It is located in close proximity to the M6.	Significant areas (>75%) of the site have low levels of peat. There is a low level of commercial forestry at the site and also some areas of quarrying.	There is a mast in Derrygreenagh works with 5 identified links through the site.	The site is not pumped. It has no recognised flood point in the local area	The site has access to the R400 and is adjacent to the M6.
Garryhinch	Site is within reasonable proximity to existing 110 kV grid infrastructure with potential available grid capacity.	The Irish Wind Atlas outlines that wind speeds in midlands bog groups are typically between 7 – 8 m/s. Therefore, this criterion is neutral across all sites.	Within area open for consideration	This criterion is neutral with respect to the outlined environmental effects as BnM wind farms are generally designed for turbine setback distance of 750m or greater.	No Natura areas in the site, low number of Natura sites in the wider area, Mixture of low to moderate value habitat on the site	There are three wind farm sites (constructed) within 20km of the site.	The site is at a significant distance from local and regional airports as well as the main motorway network	Significant areas (>75%) of the site have low levels of peat. There are no other significant uses at the site.	There is a major telecoms hub on the Sliabh Blooms and two masts adjacent to the site with multiple links.	The site is pumped. It has no recognised flood point in the local area.	The site has limited access to the regional and national road network.

Candidate Sites	Grid Access/ Capacity	Wind Resource Assessment	CDP and Zoning	Proximity to Houses	Environmental Sensitivity	Landscape Capacity/ Cumulative Impact	Aviation	Land Use	Communications Infrastructure	Flood Plain Analysis	Supporting Infrastructure
Timahoe 2 (Timahoe South)	110kV network runs to the north of Timahoe South bog (i.e., through Timahoe North bog) with potential available capacity	The Irish Wind Atlas outlines that wind speeds in midlands bog groups are typically between 7 – 8 m/s. Therefore, this criterion is neutral across all sites.	In medium risk area	This criterion is neutral with respect to the outlined environmental effects as BnM wind farms are generally designed for turbine setback distance of 750m or greater.	No Natura areas in the site, low number of Natura sites in the wider area, Mixture of low, moderate and high value habitat on the site	There are two wind farm sites (either constructed or consented) within 20km of the site.	This site is also close to Casement Aerodrome. It is located proximate to the M4.	Large areas of the site have low levels of peat. The site is also used for waste processing and as an engineered landfill.	There are some links on the northern boundary.	The site is pumped. It has no recognised flood point in the local area.	The site has direct access to the R415
Ballybeg	110 kV grid infrastructure runs to south of Ballybeg with potential available grid capacity.	The Irish Wind Atlas outlines that wind speeds in midlands bog groups are typically between 7 – 8 m/s. Therefore, this criterion is neutral across all sites.	Partially in preferred, partially with scenic buffer zone (Croghan Hill)	This criterion is neutral with respect to the outlined environmental effects as BnM wind farms are generally designed for turbine setback distance of 750m or greater.	No Natura sites within the boundary, Low number of Natura sites in the wider area, mixture of low and high value habitats within the site.	There are four wind farm sites (either constructed or consented) within 20km of the site.	The site is at a significant distance from local and regional airports. It is located in relative proximity to the M6.	Significant areas (>75%) of the site have low levels of peat. There are no other significant uses at the site.	It has 5 links that cross the site.	The site is pumped. It has no recognised flood point in the local area.	The site has access to the R400.

3.3.3 Alternative Renewable Electricity Technologies

Alternative sources of renewable electricity generation considered for this site, given its scale, is solar photovoltaic (PV) energy plant (a solar farm). To achieve the same energy output from solar energy, the site would require a significantly larger development footprint due to the significant difference in capacity factors between solar and wind technologies and the footprint of the technology infrastructure. . In addition, a solar development would have a higher potential environmental effect on Hydrology and Hydrogeology (larger areas requiring a higher level of drainage infrastructure), Traffic and Transport (construction phase) and Biodiversity (habitat loss) at the site. Chapter 2 of this EIAR also sets out the need and benefits of the Proposed Development. For these reasons, wind energy is considered the most suitable renewable electricity generation option for the site.

A comparison of the potential environmental effects of the development of a solar PV array when compared against the chosen option of developing the proposed wind farm at this site are presented in Table 3-4 below.

Table 3-4 Comparison of environmental effects for an alternative technology e.g. solar when compared against the chosen option (wind turbines)

Environmental Consideration	Solar PV Array (with a 130MW output)	Wind Farm (130MW)
Population & Human Health (incl. Shadow Flicker)	No potential for shadow flicker to affect sensitive receptors. Potential for glint and glare impacts on local road users and residential receptors.	Potential for shadow flicker to affect sensitive receptors. No potential for glint and glare impacts on local road users and residential receptors.
Biodiversity & Ornithology	Larger development footprint would result in greater habitat loss/impact due to the higher level of drainage requirement. Potential for glint and glare impacts on birds. No potential for collision risk on bird.	Smaller development footprint. No impact for glint and glare on birds. Potential for collision risk on birds.
Land, Soils & Geology	Larger development footprint would have potential to result in greater volumes of peat and spoil to be excavated.	Smaller development footprint resulting in smaller volumes of peat and spoil to be excavated.
Geotechnical/Peat Stability	Shallower excavations involved in solar PV array developments would decrease the potential for peat instability (construction phase).	Deeper excavations required which increases the potential for peat instability (construction phase).
Hydrology & Hydrogeology	A solar PV array development would require a larger development footprint increasing the potential for silt laden runoff to enter receiving watercourses.	Smaller development footprint therefore decreasing the potential for silt laden runoff to enter receiving watercourses.
Air & Climate	Reduced capacity factor of solar PV array technology would result in a longer carbon payback period.	Higher capacity factor resulting in shorter carbon payback period.

Environmental Consideration	Solar PV Array (with a 130MW output)	Wind Farm (130MW)
Noise & Vibration	Less potential for noise impacts on nearby sensitive receptors.	Increased potential for noise impacts on sensitive receptors.
Landscape & Visual	Potentially less visible from surrounding area due to screening from forestry and topography.	More visible at a greater distance from the site.
Cultural Heritage & Archaeology	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.	Smaller development footprint decreases the potential for impacts on unrecorded, subsurface archaeology.
Material Assets	Potential for greater traffic volumes during construction phase due to the number of solar panels required to be delivered to achieve the same MW output.	Potential for smaller traffic volumes during construction phase due to the fewer component deliveries to build out a wind farm to achieve the same MW output.

3.3.4 Alternative Project Design Options

3.3.4.1 Alternative Turbine Numbers and Model

The proposed wind turbines will have a potential power output in the 4.5 – 6.5 -megawatt (MW) range. It is proposed to install 26 turbines at the site which could achieve approximately 117 MW to 169 MW output. Such a wind farm could also be achieved on the proposed site by using smaller turbines (for example 3.8 MW machines). However, this would necessitate the installation of between 30 and 44 turbines to achieve a similar output. Furthermore, the use of smaller turbines would not make as efficient use of the wind resource available at higher elevations above ground level. having regard to the nature of the site. A larger number of smaller turbines would result in the wind farm occupying a greater footprint within the site, with a larger amount of supporting infrastructure being required (i.e., roads, steel, etc.) and increasing the potential for negative environmental impacts to occur on biodiversity, hydrology and traffic and transportation. The proposed number of turbines takes account of all site constraints and the distances to be maintained between turbines and features such as roads and houses, while maximising the wind energy potential of the site. The 26-turbine layout selected for the site has the smallest development footprint of the other alternatives considered, while still achieving the optimum output at a more consistent level than would be achievable using different turbines. The other alternatives considered included a 35-turbine layout which is discussed in further detail in Section 3.3.5 below.

The turbine model to be installed on the site will have an overall ground-to-blade tip height of 200 metres maximum; blade rotor diameter of 170 metres and hub height of 115 metres minimum. The use of alternative smaller turbines at this site would not be appropriate as they would fail to make the most efficient use of the wind resource passing over the site at higher elevations and would potentially require a larger development footprint. This alternative would potentially lead to additional environmental effects.

A comparison of the potential environmental effects of the installation of a larger number of smaller wind turbines when compared against the chosen option of installing a smaller number of larger wind turbines are presented in Table 3-5 below.

Table 3-5 Comparison of environmental effects between larger quantity of smaller turbines against the chosen option of fewer but larger turbines

Environmental Consideration	Larger number of smaller turbine models	Smaller number of larger turbines
Population & Human Health (incl. Shadow Flicker)	Greater potential for shadow flicker impacts on nearby sensitive receptors due to the increased number of turbines.	Decreased potential for shadow flicker due to greater setbacks from houses, greater separation between turbines.
Biodiversity & Ornithology	Larger development footprint would result in greater habitat loss.	Smaller development footprint would result in smaller and less fragmented habitat loss.
Land, Soils & Geology	Larger development footprint would result in greater volumes of peat and spoil to be excavated and managed.	Smaller development footprint would result in smaller volumes of peat and spoil to be excavated and managed.
Geotechnical/Peat Stability	Neutral (the larger quantity of smaller turbines would still be designed to minimise peat slippage).	Neutral (the smaller quantity of larger turbines would still be designed to minimise peat slippage).
Water (Hydrology and Hydrogeology)	Neutral (the larger quantity of smaller turbines would still be designed to minimise hydrological impacts).	Neutral (the smaller quantity of larger turbines would still be designed to minimise designed to minimise hydrological impacts).
Air & Climate	Increased potential for vehicle emissions and dust emissions due to an increased volume of construction material and turbine component deliveries to the site.	Decreased potential for vehicle emissions and dust emissions due to a decreased volume of construction material and turbine component deliveries to the site.
Noise & Vibration	Potential for increased noise levels at nearby sensitive receptors due to reduced separation distance between residential dwellings and turbine locations.	Potential for decreased noise levels at nearby sensitive receptors due to increased separation distance between residential dwellings and turbine locations.
Landscape & Visual	A larger number of turbines may have a greater landscape and visual impact.	A smaller number of turbines may have a lower landscape and visual impact.
Cultural Heritage & Archaeology	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.	Smaller development footprint would decrease the potential for impacts on unrecorded, subsurface archaeology.
Material Assets	Potential for greater traffic volumes during construction phase due to larger development footprint and requirement for more construction materials and turbine components.	Potential for smaller traffic volumes during construction phase due to smaller development footprint and requirement for fewer construction materials and turbine components.

3.3.4.2 Alternative Turbine Layout and Design

The design of the Proposed Development has been an informed and collaborative process from the outset, involving the designers, developers, engineers, landowners, environmental, hydrological, geotechnical, archaeological, and traffic specialists.

Throughout the preparation of the EIAR, the layout of the Proposed Development has been revised and refined to take account of the findings of all site investigations and baseline assessments, which have brought the design from its first initial layout to the Proposed Development layout. The design process has also taken account of the recommendations and comments of the relevant statutory and non-statutory organisations, the local community and local authorities as detailed in Chapter 2 Background to the Proposed Development.

3.3.4.2.1 *Constraints Mapping*

The design and layout of the proposed wind energy development follows the recommendations and guidelines set out in the *'Wind Energy Development Guidelines'* (Department of the Environment, Heritage and Local Government (DoEHLG), 2006) and the *'Best Practice Guidelines for the Irish Wind Energy Industry'* (Irish Wind Energy Association, 2008). The '*Wind Energy Development Guidelines'* (DoEHLG, 2006) are currently the subject of a targeted review. The proposed changes to the assessment of impacts associated with onshore wind energy developments are outlined in the document *'Proposed Revisions to Wind Energy Development Guidelines 2006 – Targeted Review'* (2013), the '*Review of the Wind Energy Development Guidelines 2006 – Preferred Draft Approach'* (June 2017), and the Draft Revised Wind Energy Development Guidelines, December 2019. The Climate Action Plan 2023 states that new draft wind energy guidelines will be published in 2023 with final guidelines adopted in 2024.

The constraints mapping process involves the placing of buffers around different types of constraints to clearly identify the areas within which development infrastructure will be limited. The size of the buffer zone for each constraint has been assigned using a combination of desktop assessments, baseline information and guidance presented in the 'Wind Energy Development Guidelines' (DoEHLG, 2006). As it is plausible that the new guidelines will be adopted during the application process timeframe, the proposed guideline changes from the amended version have been incorporated into the design. The constraints map for the site, as shown in Figure 3-1, encompasses the following constraints and associated buffers:

- Residential dwellings plus a minimum 800-metre buffer to the nearest turbine (meeting the proposed requirement for a 4 times tip height separation distance from the curtilage of properties in line with the new draft guidelines);
- Natura 2000 and Designated sites plus 200-metre buffer;
- Habitats of County Importance (see Chapter 6: Biodiversity);
- Telecommunication Links plus operator specific buffer;
- Overhead transmission lines plus 3.5 times proposed rotor diameter buffer (as required by Eirgrid);
- Design distances from the adjacent proposed wind farms to take account of turbulence and wake effects in accordance with relevant guidance requirements.
- Watercourses plus 50-metre buffer; and
- Archaeological Sites or Monuments, 50-metre buffer, plus 'Zone of Notification' as required by the National Monuments Service (ROI).

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

- Lands are available for development;
- No Natura 2000 or Designated sites located within the Proposed Development site;
- Onsite existing 110kV transmission lines for grid connection;
- Absence of recognised flood points on site; and

- Accessibility of site via National and/or Regional Roads;
- Existing site access points/entrances.

The inclusion of the constraints on a map of the study area allows for a viable area to be identified. An initial wind farm layout is then developed to take account of all the constraints mentioned above and their associated buffer zones and the separation distance required. Following the mapping of all known constraints, detailed site investigations were carried out.

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

The hydrological and geotechnical investigations of the site examined the proposed locations for turbines, roads and other components of the Proposed Development, such as the construction compound. Where specific areas were deemed as being unsuitable for the siting of turbines or roads, etc., alternative locations were proposed and assessed, taking into account the areas that were already ruled out by constraints.

The flat topography/nature of the terrain on site reflects the low risk of peat failure. A Peat Stability Assessment (Appendix 8-1) was undertaken for the Proposed Development site. The assessment concluded that the design has a Factor of Safety (FoS) of greater than 1.3. An FoS below 1 is considered unstable. The assessment concludes that the siting of turbines and all ancillary infrastructure to have a FoS within the acceptable range indicating a low to negligible risk to peat instability. Please see Appendix 8-1 for further details.

The turbine layout for the Proposed Development has also been informed by wind data, the results of noise assessments, shadow flicker and the separation distance to be maintained between turbines. Thus, the baseline environmental assessment of the site and wind farm design was an iterative process, where findings at each stage of the assessment were used to further refine the design, always with the intention of minimising the potential for environmental impacts.

Map Legend

- Wind Farm Site Boundary
- 200m Environmental Designations Buffer
- Article 17 Habitats
- Telecommunication Link Buffers (various scale as per operator request)
- 800m Residential Dwelling Buffer (4x tip height)
- Residential Dwelling
- National Monuments with Zone of Notification
- Protected Structure
- 110kV Overhead line 425m buffer
- 50m Watercourse Buffer
- 50m Lake Buffer
- Viable Area for Turbine Placement

Drawing Title

Environmental Constraints

Project Title

Proposed Ballivor Wind Farm

Drawn By	Checked By
Karen Mulryan	Eoin McCarthy
Project No.	Drawing No.
191137	Figure 3-1
Scale	Date
1:35,000	2023-03-21

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

3.3.4.2.2 *Turbine Layout Iterations*

The final proposed turbine layout takes account of all site constraints and the distances to be maintained between turbines and from houses, roads, etc. The layout is based on a combination of the results of all site investigations and surveys that have been carried out during the EIAR process, the community engagement process and the EIA scoping process with statutory and non-statutory consultees.

As information regarding the Proposed Development site was compiled and assessed, the layout was revised and amended to take account of the physical constraints of the site, the required buffer zones, areas where no turbines could be located, availability of land, and cumulative impacts.

The selection of turbine numbers and layout has also had regard to wind-take, noise and shadow flicker impacts and the separation distance to be maintained between turbines. The EIAR and wind farm design process was an iterative process, where findings at each stage of the assessment were used to further refine the turbine layout, always with the intention of minimising the potential for environmental impacts.

There were a number of reviews by the wind farm design team of the specific locations of turbines during the optimisation of the site layout. The initial constraints study identified a significant viable area within the overall study area. Please refer to Figure 3-2, Figure 3.3, and Figure 3-4 to see the evolution of the turbine layout for the Proposed Development.

35 Turbine and 29 Turbine Layouts - Project Commencement Stage

At the design commencement stage, the wind farm design team produced two alternative turbine layouts. See Table 3-6 for turbine quantities relative to each of the five Ballivor Bog Group bogs. A 35 turbine layout (Figure 3-2) utilising all bogs and maximising the potential viable area and a 29 turbine layout (Figure 3-3) excluding Carranstown Bog. Carranstown Bog was also selected as a potential location for the 110kV substation.

Table 3-6 Turbine Layout for 35 and 29 turbine designs at project commencement stage

Project Commencement Stage Design Options		
Bogs	35 Turbine Layout	29 Turbine Layout
Lisclogher Bog	8 turbines	7 turbines
Lisclogher West Bog	2 turbines	2 turbines
Carranstown Bog	3 turbines	0 turbines
Bracklin Bog	10 turbines	9 turbines
Ballivor bog	12 turbines	11 turbines

The assessment concluded that the 29-turbine layout presented a materially better layout in the context of residential visual amenity. From a visual perspective, the 29-turbine layout was read in two discrete clusters (Lisclogher Bog, Lisclogher West Bog, and Bracklin Bog as one cluster and Ballivor Bog as another cluster) approximately 3.5km apart with connection to the 110kV line at a substation at Carranstown Bog i.e. between both clusters. Based on a high level visual assessment, it was concluded that the omission of turbines 31 to 33 (Carranstown Bog) would have the largest reduction in the potential for visual impact from the surrounding housing clusters.

The omission of turbine no. 30 in Bracklin Bog and turbine no. 34 and 35 will have a reduction in the potential for visual effects however they comply with the 4 times tip height separation distances and did

not add significantly to the potential for surrounding effects due to their ability to blend in with surrounding turbines i.e. they did not present as outliers or distinguishable in the landscape. Please see Chapter 13 Landscape and Visual Impact Assessment for details on Residential Visual Amenity. Please see Figure 3-2 and Figure 3-3 for the 35 turbine and 29 turbine layouts, respectively.

Figure 3-2 Initial 35 Turbine Layout

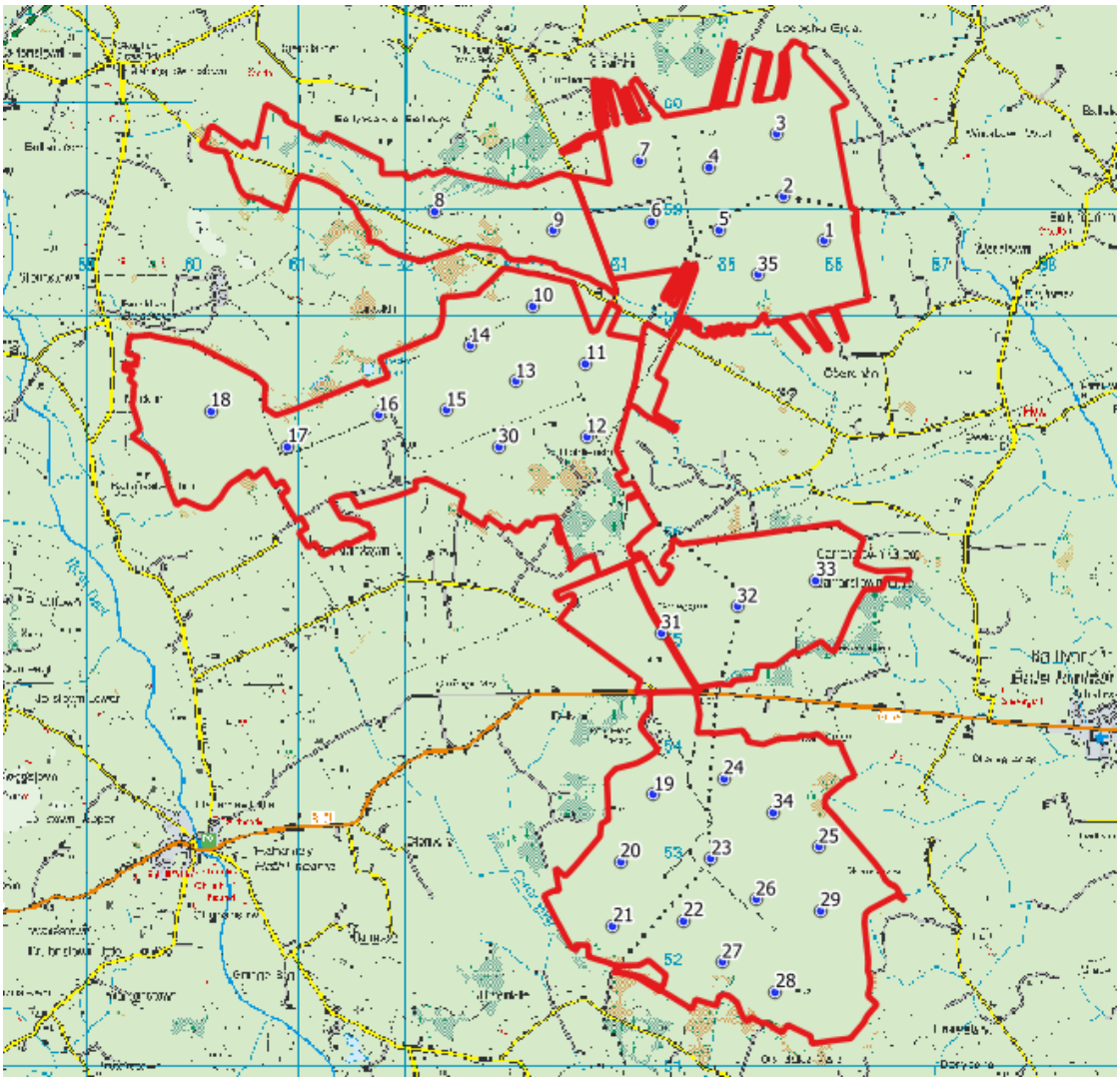
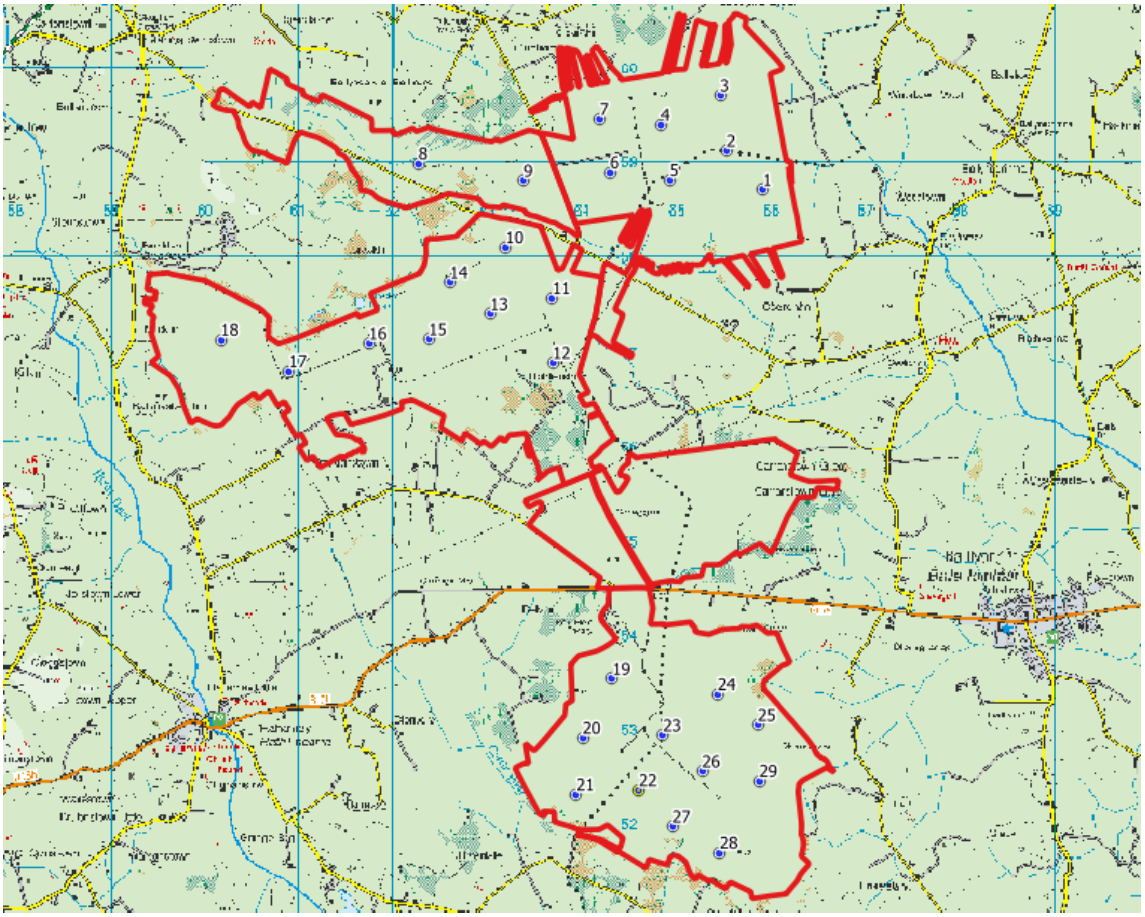


Figure 3-3 29 No. Turbine Layout Options

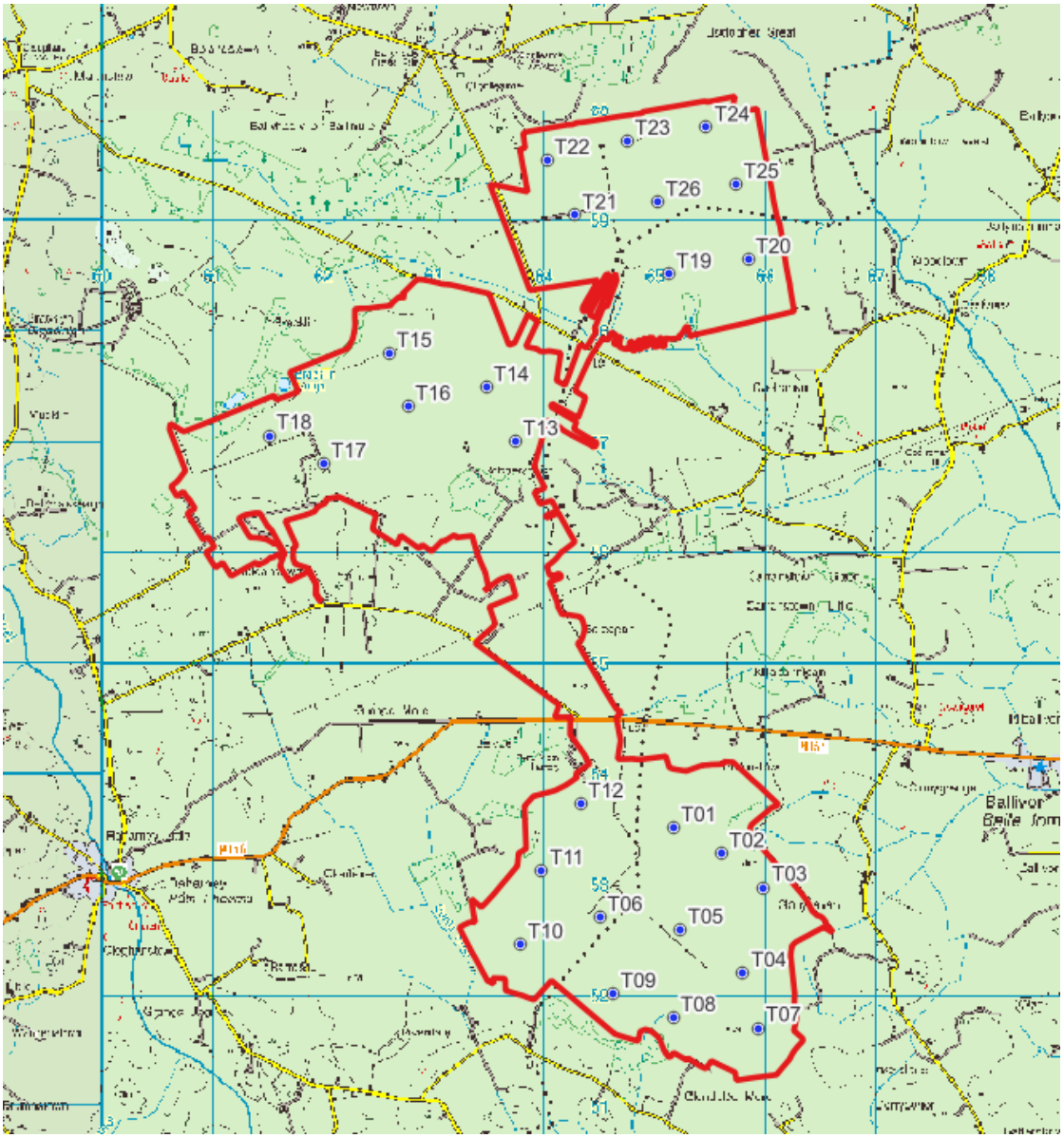


26 Turbine Layout

Further desk-based and environmental surveys, noise and shadow flicker modelling, engagement with local residents and discussions with the proposed adjacent wind farm design team, the 29 turbine design was further scaled down to a 26 turbine layout across 3 no. bogs, Bracklin Bog, Ballivor Bog and Lisclogher Bog. Lisclogher West Bog was completely removed from the project design due to ecological potential as a wetland area.

Following feedback from telecoms operators and the project hydrogeologist, the 26-turbine design was refined further by small movements of selected turbines. Thus, the turbine layout design went through four separate iterations. Please refer to Figure 3-4 for the final turbine locations. The final proposed turbine layout takes account of all site constraints (e.g., ecology, ornithology, hydrology, peat depths, etc.) and design constraints (e.g., setback distance from houses and third-party lands/infrastructure and distances between turbines on-site, etc.). The layout also takes account of the results of all site investigations and baseline assessments that have been carried out during the EIAR process in addition to feedback from ongoing discussions with the local community.

Figure 3-4 Final 26 Turbine Layout



A comparison of the potential environmental effects of initial and first iterations of the turbine layout as compared against the second and final turbine layout are presented in Table 3-7 below.

Table 3-7 Comparison of environmental effects of previous design iterations when compared against the final 26 turbine layout.

Environmental Consideration	Initial Layout (35 no. turbines)	Second Layout (29 no. turbines)	Final Layout (26 no. turbines)
Population & Human Health (incl. Shadow Flicker)	No material environmental difference for population or human health. Potential for increased shadow flicker duration at nearby sensitive receptors.	No material environmental difference for population or human health. Reduced potential for shadow flicker duration for sensitive receptors surrounding Carranstown Bog.	No material environmental difference for population or human health. Reduced potential for shadow flicker duration for sensitive receptors surrounding Carranstown Bog, and Lisclogher West Bog. Reduced potential for cumulative shadow flicker impact (with consented Bracklyn Wind Farm Planning Ref: PA25 M.311565) duration for sensitive receptors surrounding Bracklin Bog.
Biodiversity & Ornithology	Larger development footprint therefore, increase overall habitat loss.	Smaller development footprint would have resulted in reduced habitat loss within the constrained-out area i.e. viable area.	Smaller development footprint resulting in a reduced habitat loss within the constrained-out area i.e. viable area.
Land, Soils & Geology	Larger development footprint would have resulted in larger peat and spoil volumes to be excavated or crushed stone to be extracted for construction.	Smaller development footprint would lead to a reduction in peat and spoil volumes to be excavated and would require less crushed stone to be extracted for construction.	Smaller development footprint which leads to a reduction in peat and spoil volumes to be excavated and less crushed stone requirement to be extracted for construction.
Geotechnical/Peat Stability	Geotechnical investigations followed by careful design would lead to no significant environmental impacts.	Overall, no significant environmental difference.	Overall, no significant environmental difference.
Water (Hydrology and Hydrogeology)	Neutral (the larger area of hard surfaces would still be designed to minimise hydrological impacts).	Neutral (the marginally smaller area of hard surfaces would still be designed to minimise hydrological impacts).	Neutral (the marginally smaller area of hard surfaces would still be designed to minimise hydrological impacts).
Air & Climate	More turbines increase the potential to maximise the use of the site wind resource and the opportunity to further reduce the country's dependence on fossil fuels.	Fewer turbines reduced the potential to maximise the use of the site wind resource and the opportunity to further reduce the country's dependence on fossil fuels.	Fewer turbines reduced the potential to maximise the use of the site wind resource and the opportunity to further reduce the country's dependence on fossil fuels.

Environmental Consideration	Initial Layout (35 no. turbines)	Second Layout (29 no. turbines)	Final Layout (26 no. turbines)
Noise & Vibration	Potential for greater noise impacts due to reduced separation distance between turbines and closest sensitive receptors.	Fewer turbines allow for a larger separation distance between turbines; fewer turbines will generate reduced noise levels; fewer turbines sited 4x tip height from sensitive receptors.	Fewer turbines allow for a larger separation distance between turbines; fewer turbines will generate reduced noise levels; fewer turbines sited 4x tip height from sensitive receptors. Predicted noise levels from the chosen layout indicate that the Proposed Development noise levels fall within best practise noise criteria as recommended in the WEGS 2006.
Landscape & Visual	Potential for greater visual impacts due to the wider visual extent of the proposed turbines.	Potential for lesser visual impacts due to the reduced visual extent of the proposed turbines.	Reduced visual impacts due to the reduced visual extent of the proposed turbines.
Cultural Heritage & Archaeology	No material environmental difference for cultural heritage.	Smaller development footprint would decrease the potential for impacts on unrecorded, subsurface archaeology.	Smaller development footprint decreases the potential for impacts on unrecorded, subsurface archaeology.
Material Assets	No material environmental difference for material assets.	Smaller development footprint would lead to a reduction in construction traffic volumes and traffic impacts across a greater extent of the public road network. Smaller development footprint would require less aggregate material to be brought in from surrounding quarries during construction.	Smaller development footprint results in a reduced construction traffic volume and traffic impact across a greater extent of the public road network. Smaller development footprint would require less aggregate material to be brought in from surrounding quarries during construction.

3.3.4.2.3 *Alternative Road Layout*

Access tracks are required onsite to enable transport of infrastructure and construction materials within the Proposed Development. Such tracks must be of a gradient and width sufficient to allow safe movement of equipment and vehicles. As the turbine layout was finalised, the most suitable routes between each component of the Proposed Development were identified, taking into account the shortest routes and existing access tracks and filtering out the physical and environmental constraints of the site and associated buffers and utilising the most direct route between turbines in order to minimise the footprint.

The site currently includes machine passes used to take previously harvested peat off the bogs via tractor or rail. Due to their current low load bearing capability, these machine passes are not considered suitable for turbine component delivery or the various wind farm construction machinery. Therefore, new roads are required for suitable access to and linkages between the various project elements, and efficient and safe movement of vehicles around the site by applying the required vehicle turning radii. Where possible, the new road network follows the existing machine passes. The road layout was adjusted relative to new turbine locations with each revision of the turbine layout. Furthermore, minor adjustments were made where possible to reduce the number of railway track interactions where the wind farm roads would have to float over the permanent railway tracks. Instead, the roads were realigned to avoid the railway line altogether, where possible, reducing the need to float over railways at 14 locations to 7 locations. Passing bays were designed for selected locations along the internal roads. These bays were located in specific areas to ensure minimum environmental effect by locating the passing bays away from higher value habitat and also in a configuration that facilitates the design of the amenity pathways/cycleways. Finally, amenity paths were added linking the overall wind farm development to the public access points around the site.

Within Bracklin Bog there was one area of the Proposed Development site where there were two potential options considered for an interconnecting wind farm road around an ecological/heritage area which is discussed below.

3.3.4.2.4 *Alternative Access Track Route Options through Bracklin Bog*

Within Bracklin Bog two proposed internal access track options were initially proposed. Option A follows along the existing machine pass through Bracklin Bog and runs west of a cultural heritage site and an ecological area of County Importance. Option B runs adjacent to an existing Bord na Móna railway and runs east of the cultural heritage site and area of ecological County Importance. Through further assessment and environmental surveys, it was determined that Option B had the potential to impact on cutover bog and therefore Option A emerged as the preferred route to limit environmental impacts. A comparison of the potential environmental effects when comparing the Option A to Option B is included in Table 3-8 and illustrated on Figure 3-5 below.

Figure 3-5 Alternative routes around Cultural area of Bracklin Bog. Option A selected.

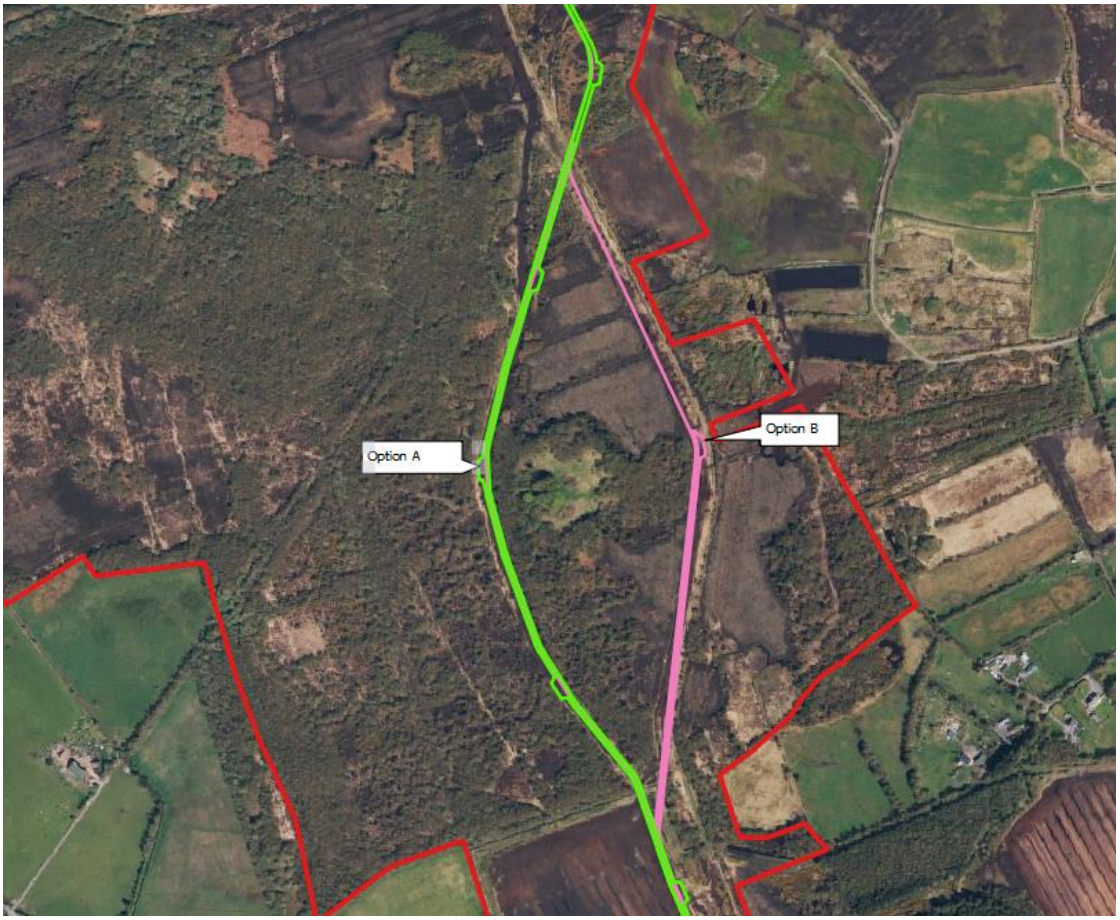


Table 3-8 Comparison of environmental effects on option A and B internal tracks in Brackin Bog

Environmental Consideration	Option A west of Cultural Site (Selected Option)	Option B east of Cultural Site
Population & Human Health (incl. Shadow Flicker)	Potential for vehicular, noise and dust emissions due to road construction and use throughout construction phase.	Potential for vehicular, noise and dust emissions due to road construction and use throughout construction phase.
Biodiversity & Ornithology	Habitat loss of low ecological value (bare peat, scrub, dry heath and poor fen)	Habitat loss, potential to impact on higher value habitats (raised bog, riparian areas), and habitats of lower ecological value (bare peat, scrub, dry heath and poor fen).
Land, Soils & Geology	Similarly-sized footprint, no material difference.	Similarly-sized footprint, no material difference.
Geotechnical	Similarly-sized footprint, no material difference.	Similarly-sized footprint, no material difference.
Water	Neutral (drainage design).	Neutral (drainage design).
Air & Climate	Potential for vehicular, noise and dust emissions due to road construction and use throughout construction phase.	Potential for vehicular, noise and dust emissions due to road construction and use throughout construction phase.

Environmental Consideration	Option A west of Cultural Site (Selected Option)	Option B east of Cultural Site
Noise & Vibration	Potential for vehicular noise emissions due to road construction and use throughout construction phase.	Potential for vehicular noise emissions due to road construction and use throughout construction phase.
Landscape & Visual	Similarly-sized footprint, both routes screened by vegetation, no material difference.	Similarly-sized footprint, both routes screened by vegetation, no material difference
Cultural Heritage & Archaeology	Similarly-sized footprint, similar potential for impacts on unrecorded, subsurface archaeology.	Similarly-sized footprint, similar potential for impacts on unrecorded, subsurface archaeology.
Material Assets	Similarly-sized footprint, no material difference.	Similarly-sized footprint, no material difference.

3.3.4.3 Alternative Electricity Substation Locations and Grid Connection

As the Mullingar to Corduff 110kV overhead line traverse the site at Carranstown Bog, it was decided from the onset, that the proposed 110kV substation would be sited within this Bog in order to connect into the existing grid infrastructure and thereby negating the need to utilise the public road network for grid connection works. As the overhead line crosses the Bog in a northeast to southwest orientation, the northwest corner of the Bog was initially selected as the most suitable location for the proposed substation. Three location options for the proposed substation were selected, Option A, Option B and Option C.

- Option A is located in the northwest of Carranstown Bog, under the existing Mullingar to Corduff 110kV overhead line. Construction access to Option A was initially proposed via a local road which runs along the western boundary of Carranstown Bog. An internal road would be constructed from this local road into the substation. This access would be maintained during the operational phase for Eirgrid access only. Following further assessment, this access option was removed due to road upgrade requirements and the potential for noise, dust and traffic impacts on local road users and nearby residential receptors. Access to the substation for the construction and operation phase will be via the proposed internal wind farm tracks. Due to its location under the existing overhead line, minimal additional ground disturbance and overhead line is required.
- Option B is located southwest of Option A in Carranstown Bog, approx. 200m south of the existing Mullingar to Corduff 110kV overhead line. Construction and operational access to Option B is via proposed internal wind farm tracks. Additional ground disturbance and grid connecting infrastructure including overhead lines would be required to connect this substation to the national grid.
- Option C is located in the southwest of Carranstown Bog, approx. 800m south of the existing Mullingar to Corduff 110kV overhead line. Construction and operational access to Option B is via proposed internal wind farm tracks. Additional ground disturbance and grid connecting infrastructure including overhead lines would be required to connect this substation to the national grid.

A comparison of the potential environmental effects of constructing substations at the various locations marked on Figure 3-6 is presented after Table 3-9 below.

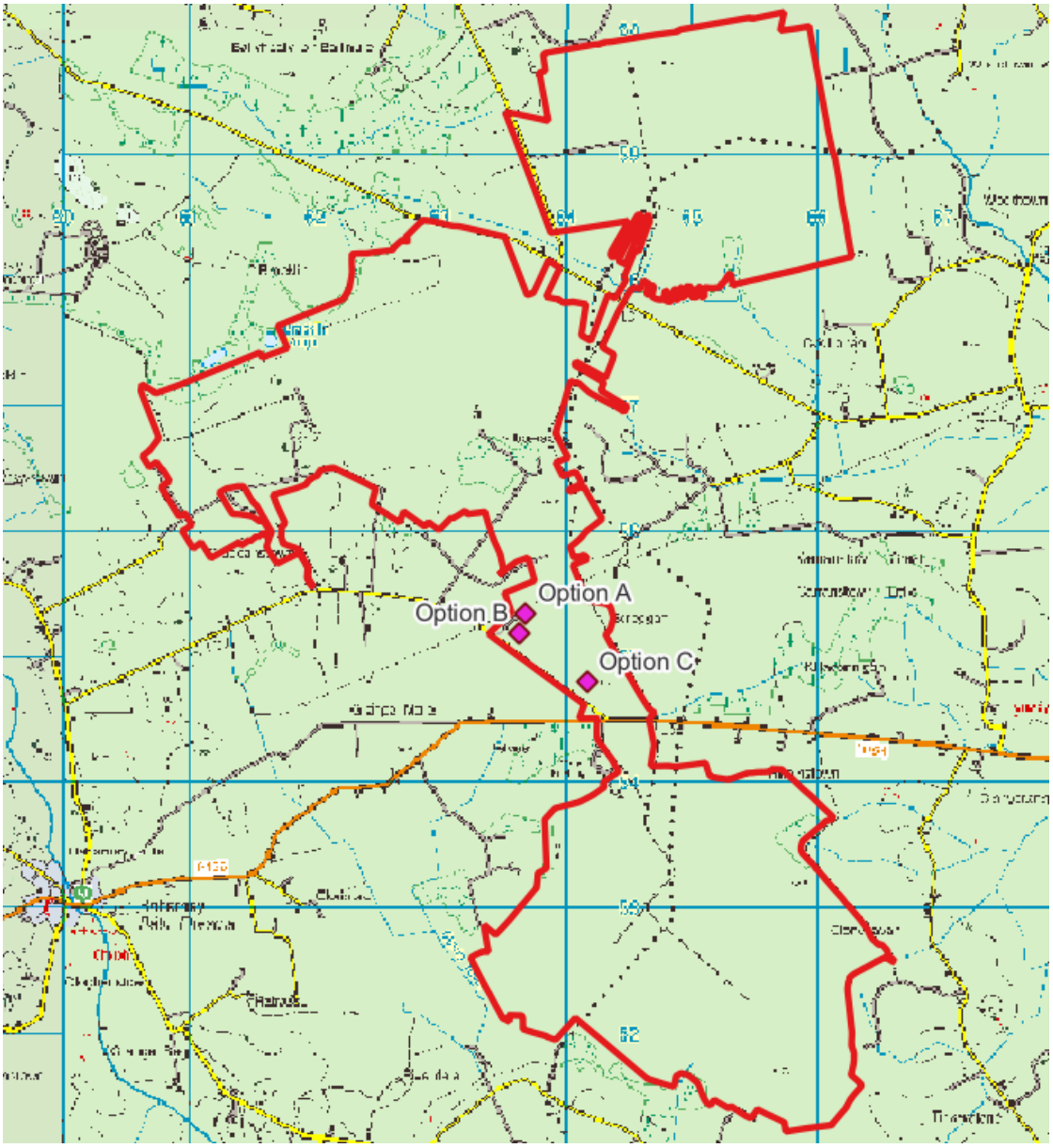
Table 3-9 Comparison of environmental effects on all Substation Location options

Environmental Consideration	Option A (Selected)	Option B	Option C
Population & Human Health (incl. Shadow Flicker)	Potential for vehicular and dust emissions from traffic movements during construction phase, which could have adverse health effects. Removal of access to substation A from local road west of Carranstown in final design has removed the potential for dust, noise and traffic impacts on local road users and nearby residential receptors during the buildout phase	Potential for vehicular and dust emissions from traffic movements during construction phase, which could have adverse health effects.	Potential for increased vehicular and dust emissions from increased traffic movements within the site, due additional grid connection footprint construction, which could have adverse health effects.
Biodiversity & Ornithology	One pair of lattice loop in/loop out masts required to connect the existing 110kV overhead line to the selected substation location via approximately 19m connecting overhead line. This has a reduced habitat loss and a reduced potential for bird collision risk	Two or more pairs of lattice loop in/loop out masts would be required to connect the existing 110kV overhead line to this proposed substation location via approximately 230m connecting overhead line. This is a greater habitat loss and has a greater potential for bird collision risk	Several pairs of lattice loop in/loop out masts would be required to connect the existing 110kV overhead line to this proposed substation location via approximately 800m connecting overhead line. This is a greater habitat loss and has a greater potential for bird collision risk
Land, Soils & Geology	One pair of lattice loop in/loop out masts is required to support the connection of the existing 110kV overhead line to this substation requiring a smaller footprint, generating the smallest volume of peat and spoil for grid connection build out period.	Two or more pairs of lattice loop in/loop out masts would be required to connect the existing 110kV overhead line to this proposed substation requiring a larger footprint, generating a greater volume of peat and spoil for grid connection build out period.	Several pairs of lattice loop in/loop out masts would be required to connect the existing 110kV overhead line to this proposed substation requiring a largest footprint, generating a greatest volume of peat and spoil for grid connection build out period
Geotechnical/Peat Stability	No impact on borrow pit locations or potential volumes to be won on site.	No impact on borrow pit locations or potential volumes to be won on site.	Located in area of Borrow pit no. 1. This may be a potential impact on materials that can be sourced from this location as this borrow pit would likely have to be decreased in scale to accommodate substation footprint.

Environmental Consideration	Option A (Selected)	Option B	Option C
Water (Hydrology & Hydrogeology)	Neutral (drainage design).	Neutral (drainage design).	Neutral (drainage design).
Air & Climate	Proposed substation is under an existing overhead line- which reduces the grid connection construction build out period and infrastructure/footprint and reduces dust generation and emissions as vehicles are onsite for the shorter grid connection construction period. Location of substation adjacent to vegetation screening acts as a dust guard between nearby receptors, and the construction activities helping to minimise impacts	Proposed substation is further away from an existing overhead line- requiring further grid connecting infrastructure/footprint, a longer grid connection build out period and more dust generation and emissions due to vehicles onsite for longer. Location of substation is further away from vegetation screening so its ability to act as a dust guard between nearby receptors, and the construction activities is reduced.	Proposed substation is furthest away from an existing overhead line- requiring further grid connecting infrastructure/footprint, a longer grid connection build out period and more dust generation and emissions due to vehicles onsite for longer. Location of substation furthest away from vegetation screening therefore no potential containing dust emissions. However, substation is furthest away from residential receptors.
Noise & Vibration	Less grid connecting infrastructure is required so this phase is reduced resulting in reduced noise impacts. The substation location is closest to residential receptors, however, the impact assessment has concluded noise emissions will be inaudible at this location. Removal of substation access from local road has eliminated potential for noise, traffic, dust and vehicular emissions for road and residential receptors.	More grid connecting infrastructure is required so this phase is increased resulting in increased noise impacts.	More grid connecting infrastructure is required so this phase is increased resulting in increased noise impacts.
Landscape & Visual	Location is screened by adjacent vegetation- the closer the vegetation to the structure, the more screened it is from nearby receptors. Reduced potential for visual impact with just one pair of lattice loop in/loop out masts and 19m of overhead line required to connect the existing 110kV overhead line	Location is screened by adjacent vegetation- the closer the vegetation to the structure, the more screened it is from nearby receptors. Greater potential for visual impact with more than one pair of lattice loop in/loop out masts and 230m of overhead line required to connect the	Location is more visually exposed to the surrounding residential dwellings as this substation option location is further inside the bog and therefore may be more visible to receptors than infrastructure located adjacent to screening. Greater potential for visual impact with several pairs of

Environmental Consideration	Option A (Selected)	Option B	Option C
	to the selected substation location	existing 110kV overhead line to the substation location	lattice loop in/loop out masts and 800m of overhead line required to connect the existing 110kV overhead line to the substation location
Cultural Heritage & Archaeology	Potential to impact on unknown subsurface archaeology. Less potential to impact on unknown subsurface archaeology during grid connection build out phase due to smallest footprint requirements.	Potential to impact on unknown subsurface archaeology. Slightly greater potential to impact on unknown subsurface archaeology during grid connection build out phase due to larger grid connection footprint requirements	Potential to impact on unknown subsurface archaeology. Greater potential to impact on unknown subsurface archaeology during grid connection build out phase due to largest grid connection footprint requirements
Material Assets	More efficient construction practise as overhead line crosses this area. Removal of substation access from local road has eliminated requirement for local road upgrades which would have had potential to impact on local road users and traffic flow.	More efficient construction practise as overhead line crosses this area.	Less efficient construction practises as additional underground or overhead electrical works would be needed.

Figure 3-6 110kV onsite Substation Location Options



It is noted that while the operational lifespan of the Proposed Development is expected to be 30 years (following which they may be replaced or decommissioned) the electricity substation and associated infrastructure will become an ESB asset and will be required to become a permanent feature as it will be required to continue to form part of the electrical infrastructure of the area in the event of the remainder of the site being decommissioned.

3.3.4.4 Alternative Met Mast Locations

The initial design included for three proposed meteorological masts located in Lisclogher Bog, Bracklin Bog and Ballivor Bog, each at a height of 140m. Free standing masts (e.g. no guy wires) were chosen as they have less potential impact on birds. Upon further consultation with Eirgrid it was confirmed that two met masts at Ballivor and Bracklin alone would capture the required data for the entire project. As such, the proposed mast in Lisclogher Bog was considered redundant and therefore no longer brought forward. Furthermore, further analysis confirmed that the lower mast height of 115m was the optimal height to capture the necessary wind data. Therefore, the final design incorporates two met masts at a 115m height located at Bracklin and Ballivor Bogs. As the proposed masts in the final design are smaller and fewer in

number, they therefore have a reduced environmental impact as a smaller habitat loss at the mast bases will occur, less excavation material will be generated, and less construction material will be required. Given the smaller height of the 115m masts, a reduced visual impact is also anticipated.

A comparison of the potential environmental effects of constructing three larger met masts in comparison to two smaller masts is presented in Table 3-10 and their locations are illustrated on Figure 3-7 below.

Table 3-10 Comparison of environmental effects on meteorological mast scale and quantity

Environmental Consideration	Three 140m Met Masts	Two 115m Met Masts (Selected)
Population & Human Health (incl. Shadow Flicker)	Potential for vehicular and dust emissions from increased traffic movements during construction phase, which could have adverse health effects.	Potential for vehicular and dust emissions from decreased traffic movements during construction phase, due to omission of mast from Lisclogher Bog, reduced materials required, and reduced excavation required which could have adverse health effects.
Biodiversity & Ornithology	Increased habitat loss due to larger footprint of met masts and greater quantity. Increased height increases potential bird collision risk.	Reduced habitat loss due to smaller footprint of met masts and reduced quantity. Reduced height reduced potential bird collision risk.
Land, Soils & Geology	Greater excavation required, increased peat and spoil volumes to be managed.	Reduced excavation required, reduced peat and spoil volumes to be managed.
Geotechnical/ Peat Stability	Increased risk to peat instability due to larger footprint and larger area of excavation required.	Decreased risk to peat instability due to smaller footprint and smaller area of excavation required.
Water (Hydrology & Hydrogeology)	Neutral (drainage design).	Neutral (drainage design).
Air & Climate	Greater dust emissions due to longer build out period as an additional met mast and road leading to it would be constructed.	Lesser dust emissions due to shorter build out period as fewer met masts will be erected.
Noise & Vibration	Potential for increased noise impact duration during construction phase as more roads would be required to reach the met mast, more vehicle movements required.	Potential for decreased noise impact duration during construction phase as less road and materials would be required, therefore less vehicle movements would be needed.
Landscape & Visual	Taller met masts and greater quantity- more visually intrusive.	Considerably lower masts and fewer in number therefore less of a visual impact.
Cultural Heritage & Archaeology	Greater potential to impact on unknown subsurface archaeology.	Lesser potential to impact on unknown subsurface archaeology.

Environmental Consideration	Three 140m Met Masts	Two 115m Met Masts (Selected)
Material Assets	Less efficient to have larger and excessive infrastructure to provide the same function. Similar maintenance requirements.	Smaller and fewer met masts provide the same function is more efficient. similar maintenance requirements.

Figure 3-7 Met Mast Options: Location 1 Ballivor Bog (selected), Location 2 Bracklin Bog (selected), Location 3 Lisclogher Bog (removed).

3.3.4.5 Alternative Locations for Temporary Infrastructure

The supporting temporary infrastructure required for the Proposed Development include temporary construction compounds, temporary security cabins and temporary borrow pits.

3.3.4.5.1 *Construction Compounds*

The four construction compounds will be used during the construction phase for the storage of all construction materials and turbine components. The construction compounds are interspersed at four

locations within the site and are accessed off either existing road entrances to the Proposed Development site, existing internal road infrastructure at the Ballivor Works or via an internal site roads that will be constructed. The use of multiple temporary construction compounds was deemed preferable to the alternative of a single large compound in the centre of the site for a number of reasons. Principally, it will facilitate more efficient construction practices and will result in shorter distances for traffic movements within the site during construction. As a result, vehicle emissions and the potential for dust arisings will be reduced.

A comparison of the potential environmental effects of constructing a single, large construction compound when compared against constructing multiple, smaller compounds is presented in Table 3-11 below.

Table 3-11 environmental effects of one large compound when compared against the chosen option (multiple construction compounds)

Environmental Consideration	Single Large Construction Compound	4 no. smaller construction compounds
Population & Human Health (incl. Shadow Flicker)	Potential for increased vehicular and dust emissions from longer distance of traffic movements within the site which could have adverse health effects.	Shorter distances for site workers to travel around the site, greater option to walk short distances from a compound to a required area due to welfare, office facilities and carparks nearby.
Biodiversity & Ornithology	Short term habitat loss in large area.	Smaller segments of temporary habitat loss across the site would be unlikely to have as much of an impact as the removal one large area.
Land, Soils & Geology	Inefficiencies in managing one large volume of peat and spoil material in one single location.	More efficient to deal with smaller volumes of peat and spoil at a time across a large site.
Geotechnical/ Peat Stability	One larger area of excavation may increase instability in an area.	Smaller compounds would have less instability risk due to the smaller footprint required.
Water (Hydrology & Hydrogeology)	Neutral as the drainage design removes the potential for environmental effects. The drainage design is the same regardless of number or size of compounds-it is scaled up or down depending on the size of the compound.	Neutral as the drainage design removes the potential for environmental effects. The drainage design is the same regardless of number or size of compounds-it is scaled up or down depending on the size of the compound.
Air & Climate	Potential for increased vehicular and dust emissions from longer distance of traffic movements within the site.	Potential for fewer noise and dust emissions as shorter journeys are required. Facilitates walking between areas for site workers as facilities are nearby.
Noise & Vibration	Potential for increased noise impacts on nearby sensitive receptors due to longer distance of traffic movements within the site.	Potential for reduced noise impacts on nearby sensitive receptors due to shorter distance of traffic movements within the site.
Landscape & Visual	One large compound may be visually intrusive (on a temporary basis).	Several small compounds may be more visually inconspicuous (on a

		temporary basis) due to the presence of boundary vegetation throughout.
Cultural Heritage & Archaeology	May impact on unknown subsurface archaeology.	May impact on unknown subsurface archaeology.
Material Assets	Less efficient construction practices due to longer movements of construction vehicles, plant and materials within the site.	More efficient construction practises due to shorter vehicle movements throughout the site. Safer practices due to carparks, site offices and welfare facilities near staff at all times.

3.3.4.5.2 *Construction Phase Borrow Pits*

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

A review of potential construction phase borrow pit locations was carried out in consultation with internal Bord na Móna personnel with input from field studies and external geotechnical experts who were familiar with the site. Existing GIS data and site constraints were also considered, namely aerial photography, peat depths, biodiversity, on site drainage, proximity to the proposed internal road network, and proximity to sensitive receptors.

Arising from this process, 15 test pit locations were identified across the bogs and in adjacent third party lands at which geological site investigations were carried out to determine their potential suitability for borrow pit use. The findings of the geological site investigations concluded that there were 3 no. potential borrow pits within the Bord na Móna landholdings; Borrow Pit no. 1a and no. 1b in Carranstown Bog, separated by a proposed wind farm track, Borrow Pit no. 2 within the townland of Craddanstown, adjacent to Applicant's landholding, and Borrow Pit no. 3 in Ballivor Bog at the south of the Wind Farm Site Boundary. Landownership agreements for the use of the Craddanstown borrow pit are in place. Please see Appendix 2-3 which contains the Landowner Agreements for the Proposed Development and Figure 3-8 below which shows the location of all 3 initially proposed borrow pit locations.

After further investigations and volume calculations, and discussions with surrounding landowners, it was determined that Borrow pit no. 3 in Ballivor Bog would not be carried forward to planning due to the lack of suitable access/egress onto surrounding local roads, its considerable distance from the other bogs and the overall low yield of materials it would have provided.

Figure 3-8 Proposed Borrow Pit Locations. Location 1a and 1b in Carranstown Bog (selected), Location 2 in third party land (selected), Location 3 Ballivor Bog (not selected)

While a certain volume of more durable, crushed stone for the finished surface layer of site roads and hardstanding areas will be sourced from fully authorised, local quarries (identified in Chapter 4), an alternative to using an on-site borrow pit was the option of sourcing of all stone and hardcore materials from a licensed quarry or quarries in the vicinity of the site. The movement of the volume of material required for the construction of a 26-no. turbine wind farm would result in a large temporary increase in construction traffic and heavy loads, in combination with a potential for an increase in noise and dust emissions along the haul routes and was therefore considered a less preferable option. The cost of importing the required volume of crushed stone was also a factor in choosing to obtain stone from an on-site borrow pit.

A comparison of the potential environmental effects when comparing the sourcing of stone from local, off-site quarries when compared against the chosen option (on-site borrow pits) is included below in Table 3-12.

Table 3-12 Comparison of environmental effects when comparing sourcing all materials offsite against the selected option

Environmental Consideration	Sourcing all stone from local, off-site quarries	Sourcing material onsite (where possible) - Selected Option
Population & Human Health (incl. Shadow Flicker)	Potential for increased vehicular, noise and dust emissions at road receptors from traffic movements on local roads, due to the volume of rock to be transported along the public road network to the site, which could be a nuisance to local residents along the haul route.	Potential for decreased vehicular, noise and dust emissions due to fewer traffic movements, as materials are sourced (where possible) from within the site.
Biodiversity & Ornithology	Decrease in habitat loss as there would be no on-site borrow pit.	Increase in habitat loss due to borrow pits footprint .
Land, Soils & Geology	Slight reduction in peat and spoil to be excavated. Additional peat landscaping would be required if no onsite borrow pits were available to deposit excavated peat and spoil.	Slight increase in peat and spoil to be excavated but this will be offset by peat and spoil storage in borrow pits in addition to peat and spoil landscaping.
Geotechnical	Neutral- Peat and spoil materials excavated will be landscaped across the site in designated areas.	Neutral- excess peat and spoil excavated from borrow pits will be deposited in borrow pits and/or landscaped in designated areas.
Water	Increased potential for silt laden runoff to enter watercourses due to additional landscaping of peat and spoil required within the site.	Decreased potential for silt laden runoff to enter watercourses due to decreased landscaping of peat and spoil required within the site.
Air & Climate	Potential for increase in dust and emissions from quarry trucks for residential receptors along the quarry haul routes due to an increased number of vehicular movements to and from the site.	Potential for increased dust and emissions at sensitive receptors near Borrow Pit 2 due to increased traffic movements in this area in the early stages of the construction phase until the roads connecting this borrow pit to the Bracklin Bog are complete. Distance of Borrow Pit 1a and 1b from residential receptors and screening by boundary vegetation would suppress dust emissions from these borrow pits.
Noise & Vibration	Reduced potential for noise and vibration effects on local sensitive receptors as no large-scale rock breaking or blasting required within the site. Increased potential for noise and vibration effects on sensitive receptors along haul routes due to volume of traffic required to transport the volume of crushed stone needed for the construction of the proposed development.	Increased potential for noise and vibration effects on local sensitive receptors due to large-scale rock breaking required within the site. Decreased potential for noise and vibration effects on sensitive receptors along haul routes as reduced volumes of materials will be transported from offsite quarries.
Landscape & Visual	Decreased (temporary / short-term) visual impact due to fewer HGVs on site	Increased (temporary / short-term) visual impact due to HGVs on site.

Cultural Heritage & Archaeology	Slightly smaller development footprint would reduce the potential for impacts on unrecorded, subsurface archaeology.	Slightly larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.
Material Assets	Higher traffic volumes on the public road network during construction phase due to the volume of crushed stone required to be transported to the site.	Lower traffic volumes on the public road network during construction phase due to the volume of materials sourced on site.

3.3.4.5.3 *Alternative Access routes from the Craddanstown Borrow Pit (Borrow Pit no. 2)*

At the commencement of the construction phase, access to Borrow Pit no. 2 in third party pastureland in the townland of Craddanstown will be via an existing farmyard entrance. Works will commence to lay an access track from the borrow pit area directly into Bracklin Bog. Once the internal access track is completed and the borrow pit is operational, for the reminder of the construction phase, access and egress to/from Borrow Pit no. 2 will be mainly via this access track. The only requirement to use the local road infrastructure to get to Borrow Pit no. 2 will be for staff access and plant refuelling (e.g. non-HGV movements) until Borrow Pit no. 2 is linked with the internal wind farm access tracks. Thereafter this site entrance will only be used for construction worker access at the beginning and end of each day.

Three proposed access tracks from Bracklin Bog to Borrow Pit no. 2 were studied as part of the design process, as shown in Figure 3-9. Option A included culverting an existing drain through a small area of bog over which a floating road from the borrow pit to the existing local road to the north was proposed. Option B and Option C both proposed laying temporary new roads from the borrow pit through additional third-party pastureland to the existing local road. However, due to difficulty acquiring third party landowner agreements, Option B and Option C were no longer viable options.

Option A which predominantly involves works within the Applicants folio was selected. A small portion of Option A falls within the same third party land as the Craddanstown borrow pit No.2 and therefore an agreement for this additional piece of land was achieved. Please see Appendix 2-3 for landowner agreements.

Approximately 0.035 hectares of tree removal and 200m of hedgerow will be required to be removed to gain access the borrow pit location. Once the extraction period is complete, this area will be reinstated, and the hedgerows and trees will be replanted with the same species.

Figure 3-9 Three proposed access options from Borrow Pit No. 3. Option A selected

3.3.5 Alternative Delivery Routes and Access options for Turbine Components

This section discusses the options considered for turbine component delivery to the Proposed Development site, the options considered for the construction phase site entrances and the options considered for the operational phase for maintenance and amenity use.

3.3.5.1 Alternative Component Delivery Routes

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

3.3.5.1.1 *Alternative Ports of Entry*

The alternatives considered for the port of entry of wind turbine components into Ireland for the Proposed Development include Shannon-Foynes Port, County Limerick and the Port of Galway. Shannon Foynes Port is the principal deepwater facility on the Shannon Estuary and caters for dry bulk, break bulk, liquid, and project cargoes. The Port of Galway also offers a roll-on roll-off procedure to facilitate import of wind turbine components. Both ports and indeed others in the state (including Cork and Dublin), have been used for the importing of turbine components. The final selection of the port of entry will made prior to the commencement of construction. As stated, all four ports have a proven track record in the handling and subsequent transport of large turbine components. The final selection will be driven by commercial, availability and scheduling considerations. There are clear access routes for all four ports utilising the motorway network to the proposed haul route to the site.

3.3.5.1.2 Alternative Turbine Delivery Routes

For turbine transport, cognisance was taken of the haul routes used for other wind farm developments in the Midlands in addition to the general preference to primarily use National and Regional roads where possible with minimal requirements for junction accommodation works. This approach was deemed preferable to using local roads to minimise significant upgrade works to local roads and associated environmental effects.

Three potential transport routes were identified for turbine component delivery to the site as follows:

- **Option A**: utilising the M3 from Dublin, exiting at Junction 6 on to the R125 before turning northwest onto the R154 Trim Road. The route enters Trim town and roundabout at the R154/160 junction, the route turns south onto the R160 continuing for approximately 6.6km where it meets the R156. Option A continues west-northwest for approximately 12.6km along the R156 through Ballivor Village before reaching the main site entrance on the R156.
- **Option B:** utilising the M4/N4 from Dublin, existing at Junction 16 on the Mullingar Bypass heading northeast onto the N52 for 15.3km before turning southeast onto the L1504 road. It continues southeast for approximately 780m before cutting through a Dumpers Yard out onto a local unnamed road before continuing south for 2.3km to the proposed new site entrance at Bracklin Bog.
- **Option C**: this option follows the majority of the Option A route. However, approximately 130m before the roundabout at the R154/160 junction, it verges west along a 'cul de sac' road terminated by line of bollards and pedestrian railing that separate it from the R160. The proposed haul route will temporarily remove these items, cross the R160 onto the R161/St Patricks Rd, and continue west-southwest along the R161 for approximately 8km until it turns northwest onto the R156. From here it continues west-northwest along this road for approximately 11km, through Ballivor Village before reaching the main site entrance on the R156.

Due to the difficulties in acquiring third party agreements along Option B, this route was not considered further.

As assessment of the remaining two options was undertaken taking into account criteria such as third-party land take (see below), road upgrade requirements (not required) and the associated environmental effects (Table 3-13). Additionally, the assessment of the most suitable delivery routes was conducted in parallel with the assessment of potential site entrances discussed in the following section.

Third Party Landtake requirement of the two component delivery route options:

Option A:

1. Junction at the R154/160 roundabout in Trim town, Co. Meath: It was proposed to temporarily remove a segment of wall and adjacent trees at the northwest side of the roundabout followed by the temporary stoning up of these areas to facilitate turning of delivery vehicles carrying turbine components and other abnormal loads, from the R154 south onto the R160. Further accommodating works in the form of treeline removal/trimming and stoning up of a portion of the Norman Pratt Park on the southeast side of the roundabout to facilitate turning of delivery vehicles carrying turbine components and other abnormal loads, from the R154 south onto the R160. These works fall within the River Boyne and River Blackwater Special Area of Conservation (SAC) and Special Protection Area (SPA). The total area works area required within the SAC/SPA measured approximately 650m^2. The proposal included for the wall to be reinstated, and the area reseeded once all abnormal loads have reached the site.
2. Junction between the R156 and the R160 approximately 6.4km southwest of Trim: The junction accommodation works would have comprised the road-widening within third-

party land in order to facilitate turning of delivery vehicles carrying turbine components and other abnormal loads, from the R160 onto the R156 as well as the provision of off-road parking and storage facilities. The proposed landtake measured approximately 5,900m^2.

3. East of Ballivor Village on the R156: Accommodating works will be required on the R156 approximately 3.6km east of Ballivor Village. Here, road-widening within third-party land will be required in order to facilitate turning west of delivery vehicles carrying turbine components and other abnormal loads, toward Ballivor Village on the R156. The land take will also provide off-road parking and storage facilities. The proposed accommodation works area on the road will measure 1,809m^2 and the area of land take for the proposed parking and storage facilities will measure 6,770m^2.

Option C:

1. Junction between the R156 and the R161 approximately 6.5km southwest of Trim: The junction accommodation works will comprise the road-widening within third-party land in order to facilitate turning of delivery vehicles carrying turbine components and other abnormal loads, from the R161 onto the R156 as well as the provision of off-road parking and storage facilities. The proposed widening will measure 3,751m^2 and the area of land take for the proposed parking and storage facilities measure 5,375 m^2
2. East of Ballivor Village on the R156: Accommodating works will be required on the R156 approximately 3.6km east of Ballivor Village. Here, road-widening within third-party land will be required in order to facilitate turning west of delivery vehicles carrying turbine components and other abnormal loads, toward Ballivor Village on the R156. The land take will also provide off-road parking and storage facilities. The proposed accommodation works area on the road will measure 1,809m^2 and the area of land take for the proposed parking and storage facilities will measure 6,770m^2.

Table 3-13 Comparison of environmental effects when comparing turbine delivery route options.

Environmental Consideration	Option A	Option C
Population & Human Health (incl. Shadow Flicker)	Potential for higher vehicular, noise and dust emissions at road receptors from traffic movements due to additional manoeuvres required to make turn at R154/R160 roundabout. Movements will be undertaken at night with garda escort and an agreed Traffic Management Plan with Meath. Co. Council.	Potential for vehicular, noise and dust emissions at road receptors from traffic movements. Movements will be undertaken at night with garda escort and an agreed Traffic Management Plan with Meath. Co. Council
Biodiversity & Ornithology	Requirement to temporarily remove and trim boundary trees and vegetation of along the River Boyne Special Area of Conservation /Special Protection Area to facilitate abnormal load manoeuvres. Requirement to temporarily remove habitats of low ecological value (Improved agricultural grassland, Recolonising bare ground, and Dry meadows and grassy verges, Treelines and Hedgerow), to facilitate abnormal load manoeuvres, provision of offroad parking and storage facilities	Requirement to temporarily remove habitats of low ecological value (Improved agricultural grassland, Recolonising bare ground, and Dry meadows and grassy verges, Treelines and Hedgerow), to facilitate abnormal load manoeuvres, provision of offroad parking and storage facilities

Environmental Consideration	Option A	Option C
Land, Soils & Geology	Requirement to remove topsoil to facilitate the stoning up of areas for vehicle and component set down as	Requirement to remove topsoil to facilitate the stoning up of areas for vehicle and component set down
Geotechnical/Peat Stability	Due to the temporary removal of topsoil only, potential for peat instability is negligible	Due to the temporary removal of topsoil only, potential for peat instability is negligible
Hydrology & Hydrogeology	No impacts foreseen due to temporary removal of topsoil and boundary vegetation	No impacts foreseen due to temporary removal of topsoil and boundary vegetation
Air & Climate	Greater potential for dust and emissions from turbine delivery vehicles due to several vehicular manoeuvres required to navigate the R145/R160 roundabout. Potential for dust and emissions from plant required to removal topsoil, trim vegetation and delivery aggregate to provide set down areas.	Potential for dust and emissions from turbine delivery vehicles and from plant required to removal topsoil, trim vegetation and delivery aggregate to provide set down areas.
Noise & Vibration	Potential for noise effects on sensitive receptors along haul routes. However, deliveries will be undertaken at night when general traffic volumes/noise is minimal. Potential for noise and vibration effects on sensitive receptors along haul routes from plant required to removal topsoil, trim vegetation and delivery aggregate to provide set down areas.	Potential for noise effects on sensitive receptors along haul routes. However, deliveries will be undertaken at night when general traffic volumes/noise is minimal. Potential for noise and vibration effects on sensitive receptors along haul routes from plant required to removal topsoil, trim vegetation and delivery aggregate to provide set down areas.
Landscape & Visual	Temporary but slight visual impact due to removal of vegetation and stoning up of accommodating areas along the haul route. Potential for visual impact due to temporary removal/trimming of mature trees along the River Boyne SAC/SPA.	Temporary but slight visual impact due to removal of vegetation and stoning up of accommodating areas along the haul route.
Cultural Heritage & Archaeology	No recorded monuments or protected structures present at haul route accommodation works areas will be impacted. Mitigation regarding monitoring of all ground works will be implemented.	Neutral- no recorded monuments or protected structures present at haul route accommodation works areas will be impacted. Mitigation regarding monitoring of all ground works will be implemented.
Material Assets	Higher traffic volumes on the public road network during construction phase due 3 areas (1 urban, 2 rural) requiring topsoil removal/vegetation removal and aggregate delivery to form set down/parking facilities.	Lower traffic volumes on the public road network during construction phase due 2 areas (both rural) requiring topsoil removal and aggregate delivery to form set down/parking facilities.

As Option A required temporary works in the River Boyne SAC/SPA which created additional potential ecological, ornithological and visual impacts, and generated additional noise and air emissions, the preferred and selected option for component delivery is Option C.

The temporary accommodating works required to facilitate delivery of the proposed Ballivor Wind Farm turbines are assessed in this EIAR in section 14.1 of Chapter 14 Material Assets: Traffic and Transport. The turbine transport route will utilise the national and primary roads available to ensure the road network holds the capacity to manage large abnormal loads.

3.3.5.1.3 *Alternative Site Entrance Options for Turbine Component Delivery*

Arising from past peat extraction activities on site, there are a number of existing access points to the Proposed Development site. These comprise a mixture of machine and rail entrances. An initial review of all existing locations was carried out to identify the most suitable locations for wind farm construction and operation site entrances. Following the review, a number of potential site entrance points were identified and considered for their suitability for the successful delivery of turbine components- abnormal loads. The locations identified are discussed in the following paragraphs. It should be noted that all component deliveries (abnormal loads) will be undertaken as described in the Traffic Management Plan which will be submitted and agreed with the local authorities and roads authorities upon consent of this application. All component deliveries will be subject to garda escort. All manoeuvres around junctions and into site entrances will be supervised by a qualified team of turbine delivery experts. Please see section 14.1 Material Assets- Traffic and Transport for further details.

Three entrance points for component delivery were identified and considered as part of the design process as follows:

- **Option A:** Widening the existing northern entrance off the R156 to deliver components from Haul Route Option A into Carranstown Bog, from where deliveries can be made on site to Bracklin Bog and Lisclogher Bog; Widening of existing south entrance on the R156 to deliver components from the Haul Route into Ballivor Bog.
- **Option B**: New proposed north entrance off the R156 (adjacent to existing entrance) to deliver components from the Haul Route A into Carranstown Bog. From here deliveries can be made to Bracklin Bog and Lisclogher Bog; Construction of turning track approximately 200m inside Carranstown Bog to facilitate turning component deliveries southward back across the R156 and straight into the existing Ballivor Bog Entrance.
  Option C: New proposed site access point utilising third party lands off a local road to the west of Bracklin Bog to facilitate turbine component delivery from Haul Route Option B via Mullingar.

As discussed above, Haul Route Option B did not progress and therefore Site Entrance Option C was removed from the design as it was no longer required. As such, an assessment of the feasibility of Option A and B was undertaken and is discussed below. A comparison of both options can be found in Table 3-14.

Site Entrance Option A

Site Entrance Option A (Figure 3-10) comprises the widening of both the existing northern and the southern entrance off the R156. Widening works consists of the removal of tree line vegetation and low ecological value scrub (71m along the roadside). Component delivery would enter into the Carranstown Bog via a northern turn off the R156 onto a new proposed internal track which runs through the Bog and continues into Bracklin and Lisclogher Bogs. This entrance would also be used for general construction traffic.

An assessment of the vertical alignment along the R156 indicates that there is an existing driver visibility impediment in the vicinity of the proposed site entrance. It is proposed to remove this existing safety issue permanently by the lowering of a stretch of the road, approximately 44m in length prior to any other construction related activities at the wind farm site. This proposed lowering of the road section will

enhance the road safety for both construction and operational phase users as well as local road users of the R156. The works will be undertaken in agreement with the local authority and to TII standards and guidelines.

For the operational phase, this Carranstown access will be reduced in width, but retained for maintenance access, Eirgrid access and amenity access. This entrance can be widened again during the operational phase should a turbine(s) component need replacement. Car parking facilities will be provided to the north of this entrance. The proposed vertical realignment at the entrance on the R156 would remain for the operational phase and beyond.

Accommodating works (removal of agricultural grassland, Bog Woodland, 65m along the roadside) to widen the existing southern entrance off the R156 into Ballivor Bog will be required to facilitate component delivery to Ballivor Bog only. This entrance will not be used during the operational phase for maintenance or amenity access. This entrance will be restored back to its original width upon completion of the construction phase and revegetated as per the habitats removed during its construction. A general construction entrance will be inserted west of the component entrance, and this will be retained for the operational phase to facilitate amenity and maintenance access. Car parking facilities will be provided to the south of this entrance. Should a turbine component require replacement it will be reopened to accommodate the delivery of replacement materials during the operational phase of the development.

This staggered entrance design off the R156, i.e. general construction phase traffic into Carranstown is to the east of the general construction phase traffic into Ballivor complies with TII requirements[1], and therefore all non-turbine component traffic movements would not require manned control or a stop/go system. While the turbine component entrances are not staggered, these deliveries will be at night, will follow a detailed Traffic Management Plan as agreed with the road and local authorities, will be supervised on the ground by an expert turbine delivery team and will also be under Garda escort.

Figure 3-10 Turbine Component Entrance Option A- Selected

[1] *Transport Infrastructure Ireland April 2017– Geometric Design of Junctions*

Site Entrance Option B

Site Entrance Option B (Figure 3-11) comprised a new proposed Carranstown Bog entrance off the R156 (adjacent to the existing entrance) onto a new proposed access track which would run in a northwest direction before turning east then bifurcating into a northern and southern track. The northern track proceeded north through Carranstown Bog and on to Bracklin Bog and Lisclogher Bog while the southern track turned south onto a new proposed internal track, before exiting from the existing but widened entrance onto the R156 where it proceeded straight into the existing Ballivor Bog entrance to deliver components to Ballivor Bog. Both the widened Carranstown and Ballivor Bog entrances would be directly opposite each other. Accommodating works (removal of scrub, treeline vegetation, 89m along the roadside), would have been required to open the new entrance and widen the existing entrance into Carranstown Bog. Accommodating works (removal of agricultural grassland, Bog Woodland, 113m along the roadside) would have been required to facilitate component delivery into Ballivor Bog.

An assessment of the vertical alignment along the R156 indicates that there is an existing driver visibility impediment in the vicinity of the proposed site entrance. It is proposed to remove this existing safety issue permanently by the lowering of a stretch of the road, approximately 44m in length prior to any other construction related activities at the wind farm site. This proposed lowering of the road section will enhance the road safety for both construction and operational phase users as well as local road users of the R156. The works will be undertaken in agreement with the local authority and with reference to TII standards and guidelines.

For the operational phase, the existing access point into Carranstown Bog would be reduced in width, but retained for maintenance access, Eirgrid access and amenity access. This entrance could be widened again during the operational phase to facilitate component replacement should it be required. The new adjacent entrance would have been reinstated completely. The existing access into Ballivor Bog would be retained and used for maintenance, including component replacement and amenity access. Car parking facilities would be provided at the southern entrance. The proposed vertical realignment at the entrance on the R156 would remain for the operational phase and beyond.

This entrance design off the R156, is not staggered i.e. general construction phase traffic into Carranstown is directly opposite the general construction traffic entrance into Ballivor Bog and therefore does not comply with TII requirements[2]. As such, all vehicular movements including non-turbine component movements to and from Ballivor and Carranstown Bogs would require manned supervision and a stop/go system.

[2] *Transport Infrastructure Ireland April 2017– Geometric Design of Junctions*

Figure 3-11 Component Entrance Option B – not brought forward.

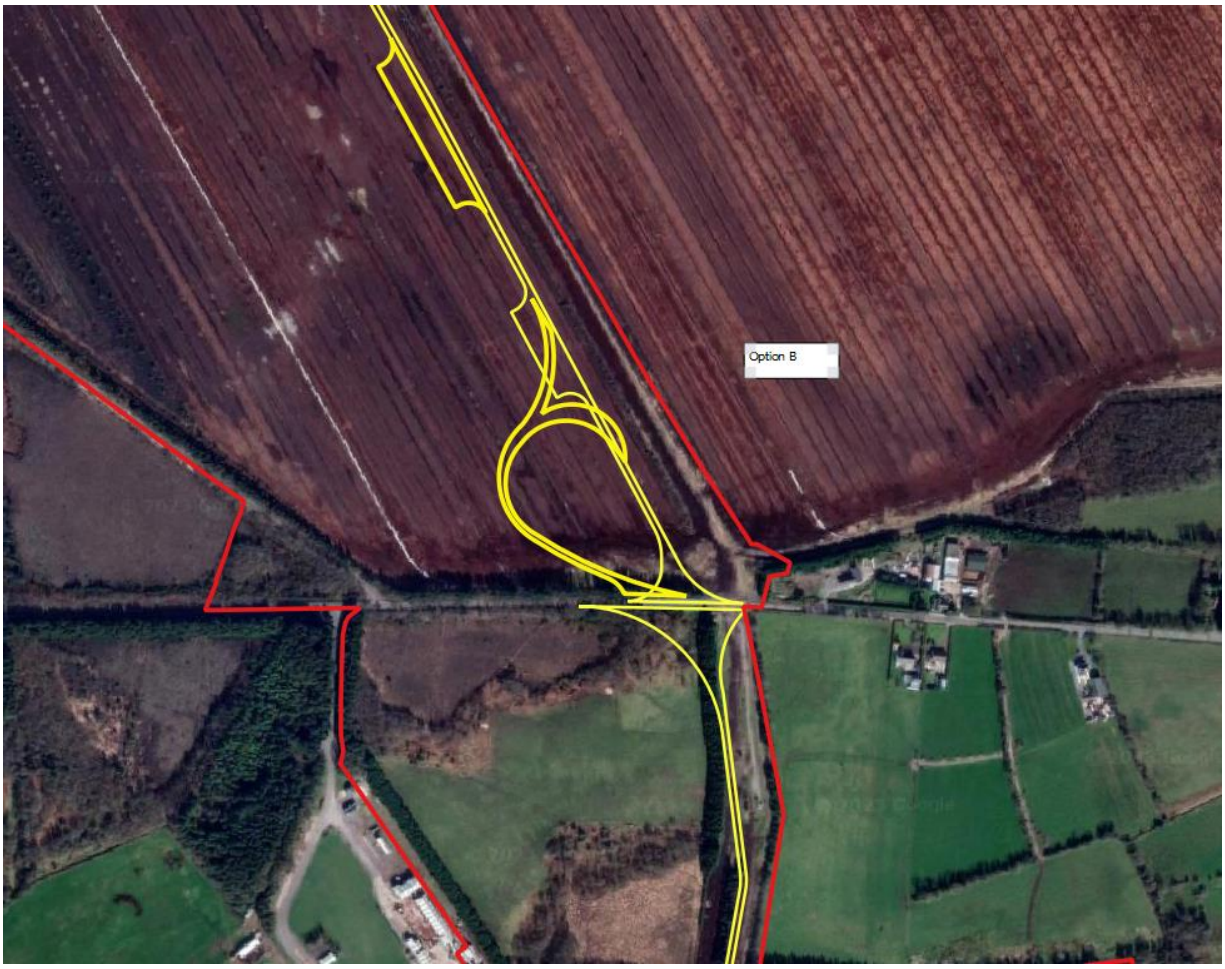


Table 3-14 Comparison of environmental effects for turbine component site entrances options A and B.

Environmental Consideration	Option A	Option B
Population & Human Health (incl. Shadow Flicker)	Potential for vehicular, noise and dust emissions at road receptors from traffic movements due to accommodating works to facilitate entrances. Component delivery will be undertaken at night to minimise traffic disruptions on local road users. Complies with TII staggered junction design requirements therefore no manned or stop/go system needed- no disruptions to traffic flow along the R156 in this area. Vertical Realignment works would remove the existing driver visibility impediment and make the road safer for construction staff and local road users	Potential for vehicular, noise and dust emissions at road receptors from traffic movements due to accommodating works to facilitate entrances and from component vehicle deliveries. Component delivery will be undertaken at night to minimise traffic disruptions on local road users. Does not comply with TII staggered junction design requirements therefore a manned traffic system would be required. Potential for additional dust, noise and vehicular emissions due to traffic delays. Vertical Realignment works would remove the existing driver visibility

Environmental Consideration	Option A	Option B
		impediment and make the road safer for construction staff and local road users
Biodiversity & Ornithology	Smaller habitat loss due to smaller areas of vegetation to be removed for entrances. Reduced footprint as turning area for component vehicles isn't required No potential for collision risk	Larger habitat loss due to larger area areas of vegetation to be removed for entrances. Larger footprint required to construction turning area in Carranstown bog to facilitate the turning of component vehicles southwards towards Ballivor Bog . No potential for collision risk.
Land, Soils & Geology	Smaller volumes of topsoil to facilitate the stoning up of areas to allow entrance to sites.	Larger volume to remove topsoil to facilitate the stoning up of areas for vehicle and component set down. Additional peat and spoil to be excavated to build the turning road inside Carranstown Bog.
Geotechnical/Peat Stability	Decreased risk to peat instability due to smaller footprint and smaller area of excavation required.	Increased risk to peat instability due to larger footprint- turning road
Hydrology & Hydrogeology	Neutral= drainage design	Neutral= drainage design.
Air & Climate	Potential for dust and emissions from plant required to removal topsoil, trim vegetation and delivery aggregate to provide vehicle turning and set down areas.	Increased potential for dust and emissions from plant required to removal topsoil, trim vegetation and delivery aggregate to provide vehicle turning and set down areas for the larger footprint Increased potential for vehicular emissions along R156 due to manned traffic system requirements at an unstaggered entrance junction
Noise & Vibration	Potential for vehicular noise emissions at road receptors from traffic movements due to accommodating works to facilitate entrances. Component delivery will be undertaken at night to minimise noise impacts on local road users.	Potential for vehicular noise emissions at road receptors from traffic movements due to accommodating works to facilitate entrances and from component vehicle deliveries. Additional potential for noise emissions as higher volume of construction vehicles required to transport aggregate materials for additional turning road inside Carranstown Bog. Additional potential for noise emissions due to manned traffic system requirements at an unstaggered entrance junction causing traffic delays

Environmental Consideration	Option A	Option B
		Component delivery will be undertaken at night to minimise noise impacts on local road users.
Landscape & Visual	Decreased short-term visual impact due to fewer HGVs on site	Increased (temporary / short-term) visual impact due to HGVs on site.
Cultural Heritage & Archaeology	No recorded monuments at accommodating works areas. Potential for unknown recorded artefacts is negligible due to initial laying of and maintenance of R156 in this area and subsequent boundary planting.	No recorded monuments at accommodating works areas. Potential for unknown recorded artefacts in negligible due to initial laying and maintenance of R156 in this area and subsequent boundary planting. No recorded national monuments along route of additional internal road (yellow road Figure 3-11). However, increased potential to impact subsurface unrecorded archaeology during excavation. .
Material Assets	Lower traffic volumes on the public road network during construction phase due to the volume of materials sourced on site. Vertical Realignment works would remove the existing driver visibility impediment and make the road safer for construction staff and local road users	Higher traffic volumes on the public road network during construction phase due to higher volume of material needed for additional turning road inside Carranstown Bog. Increased potential for traffic impacts along R156 due to manned traffic system requirements at an unstaggered entrance junction Vertical Realignment works would remove the existing driver visibility impediment and make the road safer for construction staff and local road users

After further design refinement it was concluded that the internal bifurcated road design yellow road (Figure 3-11) was not required as components could be delivered directly into Ballivor Bog from the R156 if it was sufficiently widened. In addition to this, the comparison of the environmental impacts between Option A and Option B reinforced the decision to selection Option A as the preferred and optimal component entrance design.

3.3.6 Alternative Construction/Operational Entrance Options

Several construction site entrances were assessed for the purposes of general construction traffic, heavy goods vehicles (HGVs) and light goods vehicles (LGVs, including personnel vehicles), as well as operational entrances for maintenance and public amenity access. Continuing on from component entrances A, B and C, the below options considered are labelled options D to K. Please see Figure 3-12 for all the considered construction/operational entrances and Figure 3-13 for the final proposed construction/operational entrances.

- **Option D:** Widening of existing entrance off R156 into Carranstown Bog
- **Option E** Widening of existing entrance off R156 into Ballivor Bog
- **Option F** Proposed new general entrance off R156 into Ballivor Bog
- **Option G:** Proposed entrance off local road west of Bracklin Bog
- **Option H**: Proposed construction and permanent entrance into Carranstown Bog off L5507 road.
- **Option I**: Use of existing entrance into south Ballivor Bog along a public right of way.
- **Option J**: Proposed construction and operational entrance into Lisclogher Bog off local road.
- **Option K**: Propose new construction entrance into Bracklin Bog off a local road to the west.

Construction/Operational Entrance Option D

Option D comprises the same entrance for component delivery as discussed above in section Option A 3.4.6.1.3. In this instance, this entrance would be used as a general construction entrance during the daytime hours as components are delivered at night only. This entrance is staggered from option F below and therefore complies with TII and as such, construction phase traffic and operation traffic into this bog will not need to be manned. Therefore, this option has been brought forward as part of the Proposed Development design. Accommodating works and associated impacts are discussed under Option A in Table 3-14 above.

Construction/Operational Entrance Option E

Option E comprised the same entrance into Ballivor Bog as Option A component delivery entrance as discussed above in section 3.4.6.1.3. It was intended to use the same component entrance for general construction traffic, amenity and maintenance. However this entrance is directly opposite the entrance into Option A and therefore does not comply with TII requirements. As such all traffic movements, including non-component deliveries would require to be manned. Therefore this option for general construction access or operational access was not considered further for non-component delivery.

Construction/Operational Entrance Option F

Site Entrance option F comprised a new entrance west of the selected component entrance into Ballivor Bog (Option A). This option was put forward for general construction traffic and operational traffic as it is staggered from the Option A entrance into Carranstown Bog. Therefore it complies with TII design requirements and as such, traffic using this entrances do not need to be manned. Accommodating works (removal of approx. 45m of low ecological value scrub along the roadside) and associated impacts are discussed under Option A in Table 3-14 above.

Construction/Operational Entrance Option G

Site entrance Option G comprises an existing access point from a public right of way lane into Bracklin Bog. From the outset, it was never considered suitable for the delivery of large turbine components or construction traffic given the requirements for third party land take. However, it is considered to be a suitable amenity access point for locals as it requires no upgrades. As such, it forms part of the amenity

proposal of the wind farm. Environmental impacts are considered neutral as it is an existing local access road with no works required.

Construction/Operational Entrance Option H

Site entrance Option H comprised entry from the L5507 into Carranstown Bog. From the outset, it was never considered suitable for the delivery of large turbine components given the requirements for third party land take. However, it was considered to be potentially suitable for delivery of construction materials and components for construction of the proposed substation. However, with further assessment, it was concluded that considerable permanent accommodating works are required at the L5507/R156 junction to provide safe sight line visibility. As such, this option did not progress further.

Construction/Operational Entrance Option I

Site entrance Option I comprises an existing public right of way into Ballivor Bog from a local unnamed road. From the outset, it was never considered suitable for the delivery of large turbine components due to the degree of road widening works, third party land take and requirements for temporary closure of the right of way duration of the construction phase. Consideration was given to this right of way as a designated amenity access point. However, as the width of the lane is very narrow and only accommodates one lane of traffic and the lack of laybys/parking along it, it was decided to remove this lane as a designated access point to discourage drivers. Therefore, Option I did not progress further.

Construction/Operational Option J

Site entrance Option J comprises the reopening of an old entrance into Lisclogher Bog off a local public road. Adjacent to the existing Bord na Móna level crossing gates at the southern boundary of Lisclogher Bog, a new site entrance is proposed to facilitate the movement of turbine components and construction materials from Bracklin Bog to Lisclogher Bog and construction material delivery into this bog. Deliveries will enter into Carranstown and Bracklin Bogs and utilise the proposed internal track infrastructure before exiting northeast of Bracklin Bog before directly crossing the local public road into the new entrance. This component and construction entrance design into Lisclogher is considered the least impactful on local traffic and transport as it does not require use of the local public road network except for one short crossing point from Bracklin Bog to Lisclogher Bog. After the construction phase, the entrance into Lisclogher Bog will be reinstated and used for pedestrian and maintenance access only. Car parking facilities will be provided across this local road inside Bracklin Bog.

Construction/Operational Entrance Option K

New proposed construction site access point at the northwest of Bracklin Bog was initially considered as part of the design. This access would require third party land to connect the bog onto the local road. This access was intended to be the same access into site as the Component Entrance Option B. When the Haul Route Option B via Mullingar fell away, so did this entrance option for components as it was no longer needed. As such, the road through Bracklin West to join this component entrance was no longer required. Therefore, there was no longer a requirement for an entry point here for construction traffic or otherwise.

3.3.6.2 Site Entrance Options Summary

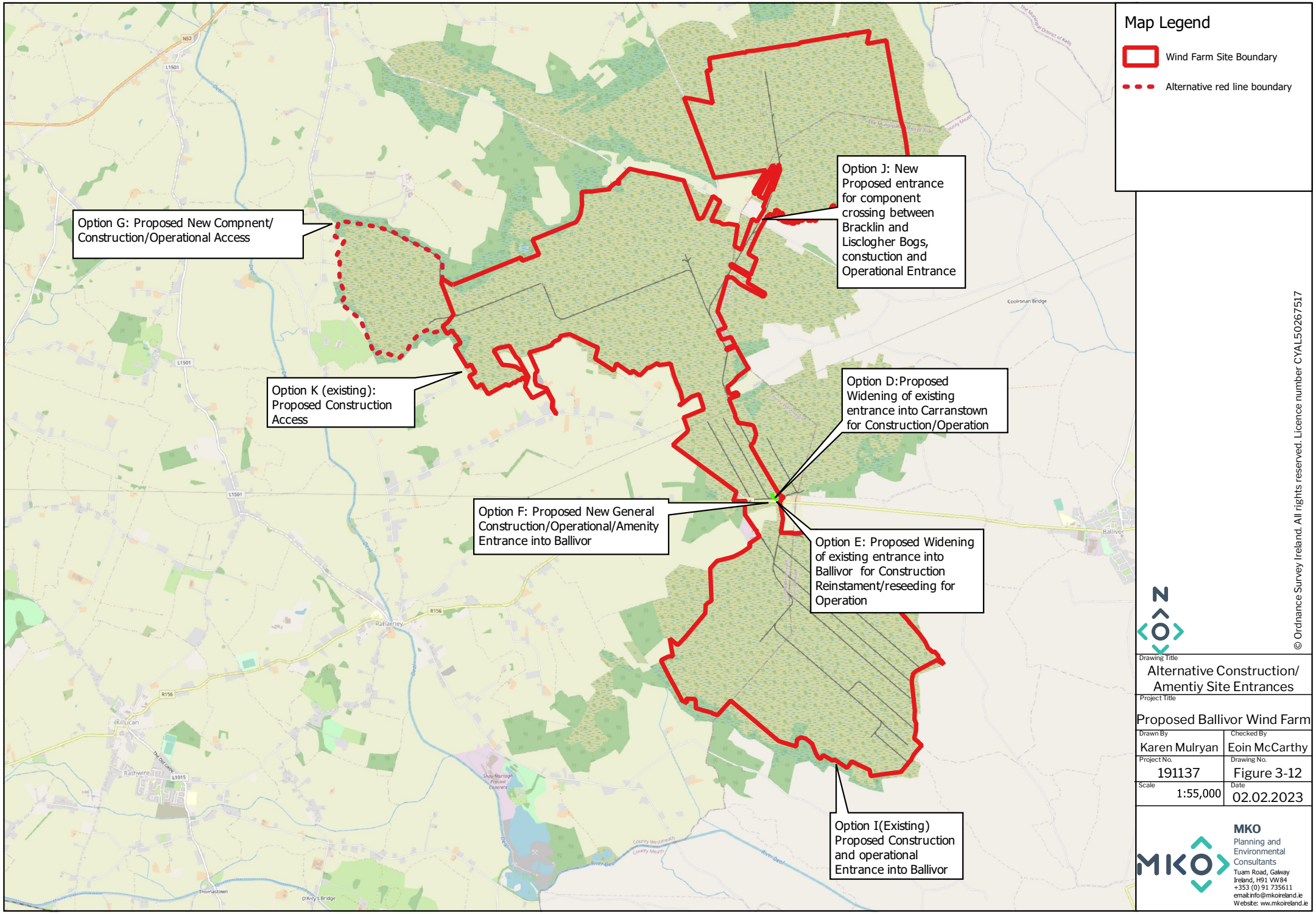
Site entrance Option A is selected as the main site entrance for the wind farm design. Turbine components will travel along the selected haul route (haul route Option C) and arrive at the Proposed Development site from the R156 which separates Ballivor and Carranstown Bogs. The components will turn south into Ballivor bog to provide components for said bog or turn north into Carranstown Bog and provide components to Carranstown Bog. From this bog, the components will travel along the pre-constructed

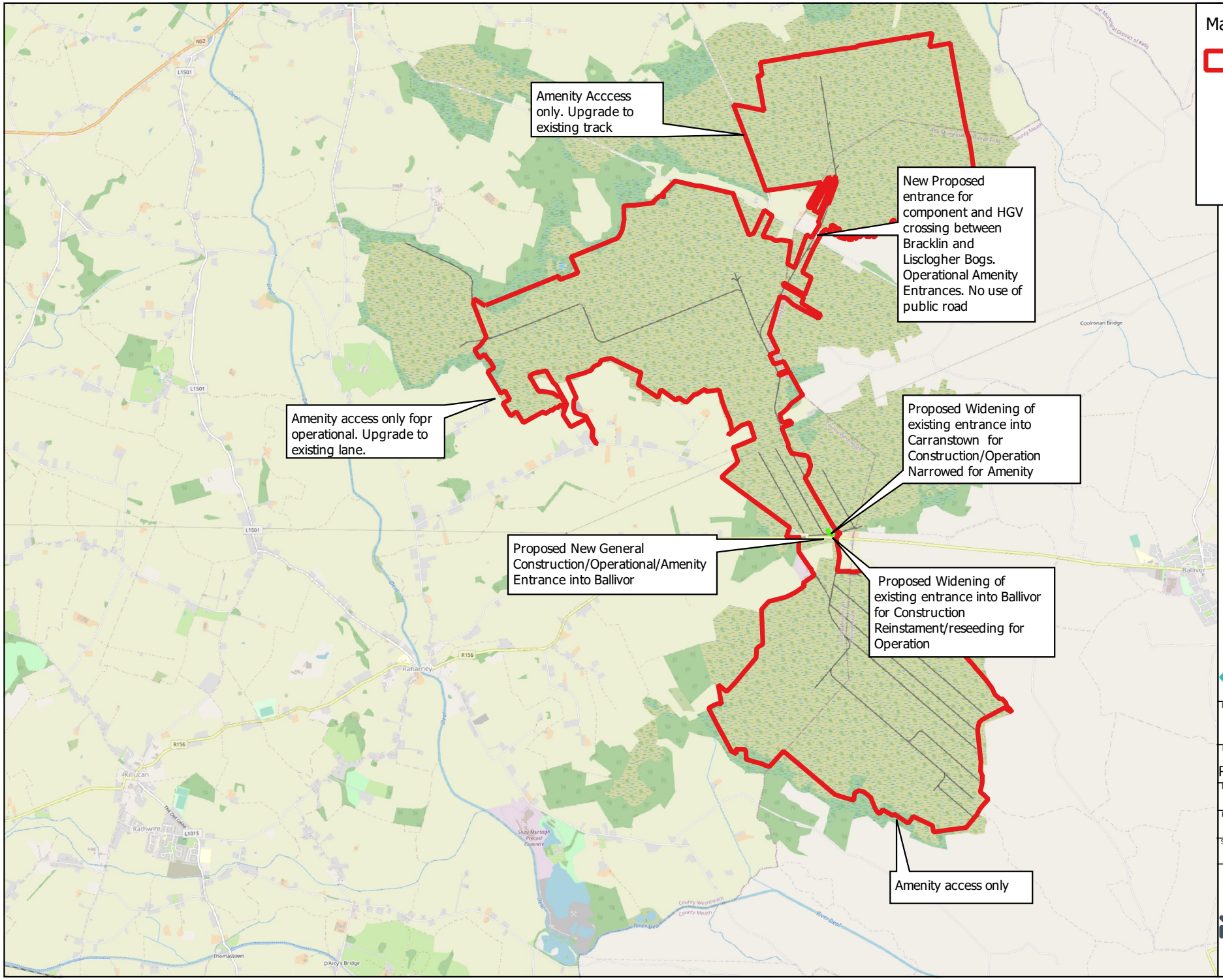
internal tracks to Bracklin Bog and cross a local road directly into Lisclogher bog as described in Option J above.

General construction traffic will utilise the Carranstown entrance of Option A which will allow for construction traffic to be delivered into Brackin and Lisclogher Bogs (Option J). Construction traffic will enter Ballivor Bog using Option F described above.

Amenity access to Carranstown will be via Option A. The component set down area inside the Carranstown entrance will be converted into a carparking facility (with bike racks included). Amenity access into Ballivor will be provided via Option J, with the construction compound inside this entrance converted to a car parking facility. Amenity access to Bracklin will be provided via the existing entrance at Option G and to Lisclogher Bog via a retained pedestrian access point only. Carparking facilities will be provided in the northeast of Bracklin Bog which will also provide racks for bikes.

Further information on entrances is provided in Chapter 4, Description of the Proposed Development.


Map Legend
Wind Farm Site Boundary
Alternative red line boundary
Option G: Proposed New Compnent/ Construction/Operational Access
Option J: New Proposed entrance for component crossing between Bracklin and Lisclogher Bogs, constuction and Operational Entrance
Option K (existing): Proposed Construction Access
Option D:Proposed Widening of existing entrance into Carranstown for Construction/Operation
Option F: Proposed New General Construction/Operational/Amenity Entrance into Ballivor
Option E: Proposed Widening of existing entrance into Ballivor for Construction Reinstament/reseeding for Operation
Option I(Existing) Proposed Construction and operational Entrance into Ballivor
N
© Ordnance Survey Ireland. All rights reserved. Licence number CYAL50267517
Drawing Title
Alternative Construction/ Amentiy Site Entrances
Project Title
Proposed Ballivor Wind Farm
Drawn By
Karen Mulryan
Checked By
Eoin McCarthy
Project No.
191137
Drawing No.
Figure 3-12
Scale
1:55,000
Date
02.02.2023
MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: ww.mkoireland.ie



Drawing Title
Proposed Construction/ Operation/Amentiy Site

Project Title
Proposed Ballivor Wind Farm

Drawn By	Checked By
Karen Mulryan	Eoin McCarthy
Project No. 191137	Drawing No. Figure 3-13
Scale 1:55,000	Date 02.02.2023

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

3.3.7 Alternative Wind Farm Site Boundary Options

As discussed in section 3.4.1, the project evolved from a 35 turbine layout across 5 bogs (Lisclogher, Lisclogher West, Bracklin, Carranstown and Ballivor) to a final 26 turbine layout across 3 bogs (Lisclogher, Bracklin and Ballivor).

Once all elements of the project design were finalised, the Wind Farm Site Boundary was subsequently refined. Please see Figure 3-14 below.

Lisclogher West Bog was removed from the project due to environmental sensitivities and was therefore no longer required as part of the Wind Farm Site Boundary. As discussed in section 3.3.4.2.2, turbines were removed from Carranstown to eliminate the most visually impactful turbines of the wind farm design on local receptors, and a turbine was removed from Bracklin West after further noise and shadow flicker modelling and discussions with the design team of the Bracklyn Wind Farm (since consented PA25M.311565).The final substation location Option A was selected for the northwest of Carranstown Bog. Therefore, Carranstown East and Bracklin West were no longer required as part of the Wind Farm Site Boundary.

Subsequent to these design revisions, Carranstown East and Bracklin West were selected by Bord na Móna for the Peatland Climate Action Scheme(PCAS). The Scheme is a programme of enhanced peatland rehabilitation measures designed to exceed/meet the standard stabilisation requirements as defined by the IPC Licence and to enhance the ecosystem services the Ballivor Bog Group, principally optimising climate action benefits. This programme has been developed to optimise ecosystem service benefits of peatland rehabilitation and restoration, particularly carbon storage and reducing carbon emissions. In addition, this will also benefit biodiversity and water (water quality and catchment management), as well as providing space for local communities and people to enjoy the outdoors. The scheme is supported by Government through the Climate Action Fund and Ireland's National Recovery and Resilience Plan administered by the Department of Environment, Climate and Communications (DECC). Please see https://www.bnmpcas.ie/ for details. The National Parks and Wildlife Service (NPWS) acts as the Scheme regulator and there is ongoing engagement with the EPA. Carranstown East and Bracklin West were identified as suitable for the prescribed enhancement measures and the scheme was completed in Carranstown East in 2022. The scheme will commence in Bracklin West in 2023. Please see Chapter 4 for details.

Figure 3-14 Site Boundary evolution: Green denotes project commencement boundary; red denotes final Proposed Development site boundary.

3.3.8 Alternative Mitigation Measures

Mitigation by avoidance (buffer zones/separation distances as per Constraints Mapping Section 3.3.4.2.1 above) has been a key aspect of the Proposed Development design process. Avoidance of the most ecologically sensitive areas of the site reduces the potential for environmental effects. As noted above, the site layout aims to avoid any environmentally sensitive areas. Where loss of habitat occurs on the site, this has been mitigated with the proposal of Habitat Enhancement Plans, please see Chapter 6 Biodiversity and Appendix 6-5 for details. The alternative to this approach is to encroach on the environmentally sensitive areas of the site and accept the potential adverse environmental effects associated with this.

The best practice design and mitigation measures set out in this EIAR will contribute to reducing likely impacts and have been designed to break the pathway between the site and any identified environmental receptors.