Bracklyn Wind Farm

Non-Technical Summary

Bracklyn Wind Farm Limited

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Contents

1.0 Introduction

Bracklyn Wind Farm Limited (BWFL) is applying for planning permission for the construction of a 9 no. turbine wind farm project, associated site development works together with approximately 6.3 kilometres (km) of underground 110 kilovolt (kV) electricity line and 110 kV electrical substation which will connect to the existing 110kV Mullingar-Corduff electricity transmission line.

The proposed development is located in east County Westmeath and west County Meath, approximately 16 kilometres (km) east of Mullingar, approximately 4km south of Delvin and approximately 5km north of Raharney. The proposed wind farm will be located within the townland of Bracklin, County Westmeath; while the proposed grid connection infrastructure and electricity substation will be located within the townlands of Bracklin, Co. Westmeath and Coolronan, Co. Meath.

Planning legislation requires that that planning applications for such projects be accompanied by an Environmental Impact Assessment Report (EIAR). An EIAR is a statement of the effects, if any, which the proposed development, if carried out, would have on the environment. It provides information which a planning authority, in this case An Bord Pleanála, can use in undertaking a formal Environmental Impact Assessment (EIA) and in informing their decision making process. The EIAR can also be used by third parties to evaluate the proposed development and its likely effects.

Galetech Energy Services (GES) has been appointed by BWFL to manage and co-ordinate the management and preparation of this EIAR. The content of the EIAR has been prepared by individual specialist and technical consultants who were appointed in order to undertake assessments and prepare chapters on specific environmental topics.

Volume I of the EIAR is arranged in 14 no. separate chapters which describe the proposed development and addresses each component of the environment likely to be affected and their likely interactions. **Volume II** includes technical information and annexes associated with the EIAR.

The EIAR may be inspected or purchased at the public offices of An Bord Pleanála or Westmeath County Council or Meath County Council during public opening hours. The EIAR may also be inspected at the dedicated project website www.bracklynwindfarmplanning.ie/ and through the Department of Housing, Local Government and Heritage EIA Portal.

A submission or observation in respect of the EIAR and the planning application may be made in writing only to An Bord Pleanála on payment of the €50 prescribed fee within the period of seven weeks and such submissions or observations will be considered by An Bord Pleanála in making the decision on the planning application.

2.0 Site Location

The proposed development is located in east County Westmeath and west County Meath, approximately 16 kilometres (km) east of Mullingar, approximately 4km south of Delvin and approximately 5km north of Raharney. The proposed wind farm will be located within the townland of Bracklin, County Westmeath; while the proposed grid connection infrastructure and electricity substation will be located within the townlands of Bracklin, Co. Westmeath and Coolronan, Co. Meath. The local area is typical of this part of Ireland, with settlement patterns largely comprising dispersed rural dwellings often accompanied by agricultural holdings and buildings. In total, there are 78 no. dwellings located within 1.85km of a proposed wind turbine, the general location of the proposed development is illustrated in **Figure 1** below.

Figure 1: Proposed Development Location

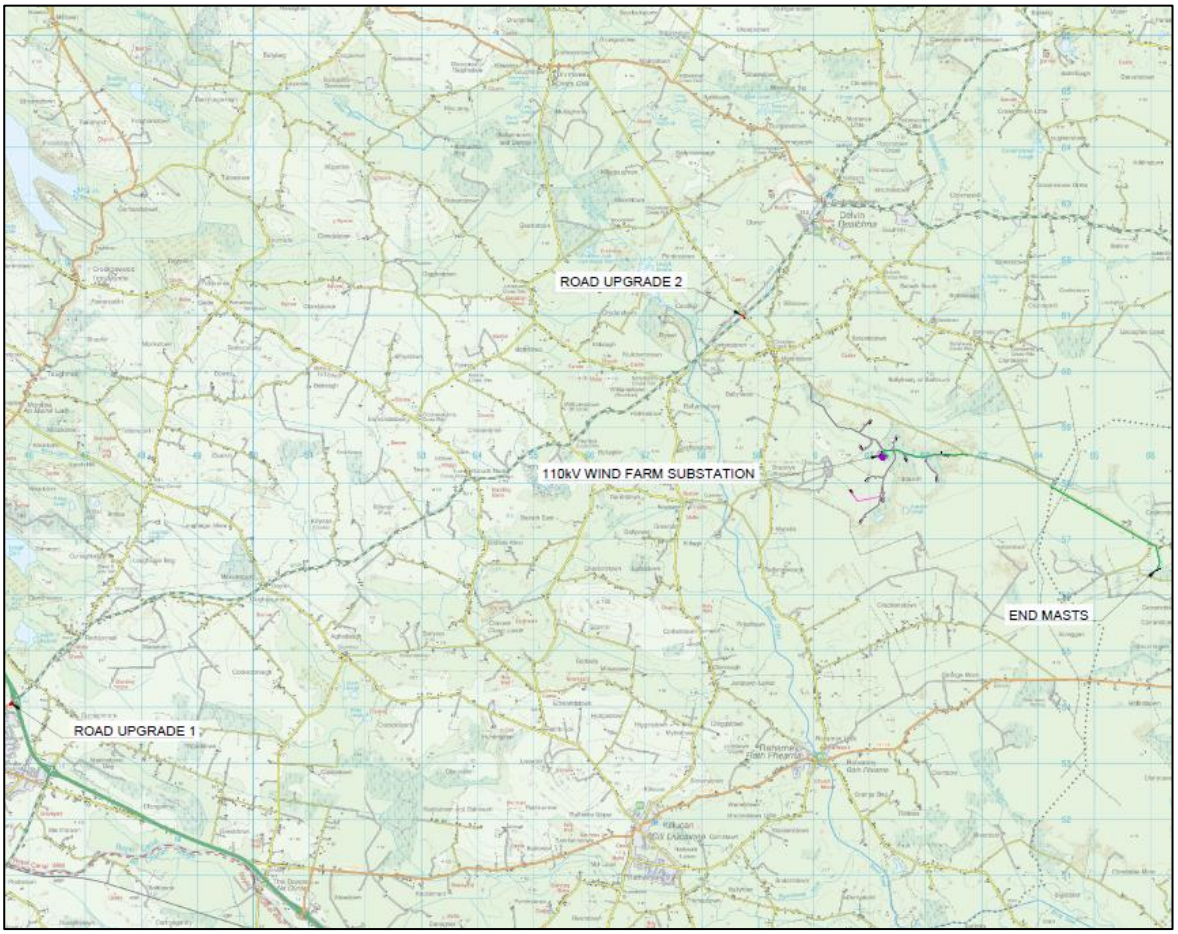

Figure 2: Overall Site Location

The proposed development site and surrounding environment are typical of the Midlands Region and comprises a generally flat landscape with occasional gentle undulations. The local landscape is also characterised by the presence of extensive peatlands to the south and east of the proposed development site which have been harvested by Bord na Móna.

The site comprises a mosaic of arable crop fields, improved grassland, conifer plantation, natural and broadleaf woodland, and bog woodland. The proposed development site includes commercial conifer plantations, particularly on its southern and eastern fringes. Habitat surveys have also identified pockets of mature woodland scattered throughout the site. Field boundaries generally consist of mature and semi-mature tree lined hedgerows which consist of a mix of species including; ash, beech, hawthorn, birch, hazel, blackthorn, Scots pine, sycamore, spindle, oak, elder, dog rose, bramble, holly, and ivy.

Figure 3: General View across the Proposed Development Site

3.0 Description of the Proposed Development

The proposed development assessed within this EIAR comprises a wind farm, including all associated development works to accommodate its construction, installation, operation, maintenance and the export of electrical power to the national grid. This will include:-

The proposed development assessed within this EIAR comprises a wind farm, including all associated development works to accommodate its construction, installation, operation, maintenance and the export of electrical power to the national grid. This will include:-

- 9 no. wind turbines with a hub height of 104 metres (m), a rotor diameter of 162m, and an overall tip height of 185m;
- All associated foundations and crane hardstanding areas;
- All associated underground electrical and communications cabling;
- Provision of new internal wind farm site access tracks and use of, and upgrades to, existing agricultural/forestry tracks, and associated site entrance from the L5508 local public road;
- 1 no. site control building;
- 1 no. free-standing meteorological mast of 104m in height;
- 1 no. temporary construction compound;
- Felling of 28 hectares (ha) of commercial forestry plantation to facilitate the construction of infrastructure;
- The storage of excavated material at 2 no. spoil deposition areas;
- Upgrade works to public roads along the turbine component haul route;
- A 110 kilovolt (kV) 'loop-in/loop-out' Air-Insulated Switchgear (AIS) electrical substation and all associated electrical equipment including an Electricity Storage System ;
- 6.3 kilometres (km) of 110kV underground electricity lines, accompanied by 2.5km of associated access track and 3 no. site entrances to facilitate connection of the proposed electricity substation to the existing 110kV Mullingar-Corduff overhead electricity transmission line;
- Upgrade works to public roads along the turbine component haul route; and
- All associated and ancillary site development, excavation, construction, landscaping and reinstatement works, including provision of site drainage infrastructure and environmental mitigation measures.

It should also be noted that this EIAR includes an assessment of permanent and temporary off-site works which will be required along the proposed turbine component haul route to facilitate access of oversized abnormal loads.

The layout of the proposed wind farm is illustrated at **Figure 4** below.

Figure 4: Proposed Development Layout

4.0 Assessment of Project Alternatives

A description of the reasonable alternatives to this project has been provided detailing the assessment, evaluation and analysis undertaken. A range of alternate development options have been assessed through an iterative and recursive project design and environmental assessment process, including alternative grid connections; alternative siting; and alternative design technologies. The objective of this process was to arrive at a proposed development, which has inherent design characteristics, which has the least likely adverse environmental effects.

The final proposed development evaluated in this EIAR has been selected as it strikes the best balance between the avoidance of any adverse environmental effects and achieving the objectives of the project.

5.0 Population & Human Health

5.1 Background

The chapter presents an assessment of the likelihood of effects on population and human health. Human beings are an important element of the environment and any likely effects on the status of population and human health must be comprehensively addressed.

5.2 Methodology

The methodology used to inform the assessment generally comprised research of existing documents and information sources to fully understand the population, social and economic characteristics of the local area. Information sources included information from the 2016 National Census, local economic and community plans and tourism information for counties Westmeath and Meath.

Consultation was also undertaken with a range of bodies including Failte Ireland, Westmeath County Council, Meath County Council, the Health and Safety Authority and Health Service Executive.

5.3 Description of Likely Effects

The assessment finds that the likelihood of effects during the construction phase are limited to effects on population sustainability, general amenity and well being, economic and employment effects, effects on tourism, and the possibility of accidents or natural disasters. The assessment concludes that the proposed development will result in both negative and positive effects on the above factors; however, the level of significance is at the lower end of the spectrum.

For example, amenity levels, in terms of local population, are likely to be subject to a minor adverse effect for the temporary duration of the construction phase; however, while these effects may be substantial at a personal level, they are not assessed to be significant in EIA terms, particularly given their short-term temporary duration.

Economic opportunities, through the provision of materials or services, local companies and the construction phase is likely to involve the employment of up to approximately 100 people over a period of 15-18 months. Additionally, plant and materials will be sourced locally. The socio-economic benefits resulting from the construction and operation of the proposed development are likely to make a substantial positive effect on the local economy of the local area, through direct employment and rural diversification.

The operational phase of the proposed development is not likely to result in any significant positive or negative effects in terms of population sustainability and residential amenity, general amenity and well being, economic and employment effects and effects on tourism. While minor localised effects are likely to arise, both positive and negative; these effects are not assessed as likely to be significant.

The Applicant is committed to operating a community benefit fund in accordance with the Wind Energy Ireland (WEI) best practice and it will be available to the community at a rate of €2 euro per megawatt hour (MWh) produced, should RESS be awarded. An investment of approximately €16,000 per turbine per year for up to 15 years, is committed. There will also be a community investment element available where there will be an opportunity for all local residents to participate, should they wish to do so. The structure for the investment scheme will form part of the Renewable Energy Support Scheme (RESS) design; however, the precise arrangements for the RESS have not yet been published.

5.4 Mitigation Measures

The land on which the proposed development has been sited is privately owned and there will be no unauthorised public access to the site. This will ensure that there are no impacts on the local population which could affect human health.

During the operational phase, the proposed development will generally be unmanned. Operational monitoring activities will be carried out, remotely, on an ongoing basis. However, regular visits to the site will be undertaken for routine

inspections and maintenance.

5.5 Overall Findings

The overall conclusion of the chapter is that any adverse effects of the proposed development on population and human health are unlikely to be significant. No specific mitigation measures, other than full adherence to all health and safety and public health guidance, have therefore been identified as being required.

6.0 Biodiversity

6.1 Background

This chapter provides an assessment of the likely significant effects on biodiversity as a result of the proposed development. This assessment considers the ecological impact of the entire proposal through the construction, operational and decommissioning phases for a 9 no. turbine wind farm and electrical substation, including all associated ancillary works, proposed grid connection route and turbine components haul route.

6.2 Methodology

A comprehensive desk study was undertaken to inform this ecological impact assessment, involving a thorough review of available information that is relevant to the ecology of the proposed development site.

The ecological baseline for the impact assessment is informed by a suite of ecological surveys undertaken by appropriately qualified ecologists between October 2018 and May 2021. These surveys applied best practice guidelines, as required for ecological assessment for proposed wind farm developments. Surveys undertaken included:-

- Habitat mapping
- Invasive species surveys;
- Invertebrate habitat suitability assessment (marsh fritillary and *Vertigo* species);
- Aquatic and fisheries assessments;
- Amphibian and reptile suitability assessments;
- Bird surveys, including:-
  - Two years of vantage point (VP) watch surveys covering the 500m turbine buffer and used to predict the avian collision risk for the proposed development;
  - Monthly winter waterbird surveys covering any suitable habitat up to 5km; from the proposed development site conducted over three winters;
  - Breeding raptor surveys covering suitable habitat within 2km of proposed turbine locations;
  - Hen harrier roost searches covering suitable habitat within 2km of proposed turbine locations;
  - Breeding bird surveys of the 500m turbine buffer, surveys for breeding waders;
  - Dusk surveys for breeding woodcock and owls; and
  - Winter walkover surveys covering the 500m turbine buffer;
- Kingfisher habitat suitability surveys of watercourses within the proposed development site and extending 800m downstream
- Protected terrestrial mammal surveys covering suitable habitat, including waterbodies within and up to 150m from the proposed development site; and
- Bat surveys, including:-
  - Bat habitat suitability surveys, identifying potential roost features;

- Dusk and dawn surveys at potential roosts and inspection of potential roost features;
- Bat activity transects; and
- Three (10 night minimum) seasonal deployments of static bat detectors in positions at, or representative of, proposed turbine locations.

6.3 Description of Likely Effects

The ecological impact assessment was undertaken following specific guidelines for habitats and species found to be occur within the respective zones of influence for the for the proposed development and is consistent with the 'CIEEM Guidelines' (*Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal* 2018, updated 2019). In the absence of mitigation, likely significant effects were identified due to:-

- Deterioration in water quality for:-
  - Two downstream Natura 2000 sites, including the River Boyne and Blackwater SAC and SPA, with likely significant effects on the following species salmon, river lamprey, otter and kingfisher;
  - Downstream aquatic ecology of Local (higher value) Importance, including onsite drainage ditches and channelised stream;
- Habitat loss and alteration for:-
  - Mixed broad-leaved woodland (non-plantation);
  - Non-Annex I Oak-birch-holly woodland & Bog woodland;
  - Annex I Bog woodland;
  - Treelines and Hedgerows;
  - Breeding birds;
  - Resting places of protected mammal;
  - Roosting, foraging and commuting bats;
- Construction related direct/indirect disturbance for:-
  - Breeding birds, with specific effects of low significance on local breeding populations of woodcock, kestrel, lapwing and a range of red/amber listed breeding birds, especially those nesting in woodland/scrub;
  - Badger setts, in particular a maternity set adjacent to the proposed substation;
  - Bat roosts;
- Collision risk for:-
  - Locally sensitive bird populations of kestrel, and possibly woodcock and swift;
  - Bats including Leisler's bat and pipistrelle species;
- Operational disturbance for:-
  - Local breeding population of woodcock.

6.4 Mitigation Measures

Proposed mitigation measures, required to prevent adverse effects on downstream Natura 2000 sites are outlined in the Natura Impact Statement (NIS) for the proposed development. The mitigation measures relate to protection of water quality flowing into the River Boyne and River Blackwater SAC and SPA through adherence to best practice construction guidelines. If these measures are implemented in full, they will ensure that adverse effects on these Natura 2000 sites are avoided. These measures will also protect water quality locally within the channelised streams draining the proposed development site and therefore avoid any likely significant effects on local aquatic ecology.

Impact to sensitive semi-natural woodland habitats were avoided during the design

process for the proposed development. The proposed development site selected habitats of Local Importance for the proposed infrastructure, including existing access tracks, improved grassland, tillage and commercial forestry plantations. For sections of treelines, hedgerow, older growth broadleaf beech dominated woodland and non-Annex I bog woodland, where habitat loss of Local (Higher Value) Importance could not be avoided, compensatory planting and woodland enhancement measures are proposed.

As part of the design process ('designed-in' mitigation), areas of old growth woodland have been avoided and will be retained, with enhancement measures proposed at selected locations. As well as protecting the habitats, this also ensures the that best areas for associated wildlife have been retained, including for breeding birds such as woodcock and mammals including badgers and bats. In addition, while significant areas of woodland will be removed (mainly commercial plantations), the felling plan for the proposed development ensures that overall connectivity will be retained throughout the site and where this is interrupted, compensatory planting will be undertaken.

To avoid widespread disturbance to habitats and associated wildlife during construction, access within the proposed development site will be restricted to the footprint of the proposed works corridor and no access between different parts of the site will be permitted except via the proposed works corridor. An Ecological Clerk of Works (ECoW) will be employed throughout the construction phase to ensure that construction activities are compliant with the mitigation measures. This will include preconstruction site walkovers to implement the specified construction exclusion zones around any sensitive ecological features identified during baseline.

To avoid direct and indirect disturbance to breeding birds during construction, site clearance works (vegetation removal) will be undertaken outside the bird breeding season. Should the clearance of vegetation suitable for nesting birds be required during the bird breeding season, the relevant vegetation will be surveyed in advance clearance works and appropriate (species specific) exclusion zones will be implemented if nests are identified.

Several badger setts were identified within the proposed development site and have been avoided by the proposed infrastructure. Indirect and direct disturbance of badger setts during construction will be avoided by ensuring appropriate exclusion zones are implemented during construction, as per NRA (2006) *Guidelines for the treatment of badger prior to the construction of national road schemes*. This includes no construction works within 50m of active setts, nor blasting or pile driving within 150m of active setts during the breeding season (December to June inclusive). Out of the breeding season no heavy machinery will be permitted within 30m of badger setts and no lighter machinery within 20m, unless carried out under NPWS licence.

No bat roosts were identified within the proposed works corridor and the older growth woodland with the potential to support significant maternity or hibernation roosts has been avoided by the proposed development. Pre-construction roost surveys will be undertaken to identify and protect any bats occupying roosts in vegetation earmarked for removal. Any trees identified as supporting moderate to high potential roost features within the works corridor will be targeted with further surveys, including emergence/re-entry surveys and/or roost inspections (using endoscopes and thermal imaging cameras). For any occupied roost, where vegetation removal is proposed, these surveys will inform the implementation of exclusion zone buffers, re-scheduling of works and, if required, a derogation license to undertake appropriate mitigation actions.

For the operational phase of the proposed development collision risk modelling, based on bird flight times for target species recorded within the 500m turbine buffer, found that predicted risk would have a 'low-to-moderate' effects on the local kestrel population. Mitigation measures are proposed to limit kestrel foraging activity around turbines. Due to a deficiency in population data on breeding woodcock in Ireland, there is uncertainty regarding the significance of effects the proposed development will have on the four territorial males estimated to be holding territories in the area. Woodland enhancement will ensure the protection of woodland habitats for breeding woodcock and habitat management measure will improve cover and create foraging opportunities for this species.

The primary mitigation measure employed to avoid collision and negative effects on bats relates to the design of the proposed development to avoid features utilised by foraging/commuting bats, A 50m separation distance from habitat features used by bats and the blade tips of wind turbines will be implemented to limit bat flight activity within the collision risk zone around turbines. Felling plans for the proposed development allow for a maximum buffer of 104m around turbine towers. This will facilitate a 50m blade-tip to vegetation feature separation distance for features up to 25m in height. Bat feature buffers will be implemented around T4, T5, T6, T7, T10, T11. The area where trees/scrub is cleared to create the bat feature buffers will be rendered as unfavourable for bats as possible, and maintained as such over the lifetime of the proposed development. It is anticipated that implementing bat feature buffers will limit bat activity in the vicinity of turbines and will be effective in reducing the potential for collision risk.

However, best practice guidance acknowledges that it is difficult to predict how bat behaviour will change following construction. Therefore, further mitigation informed by post-construction monitoring may be required, such as smart curtailment, whereby the operation of turbines identified in higher risk locations by post-construction monitoring are curtailed to run at < 2rpm, while optimal flight conditions for bats occurs. Smart curtailment has the potential to limit collision risk for Leisler's bat, in particular, as this species' feeding behaviour is often associated with open areas Recorded Leisler's bat activity within the proposed development was generally low, with more activity recorded during spring at specific locations when bats were thought to be targeting foraging opportunities above the canopy. Felling around turbines will limit this resource.

Any requirement for smart curtailment must be guided by a coherent and comprehensive post-construction monitoring methodology, which will clarify the bat usage of the site at turbine locations post-construction and will identify any potential collisions.

6.5 Overall Findings

Residual effects are those which are considered likely after taking account of the mitigation proposed**.** For the likely significant effects assessed, application of the proposed mitigation measures in full will limit residual effects to negligible/not significant.

The exception being a level of uncertainty relating to the effectiveness of mitigation to limit the effects of collision risk on the local kestrel population which, as a result, has a residual effects of very low significance. Uncertainty arises from the combination of mitigation/compensation measures to limit foraging opportunities around turbines and offsetting turbine mediated mortality through provision of nest boxes, as these have not been tested for this species in the context of an Irish wind farm development. Residual effects of very low significance also remain for breeding

woodcock, due to a lack of data for national breeding population estimates and uncertainty around the displacement effect/collision risk posed by the proposed development, especially if assessed in combination with the proposed neighbouring wind farm, which has proposed turbines for Lisclogher Bog. Importantly, for both kestrel and woodcock, the significance of the population effect are assessed on local populations and the collision risk/displacement effects on national populations would be negligible. Residual effects of very low significancy also remain for swift.

Similarly, for high collision risk bat species, while it is anticipated potential collision risk will be sufficiently reduced through implementing bat feature buffers around turbines, predicting bat behaviour post-construction is problematic and further remedial mitigation measures may be required. Therefore, for local populations of these species there are residual effects of low significance. A programme of post-construction monitoring of bat activity is proposed and this will inform requirements for any further remedial mitigation. With this measure in place any residual effects can be reduced to not significant.

Overall, therefore, no likely significant residual effects are predicted.

7.0 Land & Soils

7.1 Background

This chapter provides an assessment of the likely and significant effects of the proposed Bracklyn Wind Farm near Raharney, Co. Westmeath and its associated grid connection infrastructure (which extends into County Meath) on the land, soil and geological environment.

The majority of the proposed development is located within the administrative area of County Westmeath; while 2.5km of underground electricity line and the proposed end masts will be located within County Meath. Additionally, candidate quarries which may supply construction materials are also located within County Meath.

7.2 Methodology

A desk study of the proposed development and its environs was completed in advance of undertaking the walkover survey and site investigations. This involved collecting all relevant land and geological information for the proposed development site and surrounding area. Data sources included:-

- Environmental Protection Agency databases (www.epa.ie);
- Geological Survey of Ireland – Groundwater and Geological Database (www.gsi.ie);
- Bedrock Bedrock Geology 1:100,000 Scale Map Series, Sheet 12 (Geology County Meath);
- Geological Survey of Ireland – 1:25,000 Field Mapping Sheets;
- Ordnance Survey Ireland (OSI) – 6" and 1;5000 scale basemaps; and,
- Aerial photography (www.bing.com/maps; www.google.com/maps).

An initial site walkover, geological mapping and soil probing exercise was undertaken by HES on 21 February 2020. Further site investigation including trial pits, peat probes and gouge cores were undertaken on 11 and 12 June 2020. Additional site walkovers were completed in February 2021.

A detailed geotechnical and peat stability assessment, used to inform the assessment contained within this chapter was carried out by Fehily Timoney & Company (FT).

In summary, site investigations to inform this assessment include the following:-

- Detailed site walkovers to assess ground conditions;
- Soil cores and probing (50+) were undertaken by HES and FT at the proposed development site to investigate peat depths, subsoil type and lithology;
- A trial pit (~2–3.5m depth) was undertaken at each of the turbine locations (or nearby) and the meteorological mast to investigate subsoil depth and lithology. A total of 13 no. trial pits were completed;
- Logging of bedrock outcrops and subsoil exposures; and,
- Mineral subsoils and peat were logged according to BS: 5930 and Von Post Scale respectively.

7.3 Description of Likely Effects

Construction of the wind farm infrastructure will require the removal of peat, soil, subsoil and sometimes bedrock to a competent base layer. Importation of bedrock from an off-site local borrow pit will provide material for access road, turbine base and general hard-standing construction. Relatively minor excavation works will be required for the grid connection options (cable trench/end masts) and haul route works. Excess overburden/spoil that remains after landscaping and reinstatement will be placed in dedicated peat and spoil storage areas. Other potential effects such as soil erosion and compaction are expected to be negligible. During the construction phase sources of contaminants (such as oil based substances or other hazardous chemicals) will not be stored at the site except where this is done within safely bunded areas that safely contain all spillages and prevent the migration of contaminants into soil and subsoil. Refueling will be done with a double skinned bowser with spill kits on the ready in case of accidental spillages.

With regard cumulative effects, the land and soil impact assessment conclude that, significant effects are unlikely to arise predominately due to the localised and near surface nature of the construction works. All effects relating to the proposed development are assessed to be direct and contained within the immediate vicinity of the proposed development and it is assessed that there is no pathway for the development to act in combination with other projects.

The development will not be constructed within or near any designated sites for the protection of geological feature such as geological heritage, NHAs or SACs.

The proposed development will not affect or be affected by any proposed bog rehabilitation plans that might be carried out in the future on any adjoining boglands.

7.4 Mitigation Measures

The excavation of peat, soil and subsoil will have a direct effect on the geological environment and no specific mitigation measures are proposed. The excavation of materials will be completed in accordance with best practice for the management and treatment of such materials.

7.5 Overall Findings

No significant impacts on the land, soil or the geological environmental are anticipated during the construction, operation or decommissioning of the proposed development.

8.0 Water

8.1 Background

This EIAR chapter provides an assessment of the likely and significant effects of the proposed Bracklyn Wind Farm near Raharney, Co. Westmeath and its associated

grid connection infrastructure (which extends into County Meath) on water aspects (hydrology and hydrogeology) of the receiving environment.

8.2 Methodology

A desk study of the proposed development site and surrounding area was completed in advance of undertaking the walkover survey, field mapping and site investigations. This involved collecting all relevant geological, hydrological, hydrogeological and meteorological information for the proposed development and surrounding area. The desk study included consultation of the following data sources:-

- Environmental Protection Agency database (www.epa.ie); Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive/EPA Catchments Map Viewer (www.catchments.ie);
- Bedrock Bedrock Geology 1:100,000 Scale Map Series, Sheet 13 (Geology of Meath);
- Geological Survey of Ireland (2004); Groundwater Body Initial Characterization Reports;
- OPW Flood Hazard Mapping (www.floodinfo.ie);
- Environmental Protection Agency – "Hydrotool" Map Viewer (www.epa.ie);
- CFRAM Flood Risk Assessment (PFRA and CFRAM) maps (www.cfram.ie); and,
- Department of Environment, Community and Local Government on-line mapping viewer (www.myplan.ie);
- Meath Co. Co. and Westmeath Co. Co. Strategic Flood Risk Assessment Mapping;
- Ordnance Survey Ireland (OSI) – 6 inch and 1;5000 scale basemaps; and,
- Aerial photography (www.bing.com/maps, www.google.com/maps).

Detailed drainage mapping, hydrological constraints mapping, and baseline monitoring was initially undertaken by HES on 21 February 2019. Intrusive site investigations (described below) and baseline monitoring were undertaken on 14 and 15 June and 4 September 2020. An additional site walkover was completed in February 2021.

In summary, site investigations to address and inform the preparation of this water chapter include the following:-

- Walkover surveys and hydrological mapping of the proposed development and the surrounding area were undertaken whereby water flow directions and drainage patterns were recorded;
- A trial pit (~2 – 3.5m depth) was undertaken at each of the turbine locations (or nearby) and the met mast) to investigate subsoil depth and lithology along with groundwater conditions (i.e. potential inflows). 13 no. trial pits in total were completed;
- Field hydrochemistry measurements (electrical conductivity, pH, dissolved oxygen and temperature) were taken to determine the origin and nature of surface water flows; and,
- Surface water sampling (3 no. samples) was undertaken to determine the baseline water quality of the primary surface waters originating from the wind farm site and grid connection.

8.3 Description of Likely Effects

Due to the nature of wind farm developments, being near surface construction activities, impacts on groundwater are generally negligible and surface water is generally the main sensitive receptor assessed during impact assessments. The primary risk to groundwater at the site would be from hydrocarbon spillage and leakages during refuelling. These are common potential impacts to all construction sites (such as road works and industrial sites). These potential contamination sources are to be carefully managed at the site during the construction and operational phases of the development and measures are proposed within the EIAR to deal with these potential minor local impacts.

With regard likely cumulative surface water quality effects, it is assessed in the EIAR that any residual effects will be negligible and short-term following the implementation of measures described in the Surface Water Management Plan and proposed hydrological mitigation measures.

8.4 Mitigation Measures

Two methods will be employed to control drainage water within the site during construction, thereby protecting downstream surface water quality and aquatic habitats. The first method involves 'keeping clean water clean' by avoiding disturbance to natural drainage features, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations and construction areas. The second method involves collecting any drainage waters from works areas within the site that might carry silt, to allow settlement and cleaning prior to its release. During the construction phase all runoff will be treated to a high quality prior to being released. There will be no risk of increased flooding down-gradient of the site as a result of the proposed development due to these drainage measures. Impacts on water quality during the construction phase of the wind farm will be imperceptible to none. A surface water monitoring programme will be put in place during the construction phase.

During the operational phase drainage control measures will ensure that surface runoff from the developed areas of the site will continue to be of good quality and will therefore not impact on the quality of down-stream rivers and streams. The present drainage regime of the site will not be altered in any way. No impacts on surface water quality are anticipated during the operational phase.

8.5 Overall Findings

The proposed Bracklyn Wind Farm will not alter the hydrology or water balance of the catchments/watercourses downstream of the proposed site, therefore the proposed development will not affect any proposed bog rehabilitation plans that might be carried out in the future on any adjoining boglands. Any rehabilitation plans that are carried out will also have to be done in a manner that will not affect upstream drainage and therefore no effects on the proposed Bracklyn Windfarm site are anticipated.

Overall, no significant impacts on the water environmental are anticipated during the construction, operation or decommissioning of the proposed development.

9 Air Quality & Climate

9.1 Background

This chapter comprises an assessment of the likely impact on air quality and climate associated with the proposed Bracklyn Wind Farm during its construction, operation and decommissioning phases.

9.2 Methodology

The methodology employed as part of this assessment comprised a desktop appraisal and evaluation of existing environmental conditions; the likely impacts which may arise during the construction, operational and decommissioning phases; and identification of measures to off-set or reduce likely adverse effects.

9.3 Description of Likely Effects

The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. Due to the rural location of the proposed development, there are very few sensitive receptors within 1 km of the site boundary reducing the potential for impacts greatly. The majority of any dust produced will be deposited close to the potential source and any impacts from dust deposition will typically be within several hundred metres of the construction area.

The impact of the construction, operation and decommissioning of the proposed development on Ireland's total national greenhouse gas emission is compared to Ireland's 2019 total greenhouse gas emissions and obligations under Irelands EU 2030 commitments. Any adverse impacts are predicted to occur during the construction phase, with the dominant sources of greenhouse gas emissions as a result of the development due to the construction traffic and embodied energy for turbine construction.

The generation of electricity to the national grid during the operational phase will lead to a net saving for the development in terms of greenhouse gas emissions. The generation of 148,920 MWh / Year of electricity from the proposed development will lead to a net saving in terms of greenhouse gas emissions. The production of this renewable electricity results in the proposed development having a net positive annual impact on GHG emissions of the order of 0.36% of the National Emission Ceiling.

9.4 Mitigation Measures

A dust minimisation plan has been formulated for the construction phase of the proposed development, as construction activities are likely to generate some dust emissions.

9.5 Overall Findings

Due to the size, nature and location of the proposed development, increased road traffic emissions resulting from the proposed development are expected to have an imperceptible impact on air quality. The proposed development will, once operational, result in a long term positive effect on air quality and a reduction in greenhouse gases.

10 Landscape

10.1 Background

This chapter describes the landscape context of the proposed development and assesses the likely landscape and visual impacts of the scheme on the receiving environment. Although closely linked, landscape and visual impacts are assessed separately.

Landscape Impact Assessment (LIA) relates to assessing effects on the landscape as a resource in its own right and is concerned with how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the

landscape and its distinctive character. Visual Impact Assessment (VIA) relates to assessing effects on specific views and on the general visual amenity experienced by people. Cumulative landscape and visual impact assessment is concerned with additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments, or actions that occurred in the past, present or are likely to occur in the foreseeable future.

10.2 Methodology

Production of this assessment involved baseline work in the form of desktop studies and fieldwork comprising professional evaluation by qualified and experienced Landscape Architects. This entailed a desktop study, fieldwork to inform the assessment and an appraisal which estimated the significance of landscape and visual impacts base on a balance of receptor sensitivity weighed against the magnitude of effects. Cumulative landscape and visual effects were also assessed in respect of other surrounding developments that are either existing or permitted.

This assessment uses methodology as prescribed in the following guidance documents:-

- Environmental Protection Agency (EPA) publication 'Guidelines on the Information to be contained in Environmental Impact Statements (Draft 2017) and the accompanying Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (Draft 2015);
- Landscape Institute and the Institute of Environmental Management and Assessment publication entitled Guidelines for Landscape and Visual Impact Assessment – Third Addition (2013);
- Scottish Natural Heritage (SNH) Guidance Note: Cumulative Effect of Wind Farms (2012);
- Department of the Environment, Heritage and Local Government Wind Energy Development Guidelines (2006/2019 draft); and
- Scottish Natural Heritage (SNH) Visual representation of wind farms: Best Practice Guidelines (version 2.2 - 2017).

10.3 Description of Likely Effects

There will be direct physical impacts on the site during the construction and operational stages of the development, but such effects are considered to be modest in scale and nature in this already modified rural setting. There will also be effects on the landscape character of the central study area from the introduction of tall moving structures, and whilst turbines are not a familiar feature within the study area, there is some thematic relationship with the surrounding peat bog context where the landscape was once used to harvest fuel for energy and will now harvest wind as a source of energy. Landscape impacts will arise during the construction and operational stages of the proposed substation, which is discreetly sited within the main wind farm site and is surrounded by dense vegetation. Within the central study area, the magnitude of landscape impacts is deemed to be 'Medium', which, combined with the previously identified 'Medium-low' landscape sensitivity, results in a landscape impact significance of 'Moderate-slight'.

Beyond the central study area (<5km), the turbines will have a lesser background influence on prevailing landscape character, especially considering the flat nature of much of the study area, which diminishes the potential for clear views of the proposed turbines. Landscape impacts beyond 5km are considered to be no greater than 'Slight' diminishing to 'Imperceptible' with distance, and as the proposed wind farm becomes a comparatively small scale component of the overall landscape fabric.

Visual impacts were assessed at 40 visual receptor locations throughout the study area, which were deemed to range widely in sensitivity from Very High to Low. Those locations with the highest levels of sensitivity tend to be sensitive heritage features such as the Loughcrew complex, Trim Castle, and The Spire of Lloyd. Other views with medium to high sensitivity typically relate to elevated areas of terrain that afford distant views across the landscape, designated scenic views within the County Development Plans, and areas that provide a notable degree of scenic and/or recreational amenity. Medium-low sensitivity tends to be attributed to less remarkable and contained views from local and regional roads, often comprising a range of typical anthropogenic land uses.

As a result of the flat landscape contained within the study area combined with the numerous layers of hedgerows and mature tree lines, a notable degree of containment is apparent throughout the low-lying parts of the central and wider study area. Thus, the most notable visual impacts are likely to occur in the central study area. Eight viewpoints were selected to represent views within the local community, all of which were classified with a 'medium-low' sensitivity. The highest visual impact of 'High-medium' is considered to occur at both VRP13 and VRP19, as these views will afford the clearest views of the turbines from a near distance. Whilst the turbines will be dominant features of these views, they are not overbearing and generate little, if any, sense of visual ambiguity. The nearest settlement to the proposed development is that of Delvin, which is represented by both VRP10 and VRP11. VRP10 is located on the main street that runs through the centre of Delvin and will afford no visibility of the proposed turbines due to the built surrounds of the settlement. VRP11 is situated on the southern outskirts of the town and will afford a clear view of the proposed turbines resulting in a 'Moderate-slight' impact significance.

The most notable point to make is that visual impacts are typically contained within the central portions of the study area, beyond which the proposed turbines are often heavily screened by dense layers of hedgerow vegetation and mature tree lines. This is further reinforced by the fact that out of the 29 no. representative viewpoints within the wider study area, only two have an impact significance of 'Slight' with the remainder ranging between 'Slight-imperceptible' and 'Imperceptible'.

Wind energy development is a relatively unfamiliar feature within the study area, with no existing developments located within the 20km study area. Nevertheless, Yellow River Wind Farm is a permitted large-scale wind energy development comprising of 29 no. turbines that will be situated within the southern half of the study area. As a result of the considerable separation distance between both developments in combination with the flat and densely vegetated nature of the study area, it is not considered that the proposed development will contribute to a strong sense of wind farm proliferation. Thus, cumulative effects are not considered to be significant.

Notwithstanding the current cumulative scenario, there is a potential cumulative scenario that could include the adjacent proposed Ballivor Wind Farm. Nonetheless, due to its smaller scale, the proposed Bracklyn Wind Farm makes a considerably lesser contribution to cumulative effects in combination with the proposed Ballivor Wind Farm. Furthermore, given the pre-planning status of Ballivor Wind Farm, consideration of potential cumulative impacts Is somewhat premature and should not necessarily be taken as the future reality.

10.4 Mitigation Measures

Aside from construction stage mitigation measures to minimise land and vegetation disturbance and dust emissions, there are no specific mitigation measures to be implemented. The appropriate management and reinstatement of excavations, in a timely manner, will ensure that any adverse effects caused, for example at site entrances or road upgrade locations, are minimised insofar as possible. Similarly, the progressive reinstatement and landscaping of the site will remediate any short term adverse effects on the local landscape.

Given the highly visible nature of commercial wind energy developments it is not generally feasible to screen them from view using on-site screening measures typically employed for other forms of development during the operational phase. Instead, landscape and visual mitigation measures have been incorporated into the siting and design of the development at an early stage (see **Chapter 2**). In the case of the proposed development, the guidance provided in the Wind Energy Development Guidelines for Planning Authorities 2006 (and 2019 revision) was the principal consideration. The relevant guidance for the landscape types that constitute the landscape and visual setting of the proposed development are discussed above. It is considered that the proposed development is broadly in line with the recommendations contained within the Guidelines.

The proposed development has embedded landscape and visual mitigation measures and thus, the appraisal of potential landscape and visual effects is equivalent to any appraisal of residual effects in this instance.

Some of the general mitigation measures that will be implemented to make the development less intrusive and less eye catching on a localised level include:-

- The colour will be industry standard off-white/light grey semi-matt non-reflective finish;
- Transmission lines between individual turbines and the substation will be placed underground;
- Special care will be taken to preserve any features, insofar as possible, which contribute to the landscape character of the study area; and
- Counter rotation of blade sets will be avoided.

10.5 Overall Findings

The highest level of impact significance occurs at VRP13, VRP18, VRP19, VRP25 and VRP26 which relates to a 'Moderate' visual impact significance and is representative of views from the local community (within 5km). Outside of the central study area, the significance of impacts considerably reduces and ranges between 'slight' and imperceptible due to the flat nature of the study area and dense layers of vegetative screening. When coupled with the assessed landscape impact and cumulative impacts, it is assessed that the proposed development will not give rise to significant landscape and visual impacts or cumulative impacts.

11 Cultural Heritage

11.1 Background

This chapter has been prepared to assess and define any likely significant impacts or effects which the construction, operation and decommissioning of the proposed development may have on the archaeological, architectural and cultural heritage resource. The chapter includes an identification of likely significant impacts or effects which may arise and outlines mitigation measures, based on current information, which may be used to avoid, reduce or offset any likely adverse effects.

Construction phase effects may arise as a result of the development of turbine

foundations and hardstand areas, access roads, underground cabling, grid connection works, road upgrade works and associated activities; each of which will involve the mechanical excavation of all topsoil and overburden down to and through geologically deposited strata at their identified locations. Operational phase effects may arise as a result of the visual effects resulting from the presence of the proposed wind turbines in the landscape.

As a result of carrying out this assessment, the following potential archaeological, architectural and cultural heritage direct, indirect, construction, operational, decommissioning, cumulative and residual effects have been assessed.

11.2 Methodology

There is no professional standard for defining the extent of a study area when assessing the likelihood of effects on archaeological, architectural or cultural heritage remains. A 1km study area has been applied around the proposed development to assess the presence of statutorily protected archaeological remains (RMP sites). In addition, a 5km study area has been applied around the proposed development to assess the presence of any World Heritage Sites, sites included in the Tentative List as consideration for nomination to the World Heritage List, National Monuments, sites with Preservation Orders or Temporary Orders, Protected Structures, Conservation Areas or Proposed Conservation Areas.

A 1km study area has been applied around the proposed development to record the presence of any structures recorded on the National Inventory of Architectural Heritage (NIAH). An assessment has also been made of any historic gardens or designed landscapes as recorded on the NIAH that may exist within the proposed development area.

A 100m study area has been applied around the proposed grid connection, while the area of land take associated with the proposed road upgrade works has also been assessed.

Research has been undertaken in two phases. The first phase comprised a desk review, namely a paper and digital survey of archaeological, historical and cartographic sources. The second phase involved field inspections of the proposed development area.

11.3 Description of Likely Effects

There will be no direct construction phase effect on the recorded archaeological, architectural or cultural heritage resource. It is assessed that there will be a likely permanent, direct and imperceptible construction phase effect on any previously unrecorded archaeological remains that may exist within the proposed development site and which may be discovered during the construction phase. It is assessed that there will be a likely temporary, reversible and imperceptible visual and noise effect on the archaeological resource during the construction phase.

It is assessed that there will be a likely residual, long-term, reversible and significant operational phase visual effect on the setting of two Recorded Monuments located within the planning application boundary; a likely residual, long-term, reversible and moderate operational phase visual effect on the setting of an additional 12 no. Recorded Monuments located within the wind farm 1km study area; and a likely residual, long-term, reversible and imperceptible operational phase visual effect on the setting of two National Monuments in State Care within the 5km study area.

It is assessed that there will be a likely residual, long-term, reversible and moderate operational phase visual effect on the setting of Bracklyn House; a likely residual,

long-term, reversible and slight operational phase visual effect on the setting of the Gate Lodge; a likely residual, long-term, reversible and slight operational phase visual effect on the historic character of Bracklyn Demesne; and a likely residual, long-term, reversible and slight operational phase visual effect on the setting of an additional 55 no. Protected Structures located within the 5km study area. However the proposed development provides for an operational phase of 30-years and, as a result, any likely effects will be entirely reversed following the decommissioning of the proposed wind turbines.

It is assessed that there will be no likely decommissioning phase effects on the archaeological, architectural or cultural heritage resource. The decommissioning phase will result in the removal of wind farm infrastructure and is likely to result in an improvement in the archaeological, architectural and cultural heritage resource.

It is assessed that there is no likelihood of the constituent components of the proposed development to act, in combination with each other, to result in cumulative effects during either the construction, operation or decommissioning phases of development.

The proposed development will be located in close proximity to the proposed Ballivor Wind Farm. While construction of Ballivor Wind Farm will involve excavations, the fact that construction phase effects arising from either of the respective developments are unlikely to be experienced beyond its site boundary results in a limited likelihood of cumulative construction phase effects. The operation of Ballivor Wind Farm may result in a long-term, reversible and imperceptible cumulative visual effect with the proposed development. It is assessed that there are no additional developments which could act in combination with the proposed development to result in cumulative direct or indirect construction or operational phase effects.

11.4 Mitigation Measures

A post-consent pre-construction archaeological geophysical survey shall be carried out in all areas of land take associated with the proposed turbine bases and crane hardstands. Post-consent pre-construction test trenching shall be carried out in all areas of land take associated with the proposed turbine bases and hardstands, as well as along the access roads leading to Turbine 3 and Turbine 11. Archaeological monitoring of all excavations associated with construction of the wind farm, the grid connection and the road upgrade works shall be carried out.

Given their proximity to existing heritage features, it is recommended that micrositing should not be considered in respect of Turbine 3 or Turbine T11 should it result in turbines being moved closer to the Recorded Monuments in these two areas.

The micrositing of other infrastructure, within the tolerances outlined in Chapter 3, will not result in any adverse effect on archaeological, architectural or cultural heritage features.

11.5 Overall Findings

Following the implementation of mitigation measures outlined, the likely residual effects of the proposed development remains imperceptible to significant. This assessment has further concluded that the proposed development will not result in any likely significant cumulative effects with other existing, permitted or proposed development.

12 Noise & Vibration

12.1 Background

This assessment comprises an assessment into the likely environmental noise and vibration impacts of the proposed development.

12.2 Methodology

The methodology adopted for assessing the noise impact of the wind energy development is based on the guidance in the document 'Wind Energy Development Guidelines for Planning Authorities' published by the Department of Environment, Community and Local Government, which are based on the UK document ETSU-R-97 The Assessment and Rating of Noise from Wind Farms which describes a detailed method for deriving maximum values of wind turbine noise, when measured at an external location in the vicinity of a house. Maximum values, or limits, are primarily based on the background noise levels and how it varies with wind speed, in the absence of wind farm.

The background noise environment has been established through noise monitoring surveys undertaken at several noise sensitive locations (NSLs) surrounding the proposed development. Typical background noise levels for day and night periods at various wind speeds have been measured in accordance with best practice guidance contained in the Institute of Acoustics document 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise' (IOA GPG). Prevailing noise levels are primarily attributable to wind noise in foliage, local road traffic noise and other agricultural and anthropogenic sources in the area.

When considering a development of this nature, the potential noise and vibration effects on the surroundings must be considered for two stages: the short-term construction phase and the long-term operational phase.

12.3 Description of Likely Effects

The assessment of construction noise and vibration and has been conducted in accordance best practice guidance contained in BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise and BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Vibration. Subject to good working practice as recommended in the EIAR Chapter, noise associated with the construction phase is not expected to exceed the recommended limit values. The associated noise and vibration are not expected to cause any significant effects.

Based on detailed information on the site layout, turbine noise emission levels and turbine height, worst-case turbine noise levels have been predicted at NSLs for a range of operational wind speeds. The predicted noise levels associated with the proposed development will be within best practice noise limits recommended in Irish guidance, therefore it is not considered that a significant effect is associated with the development.

No significant vibration effects are associated with the operation of the site.

12.4 Mitigation Measures

The various contractors involved in the construction phase will be obliged, under contract, to take specific noise abatement measures and comply with the recommendations of BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise.

The level of vibration from construction activities shall be limited to the values set out in the EIAR. It should be noted that these limits are not absolute but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic

damage. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage these limits may need to be reduced by up to 50%.

Given the substantial distances between locations where notable levels of vibration may take place (e.g. piling at turbine locations or extensive use of vibration rollers in access track construction) and the nearest NSLs, no likely significant effect will be experienced. Therefore, no specific mitigation measures are proposed in respect of these works.

The completion of upgrade works to the haul route (i.e. along the L1504 and L5508) and the transportation of construction materials will occur in close proximity to a number of residential properties along these roads. All dwellings located within 50m of proposed upgrade works and above-referenced local roads are assessed to be modern buildings of sound construction (see Section 11.3.1.2 above) and are not, therefore, assessed as likely to be susceptible to cosmetic or structural damage from the magnitude of vibration predicted to be generated by the proposed upgrade works and traffic movements.

However, and notwithstanding the above; prior to the commencement of development a visual inspection (with photographic record) of all structures (buildings) within 50m of the L1504 and L5508 will be undertaken by a suitably qualified engineer to identify any pre-existing evidence of structural deterioration. A report on the visual inspection of each property will, on completion, be furnished to the respective property owners. During construction, it is also proposed to undertake occasional inspections to ensure the early identification of any adverse effects.

Following the completion of construction, a similar survey shall be completed and if a deterioration is identified and can be directly attributed to the construction of the proposed development, appropriate action will be immediately undertaken in agreement with the property owner and at the expense of the Applicant. The Planning Authority will also be advised of any necessary remedial work.

As further level of protection to those properties located immediately adjacent to the L5508 (identified as H17, H24 and H77) where it is proposed to increase the width of the existing road carriageway, the following additional mitigation measures are recommended:-

- Prior to the commencement of construction, a dilapidation survey of each property will be undertaken. This survey will form the basis of a report (to be furnished to the property owner) providing detailed description of the condition of the property;
- Crack 'tell-tales' will be installed on any existing cracks that are of concern. These 'tell-tales' will allow the cracks to be carefully monitored and will indicate whether any movement or opening of the cracks has occurred. The tell-tales will be inspected regularly during construction;
- A vibration monitor will be installed at each of the properties and will allow for actual vibration levels to be carefully monitored;
- A speed limit of 20 km/h will be put in place for all construction traffic using the L5508 within 100m of each of the above dwellings; and
- Following construction, a further dilapidation survey of the properties will be undertaken and furnished to the property owners. The results of this survey will be compared to that carried out prior to construction and can be used to determine if any damage has been caused to the properties.

With the above mitigation and monitoring measures in place, the likelihood of any

damage to buildings, but in particular residential dwellings, will be minimised. Moreover, the regular monitoring of the proposed 'tell-tales' and vibration monitors will give an early indication of vibration levels and will ensure that a timely intervention can be made, and additional mitigation or remedial measures implemented, if adverse effects are assessed as likely to arise.

An assessment of the operational phase noise levels, both specific to the proposed development and in combination with the proposed Ballivor Wind Farm, has been undertaken in accordance with best practice guidelines and procedures. The findings of the assessment confirm that predicted operational phase noise levels will be within the relevant best practice noise criteria curves for wind farms. Therefore, noise mitigation measures are not required for the operational phase of this development.

12.5 Overall Findings

In summary, the noise and vibration impact of the proposed development is not significant in the context of current national guidance.

13 Shadow Flicker

13.1 Background

Shadow flicker from wind turbines can occur when a particular combination of weather conditions coincide in specific locations at particular times of the day and year. It usually occurs when the sun is low in the sky and shines on a building or location from behind a turning rotor. This can cause the shadow of the turbine blades to flicker on and off as the turbine blades rotate. The proposed development has been carefully designed to reduce the potential impact of shadow flicker as far as is reasonably possible and the location of each proposed turbine has been carefully chosen to reduce the potential impact in relation to shadow flicker.

This EIAR assesses the potential number of hours per year likely to be experienced under exceptional 'worst case' shadow flicker on properties within 1,850m (10-times overall tip height) from the proposed wind turbines.

13.2 Methodology

This assessment has been carried out in accordance with all statutory guidelines and uses techniques which are recognised as best practice by the relevant environmental health organisations.

WindPro software, a detailed computer software model which can estimate the likely occurrence of shadow flicker, was used to predict the likely effect of the proposed development. The prediction model assesses the likelihood of shadow flicker occurring at receptor locations relative to the wind turbine locations and with long term average sunshine hours.

13.3 Description of Likely Effects

As the proposed wind turbines will not be operational during the construction phase, shadow flicker will not occur.

The 'worst case' results indicate that 9 no. receptors are likely to experience shadow flicker in excess of 30-minutes per day and, therefore, curtailment of wind turbines is likely to be required to ensure absolute compliance with the limits prescribed in the Wind Energy Development Guidelines for Planning Authorities 2006.

However, it is again reiterated that this calculation is a 'worst case' scenario and is not representative of likely shadow flicker effects. The 'worst case' scenario can only

occur under rare and specific combination of circumstances occurring simultaneously i.e. when the sun is at a certain position in the sky, the sun is shining, the turbines rotor is rotating and rotating parallel (directly or indirectly) to the shadow receptor.

The 'expected' results over the course of a year; which, while also being likely to significantly overestimate the actual shadow flicker impact, are more realistic prediction of likely shadow flicker levels; are also presented. The likely curtailment described above has also been incorporated within the assessment of 'expected results'; the prediction model indicates that none of the 78 no. receptors surveyed is likely to experience shadow flicker in excess of 30-hours per annum even prior to the curtailment of any wind turbine.

The highest prediction of shadow flicker effects relates to H03 (a financially involved landowner in the proposed development), which is predicted to experience 26:36 hours per year prior to curtailment and, following curtailment to ensure that the 30-minute per day criterion is not exceeded, 20:59 hours per year. Notably, no 'non-involved' property is assessed as likely to experience shadow flicker in excess of 7-hours per year, with 33 no. dwellings likely to experience no shadow flicker at all.

It can be confirmed, therefore, that the proposed development will not give rise to shadow flicker levels in excess of 30-minutes per day or 30-hours per year at any dwelling and, therefore, it is assessed that a likely significant effect will not occur.

13.4 Mitigation Measures

The following mitigation measures relate solely to the subject proposed development and are not applicable to the proposed Ballivor Wind Farm; however, it is assumed that the Ballivor Wind Farm will implement similar measures such that no dwelling experience shadow flicker levels greater than the limits prescribed in the 2006 Guidelines.

As there is no likelihood of effects during the construction phase, no mitigation measures or monitoring proposals are required, or proposed.

In the first instance, the likely shadow flicker effects have been minimised, and avoided where possible, through the iterative design process and assessment of project alternatives. However; while the proposed development strikes the best balance between the avoidance of likely significant effects and achieving the objectives of the project, shadow flicker effects remain, as discussed above.

Technological mitigation is available, and widely implemented, on wind farm developments where shadow flicker levels are proven to be in excess of the recommended limits. These mitigation measures effectively limit (curtail) the operation of turbines during the infrequent and rare periods when shadow flicker occurs. In short, if a particular turbine is creating shadow flicker effects at a particular receptor, then the operation of that turbine may be temporarily curtailed. This is usually achieved by turning off the turbines at predetermined times, as predicted by the shadow flicker model, when shadow flicker is proven to occur.

The wind turbines will each be fitted with shadow flicker curtailment software, inherent to their design, to facilitate their shut down as required. If the sun is shining, the software will turn off the turbine at the predetermined times when shadow flicker is predicted to occur based on the prediction model. This approach will be implemented, as necessary, to ensure that actual levels of shadow flicker do not exceed either of the relevant limits.

The level of turbine curtailment required to ensure that shadow flicker limit values are not exceeded will have an imperceptible effect on the overall renewable energy output of the proposed development.

13.5 Overall Findings

This chapter has assessed the likelihood of shadow flicker effects at all dwellings (78 no.) located within 10-times the overall tip height (1,850m) of the proposed wind turbines using a shadow flicker model. Shadow flicker is a rare phenomenon and can only occur during the infrequent coincidence of a number of specific, variable meteorological and geographic factors. The shadow flicker model is also based on a number of precautionary assumptions which significantly overestimate the likely shadow flicker impact at any receptor.

There is no likelihood of any significant effects during the construction or decommissioning phases as the proposed wind turbines will not be operational. Similarly, secondary developments associated with the wind farm, such as the proposed grid connection infrastructure and haul route upgrade works, are not capable of causing shadow flicker.

Technological mitigation measures are available, and widely implemented, to exclude the likelihood for shadow flicker to occur. These measures will ensure that no dwelling experiences shadow flicker levels, arising from the subject proposed development, in excess of either of the 30-minutes per day or 30-hours per year criteria. Therefore, it is concluded that the proposed development will not result in any likely significant shadow flicker effects, either individually or in combination with other existing, permitted or proposed developments; including the proposed Ballivor Wind Farm.

14 Material Assets

14.1 Transport & Access

14.1.1 Background

The EIAR provides a detailed description of the haul route to be followed from the chosen port facility to the subject site, including the traffic management and improvement works required along the road network and at junctions and roundabouts. It also details the breakdown and schedule of the number and size of vehicles associated with the construction, operation and decommissioning phases of the development. The effect of increased construction traffic on the local road network has also been assessed.

14.1.2 Methodology

This assessment used the following method, further details of which are provided in the following sections:-

- Legislation and guidance review;
- Desk study, including review of available maps and published information;
- Site walkover, including review of road network to be used;
- Evaluation of likely effects;
- Evaluation of the significance of these effects; and
- Identification of measures to avoid and mitigate any likely effects.

14.1.3 Description of Likely Effects

It is assessed that, during the construction phase, there will be a temporary increase in traffic flows on the local road network due to vehicles carrying turbine components and construction materials. A number of oversized loads will be

required to carry the long blades, towers and heavy turbine components to the site and will necessitate upgrade works at 12 no. locations, with 11 of these being temporary upgrades and permanent upgrade works at 1 no. location. The permanent upgrade works will be along the L5508 local road between its junction with the L1504 and the proposed wind farm site entrance. Once these components are delivered and installed, traffic entering the site will be substantially reduced, with maintenance vehicles visiting the site only intermittently. The haulage route and traffic assessment concluded that the local transport network will be able to accommodate the additional traffic volume associated with the construction of the wind farm. A traffic management plan, to be agreed with the local authority, will also help to minimise the impact on local roads and traffic and to provide for the safety of all road users.

14.1.4 Mitigation Measures

A series of mitigation measures have been proposed to reduce the level of potential impact associated with the proposed development on Transport and Access. The proposed development has generally been assessed as having the likelihood to result in negative, slight/moderate, direct, short-term, and high probability effects. Following the implementation of mitigation measures, the likely final effects have been assessed as imperceptible/slight, negative and short-term in nature. In addition, there will also be a likely positive residual effect from permanent upgrade of the L5508.

14.1.5 Overall Findings

Overall, it has been identified that there is no likelihood of significant effects on transport and access which could arise as a result of the construction, operation or decommissioning of the proposed development either individually or in combination with other existing, permitted or proposed developments.

14.2 Aviation

14.2.1 Background

This section assesses the likelihood of effects on aviation arising from the construction, operation or decommissioning of the proposed development. The requirement for an assessment of the likely effects on aviation is set in the Wind Energy Development Guidelines for Planning Authorities 2006.

14.2.2 Methodology

The assessment involved consultation with various stakeholders including the Irish Aviation Authority (IAA) and Department of Defence. In addition, publications issued by the IAA and the Department were reviewed to determine if the proposed development site was assessed as being of significance or if significant effects were likely. A desktop study was also undertaken to determine the presence of aerodromes or airstrips within 20km of the subject site.

This assessment has also had regard to the Draft Air Corps Wind Farm/Tall Structures Position Paper (August 2014) which sets out the Air Corps position on the appropriate siting and management of wind farms and tall structures. This assessment includes a detailed review of this position paper, a comparison of the proposed development site with identified 'Danger Areas', 'Restricted Areas' and 'Low Level Flying Areas'.

14.2.3 Description of Likely Effects

Due to the general 'low level' of activity during the construction phase, it is assessed that there will be no likely impact on aviation. During the erection of wind turbines,

cranes will be fitted with appropriate aviation warning lighting to alert pilots to the presence of tall structures.

Following the completion of the construction phase, no significant effects are assessed as likely to occur. The installation of aviation warning lighting is inherent to the project design; and its operation during the operational phase will ensure that any civil and military aviation activities occurring then the vicinity of the proposed development are sufficiently aware of the presence of the proposed development.

The proposed development site is not located within any low flying areas, restricted areas, danger areas, military operating areas or low level routes identified within the Draft Air Corps Wind Farm/Tall Structures Position Paper.

14.2.4 Mitigation Measures

The proposed wind turbines will, as requested by the IAA and Department of Defence in their respective consultation responses, be fitted with aviation warning lighting in accordance with the specification to be agreed with the IAA and the Planning Authority.

14.2.5 Overall Findings

This assessment concludes that the proposed development, including grid connection, is unlikely to result in any significant effect on aviation. The proposed development site is not located within an area identified as being of particular sensitivity or importance in the Draft Air Corps Wind Farm/Tall Structures Position Paper on military aviation or located close to any civilian aerodrome, airfield or airport. Accordingly, with the installation of appropriate aviation warning lighting, no significant effects are assessed as likely to occur. Therefore, it is assessed that significant effects on aviation are unlikely to arise as a result of the proposed development, either individually or in combination with other existing, permitted or proposed developments; including the proposed Ballivor Wind Farm.

14.3 Telecommunications

14.3.1 Background

This section considers the likely effects of the proposed development upon a range of communications infrastructure, including telecommunication networks, broadcast radio and television and fixed infrastructure such as telecommunication masts. In theory, given the nature of the proposed development and the absence of tall structures, interference or adverse effects are unlikely.

14.3.2 Methodology

The methodology followed to assess the likelihood of significant effects on telecommunication networks consisted of desk based research and consultation with various telecommunication companies and relevant authorities.

14.3.3 Description of Likely Effects

While there are telecommunication masts located within the local area, including mobile phone masts, the detailed consultation process has not identified the likelihood of any interference with existing telecommunication links.

Open Eir had, in March 2020, advised that a microwave link passed through the proposed development site; however, given that it was anticipated to be removed in the short-term due to the availability of alternative telecommunication options in the area, no concerns were raised. In January 2021, Open Eir advised that the proposed development would not give rise to impacts on any telecommunications

network.

2rn (RTE Transmission Network) has advised that there is potential for localised interference to the terrestrial television network. 2rn have requested that the Applicant enter into a protocol arrangement to ensure the appropriate remediation of any adverse effects which may be experienced.

14.3.4 Mitigation Measures

The proposed development is not likely to result in any effects on telecommunications and, therefore, no mitigation measures are necessary with the exception of the 2rn protocol arrangement as discussed above.

14.3.5 Overall Findings

It can be concluded that, on the basis of a desktop assessment and extensive consultation with stakeholders, the proposed development will not result in likely significant effects on the telecommunications network.

14.4 Resources & Utility Infrastructure

14.4.1 Background

This section provides details of the likelihood of significant effects or interactions with existing renewable and non-renewable resources and existing utility infrastructure; including existing or permitted wind farms, quarries, mining operations and utility infrastructure (electricity lines and phone lines).

14.4.2 Methodology

The methodology followed in this assessment involved a desk based study to identify resources and utility infrastructure which could be affected by the proposed development followed by an evaluation, based on experience, as to whether these resources were likely to be affected.

14.4.3 Description of Likely Effects

The construction phase of the proposed development is not likely to have any significant effects on existing resources or utility infrastructure. The construction phase will not restrict the export of energy generated from other sources nor will it impact upon existing utility services. While there is a possibility interaction with utility services (e.g. accidental collision with overhead wires during the construction phase), this can be mitigated through good construction practices.

The construction phase will result in the extraction of non-renewable resources in the form of stone and gravel for the construction of access tracks and concrete for building foundations and electrical equipment plinths. However, stone and gravel will only be sourced from quarries with have full planning permission.

The operational phase of the proposed development will not result in any effect on existing utility infrastructure or renewable or non non-renewable resources. The connection of the proposed development to the national grid will strengthen the electricity network infrastructure in the wider region.

14.4.4 Mitigation Measures

No specific mitigation measures are proposed or required during the construction or operational phases.

14.4.5 Overall Findings

This assessment concludes that the proposed development is unlikely to result in any significant adverse effect on renewable and non-renewable resources or on utilities

infrastructure. The operation of the proposed development will bring about a benefit in terms of electricity generated from renewable sources and a strengthening of national electricity grid infrastructure in the wider region of the proposed development site. This assessment similarly concludes that the proposed development is unlikely to result in any significant adverse cumulative effects in combination with existing, permitted or proposed developments.

15 Interactions of the Foregoing

All environmental factors are interrelated to some degree. The assessment of these interactions is an important requirement of the environmental impact assessment process. Having assessed the interaction of likely effects during the construction and operational phases, the likely interactions are not assessed as likely to result in any effects that could magnify effects through the interaction or accumulation of effects.

16 Summary of Effects

This Non-Technical Summary has outlined, in summary format, the findings of the EIAR for the proposed development. Full details are set out in the EIAR and its accompanying technical appendices.

The EIAR has assessed that any likely adverse effects of the proposed development, and their interactions, can be managed and mitigated and that there are lasting social and environmental benefits as a result of the proposed development. Whilst the proposed development will have some minor residual effects on the local environment, these will be addressed through mitigation measures, good management and proposed construction techniques and are not assessed as likely to be significant.

The proposed development will make a positive contribution to sustainable energy generation in Ireland and will also help diversify and sustain the rural economy through construction, as well as operation and maintenance activities. Overall, the combined effects which have been assessed within this EIAR demonstrate that the proposed development will not result in a likely significant adverse effect on the environment.