1 Introduction & Proposed Development

Background

1.1 This Environmental Statement (ES) has been prepared by Renewable Energy Systems Limited (RES) to accompany a planning application that has been made to the Causeway Coast & Glens Borough Council Planning Department for permission to construct, operate and decommission a wind farm known as Dunbeg South Extension Wind Farm, hereinafter referred to as 'the Proposed Development'. The purpose of the ES is to inform the Planning Department in the assessment of the likely significant environmental effects resulting from the Proposed Development and to establish the need for mitigation measures to reduce such effects.

1.2 The application site is located on lands to the north of A37, to the west of the existing Dunbeg Wind Farm and lands to the south of A37 adjacent to a disused quarry, in the townlands of Dunbeg and Dunmore, 6.2km north east of Limavady, County Derry / Londonderry. The application site is shown in **Figure 1.1: Site Location** and **Figure 1.2: Planning Application Boundary.**

1.3 This chapter is supported by:

- Figures 1.1 to 1.17
- Technical Appendices 1.1 to 1.5

The Applicant

1.4 The application for planning permission is made by RES ('the Applicant').

1.5 RES is the world's largest independent renewable energy company. At the forefront of the industry for 40 years, RES has delivered more than 23GW of renewable energy projects across the globe and supports an operational asset portfolio exceeding 10GW worldwide for a large client base. RES is active in 11countries working across onshore and offshore wind, solar, energy storage and transmission and distribution. RES has developed 26 onshore wind farms in Northern Ireland totalling in excess of 400MW and operates over 134MW of wind capacity across Northern Ireland.

EIA Process

Scope of the ES

1.6 The Environmental Impact Assessment (EIA) has assessed the environmental impacts associated with the construction, operation and decommissioning the Proposed Development, comprising 4no. three bladed wind turbines, each up to 149.9m maximum tip height; associated electricity transformers; underground cabling; access tracks; turning heads; site entrances; crane hardstandings; control building and substation compound and off-site areas of widening to the public road and all ancillary works. During construction and commissioning there would be a number of temporary works including a construction compound with car parking;

temporary parts of crane hardstandings and welfare facilities. The purpose of the development is for the generation of electricity.

1.7 RES has undertaken informal scoping with Causeway Coast & Glens Borough Council regarding the Proposed Development and a letter of Intention to Submit an ES was lodged, which is included in **Technical Appendix 1.1**. An Intention to Submit response from Causeway Coast & Glens Borough Council is included in **Technical Appendix 1.2**. Informal consultation was also undertaken by individual chapter authors. Responses from consultees have been considered in the individual chapters of this ES.

1.8 An EIA has been undertaken in accordance with the Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017, (the "EIA Regulations"), to identify and assess the likely environmental effects of the Proposed Development and establish an appropriate range of mitigation measures in order to reduce adverse impacts where possible. This ES contains the findings of the EIA.

1.9 The Proposed Development will represent a 'Schedule 2' development, as defined under the "EIA Regulations". Development that is listed in Schedule 2 requires an EIA if it is likely to have an impact on the environment by virtue of factors such as its size, nature or location. Therefore, any potential effects of the construction, operation and decommissioning of the Proposed Development deemed to have significant environmental effects are subject to an EIA.

1.10 The scale of the Proposed Development means that there is the potential for significant environmental effects to arise. Consequently, it was deemed appropriate to undertake an EIA.

1.11 EIA is a process by which information about the environmental impacts of a project is collected, evaluated and taken into account in its design and the decision as to whether it should be granted planning permission. The applicant presents the information on the project and its likely environmental impacts in an ES. This enables decision-makers to consider these impacts when determining the related planning application. The EIA process has a number of key characteristics:

- It is systematic, comprising a sequence of tasks defined both by regulation and by practice;
- It is analytical, requiring the application of specialist skills from the environmental sciences;
- It is impartial, its objective being to inform the decision-maker rather than to promote the project;
- It is consultative, with provision being made for obtaining information and feedback from statutory agencies and key stakeholders; and
- It is iterative, allowing opportunities for environmental concerns to be addressed during the planning and design of a project.

1.12 This final point is particularly important with respect to the design of the Proposed Development where a number of design iterations have taken place in response to

environmental factors identified during the EIA process. This is described in **Chapter 3: Design Evolution & Alternatives**.

1.13 The EIA for the Proposed Development has been carried out in accordance with the latest regulations, guidance and advice on good practice, comprising:

- Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017;
- Environmental Impact Assessment: A guide to procedures (Department for Communities and Local Government, amended reprint 2001); and
- Guidelines for Environmental Impact Assessment (Institute of Environmental Management and Assessment, 2004).

1.14 Individual technical assessments have been undertaken in accordance with a variety of legislation, guidance, and best practice. Relevant details are contained within the Legislation and Policy Framework section where applicable to each technical chapter.

The Assessment Method

1.15 Appropriate methodologies have been used to assess the effects relating to each of the environmental topics that have been investigated as part of the EIA. These methodologies are based on recognised good practice and guidelines specific to each subject area, details of which are provided within each individual technical section.

1.16 The design team employed an iterative approach to the design of the Proposed Development where the design evolved throughout the EIA process as different constraints and potentially adverse impacts were identified and evaluated. This method is considered best practice as mitigation measures can concurrently be integrated into the design throughout the EIA process. This approach allowed the design team to alleviate or remove potentially adverse impacts and incorporate measures into the design to enhance positive impacts. The final evaluation of significance assesses the residual impacts assuming all mitigation measures are applied.

1.17 Each technical chapter assesses the impacts that could arise as a result of the Proposed Development. Impacts are assessed as being either adverse, beneficial, permanent, temporary or reversible. Significance is determined by assessing the magnitude and sensitivity of each likely impact.

1.18 The ES complies with current planning policy and will be submitted in conjunction with a planning application. This report is a formal ES under the Planning (EIA) Regulations (Northern Ireland) 2017. The ES is designed to provide information for the purpose of assessing the likely impact upon the environment.

Structure of the Environmental Statement

1.19 Schedule 4 of the "EIA Regulations" states that the following must be included within the ES:

- A description of the development (description of the physical characteristics (site, design and size of the development), land-use requirements, production processes) and an estimate of expected residues and emissions resulting from the operation of the proposed development.
- An outline of the alternatives studied by the applicant and explanation of why the particular option was chosen.
- A description of the aspects of the environment likely to be significantly affected by the development (including population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage and landscape) and the inter-relationship between the above aspects.
- A description of the likely significant effects of the development on the environment (to include direct, indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, beneficial and adverse effects of the development).
- A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.
- The data required to identify and assess the main effects that the development is likely to have on the environment.
- An indication of any difficulties (technical deficiencies or lack of know-how) encountered.
- A non-technical summary of the information contained within the ES.

1.20 This ES has been prepared in accordance with the "EIA Regulations" described above. The ES comprises the following volumes:

- **Volume 1**: Non-technical Summary (NTS) of the ES
- **Volume 2**: Main Text
- **Volume 3**: Figures (the illustrations that accompany the ES)
- **Volume 4**: Technical Appendices (technical information relating to the environmental topics such as detailed methodologies, baseline data information and data analysis).

1.21 Volume 2 is organised as follows:

- **Chapter 1**: Introduction & Proposed Development
- **Chapter 2**: Planning Policy
- **Chapter 3**: Design Evolution & Alternatives
- **Chapter 4:** Landscape & Visual
- **Chapter 5:** Archaeology & Cultural Heritage
- **Chapter 6**: Ecology
- **Chapter 7**: Ornithology
- **Chapter 8:** Fisheries
- **Chapter 9:** Geology & Water Environment
- **Chapter 10:** Acoustic Assessment

- **Chapter 11**: Traffic & Transport
- **Chapter 12:** Shadow Flicker
- **Chapter 13:** Socioeconomics
- **Chapter 14:** Schedule of Mitigation

1.22 Biodiversity is covered under Chapters 6, 7, 8, and 9; Human Health is covered under Chapters 10 & 12 and Climate Change is covered within Chapter 13. A schedule of mitigation is described in Chapter 14.

1.23 Chapters 1, 2, 3, 10, 11, 12, and 14 have been authored by RES using their in-house professionally qualified expertise in respect of these topics. The Environmental Statement has been compiled by RES, primarily by Ellen Cross (Development Project Manager).

1.24 In general, for each environmental topic, the following format has been adopted regarding the presentation of information:

- Introduction
- Scope of Assessment
- Legislation and Policy Framework
- Consultation
- Assessment Methodology
- Baseline Assessment
- Assessment of residual impacts
- Design Evolution and Mitigation Measures
- Residual Impacts
- Cumulative Impacts
- Summary and Conclusions
- References.

1.25 A number of individual disciplines have adopted variations from this format as a result of specific assessment methodologies and appropriate reporting structure.

Planning Application

1.26 The proposed development could potentially yield up to 16.8MW, it is therefore under the threshold of 30MW for regionally significant development.

1.27 In March 2024, the Department for Infrastructure (DFI) confirmed that there is no requirement to consult the Department under S26 (1); correspondence with DFI is presented in **Technical Appendix 1.3**. Therefore, the planning application was submitted to the planning authority in which the site is located; Causeway Coast & Glens Borough Council Planning Department.

The Proposed Development

1.28 The Proposed Development, comprising 4no. three bladed, horizontal axis wind turbines, each up to 149.9m maximum tip height, with a total capacity of up to

16.8MW. The development would include electricity transformers; underground cabling; access tracks; turning heads; site entrance; crane hardstandings; control building and substation compound; off-site areas of widening to the public road and all ancillary works. During construction and commissioning there would be a number of temporary works including a construction compound with car parking; temporary parts of crane hardstandings; welfare facilities. The purpose of the development is for the generation of electricity.

1.29 The Planning Application Boundary (red line boundary) is shown on **Figure 1.2**. This boundary contains the main wind farm site, including positions of the turbines and associated infrastructure, with 50 m micrositing. The Planning Application Boundary lies fully within Land under the Applicant's Control (blue line boundary), as shown in **Figure 1.2.**

1.30 A detailed plan of the Proposed Development showing the position of the turbines and other infrastructure is shown on **Figure 1.3: Infrastructure Layout**.

1.31 This chapter provides a description of the physical characteristics of the Proposed Development for the purpose of identifying and assessing the main environmental impacts of the proposal.

1.32 In this chapter in order to differentiate between land take and infrastructure that will be present for the wind farm lifetime, and land take and infrastructure which is only required for short term works during the construction period, the term 'permanent' is used to describe the former and 'temporary' used to describe the latter. However, it should be noted that the Proposed Development would have a temporary operational lifetime of approximately 35 years from the date of commissioning, after which the above ground infrastructure would be removed, and the land remediated. Therefore, the effects are largely long-term temporary as opposed to permanent.

1.33 Planning permission is being sought for the Proposed Development comprising the following:

- Up to 4no. three-bladed horizontal axis wind turbines of up to 149.9m tip-height
- Associated external electricity transformers
- New Site Entrance (to access northern portion of the site)
- To access southern portion of the site; the permitted entrance for the Dunbeg South Wind Farm site (LA01/2022/0981/F) located to the west of the proposed development (Option 1) will be used, however in the unlikely event that Dunbeg South Wind Farm is not constructed, a new Site Entrance along Broad Road will be created (Option 2)
- New access tracks
- Turning heads
- Control buildings and substation compound
- Off-site areas of widening to the public road and all ancillary works
- Turbine foundations
- Hardstanding areas at each turbine location for use by cranes erecting and maintaining the turbines
- Electricity transformers
- Approximately 2.2km of new access track if access to the southern site is via the permitted entrance for the Dunbeg South Wind Farm site (LA01/2022/0981/F) located to the west of the proposed development (Option 1). However, in the unlikely event that Dunbeg South Wind Farm is not constructed, approximately 2.6km of new access track will be developed (Option 2)
- On-site electrical, control and communications network of underground (buried) cables
- Temporary construction compound
- Small Enabling Works Compound
- Permanent and temporary drainage works
- Associated ancillary works

Flexibility

1.34 Although the design process and evolution seek to combine environmental and economic requirements, the Applicant would nevertheless wish some flexibility, where necessary, in micrositing the exact positions of the turbines and routes of on-site access tracks and associated infrastructure (50 m deviation in plan from the indicative design). Any repositioning would not encroach into environmentally constrained areas. Therefore, 50 m flexibility in turbine positioning would help

mitigate any potential environmental effects: e.g. avoidance of unfavourable ground conditions or archaeological features not apparent from current records. See **Figure 1.3: Infrastructure Layout** for details.

Site Tracks

1.35 Two options for site track routes are also presented for the southern section of the site, the option elected will be dependent on which option is selected to access the southern portion of the site. **Figure 1.3 Infrastructure Layout** (Overview) presents the overview of both of the infrastructure options for the site. It is noted that only one of the Options will be developed (i.e. only if Option 1 is chosen then Option 2 will not be developed and vice-versa), this will be agreed prior to construction with Causeway Coast & Glens and the relevant roads authority. The preferred design is Option 1, however to ensure that the proposed development has been correctly assessed, the ES Chapters considers the impact of both options.

1.36 The Proposed Development would result in the construction of approximately 2.2 km of new track under Option 1, and 2.6km under Option 2. The running width of the track would be 4.5m on straight sections, with 0.25m wide shoulders on each side, totalling 5m. The permanent land take area for the new track would be approximately 14,308 m^2 under Option 1 or 19,192 m^2 under Option 2. This sharing of infrastructure will help to minimise the impact of the Proposed Development.

1.37 The on-site access track layout has been designed to minimise environmental disturbance by avoiding sensitive habitats where possible; and keeping the length of track commensurate with the minimum required for operational safety. The track route also takes cognisance of the various identified environmental constraints. Typical access track designs are shown in **Figure 1.8**.

1.38 6 new watercourse crossings will be required as part of the track layout (Under Option 1 – five crossings would be required, Under Option 2 – five would be required). These crossings would be designed to ensure that fish movements are not restricted (where recommended in Chapter 8: Fisheries) in addition to ensuring the crossing size is adequate for potential flood flows. An example of the watercourse crossing design is shown in **Figure 1.15**.

Land Take

1.39 The turbines need to be spaced a suitable distance apart (taking into account the prevailing wind direction), so as not to interfere aerodynamically with one another (creating losses). The actual land developed is limited to the substation, wind turbine towers, transformers, permanent crane hardstandings, and the access tracks, which account collectively for approximately 5.14% (Under Option 1) (and 6.18% Under Option 2) of the total area within the Planning Application Boundary, as detailed in Table 1.1.

Table 1.1 - Summary of Temporary and Permanent Hardstanding in the Proposed Development

Wind Farm Element	Temporary hardstanding[1] in m^2	Permanent Hardstanding[2] in m^2
Turbines and transformer pads	-	904
Crane pads and laydown areas	2,520	4,800
New on-site access tracks (including junctions, entrances and turning heads)	-	14,308 *(19,192)
Control building & substation compound (including hardstand)	-	850
Construction Compound	4,065	-
Small Construction Compound	945	-
Total hardstanding in m^2	7,530	20,862 *(25,746)
Total hardstanding in ha	0.753	2.0862 *(2.5746)
Total hardstanding as % of total area within the Planning Application Boundary (Main site) (39.05ha).	1.93%	5.34% *(6.59%)
Total hardstanding as % of total area within the Land Under Applicant Control (Main site) (154 ha).	0.049%	1.35% *(1.67%)

*If Option 2 is developed

1.40 Thus, in summary, the Proposed Development would require approximately 2.0862ha under Option 1 or 2.5746ha Under Option 2 of hardstanding lasting throughout the life of the project. An estimated further 0.753 ha would be occupied by hardstanding on a temporary basis.

Wind Turbines & Foundations

1.41 The wind turbine industry is evolving at a remarkable rate. Designs continue to improve technically and economically. The most suitable turbine model for a particular location can change with time and therefore a final choice of machine for the Proposed Development has not yet been made. The most suitable machine will be selected before construction, with a maximum tip height of 149.9 m.

[1] Temporary hardstanding: this refers to ground which will be occupied by hardstanding / built structures during the construction of the Development. However, once the Development has been constructed this land will be reinstated and available for grazing.

[2] Permanent hardstanding: this refers to ground which will be occupied by hardstanding / built structures throughout the lifetime of the Development.

*Figures in brackets illustrate the difference in area / percentage if Option 2 is utilised.

1.42 Most of the dominant wind turbine manufacturers are now producing turbines that are classed as suitable for the wind regimes typical of Northern Ireland and many are also producing turbines that meet the up to 149.9 m tip height specification being suggested for the Proposed Development. Exact tower and blade dimensions vary marginally between manufacturers. A diagram of a typical 149.9 m tip height turbine is given in **Figure 1.4.**

1.43 Exact megawatt capacities also vary between manufacturers. For economic assessment purposes, a suitable candidate turbine currently available in the marketplace of 4.2MW (with an overall tip height of up to 149.9m) has been assumed.

1.44 Turbines begin generating automatically at a wind speed of around 3 to 4 metres per second (m/s) and have a shut-down wind speed of up to 32 m/s. If requested, it is proposed to install lighting on turbine(s) in a pattern that is acceptable to the Civil Aviation Authority (CAA) and Ministry of Defence (MoD) for aviation visibility purposes. Infrared lighting allows military aircraft with night vision capability to detect and avoid wind farms.

1.45 We would seek to protect commercial aircraft safety and protect amenity by agreeing a scheme for the installation of aviation lighting with City of Derry Airport (CODA). Upon erection of the turbines, the agreed lighting scheme shall be installed and operational for the lifetime of the turbines.

1.46 Each turbine would have a transformer and switchgear. The transformer's function is to raise the generation voltage from approximately 690 volts to the higher distribution level that is required to transport the electricity from the turbines to the grid connection point substation on the site and onwards into the grid network. Depending on the turbine supplier, the transformer and switchgear may be located inside or outside each turbine.

1.47 The wind turbines would be erected on reinforced concrete foundations. It is anticipated that the foundations would be of gravity base design, but there may be the requirement to use piled foundations where ground conditions dictate. Final base designs will be determined after a full geotechnical evaluation of each turbine location. **Figure 1.11** provides an illustration of a typical gravity base wind turbine foundation design.

1.48 The turbine foundation formation level is approximately 16-25 m diameter in area and 2.5-4 m below ground level. The walls of the excavation will be battered to approximately 1:2, yielding a maximum ground level excavation area of approximately 40 m diameter.

1.49 The excavation area around each turbine is significant in terms of both its scale and duration of the works and as such requires consideration. Ancillary excavation works and material storage around other parts of development, such as those for cable trenching, would have a negligible impact on environmental receptors due to the very minor scale of the excavation, or duration of the works, and are not considered further in the ES.

1.50 Following completion of the turbine installation, the permanent hardstanding would be approximately 226m^2 at each turbine site, which includes the concrete plinth to which the steel tower is attached and a maintenance track/path around the base of the turbine. The external transformer (if required) would take an additional 28 m^2 of land at each turbine. The completed foundation is covered with soil approximately 1.5m deep, leaving only the concrete plinth exposed at ground level, to which the steel tower is attached. Movement of livestock around the tower would be unrestricted.

Crane Hard Standings

1.51 During the erection of the turbines, crane hardstanding areas would be required adjacent to each turbine base. **Figure 1.12** shows the general hardstanding arrangement at each turbine. Typically, these consist of one main permanent area of 1200m^2 adjacent to the turbine position, where the main turbine erection crane will be located. The other areas, totalling 630m^2, will be temporary and used during the assembly of the main crane jib. The hardstanding will be constructed using the same method as the excavated access tracks. This involves the topsoil being replaced with suitable structural fill to finished level.

1.52 After construction operations are complete, the temporary crane pad areas, shown on **Figure 1.12**, will be reinstated. There will be a requirement to use cranes on occasion during the operational phase of the Proposed Development, so the main crane hardstanding (1200m^2) will be retained to ease maintenance activities. This approach complies with current best practice guidance[3] which recommends crane hardstandings are left uncovered for the lifetime of the Proposed Development.

Electrical Connection

1.53 Assuming the use of the currently available models, each wind turbine would generate electricity at low voltage and would have an ancillary transformer located either within or outside the base of the tower to step up the voltage to the required on-site distribution voltage. Each turbine would be connected to any adjacent turbines by underground cables.

1.54 The wind farm substation is proposed to be located on the central part of the southern section of the site as shown in **Figure 1.3: Infrastructure Layout**. All power and control cabling on the wind farm will be buried underground in trenches located, where possible, along the route of site access tracks. These trenches will be partially backfilled with topsoil. The vegetation soil tuft will be stripped and laid beside the trench and used to reinstate the trench to the original ground level immediately after the cables have been installed.

1.55 The connection of wind farms to the electrical grid typically follows a separate consenting process and it is normally the responsibility of the network operator to progress the relevant consent, where required. The Best Practice Guidance to PPS

[3] SNH, Scottish Renewables, SEPA and the Forestry Commission Scotland (2010) "*Good Practice during Wind Farm Construction*"

18 states that whilst the routing of such lines by Northern Ireland Electricity (NIE) is usually dealt with separately to the application for the wind farm, developers will generally be expected to provide details of indicative routes and method of connection.

1.56 RES considers connection to the grid system via an underground cable following the public road to the proposed Cam Cluster Substation as the most likely option available. Although not a part of the planning application for the Proposed Development, proposed grid connection route is illustrated and the environmental effects have been assessed and these are presented in **Technical Appendix 1.4**.

Control Building & Substation Compound

1.57 The grid connection substation will comprise of a Control Building and a small compound at the wind farm site as per **Figure 1.5**.

1.58 The total area taken up by the control building and associated infrastructure is expected to be 850.65m^2. This is to include the building, rear compound, all associated welfare, access and parking.

1.59 The wind farm control building (shown in **Figure 1.5)** will be designed and constructed to the standard required by NIE for the accommodation of NIE substation equipment and wind farm equipment. Where possible, local building materials and finishes will be used to ensure that the appearance is in keeping with other buildings in the area.

1.60 The control building will accommodate metering equipment, switchgear, the central computer system and electrical control panels. A spare parts store room, and welfare facilities will also be located in the control building. The building will be attended by maintenance personnel on a regular basis.

1.61 Following an assessment of foul treatment options through a review of Pollution Prevention Guidelines 4, it was determined that both the toilet, wash hand basin and sink should drain to a small package treatment plant located adjacent to the control building, which would follow the Controlled Activities Regulations (CAR) guidelines and be constructed and located in accordance with the relevant Building Standards and agreed with the Council.

1.62 A permanent external environmental waste storage area will be provided with a minimum of 6 m clearance from the buildings. The area will consist of a concrete plinth surrounded with a security fence and double gate.

Description of Access

1.63 The site entrance to access the northern portion of the site (T4) is located on the Broad Road where an existing access track will be upgraded. The construction of the Dunbeg Wind Farm has previously directly accessed the Broad Road (A37) for access and egress of both HGV and AIL deliveries (PAC 2009/A0363 (B/2007/0560/F)).

1.64 Two options are available to access the southern portion of the site, in which turbines T1, T2, and T3 are located. It is noted that only one of the Options will be developed (i.e. will be one or the other), this will be agreed prior to construction with Causeway Coast & Glens and the relevant roads authority.

1.65 Option 1 is the preferred design and involves the southern section of the site being accessed via the existing Dunbeg South Wind Farm site which has already achieved planning consent (LA01/2022/0981/F & LA01/2018/0200/F). This would be achieved by the tracks from Dunbeg South Extension joining the Dunbeg South tracks as follows; track running south from T1 would join to the track to the east of turbine T9 from Dunbeg South (Option 1a), and the track running south west from T2 at Dunbeg South Extension would join the track to the north of Dunbeg South turbine T8 (Option 1b).

1.66 Option 2 will be developed in the unlikely event that Dunbeg South Wind Farm is not constructed. Option 2 involves, the southern portion of the site (T1, T2, T3) being accessed via the Broad Road, with the southern access being located immediately south of the northern access as shown in **Figure 1.3 Infrastructure** Layout (Overview & Option 2); 'Entrance to Southern Section (Option 2)'.

1.67 The site entrance drawings for those associated with the entrance to the northern portion of the site (T4) and Entrance to Southern Section (Option 2)' is shown in **Figure 1.7: Site Entrance.** Entrances for the southern portion of the site under Option 1 will be via existing track associated with Dunbeg South Windfarm, the connection point is shown in **Figure 1.3 Infrastructure Layout** (Overview & Option 1) as 'Entrance to Southern Section Option 1a & Entrance to Southern Section Option 1b'.

1.68 The proposed access route for the delivery of large turbine components, known as abnormal indivisible loads (AILs), is shown in **Figure 11.1: Turbine Delivery Route (Chapter 11)**.

1.69 **Technical Appendix 11.1 (Chapter 11)** shows a swept path analysis of all points along the turbine delivery route that require either overrun or oversail beyond the road edge.

1.70 At the end of the construction period and in consultation with DFI Roads, any reinstatement required to any street furniture which may be removed on a temporary basis will be undertaken. In the unlikely event that a replacement blade is required during the operational phase of the wind farm, any works will be undertaken following consultation with DFI Roads.

1.71 The proposed routes for construction traffic are shown on **Figure 11.2: HGV Routes (Chapter 11)**.

1.72 A full assessment is included in **Chapter 11: Traffic and Transport**.

Typical Construction Activities

1.73 Prior to commencement of construction, detailed method statements will be prepared to address best practice working methods. This is known as the Construction Method Statement (CMS). As a minimum, the following best practice construction methods will be adhered to:

- Where possible and in order to minimise impacts of earthworks, excavations will be kept to a minimum with granular material being reused where appropriate
- Consideration will be given to weather conditions when stripping soil. For example, during periods of heavy rain (>25 mm in 24 hours), significant snow event (>75 mm lying) or an extended period of freezing conditions (ground penetration >100 mm), soil stripping works will be reviewed to take in account any adverse weather conditions and were deemed applicable, works will cease until site conditions prevail that are compatible with this activity
- Vegetated turves shall be stripped and stockpiled separately prior to excavation of topsoil/peat in all work areas
- Vegetated turves will be reused as quickly as possible
- Excavations will be monitored for changing soil types to prevent cross mixing of soils in stockpiles
- Topsoil shall be stripped and stored carefully for use in reinstatement works, which shall be carried out as soon as possible after sections of work are complete. Topsoil will be stripped prior to excavation of subsoil in all work areas
- Any remaining subsoil will be excavated down to a suitable bearing stratum and set-aside for later use in landscaping, backfilling around structures and verge reinstatement
- Reinstatement will be ongoing as the works are constructed to minimise the amount of time in which any material will be stockpiled
- Where required, all stockpiled material will be sited in areas with shallow peat depths, negligible peat slide risk and avoiding all 50 m watercourse buffer zones, ecological and cultural heritage constraints
- All stockpiles shall be shaped to promote run-off. Detailed SUDS drainage and silt control methods shall be designed for each stockpile
- Additionally, a “toolbox talk” will be provided by the site management team to highlight possible events causing slope instability and provide guidance on best practice when operating in areas of peat and/or increased slopes. In addition, a workforce engagement event shall be performed at least once for the project and shall be organised by the project team and be attended by RES and project contractor’s workforce. The event will set and

communicate the required safety culture and working practices for the project.

Access Tracks

1.74 The access track itself will be constructed of inert material of suitable grade to withstand the expected traffic loading. Road construction techniques and roadside ditches will be designed to minimise the effect on natural hydrology as much as possible.

1.75 The depths of the ditches will be kept to the minimum required for free drainage of the road. Individual drain lengths will be minimised to avoid significant disruption of natural drainage patterns and avoid accumulation of large volumes of water within an individual drain.

1.76 Drains will not directly flow into watercourses, but into a buffer zone. Buffer zones are used to allow filtration of suspended solids in the water and reduction of runoff velocities. This reduces the flashiness of response, encourages deposition of sediments and allows pollutants to be filtered out.

Construction of Temporary Compound

1.77 A temporary construction compound will be located on the site, as illustrated in **Figure 1.3: Infrastructure Layout.** Details of the temporary compound layout are included in **Figure 1.9: Temporary Construction Compound Layout Plan.** The compound will include the following:

- Temporary portable cabins for office accommodation, monitoring of incoming vehicles and welfare facilities
- Self-contained toilets with provision for waste storage and removal
- Containerised storage areas for tools, small plant and parts
- An area for site vehicle parking and storage of larger material items
- A standing and turning area for vehicles making deliveries to the site
- A bunded area for storing fuels, oils and greases.

1.78 The temporary construction compound measures 4,065m^2. On completion of the construction work these facilities will be removed and the area will be used for an energy storage compound.

1.79 The location of the temporary compound has been selected to avoid environmental constraints and for reasons of security, practicality and to obtain suitable ground conditions. The proposed compound area will be constructed by top soil excavation in a similar manner to the access tracks, laying stone over a geotextile membrane.

1.80 During construction, temporary fencing will be erected as required, around the construction compound. This is illustrated in **Figure 1.9 and Figure 1.10.**

Sustainable Drainage System

1.81 The drainage measures and Sustainable Drainage System (SuDS) designs have been directed by recommendations in **Chapter 9: Geology & Water Environment**

1.82 The runoff drainage system will be designed to mimic natural conditions to mitigate against increased flashiness in water courses and reduced groundwater recharge. The SuDS will protect the status of water courses and ground waters. A proposed SuDS Design Statement is included within the Water Framework Directive Assessment in **Technical Appendix in Chapter 9.**

1.83 Construction will be carried out according to Department of Agriculture, Environment & Rural Affairs (DAERA) and Construction Industry Research and Information Association (CIRIA) guidance for site works. Pollution control measures during the construction phase will be included in the CMS & Construction Environmental Management Plan (CEMP), which will be agreed with the Planning Authority before starting construction work on site.

1.84 Mitigation measures to minimise the hydrological effect of constructing the access tracks have been proposed in **Chapter 9: Geology & Water Environment** of this ES.

Crane Hardstanding Construction

1.85 **Figure 1.12** shows the crane hardstanding layout configuration in plan. The hardstanding would be constructed using the same method as the excavated access tracks. This involves the topsoil and subsoil being replaced with suitable stone, ensuring an adequate bearing capacity has been achieved to carry the anticipated loads. The final position of the hardstanding would be decided at detailed design stage and prior to construction and shall be based on a number of considerations, including; size of crane required, depth of excavation required, hydrological/ecological features in the vicinity, local topography (it is preferable to position the crane hardstanding on the same level, or higher level to the turbine foundation level since this eases lifting operations).

Turbine Foundation Construction

1.86 The turbine towers are fixed to a concrete foundation. The foundation proposed in **Figure 1.11** comprises a gravity base design. Each foundation typically consists of a tapered octagonal block of concrete, and formation will be approximately 3.5 m below ground level. The volume of concrete used to make each foundation is approximately 500 m^3, which is reinforced by approximately 50 tonnes of steel bar. The sub formation depth of the foundation varies for each turbine location according to the depth to suitable sub formation level.

1.87 The foundation is typically poured in two parts, with a suitable construction joint between them. This will be detailed in the CMS. Following the pouring and curing of the concrete, the foundation is backfilled with material which is initially excavated and meeting the density requirements, leaving only the tower plinth, typically 4.5 m – 5.5 m diameter, sitting at or close to ground level. Surplus

excavated material will be stored in appropriate areas identified in the Peat Management Plan (PMP), produced as part of CEMP/CMS prior to construction. The proposed plan will calculate generated excavated material and identify space for the excess volume of material. An Outline Peat Management Plan is provided in **Technical Appendix Chapter 9**.

1.88 The exact quantities of concrete, reinforcement, depth and dimensions will vary on the final choice of turbine model. In the detailed pre-construction design of each foundation, geotechnical tests are carried out to determine the strength of the subsoil layers beneath the turbines and the soil behaviour under loading over time. This information is used to confirm a final design and incorporates factors for safety.

1.89 An earthing mat or electrode consisting of up to three interconnected concentric rings of bare stranded copper conductor is laid around the foundation of each tower and transformer, approximately 0.5 m below the finished ground level. In addition, earthing rods padded by bentonite (a water retaining clay mineral) are required at set locations around the foundation and are positioned vertically below the earth mat. The number of rods and length is dependent upon the electrical resistivity of the soil, which is confirmed during the site investigation, prior to construction.

1.90 Sulphate resistant cement, or higher cement content, within the concrete will be used if the site is identified to have waters with potentially low pH. This is so that they do not have a corrosive effect on turbine bases.

Wind Turbine Erection

1.91 Wind turbine towers, nacelles and turbine blades will be transported to the site as abnormal loads as described in Section 1.66. The tower sections and other turbine components will be stored at each turbine hardstanding until lifted into position.

1.92 The components would be lifted by adequately sized cranes and constructed in a modular fashion. Assembly, in general requires only fixing of bolts, torquing of nuts and electrical and hydraulic connections.

Cabling, Substation and Control Building

1.93 The location of the substation and control building is shown in **Figure 1.3: Infrastructure Layout**. Layout and elevation drawings for these buildings are presented in **Figures 1.5 -1.6**. All cabling between the turbines and the substation on the site will be connected using underground trenched cables. Where excavated, the top layer of soil will be removed and used to reinstate the excavation following the installation of the cables. Where cables are being laid in areas of peat, the various different layers will be separated and replaced appropriately. Cabling would generally run parallel to the adjacent site tracks. **Figure 1.13** presents a typical underground cable cross-section. In addition, and in an effort to ensure that the cable trench does not act as a preferential drain,

impermeable bunds will be installed perpendicular to the cable direction at suitable intervals (taking into account local ground conditions and topography).

Re-instatement

1.94 A programme of site reinstatement and enhancement would be put in place to minimise the visual and ecological impacts on the land.

1.95 Reinstatement would be implemented upon completion of construction. This would relate to the construction compound, temporary areas of the crane hardstandings, cable trenches and track shoulders where appropriate. There remains a potential to use cranes during the operational phase of the Proposed Development, therefore the main crane hardstanding will remain uncovered.

1.96 It is essential that the access track width is retained during the operation of the Proposed Development to allow occasional access if required. Therefore, no works to reduce the track width, post turbine erection, are proposed.

Construction Programme

1.97 It is anticipated that the construction would take approximately 18 months. The indicative construction programme shown in **Diagram 1.1** shows the anticipated scheduling of construction activities. Construction of tracks and foundations would be progressive, minimising the number of simultaneously active locations and ensuring that traffic density is kept low. Turbine erection would span approximately nine weeks toward the end of the work programme.

Diagram 1.1 – Indicative Construction Programme

TASK	CONSTRUCTION MONTH											
	1	2	3	4	5	6	7	8	9	10	11	12
Mobilisation & setup construction compound												
Site entrance and tracks												
Crane hardstandings												
Turbine foundations												
Control building & substation												
Cable installation												
Turbine deliveries												
Turbine erection & commissioning												
Operational take over												

Hours of Work

1.98 Construction work will take place between the hours of 0700-1900 Monday to Friday and 0700 – 1300 on Saturdays. Outside these hours, work at the Site shall be limited to turbine erection, testing/commissioning works and emergency works. Deliveries may occur outside these times to minimise disruption to local residents.

Construction Traffic and Plant

1.99 In addition to staff transport movements, construction traffic will consist of heavy goods vehicles (HGVs) and abnormal load deliveries.

1.100 As outlined in **Chapter 11: Traffic and Transport**, taking into account forecast vehicle numbers from construction activities (1,991 trips) and forecast staff vehicle numbers (5,800 private car, minibus or land rover trips), the total number of two-way vehicle movements generated during the construction period would therefore be 7,791 journeys. Approximately 65 abnormal load deliveries would be generated for the turbine erection stage which would typically result in three deliveries per day. The final number will be determined in the development of the Traffic Management Plan (TMP) which will be written in consultation with Department for Infrastructure (DfI), post-consent.

1.101 Turbine components will be supervised during their transportation using appropriate steerable hydraulic and modular trailer equipment where required. Axle loads would be appropriate to the roads and access tracks to be used. The transportation of turbine components would be conducted in agreement with the relevant roads authorities and local police. RES will notify the police of the movement of abnormal length (e.g. turbine blade delivery) and any abnormal weight (e.g. crane) vehicles and obtain authorisation from DfI prior to any abnormal vehicle movements.

1.102 Vehicle escorts will be used where necessary and the appropriate permits obtained for the transportation of abnormal loads, to ensure that other traffic is aware of the presence of large, slow moving vehicles. Where long vehicles have to use the wrong side of the carriageway, or have potential to block the movement of any vehicles travelling in the opposite direction, a lead warning vehicle will be used and escort vehicles will drive ahead to hold oncoming traffic. Vehicles will also be marked as long/abnormal loads. For return journeys, the extendible trailers used for wind turbine component delivery will be retracted to ensure they are no longer than that of a normal HGV.

Construction Method Statement

1.103 A Construction Method Statement (CMS) will be prepared once planning consent has been gained. This will describe the detailed methods of construction and working

practices and work to reinstate the site following completion of construction activities.

Construction and Environmental Management Plan (CEMP)

1.104 The CEMP, which forms part of the wider CMS, details the environmental management controls that would be implemented by RES and its contractors during the construction of the Proposed Development to ensure that potential significant adverse effects on the environment are, wherever practicable, prevented, reduced and where possible offset. This will be submitted to the planning authority for agreement prior to any construction works taking place.

1.105 The purpose of the CEMP is to:

- Provide a mechanism for ensuring that measures to prevent, reduce and where possible offset potentially adverse environmental impacts identified in the ES are implemented;
- Ensure that good construction practices are adopted and maintained throughout the construction of the Proposed Development;
- Provide a framework for mitigating unexpected impacts during construction;
- Provide a mechanism for ensuring compliance with environmental legislation and statutory consents;
- Provide a framework against which to monitor and audit environmental performance.

1.106 The CEMP will, as a minimum, include details of the following:

- Pollution prevention measures
- Peat slide, erosion and compaction management
- Control of contamination/pollution prevention
- Drainage management
- Control of noise and vibration
- Control of dust and other emissions to air.

1.107 At Site Induction the principal contractor would ensure that all employees, sub-contractors, suppliers and other visitors to the site are made aware of the content of the CEMP and its applicability to them. Accordingly, environmental specific induction training would be prepared and presented to all categories of personnel working on and visiting the site.

1.108 As a minimum, the following information would be provided to all inductees:

- Identification of specific environmental risks associated with the work to be undertaken on site by the inductee
- Summary of the main environmental aspects of concern at the site as identified in the CEMP

- Environmental Incident and Emergency Response Procedures (including specific Environmental Communication Plan requirements).

1.109 A conveniently sized copy of an Environmental Risk Map or equivalent would be provided to all inductees showing all of the sensitive areas, exclusion zones and designated washout areas. The map would be updated and reissued as required. Any updates to the map would be communicated to all inductees through a tool box talk given by specialist environmental personnel. Regular tool box talks would be provided during construction to provide ongoing reinforcement and awareness of environmental issues.

1.110 An Outline CEMP has been included as **Technical Appendix 1.5**. The final CEMP will be agreed with the relevant statutory consultees prior to construction commencing.

Pollution Prevention, Water Quality Monitoring and Emergency Response Plan

1.111 The CEMP will detail a number of measures to deal with pollution prevention, including RES' policies and procedures such as 'Environmental Requirements of Contractors', 'Water Quality Monitoring Procedure' and 'Procedure in the Event of a Contaminant Spill'.

1.112 Contractors and sub-contractors would be required to follow all pertinent Pollution Prevention Guidance. The following pollution control measures will be incorporated into the CEMP:

- Equipment shall be provided to contain and clean up any spills in order to minimise the risk of pollutants entering watercourses, waterbodies or flush areas
- Trenching or excavation activities in open land shall be restricted during periods of intense rainfall and temporary landscaping shall be provided as required to reduce the risk of oil or chemical spills to the natural drainage system
- Sulphate-resistant concrete[4] shall be used for the construction of turbine bases to withstand sulphate attack and limit the resultant alkaline leaching into groundwater
- All refuelling will be undertaken at designated refuelling points. There will be no refuelling within catchments contributing to water supply points
- Equipment, materials and chemicals shall not be stored within or near a watercourse. At storage sites, fuels, lubricants and chemicals shall be contained within an area bunded to 110%. All filling points shall be within the bund or have secondary containment. Associated pipework shall be located above ground and protected from accidental damage

[4] BS EN206:1 : 2000 Concrete Part 1: Specification, performance, production and conformity and BS 8500 – 1 : 2006 Concrete – Complementary British Standard to BS EN 206 – 1 Part 1

- Any on-site concrete wash-out shall occur in allocated bunded areas
- Drip trays shall be placed under machinery left standing for prolonged periods
- All solid and liquid waste materials shall be properly disposed of at appropriate off site facilities
- Routine maintenance of vehicles shall be undertaken outwith the site
- There shall be no unapproved discharge of foul or contaminated drainage from the Proposed Development either to groundwater or any surface waters, whether direct or via soakaway
- Sanitary facilities shall be provided and methods of disposal of all waste shall be approved by regulatory bodies
- A programme of surface water quality monitoring would be undertaken during the construction phase to provide assurances as to the absence of water quality impacts
- RES has a policy that no wind turbines, auxiliary and electrical equipment would contain askarels or Polychlorinated biphenyls (PCBs).

1.113 In the unlikely event of an environmental pollution incident, there will be an emergency response procedure to address any accidental pollution incident. For example, a procedure requiring the use of spill kits to contain the material and procedures to ensure that NIEA is notified on their Pollution Hotline number (0800 807060) within 30 minutes of an incident (unless unsafe to do so), will be applied.

General Drainage Design

1.114 As set out in **Chapter 9: Geology & Water Environment**, buffers to watercourses have taken account of and infrastructure designed in accordance with best practice guidance.

1.115 The potential impact of preferential routing of drainage and associated erosion and sediment wash-off within the sub-catchments draining the site would be mitigated through the following measures which would be incorporated into the SuDS Design:

- Maintaining existing overland flow routes and channels. Existing natural flow paths lateral to access roads will be maintained through the use of piped crossings under road alignments at natural depressions and at regular intermediate intervals. The spacing of cross drains will be specified at detailed design stage;
- Avoiding transporting rainfall runoff in long linear drainage swales by providing regular channel “breakouts”, whereby water is encouraged to flow overland, thus maintaining existing natural hydrological patterns;
- Reducing surface water flow rates and volumes by attenuating runoff from tracks and hard standings “at source” by providing check-dams in swales, whereby the flow velocity and rate of discharge is artificially reduced to mimic natural properties;

- Providing settlement ponds at turbine hard standing areas and other main surface water discharge locations, where runoff from significant new impermeable areas is treated and attenuated before being released overland;
- All swales, crossings and other hydraulic features will be engineered to ensure that dimensions are suitable to convey predicted flows and so prevent build-up of surface water and / or flooding.

Runoff and Sediment Control Measures

1.116 The following measures would be used to mitigate any potential impacts on the water quality of the sub-catchments through peat erosion, stream acidification and metals leaching during construction. These are incorporated into the CEMP:

- Appropriate sediment control measures (silt fences, attenuation ponds, etc.) would be used in the vicinity of watercourses, springs or drains where natural features (e.g. hollows) do not provide adequate protection
- Sediment control measures (e.g. check dams, silt fences etc.) would be employed within the existing artificial drainage network during construction. These would be regularly checked and maintained during construction and for an appropriate period following completion
- Watercourses would be monitored throughout the construction period by the ECoW to identify any enhanced scouring of the catchment surface. If sediment from disturbed peat is excessively mobilised through the minor channels network these would be mitigated by temporary sediment control measures (e.g. geotextiles/straw/bales/brash)
- The extent of all excavations would be kept to a minimum and during construction activities surface water flows shall be captured through a series of cut-off drains to prevent water entering excavations or eroding exposed surfaces. If dewatering of excavations is required, pumped discharges would be passed through attenuation ponds and silt fences to capture sediments before release to the surrounding land
- Where there is a permanent relocation of peat, the ground would be reinstated with vegetation as soon as practicable
- Where practicable, vegetation over the width of the cable trenches would be lifted as turfs and replaced after trenching operations to reduce disturbance
- The movement of construction traffic would be controlled to minimise soil compaction and disturbance. Vehicle movements outside the defined tracks and hardstandings would be avoided
- Trenching or excavation activities in open land would be restricted during periods of intense rainfall and temporary landscaping would be provided, as

required, to reduce the risk of sediment transport to the natural drainage system

- Construction of the track and cable crossings will cease during periods of heavy rain (>25mm in 24 hours), significant snow event (>75mm lying) or extended period of freezing conditions (ground penetration>100mm). If necessary, upstream of the crossing would be dammed and water pumped around the construction zone. The construction period would be minimised as far as practicable.

Peat Slide, Erosion and Compaction Management

1.117 Management of the risk of peat slides and storage is now recognised in literature, and a range of measures have now become standard engineering practice for construction of roads over peat.

1.118 These measures would be adopted, as appropriate, on site, ensuring that:

- Concentrated loads, such as those arising from stockpiling of material from turbine foundation excavations, would not be placed on marginally or potentially marginally stable ground
- Concentrated water flows arising from any aspect of construction or operation of the Proposed Development would not be directed onto peat slopes and unstable excavations
- Construction would be supervised on a full-time basis by engineers fully qualified and experienced in geotechnical matters
- Robust drainage plans would be developed
- Work practices would be reviewed, modified as necessary and adopted to ensure that existing stability is not compromised
- Appropriate ground investigation and movement monitoring practices would be adopted.

1.119 Preliminary peat investigations on site indicated that there is minimal peat coverage on the proposed development area.

1.120 In consideration of the above and the minimal peat disturbance anticipated, particularly where infrastructure is planned on steeper topography, it is considered that the risk from peat slide and instability is low. Should a detailed ground investigation provide further evidence of deep peat, consideration will be given to the production of a Peat Stability Risk Assessment.

Traffic Management Plan

1.121 As detailed in **Chapter 11: Transport & Traffic**, a Traffic Management Plan (TMP) would be developed to ensure road safety for all users during transit of development loads. The TMP would outline measures for managing the convoy and would set out procedures for liaising with the emergency services to ensure that police, fire and ambulance vehicles are not impeded by the loads. The TMP would

be developed in consultation with DfI, the police and the local community and agreed before deliveries to the Proposed Development commence.

Potential Construction and Decommissioning Phase Environmental Impacts

Operation and Management

Life of the project

1.122 The expected operational life of the wind farm is 35 years from the date of commissioning. At the end of this period, a decision is made whether to refurbish, remove or replace turbines. If refurbishment or replacement were to be chosen, relevant planning applications will be made. Alternatively, if a decision is taken to decommission the Proposed Development, this would entail the removal of all of the turbine components, transformers, the substation and associated buildings. Specific sections of the access tracks may remain on-site to ensure the continued benefit of improved access for the landowners. The concrete foundations will normally remain in place to avoid the unnecessary intrusion to the ground. The exposed concrete plinth may be removed to a specified depth, but the entire foundation will be graded over with topsoil and replanted appropriately to restore the land to its original conditions.

Maintenance Programme

1.123 Wind turbines and wind farms are designed to operate largely unattended. Each turbine at the Proposed Development would be fitted with an automatic system designed to supervise and control a number of parameters to ensure proper performance (e.g. start-up, shut-down, rotor direction, blade angles etc.) and to monitor condition (e.g. generator temperature). The control system would automatically shut the turbine down should the need arise. Sometimes the turbines would re-start automatically (if the shut-down had been for high winds, or if the grid voltage had fluctuated out of range), but other shut-downs (e.g. generator over temperature) would require investigation and manual restart.

1.124 The Proposed Development itself would have a sophisticated overall Supervisory Control and Data Acquisition system (SCADA) that would continually interrogate each of the turbines and the high voltage (HV) connection. If a fault were to develop which required an operator to intervene then the SCADA system would make contact with duty staff via a mobile messaging system. The supervisory control system can be interrogated remotely. The SCADA system would have a feature to allow a remote operator to shut down one or all of the wind turbines. This is monitored 24 hours a day, 7 days a week.

1.125 An operator would be employed to operate and maintain the turbines, largely through remote routine interrogation of the SCADA system. The operator would

also look after the day-to-day logistical supervision of the Proposed Development and would be on-site intermittently.

1.126 Routine maintenance of the turbines would be undertaken approximately twice yearly to ensure the turbines are maintained to Industry Standard. This would not involve any large vehicles or machinery.

1.127 If a fault should occur, the operator would diagnose the cause. If the repair warranted the Proposed Development being disconnected from the grid then the operator would make contact with NIE. However, this is a highly unlikely occurrence as most fault repairs can be rectified without reference to the network utility. If the fault was in the electrical system then the faulty part or the entire Proposed Development would be automatically disconnected until the fault is rectified.

1.128 Signs would be placed on the Proposed Development giving details of emergency contacts. This information would also be made available to the local emergency services and NIE.

Decommissioning

1.129 One of the main advantages of wind power generation over other forms of energy production is the ease of decommissioning and the simple removal of components from the site. The residual impact on the site is limited to the continued presence of the foundations and access tracks. All above ground structures can be removed from the site.

1.130 If the Proposed Development obtains planning approval it is expected that a planning condition would be set to provide for the decommissioning and restoration of the site in accordance with a scheme agreed in writing with Department for Infrastructure (DfI), which would consider the long term restoration of the site at the end of the lifetime of the Proposed Development.

1.131 The Proposed Development will be decommissioned in accordance with best practice at that time and/or in compliance with any planning conditions. Current best practice includes the removal of all above ground structures (e.g. turbines, substation etc); the removal of certain underground structures where required (e.g. cables); and reinstatement of disturbed areas all of which will be subject to any necessary consents. Consideration will be given to the retention of wind farm access tracks if they utilise pre-existing farm infrastructure or are not located on sensitive habitats if such continued use could lead to the long term degradation of these habitats.

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2 Planning Policy

Introduction

2.1. This Planning Policy chapter has been prepared RES Ltd.

2.2. This chapter demonstrates how energy and planning policy considerations have been addressed in the development proposal. The chapter opens by describing the high-level policy context within which the project has been conceived and falls to be determined. It then assesses the project's compliance with operational planning policy on a policy-by-policy basis.

Legislation and Policy Framework

UN GLOBAL POLICY

Rio Earth Summit

2.3. Since the Earth Summit in Rio de Janeiro in 1992 there has been a global trend in the search for more sustainable energy production. A number of key documents, including the Rio Declaration on Environment and Development and the Framework Convention on Climate Change, were developed as a result of the summit. The Rio Declaration (UNEP, 1992) set out 27 guiding principles for sustainable development and emphasised that long term growth needed to be grounded in the environment.

2.4. Since the 1992 Earth Summit, the subject of renewable energy has been at the forefront of UN policy with a goal to increase the uptake of renewable technologies. The main driver behind this goal has been the increasing greenhouse gas (GHG) emissions and their climate change consequences.

Kyoto Protocol

2.5. The Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC, 1998) originated from the Rio Earth Summit. The Protocol was adopted in Kyoto, Japan in 1997 and came into force in February 2005. It sets binding targets for reducing GHG emissions that apply to 37 industrialised countries (including the European Community), which have a target to reduce GHG emissions from 1990 levels by 5% over the period of 2008 to 2012. Within this, the European Community has a reduction target of 8% which is distributed across the member states. The United Kingdom's reduction target is 12.5% (European Union, 2002).

2.6. The Kyoto Protocol sets out measures by which countries can meet their reduction targets. As a result, the Protocol resulted in the creation of a 'Carbon Market' where GHG emissions are tracked and traded as a commodity. It can be seen as the main catalyst for the development and promotion of renewable technologies.

The Paris Agreement

2.7. The Paris Agreement establishes a framework for global climate action including the mitigation of and adaption to climate change, support for developing nations and the transparent reporting and strengthening of climate goals. The European Union signed The United Kingdom of Great Britain and Northern Ireland up to the Agreement on 22 April 2016 and it came into force on the 18 December 2016.

COP28

2.8. The 28th UN Climate Change Conference of the Parties (COP28) took place in Dubia on 30th November – 13 December 2023, attended by the countries that signed the United Nations Framework Convention on Climate Change. The global stocktake was considered as the central outcome of COP28, it provides counties and other stakeholders to take inventory, to assess their progress toward meeting the goals of the Paris Agreement, and where they are not. The global stocktake recognised that we are currently not on track to limit global warming to 1.5ºC. COP28 concluded with an agreement that signals the beginning of the end of the fossil fuel era.

2.9. Parties were called to take actions towards achieving a tripling of renewable energy capacity and doubling of energy efficiency improvements by 2030 at COP28. Ambitious economy-wide emission reduction targets, aligned with the 1.5ºC limit within the next round of their climate action plans by early 2025 were requested.

Strategic European Energy Review

2.10. The Strategic Energy Review was first published in 2007 to establish a core energy policy for all of Europe (Commission of the European Communities, 2007). An agenda was agreed in order to achieve the key energy objectives of:

- Sustainability;
- Competitiveness and security of supply;
- Reducing GHG emissions by 20%;
- Obtaining 20% of energy consumed from renewable energy sources; and
- Improving energy efficiency by 20%.

2.11. The Review was updated in 2008 (Commission of the European Communities, 2008), in order to propose an Energy Security and Solidarity Action Plan, which focused on diversification of energy supply, energy efficiency and making the best of the European Union's indigenous energy resources.

2.12. Development of renewable energy reserves, including wind, solar, hydro, marine and biomass energy are seen as the main sources of indigenous energy.

The Energy Road Map 2050

2.13. The Road Map (Commission of the European Communities) sets out a long-term vision for renewable energy sources in the European Union and it forms an integral part of the Strategic European Energy Review. The Energy Roadmap 2050 sets out the transition and cost effective pathways for key economic sectors for achieving an 80-95% reduction in EU emissions by 2050. To achieve this goal, significant investment is needed in new low-carbon technologies and infrastructure, energy efficiency and renewable energy.

2.14. The 2050 target will not be shifted into national targets via EU legislation, but allows more flexibility for Member Countries to meet their greenhouse gas emission reduction targets in the most cost effective method in regards to their own specific circumstances.

EU Directive 2009/28/EC on the Promotion of the use of Energy from Renewable Sources

2.15. In 2009, EU Directive 2009/28/EC (European Union, 2009) came into force in order to update Directive 001/77/EC in promoting the use of energy from renewable sources. Goals of the Directive are to improve the security and diversification of energy supply and to provide environmental protection and social and economic cohesion. The 2009 Directive further establishes this framework for promoting energy from renewable sources and it updates national targets relating to this goal. It also requires each member state to have a national renewable energy action plan in place and ready for adoption by 30 June 2010. The updated goals of the 2009 Directive are:

- A 20% target for electricity from renewable sources by 2020; and
- The UK to achieve 10% of electricity from renewables by 2010, and 15% by 2020.

2.16. The Directive was revised in 2016 to make the EU a global leading in renewable energy and ensure that the target of the final energy consumption being at least 27% renewables is met by 2030.

UK ENERGY POLICY

UK Climate Change Programme

2.17. The UK government developed a Climate Change Programme in 2000 (DECC, 2000) in response to its commitment at the 1992 Earth Summit at Rio de Janeiro. The Programme was updated in 2006 (DECC, 2006). It sets out the UK's policies and priorities for action to reduce greenhouse gas emissions. Broadly, the targets for the UK are as follows:

- Reducing GHG emissions to 12.5% below 1990 levels by 2008-2012; and

- Moving towards a domestic UK goal of 20% cut in CO2 emissions below 1990 levels by 2010.

UK Climate Change Act 2008

2.18. The UK government in June 2019 set out amendments to the Climate Change Act 2008 in the Climate Change Act 2008 (2050 Target Amendments) Order 2019. This is to ensure net greenhouse gas emissions in 2050 are at least 100% lower than the 1990 baseline. The targets set out in the Act, which cover all sectors of the economy, are legally binding and came into effect on 27 June 2019. The 'net zero' target represents a significant step-change in the commitment to addressing the climate crisis.

UK Renewable Energy Strategy 2009

2.19. The UK Renewable Energy Strategy, published by the Department of Energy and Climate Change (2009), forms the basis of the UK National Renewable Energy Action Plan required under the terms of the Renewable Energy Directive (2009/28/EC). The Strategy sets out the path required for the UK to meet its legally binding target, in order to ensure that 15% of our energy (across electricity, heat and transport) comes from renewable sources by 2020. This is a seven-fold increase in the share of renewable energy sources in scarcely more than a decade.

2.20. It makes it clear that achievement of such a target will only be possible with strong co-ordinated efforts by central, regional and local government as well as public groups, the private sector and dedicated communities. It clearly sets out the role Government will adopt and the specific actions it will take in order to deliver the strategy.

UK National Renewable Energy Action Plan 2010

2.21. The transition to decarbonisation in Northern Ireland is closely linked with broader UK-wide goals. After reaching the 40% renewable electricity target set by the Strategic Energy Framework, the Department for the Economy initiated the development of a new Energy Strategy for Northern Ireland, starting with a Call for Evidence in 2019. This was part of a broader public engagement process aimed at shaping a long-term strategy for decarbonising the energy sector by 2050 while minimising costs to consumers.

2.22. The new Energy Strategy, titled "The Path to Net Zero Energy," was released in December 2021. It aligns Northern Ireland's objectives with the UK's goal of achieving net zero carbon emissions by 2050, emphasising the urgency of accelerating the transition to renewable energy. The strategy outlines targets for 2030, including a 56% reduction in energy-related emissions, a 25% increase in energy efficiency across buildings and industry, and a doubling of the low-carbon and renewable energy economy to surpass a £2bn turnover. Additionally, the strategy aims for at least 80% of electricity consumption to be sourced from a diverse mix of renewables by 2030, aligning with the Republic of Ireland's targets.

2.23. This strategic approach is further supported by the UK Government's renewed focus on renewable energy, as highlighted in recent Westminster policies. The UK government is rolling out several significant policies and initiatives to support renewable energy and achieve net-zero goals by 2050, including:

- **Energy Act 2023:** This legislation introduces measures to increase competition in onshore electricity networks and modernise the energy sector, aiming to reduce consumer costs by £1 billion by 2050. The Act will facilitate the transition to a low-carbon energy system.

- **Mission Control Taskforce**: This newly established clean energy taskforce aims to accelerate the UK's transition to clean power by 2030. It will tackle critical issues such as planning policy and grid connectivity, essential for decarbonising the UK's electricity system.

- **Onshore Wind Industry Taskforce:** This taskforce is dedicated to revitalising the onshore wind sector, which had been significantly hindered by previous government policies. Their goal is to streamline the planning process and remove barriers to expanding onshore wind capacity, with an aim to double the current capacity by 2030. A specific sub-group of the Task Force will be looking at overcoming unnecessary planning barriers to further deployment.

2.24. These initiatives form a comprehensive strategy to expand renewable energy, strengthen energy security, and advance the UK's progress toward its net-zero targets, while also supporting Northern Ireland's efforts to double its renewable energy capacity.

2.25. In this context, recent data from the Department for the Economy's Analytical Services Unit, published in June 2023, shows that renewable energy is playing an increasingly significant role in Northern Ireland's energy mix. For the 12-month period ending March 2023, 52.3% of total electricity consumption in Northern Ireland was generated from renewable sources, up from 46.8% between April 2019 and March 2020.

2.26. Between April 2022 and March 2023, electricity consumption was approximately 7,890 GWh, with around 4,120 GWh generated from renewable sources. Wind energy remained dominant, accounting for 86.2% of renewable electricity generation during this period, up from 85.4% in the 2019-2020 timeframe.

2.27. The legislative framework supporting these ambitions was strengthened by the passage of the Climate Change (No.2) Bill in March 2022 by the Northern Ireland Assembly. This bill enshrines the target of achieving 80% renewable electricity by 2030 and commits Northern Ireland to reaching net zero carbon emissions by 2050. These targets contribute to the UK's overall climate goals and position Northern Ireland as a leader in renewable energy within the region.

NORTHERN IRELAND ENERGY POLICY

Strategic Energy Framework for Northern Ireland 2010

2.28. The aim of the Framework (DETI, 2010) is to set out the direction for energy policy for the region. It is an update to the 2004 Strategic Energy Framework which recognises that significant changes have taken place since the publication of the 2004 framework, setting out a goal for Northern Ireland to increase to 40% of electricity consumption from renewable sources by 2020.

2.29. The Strategic Energy Framework recognises the importance of renewable energy and onshore wind in particular in helping Northern Ireland secure its energy supply and meet European and national targets.

2.30. The Framework is committed to supporting and developing the industry.

Northern Ireland Energy Strategy – Path to Net Zero Energy

2.31. In part due to the recognition that the 40% target set in the existing Strategic Energy Target has been met, the Department for the Economy commenced work to developing a new Energy Strategy for Northern Ireland. The publication of a Call for Evidence was undertaken in 2019 and was part of an on-going public engagement process to inform and shape the strategy. The Call for Evidence was the first stage in a programme of work aimed at developing a new long-term strategy for decarbonisation of the Northern Ireland energy sector by 2050 at least cost to the consumer.

2.32. The Department for Economy set out intentions of an Energy Strategy Options public consultation issued by the end of March 2021, with the responses from this informing the final Energy Strategy.

2.33. The work by the Department for Economy on the Energy Strategy is set in the context of their Analytical Services Unit data published on 4 June 2020 which confirms that for the 12 month period April 2019 to March 2020, 46.8 per cent of total electricity consumption in Northern Ireland was generated from renewable sources located in Northern Ireland. This represents an increase of 3.9 percentage points on the previous 12 month period (April 2018 to March 2019) and is the highest rolling 12 month proportion on record.

2.34. In terms of the volume of electricity consumption between April 2019 and March 2020, some 7,695 Gigawatt hours (GWh) of total electricity was consumed in Northern Ireland. Over the same period, some 3,604 GWh of electricity was generated from renewable sources within Northern Ireland.

2.35. Of all renewable electricity generated within Northern Ireland over the 12 month period April 2019 to March 2020, 85.4 per cent was generated from wind. This compares to 84.7 per cent for the previous 12 month period (April 2018 to March 2019).

2.36. The new Energy Strategy – The Path to Net Zero Energy was published in December 2021. It outlines a roadmap to 2030 aiming to deliver a 56% reduction in energy-

related emissions, on the pathway to deliver the 2050 vision of net zero carbon and affordable energy. The Energy Strategy sets three main targets to drive these changes including delivering energy savings of 25% from buildings and industry by 2030; doubling the size of the low carbon and renewable energy economy to a turnover of more than £2bn by 2030; and meeting at least 70% of electricity consumption from a diverse mix of renewable sources by 2030. Such provisions would be in alignment with the Republic of Ireland's aim of 70% renewable electricity by 2030 as set out within the Region's Renewable Electricity Support Scheme (RESS). The Energy Strategy recognises that meeting this 70% target likely means doubling renewable energy capacity in order to meet new demands from heating our homes and powering our vehicles.

2.37. A more ambitious target under the Climate Change (No.2) Bill of 80% renewable energy by 2030 and achieving carbon net zero by 2050 was passed in the Northern Ireland Assembly in March 2022.

Northern Ireland Executive Programme for Government

2.38. The 2011-2015 Programme for Government (OFMDFM Economic Policy Unit, 2011) underlined the Northern Ireland Executive's commitment to the principles of an open and accountable government. The Programme established a key commitment seeking the achievement of 20% of electricity consumption from renewable sources and 4% renewable heat by 2015 in Northern Ireland and introduced milestones to reach in the intervening years to meet these targets. Priorities of the Executive included:

2.39. Growing a Sustainable Economy and Investing in the Future;

- Creating Opportunities, Tackling Disadvantage and Improving Health and Wellbeing;
- Protecting Our People, the Environment and Creating Safe Communities;
- Building a Strong and Shared Community; and
- Delivering High Quality and Efficient Public Services.

2.40. The Executive reported that it will continue to work towards a reduction in greenhouse gas emissions by at least 35% on 1990 levels by 2025 (DOE).

2.41. A new draft Programme for Government Framework was consulted on during 2016 and uses an outcomes-based approach. These outcomes are things with which people can identify, such as living longer and healthier lives or attracting better jobs - and are designed to stay in place for a generation rather than a single Assembly term.

2.42. Since June 2018 and in the (then) absence of an Executive and continued absence of a final Programme for Government, the NI Civil Service Outcomes Delivery Plan (ODP) became a key strategic document, setting out the actions that departments had put in place to give effect to the objective of improving wellbeing for all by tackling disadvantage and driving economic growth. The development of the new Energy Strategy was identified as contributing to a Key Strategic Area within

Outcome 1 – 'We prosper through a strong, competitive, regionally balanced economy.' Outcome 2 – 'We live and work sustainably – protecting the environment' references reductions in greenhouse gas emissions. The expansion of onshore wind capacity in Northern Ireland provides a clear route to delivering required long term reductions in greenhouse gas emissions.

Onshore Renewable Electricity Action Plan 2011-2020

2.43. The Department of Enterprise, Trade and Investment (DETI) published the Onshore Renewable Electricity Action Plan 2013-2020 (OREAP) for Northern Ireland in November 2013. The overarching aim of the OREAP is to optimise the amount of electricity sustainably generated from onshore renewable resources in order to enhance diversity and security of supply, reduce carbon emissions, contribute to Northern Ireland's target of 40% of electricity consumption to come from renewable energy sources by 2020 and to develop business and employment opportunities for Northern Ireland companies.

2.44. The OREAP states that with a lack of indigenous fossil fuel, no nuclear power stations and a wealth of potential renewable resources such as wind, the development of renewable technologies will play a vital role in the diversification of the future energy mix in Northern Ireland and could deliver significant investment and employment opportunities.

2.45. OREAP focuses on renewable assessments undertaken by DETI and concludes from such reports that onshore wind still has significant deployment potential. However, deployment rates are slower than previously modelled. The results of the Strategic Environmental Framework (SEF) which support the plan provide "there is still capacity for additional development to be accommodated in existing locations, for example, in the northwest". Furthermore, it is maintained that clustering development in existing locations could reduce potentially significant adverse effects occurring in other undeveloped locations.

2.46. Development should also be targeted to areas where there is already access to the grid or where grid upgrades or the provision of new infrastructure has already been planned and assessed. The plan concludes that in order to manage or limit potential adverse effects, the preferred option would be to allow onshore wind developments to continue, where possible, to cluster in existing areas of development, before moving into new areas.

Sustainable Energy Action Plan 2012 - 2015

2.47. The Action Plan was published by the DETI in May 2012 with the primary aim of clearly showing what the Northern Ireland Executive was doing to promote sustainable energy in Northern Ireland. The Plan recognises the importance of decarbonising energy production in Northern Ireland and working towards the target of 40% consumption of electricity from renewable sources by 2020.

2.48. A key action of the Plan is that the Northern Ireland Executive will work closely with developers, planners and those responsible for environmental consents to ensure the need for renewable energy to address the environmental impact of climate change is recognised and that procedures are in place for consenting of renewable installations.

Everyone's Involved - Sustainable Development Strategy 2010

2.49. This Sustainable Development Strategy (OFMDFM May 2010) aims to bring viability, stability and opportunity to all of our social, economic and environmental activities and programmes. The vision for sustainable development echoes the Programme for Government. It is intended to reinforce the commitment to ensuring that the principles of sustainability reach into all activities of Government and that everyone is involved in achieving the objectives of the Sustainable Development Strategy.

2.50. The Strategy sets out the themes of economic prosperity, social cohesion, environmental protection and meeting our national and international responsibilities and there are two guiding principles that express the overarching ambitions of the Strategy:

- living within environmental limits; and
- ensuring a strong, healthy, just and equal society.

2.51. There are four principles that describe the necessary conditions for the achievement of sustainable development:

- Achieving a sustainable economy
- Promoting good governance
- Using sound science responsibility
- Promoting opportunity and innovation.

2.52. Six Priority Action Areas are then expressed providing the framework for the actions each department will take in support of achievement of sustainable development:

- Building a dynamic, innovative economy that delivers the prosperity required to tackle disadvantage and lift communities out of poverty.
- Strengthening society such that it is more tolerant, inclusive and stable and permits positive progress in quality of life for everyone.
- Driving sustainable, long-term investment in key infrastructure to support economic and social development.
- Striking an appropriate balance between the responsible use and protection of natural resources in support of a better quality of life and a better quality environment.

- Ensuring reliable, affordable and sustainable energy provision and reducing our carbon footprint.
- Ensuring the existence of a policy environment which supports the overall advancement of sustainable development in and beyond government.

2.53. Priority Action Area 5 is of particular relevance and a set of Strategic Objectives have been identified that will be pursued in this area. These are the biggest and most urgent challenges in this Priority Area. The objectives are as follows:

- Reduce greenhouse gas emissions;
- Increase the proportion of energy derived from renewable sources;
- Implement energy efficiency measures particularly for vulnerable groups;
- Increase energy security; and
- Adapt to the impacts of climate change.

2.54. The strategy recognises that the Private Sector has a role to play, contributing innovation, focus and responsiveness in the move towards a 'sustainability focused' society. The strategy seeks to champion pro-activity and innovation across the private sector in support of the sustainability vision, creating a pathway to accelerate implementation of new technologies and solutions.

Tomorrow's Energy Scenarios Northern Ireland 2019 (TESNI 2019)

2.55. The System Operator for Northern Ireland (SONI) launched a consultation document - Tomorrow's Energy Scenarios Northern Ireland 2019 (TESNI 2019) in September 2019. This sets out scenario planning as a means to create a range of possible energy futures that capture the impact of changes in moving to low carbon electricity for NI.

Strategic Assessment Summary:

2.56. The rationale for the project is clear. Making an energy infrastructure contribution of the scale proposed (indicatively 50.4 MW) will assist in the achievement of NI strategic energy targets and objectives, consistent with a wide range of International, European, UK and Regional level priorities.

2.57. The proposal will offer job creation and economic activity to the regional economy providing significant benefits to and investment in Northern Ireland.

2.58. Given the 35-year lifetime of the Proposed Development it is expected that direct operational impacts equate to 35 job years, £1.27 million direct wages and £9.37 million of direct Gross Value Added over the operational phase.

2.59. Both the construction and operational phases will generate increased tax and business rates revenue and the proposal is estimated to involve a capital spend of £64.9 million.

2.60. The amount of electricity that could be produced by the Proposed Development is estimated at 206.4gWh per year which is equivalent to the needs of 54,800 homes each, or almost 85% of the current housing stock in the Causeway Coast and Glens Borough Council area.

2.61. The Proposed Development is also estimated to reduce CO_2 emissions by 90,800 tonnes each year, when compared against equivalent generation from non-renewable sources.

NORTHERN IRELAND PLANNING POLICY

Regional Development Strategy 2035 Building for a Better Future

2.62. The revised RDS was prepared under the Strategic Planning (Northern Ireland) Order 1999. It is an overarching strategic planning framework for the future development of Northern Ireland to 2035 and the spatial strategy of the Executive. The Order requires Departments to have regard to the RDS in exercising any functions in relation to development and it influences investment by the private sector. It represents the top tier in the hierarchy of planning policy and guidance in Northern Ireland and aims to provide a long-term policy direction with a strategic spatial perspective. It is material to decisions on individual planning applications and planning appeals and is an important consideration in determining major planning applications of strategic importance. It was agreed by the Executive on 26 January 2012 following a 12-week public consultation exercise and stakeholder meetings.

2.63. The revised RDS sets out a vision and eight aims intended to support the Programme for Government. It also contains two types of Strategic Guidance – Regional Guidance of relevance everywhere in the region and Spatial Framework Guidance which is drafted specifically for each of five separate components based on functions and geography. The component of relevance to this project is the Rural Area.

2.64. The Regional Guidelines (RG) relevant to the project are RG4 (Promote a sustainable approach to the provision of tourism infrastructure), RG5 (Deliver a sustainable and secure energy supply), RG9 (Reduce our Carbon Footprint and Facilitate Mitigation and Adaption to Climate Change whilst maintaining Air Quality), and RG11 (Conserve, Protect and where possible, Enhance our Built Heritage and our Natural Environment).

2.65. RG4 states that tourism can make a step change in the economy and emphasises the quality of our natural assets. RG5 states that new energy generation or distribution infrastructure must be carefully sited to avoid adverse environmental effects, particularly on or near protected sites. It goes on to say that decision makers will have to balance impacts against the benefits from a secure renewable energy stream. There is a clear commitment to increasing the contribution that renewable energy can make to the overall energy mix: *"There will need to be a significant increase in* all types of renewable electricity installations...., including a wide range of renewable resources for electricity generation both onshore and offshore to meet the Region's needs."

2.66. RG9 picks up the same theme of increasing the use of renewable energies and refers to the targets set in the Strategic Energy Framework. Having stated the targets RG9 confirms that "this {meeting the 40% target} will require increasing numbers of renewable electricity installations and the grid infrastructure to support them. These must be appropriately sited to minimise their environmental impact." The same RG emphasises the need to protect and extend the ecosystems and habitats that can reduce or buffer the effects of climate change. Peat bogs are identified as sinks or stores for carbon if undisturbed.

2.67. RG11 states that the environment is one of Northern Ireland's most important assets and emphasises the responsibility we have to protect it for the benefit of future generations. Specific objectives are set for the built and natural heritage including references to protecting archaeological sites/monuments, historic buildings/landscapes, priority species, designated habitat sites, landscape character, scenic quality, and protected landscapes.

2.68. The Spatial Framework Guidance (SFG) relates to each of the five key components of the Spatial Framework.

2.69. SFG13 (Sustain rural communities living in smaller settlements and the open countryside) refers to the need for development to be sensitive to the ability of landscapes to absorb development. Industries such as tourism and renewable energy are identified as being able to provide jobs and opportunities in rural areas so long as they are integrated appropriately within the rural landscape.

2.70. Section 4 of the revised RDS specifically addresses the matter of regionally significant infrastructure.

2.71. Paragraphs 4.15 to 4.18 refer specifically to renewable energy. Paragraph 4.15 refers to the 40% SEF target and states that "this is likely to mean an increase in the number of wind farms both on and offshore..." whereas Paragraph 4.16 refers to the need to strengthen the electricity grid. Paragraph 4.17 then goes on to state the importance of interconnection, whereas Paragraph 4.24 refers again to the need to increase the use of renewable energy sources to address climate change targets.

2.72. **Assessment:** Delivering a new installation for the generation of renewable energy is consistent with the imperative to meet the strategic energy targets and in line with the RDS' expectation that this will mean an increase in the number of wind farms. This ES provides sufficient information on each of the interests of acknowledged planning importance identified in the RDS to conclude that the benefits of the scheme outweigh the mitigated environmental impacts.

Planning Policy Statements

Strategic Planning Policy Statement for Northern Ireland (SPPS)

2.73. The SPPS was published by the Department of the Environment on 28 September 2015 as a statement of policy on important planning matters. Agreed by the NI Executive and judged to be in general conformity with the RDS, its provisions apply

to the whole of Northern Ireland and are material to all decisions on individual planning applications.

2.74. The existing suite of Planning Policy Statements (PPS) and the remaining provisions of the Planning Strategy for Rural Northern Ireland (PSRNI) will be cancelled when all eleven Councils have adopted a new Plan Strategy (para 1.9).

2.75. A transitional period will apply until such times as a Council's Plan Strategy has been adopted. Paragraph 1.10 states:

2.76. 'A transitional period will operate until such times as a Plan Strategy for the whole of the council area has been adopted. During the transitional period planning authorities will apply existing policy contained within the documents identified below together with the SPPS. Any relevant supplementary and best practice guidance will also continue to apply.'

2.77. Paragraph 1.12 sets out the approach which will be taken where there is conflict between the SPPS and retained policy:

2.78. Any conflict between the SPPS and any policy retained under the transitional arrangements must be resolved in the favour of the provisions of the SPPS. For example, where the SPPS introduces a change of policy direction and/or provides a policy clarification that would be in conflict with the retained policy the SPPS should be accorded greater weight in the assessment of individual planning applications. However, where the SPPS is silent or less prescriptive on a particular planning policy matter than retained policies, this should not be judged to lessen the weight to be afforded to the retained policy.

2.79. Paragraph 1.13 identifies retained policy as including the following PPSs relevant to this project:

- PPS 2: Natural Heritage (considered within Chapters 4, 6, 7 and 8)
- PPS 3: Access, Movement and Parking (considered within Chapter 11)
- PPS 3 (Clarification): Access, Movement and Parking (considered within Chapter 11)
- PPS 6: Planning, Archaeology and The Built Heritage (considered within Chapter 5)
- PPS 10: Telecommunications (Policy TEL 2 is cancelled) (considered within Chapter 3)
- PPS 15 Revised: Planning and Flood Risk (considered within Chapter 9)
- PPS 16: Tourism (considered within Chapters 4 & 5)
- PPS 18: Renewable Energy (considered within Chapter 13)
- PPS 21: Sustainable Development in the Countryside (considered within Chapters 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 & 13).

2.80. As per SPPS paragraph 1.12, in this period before the Council adopts its Plan Strategy, it is necessary to assess whether there is a conflict between the SPPS and any retained policy. Paragraph 1.12 provides an example of such a circumstance –

where the SPPS contains a change in policy direction and/or a policy clarification in conflict with retained policy.

2.81. In his written statement dated 28 September 2015, introducing the SPPS, the Minister made the following comments:

2.82. There are a number of subject policies that are likely to be of particular interest to Assembly Members.

2.83. The first of these is Renewable Energy. Having taken into account all the comments received on the draft SPPS and following additional engagement with the Committee and others in relation to this particular policy area, the SPPS has been revised and improved.

2.84. There is a greater acknowledgement of the contribution the renewable energy industry makes towards achieving sustainable development, as a provider of jobs and investment across the region, and an acknowledgement of wider government policy support for the use of renewable energy sources. This includes reference to DETI's Strategic Energy Framework.

2.85. Furthermore, the SPPS seeks to more closely reflect PPS 18 by making it clearer that development that generates energy from renewable resources will be permitted where the proposal and any associated buildings and infrastructure, will not result in unacceptable adverse impacts on interests of acknowledged importance.

2.86. In relation to how the wider environmental, economic and social benefits are to be assessed the SPPS clarifies that planning authorities will give such considerations 'appropriate' weight in determining whether planning permission should be granted.

2.87. It is also considered appropriate that a cautious approach in designated landscapes, as per the current best practice guidance, is reflected in strategic policy and therefore this approach has been carried forward in the SPPS.

2.88. Where appropriate, the SPPS also takes into account the recommendations of the Report of the Environment Committee's Wind Energy Inquiry.

2.89. This statement confirms that the SPPS clarifies policy on the weight to be attached to social, environmental and economic considerations in the determination of planning applications. PPS18 Policy RE1 states that 'significant' weight 'must' be attached to such considerations whereas paragraph 6.225 of the SPPS states that 'appropriate' weight should be attached:

2.90. The wider environmental, economic and social benefits of all proposals for renewable energy projects are material considerations that will be given appropriate weight in determining whether planning permission should be granted.

2.91. The change in wording means that whereas PPS18 directs the weight to be attached to the benefits, the SPPS provides the decision maker with discretion in deciding the appropriate amount of weight to be attached to the benefits. In making such a judgement, it is anticipated that the decision maker will take account of the

extent of the benefits in a relative or proportionate way. Where a scheme, such as this, will deliver large scale benefits (as set out within the Socio-Economic details at Chapter 14), it would be logical to suggest that the decision maker would conclude it appropriate to give significant weight to the benefits. The consequence of this is that if a scheme would deliver only small-scale benefits, less weight would be attached to the benefits.

2.92. The other main provisions of PPS18 and its associated Best Practice Guidance are carried through into the SPPS including:

- The direction to take particular care when considering the potential impact of all renewable proposals on the landscape (para 6.222);
- The direction to apply a cautious approach for renewable energy projects within designated landscapes of significant value such as Areas of Outstanding Natural Beauty (para 6.223);
- The presumption in favour of renewables proposals where there will be no unacceptable adverse effect on the PPS18 set of planning considerations (6.224);
- Stating that renewable energy development on active peatland will not be permitted unless there are imperative reasons of overriding public interest (para 6.226);
- Specifying that for wind farm development a separation distance of 10 times rotor diameter to occupied property, with a minimum distance of not less than 500m, will generally apply;
- Confirming that consideration of renewables projects will take account of their contribution meeting wider environmental benefits (para 6.228);
- Confirmation that the factors considered in a planning decision will include the wider environmental benefits as well as normal planning criteria (paragraph 6.229);
- A restatement of the acknowledgement that windfarms are highly visible in the landscape, yet this does not render them unacceptable, and the reference to the skill of the designer and the characteristics of the receiving landscape (paragraph 6.230);
- The requirement, where a project will result in unacceptable damage, for an indication of how such damage will be minimised, mitigated and compensated for (paragraph 6.231);
- The requirement to provide details of future decommissioning and site restoration (paragraph 6.233);
- The direction to take account of the supplementary planning guidance 'Wind Energy Development in Northern Ireland's Landscapes' and all other practice notes in assessing all wind turbine proposals (paragraph 6.234).

2.93. This chapter considers the retained policy framework having regard to the SPPS and its associated transition arrangements.

Planning Policy Statement 2 – Natural Heritage

2.94. PPS2 is retained policy for the purposes of the SPPS transition arrangements. There is considered to be no conflict with the equivalent provisions in the SPPS, therefore until the Council adopts its Plan Strategy, its provisions will apply, together with the SPPS, with no less weight attached to the retained policy.

2.95. SPPS policy on Natural Heritage is set out on pages 80 to 85. It consolidates and restates policy set out in PPS2. The Minister did not identify any conflicts or clarifications in his statement launching the SPPS. The principal focus of this section is, therefore, on PPS2.

2.96. PPS2 was published in July 2013 and provides strategic planning policy for the conservation, protection and enhancement of the natural heritage. For the purpose of the PPS, natural heritage is defined as 'the diversity of our habitats, species, landscapes and earth science features'.

2.97. The policy lists its objectives as:

- To seek to further the conservation, enhancement and restoration of the abundance, quality, diversity, and distinctiveness of the region's natural heritage;
- To further sustainable development by ensuring that biological and geological diversity are conserved and enhanced as an integral part of social, economic and environmental development;
- To assist in meeting international (including European), national and local responsibilities and obligations in the protection and enhancement of the natural heritage;
- To contribute to rural renewal and urban regeneration by ensuring developments take account of the role and value of biodiversity in supporting economic diversification and contributing to a high-quality environment;
- To protect and enhance biodiversity, geo-diversity and the environment; and
- To take actions to reduce our carbon footprint and facilitate adaptation to climate change.

2.98. The policy at paragraph 3.3 notes that in taking decisions, the Department should ensure that appropriate weight is attached to designated sites of international, national and local importance; priority and protected species; and to biodiversity and geological interests within the wider environment.

2.99. At section 5 the PPS lists the policy context and statutory framework, addressing international, national and local contexts.

2.100. Relevant policies to the Proposed Development include:

- Policy NH2 – Species Protected by Law
- Policy NH4 – Sites of National Conservation Importance – Local;

- Policy NH5 – Habitats, Species or Features of Natural Heritage Importance;
- Policy NH6 – Areas of Outstanding Natural Beauty.

2.101. The policies outline that a development will only be granted planning permission if it does not have a significant adverse impact on the environment. In the instance that there will be an adverse impact on a site, development may only be permitted when the benefits of the Proposed Development outweigh the value of the site, habitat or species.

European and National Species

2.102. In relation to European and National species protected by law, Policy NH2 sets out the relevant planning policy requirements. In relation to European protected species, the policy states that planning permission will only be granted for a development proposal that is not likely to harm a European protected species. It goes on to identify exceptional circumstances. In relation to National protected species, the policy states that planning permission will only be granted for a development proposal that is not likely to harm any other statutorily protected species and which can be adequately mitigated or compensated against.

2.103. **Assessment**: Chapters 6, 7 and 8 of this ES assess the impact of the project on protected European and National Species.

2.104. Chapter 6 provides an ecological and nature conservation assessment in respect of terrestrial Fauna. The potential effects of the Proposed Development on ecological receptors have been assessed and it is concluded that with the implementation of appropriate mitigation measures the effects would be reduced to a minor adverse or neutral effect that would not adversely affect the ecological integrity of the site and the wider area.

2.105. An assessment of cumulative impacts on the habitats and fauna of the area was also undertaken and concluded that this will not have a significant impact.

2.106. There is no regular usage of the area by marsh fritillary butterfly and therefore no impacts to this species is likely. No active badger setts have been identified within the red line site boundary survey area or within 25m of the boundary.

2.107. The mitigation measures proposed ensure that any potential impacts to bats will be negligible and the site poses little risk to bats or bat populations. A Bat Monitoring Mitigation Plan (BMMP) has been recommended as a precaution.

2.108. Chapter 7 assesses the impact of the Proposed Development from an ornithological perspective and concludes that with the exception of the displacement of up to one pair of breeding snipe, the Proposed Development is unlikely to have any significant adverse effects on the bird population at the local, regional or national scale. Assuming implementation of the proposed mitigation measures detailed in Chapter 7, there are no remaining residual effects and no likely cumulative effects have been identified.

2.109. Mitigation measures are recommended to include an Ornithology Mitigation Strategy (OMS) to protect breeding birds during the construction phase and an

Ornithology Management and Monitoring Plan (OMMP) to ensure implementation of the long term habitat management and to monitor the effects of the Proposed Development on local bird communities.

2.110. Chapter 8 assesses the impact of the Proposed Development from a fisheries and aquatic ecology perspective and considers the potential effects of the construction, operation and decommissioning of the development on these interests. The potential impacts are primarily related to sediment run-off and the potential release of other pollutants to the receiving watercourses with related effects on fish stocks and the wider stream ecosystem.

2.111. A series of specific mitigation measures have been designed to avoid adverse effects on fisheries with regard to both construction and operational phases of the project. Hydrology and site drainage issues have been considered in detail in Chapter 9, which outlines a surface water management system and drainage (SuDS) designed to control drainage and silt management on the Site.

2.112. Provided these measures are implemented, it is concluded that the construction and operation of the Proposed Development will have a neutral impact on the fish stocks and aquatic ecology of site drainage streams and the main downstream receiving watercourses. It follows that the Proposed Development will have no effect on the Atlantic Salmon as the primary feature of the River Roe and Tributaries ASSI/SAC.

2.113. The Proposed Development therefore complies with Policy NH2.

Habitats, Species or Features of Natural Heritage Importance

2.114. Policies relevant to Habitats, Species or Features of Natural Heritage Importance are set out at Policy NH5. The policy indicates that a development proposal which is likely to result in an unacceptable adverse impact on, or damage to, habitats, species or features may only be permitted where the benefits of the Proposed Development outweigh the value of the habitat, species or feature. In such cases, appropriate mitigation and/or compensatory measures will be required.

2.115. This policy applies to priority habitats; priority species; active peatland; ancient and long-established woodland; features of earth science conservation importance; features of the landscape which are of major importance for wild flora and fauna; rare or threatened native species; wetlands (includes river corridors); and other natural heritage features worthy of protection.

2.116. **Assessment:** Chapter 6 of this ES assess the impact of the project on important habitats, species and features of natural heritage importance, including peat and active peatland.

2.117. Chapter 6 conclude that the potential effects of the Proposed Development on ecological receptors have been assessed and it is concluded that with the implementation of appropriate mitigation measures the effects would be reduced to a minor adverse or neutral effect that would not adversely affect the ecological

integrity of the site and the wider area. A cumulative impact assessment was undertaken with no significant impact concluded.

Areas of Outstanding Natural Beauty

2.118. Policy NH6 sets out planning policy in relation to projects in Areas of Outstanding Natural Beauty (AONB). Planning permission for new development within an AONB will only be granted where it is of an appropriate design, size and scale for the locality and criteria are met, including: a) the siting and scale of the proposal is sympathetic to the special character of the AONB in general and of the particular locality; and b) it respects or conserves features (including buildings and other man-made features) of importance to the character, appearance or heritage of the landscape.

2.119. **Assessment:** The Proposed Development is located in the Binevenagh Area of Outstanding Natural Beauty (AONB). Accordingly, Policy NH6 – Areas of Outstanding Natural Beauty is applicable.

2.120. Chapter 4 of this ES assesses the impact of the project on the Binevenagh AONB. Consistent with the SPPS' cautious approach to protected landscapes (para 6.223) and the BPG (para 1.3.23), every effort in siting and design has been made to reduce the impact of the Proposed Development and aid integration into the local landscape.

2.121. The key characteristics of the AONB are the juxtaposition between the prominent escarpment at the northern end of Binevenagh Mountain overlooking the flat Magilligan lowlands. The Proposed Development is physically detached from this pat of the AONB and is positioned in a lower-lying saddle of land between the southern side of the base of Bineveagh Mountain and Keady Mountain. The landscape character of this part of the Bineveagh AONB is already dominated by manmade influences in terms of land uses such as forestry, quarrying, wind energy, telecommunications masts and extensive rough grazing land. Given its location within this type of landscape and its close relationship with the surrounding wind farms in the Keady cluster the Proposed Development is not judged to cause a significant change to the condition or quality of the physical landscape character either within the AONB or LCA 36. It is concluded that there would be No Significant landscape effects resulting from the Proposed Development.

2.122. In relation to cumulative effects of the Proposed Development, both in terms of landscape and visual effects is deemed to be Not Significant.

2.123. The LVIA concludes that the Proposed Development would have no significant effects on landscape character and is acceptable in landscape and visual terms. Therefore, the landscape and visual impact of the Proposed Development is not unacceptably adverse for the purposes Policy NH6 or for the SPPS or Policy RE1 of PPS18 because the inherent characteristics of the landscape provide the capacity to absorb it.

Planning Policy Statement 3 – Access, Movement and Parking

2.124. PPS3 is retained policy for the purposes of the SPPS transitionary arrangements. There is considered to be no conflict with the equivalent provisions in the SPPS, therefore until the Council adopts its Plan Strategy, its provisions will apply, together with the SPPS, with no less weight attached to the retained policy.

2.125. SPPS policy on Transportation is set out on pages 106 to 110. It consolidates and restates policy set out in PPS3 and PPS13. The Minister did not identify any conflicts or clarifications in his statement launching the SPPS. The principal focus of this section is, therefore, on PPS3.

2.126. PPS 3 (NI Planning Service, 2005) states that the orderly and effective implementation of the local development plan objectives requires provision of infrastructure and facilities, which include an adequate public road and transport network. Also the potential impact that a development may have on the efficiency of the public road network or on road safety is an important material consideration.

2.127. Policy AMP2 Access to Public Roads states:

'Planning permission will only be granted for a development proposal involving direct access, or the intensification of the use of an existing access, onto a public road where such access will not prejudice road safety or significantly inconvenience the flow of traffic.'

2.128. **Assessment:** Chapter 11 of this ES assesses the impact of the Proposed Development on the receiving road network and considers the potential impacts on traffic and transport associated with the construction, operation and decommissioning phases of the Proposed Development. Taking into account the existing vehicle numbers, it is considered that there will be no significant impacts on the road network subject to appropriate mitigation in the form of a Traffic Management Plan which can be secured via a planning condition on any planning permission.

2.129. The Proposed Development therefore complies with the relevant policies in the SPPS and PPS3.

Planning Policy Statement 6 – Planning, Archaeology and the Built Heritage

2.130. PPS6 is retained policy for the purposes of the SPPS transition arrangements. There is considered to be no conflict with the equivalent provisions in the SPPS, therefore until the Council adopts its Plan Strategy, its provisions will apply, together with the SPPS, with no less weight attached to the retained policy.

2.131. SPPS policy on Archaeology and Built Heritage is set out on pages 37 to 44. It consolidates and restates policy set out in PPS6. The Minister did not identify any conflicts or clarifications in his statement launching the SPPS. The principal focus of this section is, therefore, on PPS6.

2.132. PPS 6 (NI Planning Service, 1999) sets out the Department's planning policies for the protection and conservation of archaeological remains and features of the built heritage. Archaeological sites and monuments, whether scheduled or otherwise, and their settings is a material consideration due to the desire to preserve these features. The contents of PPS 6 will be taken into account when preparing development plans and will be considered when determining planning applications.

2.133. Policy BH 1 of PPS 6 states the following:

'Development which would adversely affect such sites of regional importance, or the integrity of their settings will not be permitted unless there are exceptional circumstances.'

2.134. And Policy BH 2 states:

"Development proposals which would adversely affect archaeological sites or monuments which are of local importance, or their settings will only be permitted where the Department considers the importance of the proposed development or other material considerations outweigh the value of the remains in question."

2.135. Policy BH 3 states:

'Where the impact of a development proposal on important archaeological remains is unclear, or the relative importance of such remains is uncertain, the Department will normally require developers to provide further information in the form of an archaeological assessment or an archaeological evaluation.'

2.136. Policy BH 4 states:

'Where it is decided to grant planning permission for development which will affect sites known to contain archaeological remains, the Department will impose conditions to ensure that appropriate measures are taken for the identification and mitigation of archaeological impacts of the development…'

2.137. Policy BH6 states:

'The department will not normally permit development which would lead to the loss of, or cause harm to, the character, principal components or setting of parks, gardens and demesnes of special historic interest. Where planning permission is granted, this will normally be conditional on the recording of any features of interest which will be lost before development commences.'

2.138. Policy BH11 states:

- 'The department will not normally permit development which would adversely affect the setting of a listed building. Development proposals will normally only be considered appropriate where all the following criteria are met:
- The detailed design respects the listed building in terms of scale, height, massing and alignment;
- The works proposed make use of traditional or sympathetic building materials and techniques which respect those found on the building; and

- The nature of the use proposed respects the character of the setting of the building.'

2.139. PPS6 paragraph 2.6 states that development plans, where appropriate, will designate areas of significant archaeological interest (ASAIs). Such designations seek to identify particularly distinctive areas of the historic landscape in Northern Ireland. They are likely to include a number of individual and related sites and monuments and may also be distinguished by their landscape character and topography. Local policies or proposals for the protection of the overall character and integrity of these distinctive areas will normally be included in development plans.

2.140. **Assessment: C**hapter 5 of the ES considers the potential effects the Proposed Development would have on the historic environment. The assessment concluded that no evidence of archaeological features were identified within the site boundary.

2.141. Any direct effect upon archaeological remains discovered during the construction phase is unlikely to be of greater than minor significance. Construction phase setting effects would be temporary and are not considered to be significant in EIA due to their very short duration.

2.142. Cumulative impact assessment, considering all other operational, consented and submitted applications for wind farms in the vicinity has identified no significant effects in EIA terms as a result of the Proposed Development and no direct residual decommissioning effects have been identified.

2.143. No significant effects arising from the Proposed Development are predicted and the Proposed Development complies with the relevant policies in the SPPS, PPS6 and PPS18.

Planning Policy Statement 10 – Telecommunications

2.144. PPS10 is retained policy for the purposes of the SPPS transition arrangements. There is considered to be no conflict with the equivalent provisions in the SPPS, therefore until the Council adopts its Plan Strategy, its provisions will apply, together with the SPPS, with no less weight attached to the retained policy.

2.145. SPPS policy on Telecommunications and Other Utilities is set out on pages 94 to 96. It consolidates and restates policy set out in PPS10. The Minister did not identify any conflicts or clarifications in his statement launching the SPPS. The principal focus of this section is, therefore, on PPS10.

2.146. PPS 10 (NI Planning Service, 2002) states that large, prominent structures such as wind turbines can cause disruption to analogue television services by obstructing or reflecting the wanted signals. Policy TEL2 Development and Interference with Television Broadcasting services further states that:

2.147. 'The Department may refuse planning permission for development proposals which would result in undue interference with terrestrial television broadcasting services.'

2.148. In its justification for this statement the Department advises that it:

'Will wish to be satisfied that the potential for interference has been fully taken into account in the siting and design of large and prominent buildings and structures, since it will be more difficult, costly and sometimes impossible to correct after the event. Developers of wind turbines and any other structure which by virtue of its size, height or finishes is likely to result in undue interference are therefore encouraged seek expert advice on this matter before submitting their proposals.'

2.149. It further states that:

'Only in extreme cases where there is evidence that no practical remedy exists to overcome or otherwise mitigate problems of undue interference would the Department be justified in refusing planning permission.'

2.150. Paragraph 6.35 of PPS10 states that:

'In any development, significant and irremediable interference with other electrical equipment of any kind can be a material planning consideration. Electromagnetic interference may be caused by a radio transmitter or by unwanted signals emitted by other electrical equipment. The Radio communications Agency has statutory powers for dealing with this type of interference under the Wireless Telegraphy Act 1949 (see Annex B).

2.151. **Assessment:** Chapter 3 of this ES presents a range of considerations that have been taken into account in the design of the Proposed Development including telecommunications and interference. Should interference to television reception occur as a result of Proposed Development, a range of mitigation measures will be considered, with the most suitable method chosen on a case by case basis. Any necessary work would be undertaken in a timely manner following receipt of a valid complaint and would be funded by the wind farm operator.

2.152. RES has also consulted with organisations operating microwave links which could be affected by the Proposed Development. The proposed turbines were cleared by all potentially affected operators with no requirement for mitigation.

Planning Policy Statement 15 (Revised) – Planning and Flood Risk

2.153. PPS15 is retained policy for the purposes of the SPPS transition arrangements. There is considered to be no conflict with the equivalent provisions in the SPPS, therefore until the Council adopts its Plan Strategy, its provisions will apply, together with the SPPS, with no less weight attached to the retained policy.

2.154. SPPS policy on Flood Risk is set out on pages 61 to 68. It consolidates and restates policy set out in PPS15. The Minister did not identify any conflicts or clarifications in his statement launching the SPPS. The principal focus of this section is, therefore, on PPS15.

2.155. Revised PPS15 was published in September 2014 and contains policies relevant to the development of any proposal site in relation to flood risk:

2.156. Policy FLD 3 states:

'Beyond coastal flood plains and the flood plains of rivers the Department will not permit development which is known to be at risk from flooding, or which would be likely to increase the risk of flooding elsewhere. An exception to this policy will only be permitted where an application is accompanied by measures to mitigate the risk of flooding and it is demonstrated that such measures will not increase flood risk elsewhere, will not result in an adverse impact on visual amenity or the character of the local landscape; and will not result in an adverse impact on features of importance to nature conservation, archaeology or the built heritage.'

2.157. **Assessment:** Chapter 09 of this ES assesses the impact of the Proposed Development from hydrological and hydrogeological perspective. The hydrological and hydrogeological setting of the site for the purposes of the assessment is theCurly River as identified in Chapter 09.

2.158. Aspects of the design, construction and operation of the Proposed Development that may potentially impact on the receiving geological and water environment have been identified and the pathways for impacts assessed. This has determined the mitigation methods required to prevent any significant adverse impacts.

2.159. Mitigation integrated as part of outline design and proposed during the construction phase includes the avoidance of water features based on baseline constraints mapping; design of site elements to minimise impact on the geological and water environment; implementation of a comprehensive surface water management plan comprising the use of SuDS (drainage) and silt management in order to prevent pathways for pollution; and construction phase pollution prevention procedures in accordance with NIEA requirements and guidance.

2.160. Monitoring of the effect of the Proposed Development on the water environment and fisheries habitat will be provided by the Applicant through physicochemical and biological water quality monitoring. Implementation of the mitigation measures eliminates or reduces the potential significance to all receptors to not significant. There is no likelihood of significant cumulative impacts over and above any pre-existing effect caused by existing or consented wind farm development. The Proposed Development therefore complies with PPS15 (Revised).

Planning Policy Statement 16 - Tourism

2.161. PPS16 is retained policy for the purposes of the SPPS transition arrangements. There is considered to be no conflict with the equivalent provisions in the SPPS, therefore until the Council adopts its Plan Strategy, its provisions will apply, together with the SPPS, with no less weight attached to the retained policy.

2.162. SPPS policy on Tourism is set out on pages 97 to 100. It consolidates and restates policy set out in PPS16. The Minister did not identify any conflicts or clarifications in his statement launching the SPPS. The principal focus of this section is, therefore, on PPS16.

2.163. PPS 16 was published in June 2013. This statement sets out the Department's planning policy for tourism development and also for the safeguarding of tourism assets. It seeks to facilitate economic growth and social well-being through tourism in ways which are sustainable and compatible with environmental welfare and the conservation of important environmental assets. It embodies the Government's commitment to sustainable development and to the conservation of biodiversity.

2.164. The objectives of PPS16 are to:

- Facilitate sustainable tourism development in an environmentally sensitive manner;
- Contribute to the growth of the regional economy by facilitating tourism growth;
- Safeguard tourism assets from inappropriate development;
- Utilise and develop the tourism potential of settlements by facilitating tourism development of an appropriate nature, location and scale;
- Sustain a vibrant rural community by supporting tourism development of an appropriate nature, location and scale in rural areas; and
- Ensure a high standard of quality and design for all tourism development.

2.165. Policy TSM 8 sets out the criteria for the safeguarding of tourism assets. It indicates that planning permission will not be granted for development that would in itself or in combination with existing and approved development in the locality have an adverse impact on a tourism asset such as to significantly compromise its tourism value.

2.166. **Assessment:** The information within this ES assesses the impact of the proposals on the receiving environment, considering its visibility and connection to tourist assets within the study area.

2.167. Paragraph 1.3.80 of the Best Practice Guidance refers to wind energy development not necessarily being incompatible with tourism and leisure interests.

2.168. Having regard to the conclusions of Chapters 4 & 5 in respect of landscape/visual impact and cultural heritage insofar as both of these considerations contribute to the area's tourism assets and on the basis that the proposal would not deter visitors from utilising the tourism assets in the area, it is concluded that the Proposed Development complies with Policy TSM8 of PPS16.

Planning Policy Statement 18 – Renewable Energy

2.169. PPS18 is retained policy for the purposes of the SPPS transitionary arrangements. There is considered to be conflict with the equivalent provisions in the SPPS, only insofar as the SPPS changes the direction to attach 'significant' weight to the benefits associated with renewable energy projects and provides the decision maker with discretion in deciding the 'appropriate' amount of weight to be attached to the benefits. This is set out above at paragraph 2.80. Therefore, until the Council adopts its Plan Strategy, in terms of the 'weighting direction' the

provisions of the SPPS apply, with less weight being attached to the retained policy. In all other respects, it is anticipated that no less weight will be attached to the retained policy in PPS18 Policy RE1.

2.170. PPS18, of August 2009, is the key planning policy for renewable energy in Northern Ireland. Paragraph 3.1 of PPS18 states that its aim is to facilitate the siting of renewable energy generating facilities in appropriate locations to achieve Northern Ireland's renewable energy targets and to realise the benefits of renewable energy. This is a permissive policy context. In a speech on 2nd September 2009 to the Irish Wind Energy Association (IWEA) the Minster of the Environment stated "nothing illustrates the promotive nature of PPS18 more so than the opening up of AONB's to wind energy development for the first time. This is in stark contrast to the previous policy where there was a general presumption against wind farm development in AONB's".

2.171. Within this permissive policy context PPS18 sets out the Department's objectives relevant to renewable energy and its proposed planning policies that will help deliver these objectives.

2.172. The applicable policy objectives of PPS18 are:

- to ensure that the environmental, landscape, visual and amenity impacts associated with or arising from renewable energy development are adequately addressed; and
- to ensure adequate protection of the Region's built and natural, and cultural heritage features.

2.173. Policy RE 1 - Renewable Energy Development sets out a presumption in favour of renewable energy development provided it will not result in unacceptable adverse impact on five criteria. These include criteria around the need to protect and conserve the environment, visual amenity, human health and residential amenity, and public access to the countryside.

2.174. The policy specifically adopts a mitigation/compensation led approach and emphasises the 'significant' weight to be attached to the wider benefits of renewable energy projects. Paragraph 4.1 of the justification and amplification states that:

'Where any project is likely to result in unavoidable damage during its installation, operation or decommissioning, the application will need to indicate how this will be minimised and mitigated, including details of any proposed compensatory measures, such as a habitat management plan or the creation of a new habitat.'

2.175. The wider environmental, economic and social benefits of all proposals for renewable energy projects are material considerations that will be given significant weight in determining whether planning permission should be granted.

2.176. This direction on where significant weight should be attached in the balancing exercise required by the policy is probably unique in the UK and Ireland and must be rooted in the Executive's agenda for renewable energy. The policy goes on to

establish a set of seven additional criteria specifically for wind energy proposals including protection of visual amenity, consideration of cumulative impact, landslide risk, electromagnetic interference, roads, and residential amenity. The overall wording and thrust of the policy suggests that some degree of adverse impact may be acceptable.

2.177. The policy also states that for wind farm development a separation distance of 10 times rotor diameter to occupied property, with a minimum distance not less than 500m, will generally apply. The policy note also advises that turbines should be set back at least fall over distance plus 10% from the edge of any public road; public right of way; or railway line so as to achieve maximum safety.

2.178. **Assessment:** The wider environmental, economic and social benefits (Chapter 13) of the proposal are identified of this ES. Retained policy in PPS18 Policy RE1 requires that significant weight is attached to these factors but since there is conflict with the SPPS, greater weight is to be attached to the equivalent provision in the SPPS. The equivalent provision in the SPPS states that 'appropriate' weight should be given to the benefits. Appropriate weight must be relative to the scale of the benefits. In this case the social, environmental and economic benefits of the project are large in scale, proportionate to the scale and significance of the project. It follows that when considering the appropriate weight to attach to the benefits, the decision maker should attach significant weight.

2.179. This approach is evident in the PAC's consideration of the following appeals whereby the substantial environmental, economic and social benefits of the proposal were attributed significant weight (PAC Refs: 2012/A0070, 2015/A0102, 2015/A0168, 2015/A0169 and 2015/A200).

2.180. This ES demonstrates that there are limited adverse effects after mitigation.

2.181. Tested in the round, with the appropriate weighing of the benefits as still directed by the policy, the Proposed Development is considered to meet the requirements of the SPPS and PPS18.

2.182. Planning Appeals Commission interpretation in respect of the 10 rotor diameter distance is outlined in the following appeal cases PAC Refs: 2012/A0070, 2013/A0220, 2014/A0285, 2015/A0200, 2017/A0050, 2018/A0199 where in summary a degree of latitude can be applied to separation distances and the 10 times rotor diameter need not rigidly be applied. This would reflect Policy RE1 of PPS18 which references that the consideration of the appropriate separation distances will 'generally' apply.

2.183. There are occupied residential properties located off the Bolea Road to the north of the site (H41, H107 & H108) within a distance of 10x the rotor diameter of the turbines, but generally towards the outer edge of this limit. The most proximate turbine in this location would be T4. Due the nature of the intervening landscape, presence of vegetation, and presence of farm buildings, there will be limited direct views of the turbines. Views will also primarily be from oblique angles. These

factors will all contribute to minimising the impact on residential amenity of these properties.

2.184. No turbines are located within fall distance of any roads. In relation to public roads and overhead electricity lines, buffers were applied to nearby public roads in line with the Best Practice Guidance to PPS18 which recommends a setback distance of at least tip height plus 10% between turbines and roads. In keeping with the Energy Networks Association (ENA) L44 Issue 1 dated 2012 "Separation of Wind Turbines- Principles of Good Practice" a buffer of tip height plus %10 was applied to a 33kV overhead line crossing the Site.

2.185. The Proposed Development is therefore considered to meet the requirements of Policy RE1 in this regard.

PPS18 Best Practice Guidance (BPG)

2.186. PPS18 BPG is to continue to be treated as a material consideration during the transitionary (or after) as per paragraph 1.14 of the SPPS.

2.187. The guidance document (NI Planning Service, 2009b) provides background information on a variety of renewable energy technologies and is intended to be read in conjunction with PPS 18. Section 1 is specific to wind energy. Paragraph 1.3.4 of the guidance document states that "Each planning application will be considered on its own merits, and the argument that granting permission might lead to another application will not be sufficient grounds for refusal."

2.188. The guidance document (NI Planning Service, 2009b) provides background information on a variety of renewable energy technologies and is intended to be read in conjunction with PPS 18.

2.189. The guidance document further details the issues relevant to planning applications for onshore wind energy. These include nature conservation, landscape and visual impact, hydrology and geology, archaeology and built heritage, noise, aviation, and health and safety issues (e.g. public access, shadow flicker)

2.190. **Assessment:** The policy assessment in relation to PPS18 has had regard to the guidance contained within the BPG as evident in Chapter 4.

Wind Energy Development in Northern Ireland's Landscapes – Supplementary Planning Guidance (SPG)

2.191. This SPG is to continue to be treated as a material consideration during the transitionary (or after) as per paragraph 1.14 of the SPPS.

2.192. The SPG (NIEA, 2010) sets out the background to Northern Ireland's landscapes, describes the approach and general principles that should be applied to potential wind energy developments, and it provides guidance related to specific sensitivity of each of the 130 Landscape Character Areas (LCAs) in Northern Ireland to wind energy development. It is intended to help developers in identifying appropriate sites for wind energy generation.

2.193. **Assessment:** The SPG has been taken into account in the assessment of landscape and visual impact in Chapter 4.

Planning Policy Statement 21 – Sustainable Development in the Countryside

2.194. PPS21 is retained policy for the purposes of the SPPS transitionary arrangements. Although referred to in the Minister's statement launching the SPPS, as far as renewable energy proposals are concerned there is considered to be no conflict with the equivalent provisions in the SPPS. Therefore until the Council adopts its Plan Strategy, the renewable energy related provisions of PPS21 will apply, together with the SPPS, with no less weight attached to the retained policy.

2.195. The aim of PPS 21 (NI Planning Service, 2010) is to manage development in the countryside in a manner consistent with achieving the strategic objectives of the Regional Development Strategy for Northern Ireland, which also strikes a balance between the need to protect the countryside from unnecessary or inappropriate development, while supporting rural communities.

2.196. Policy CTY 1 (Development in the Countryside) states that there are a range of types of development which in principle are considered to be acceptable in the countryside and that will contribute to the aims of sustainable development. Non-residential developments such as renewable energy projects are considered an acceptable type of development when they are in accordance with PPS 18.

2.197. **Assessment:** On the basis that the proposals meet the requirements of PPS18, the project is also acceptable in respect of PPS21.

Local Policy Context

2.198. Section 6(4) of the Planning Act (NI) 2011 (the Act) requires that the determination of proposals must be in accordance with the prevailing local development plan unless material considerations indicate otherwise.

2.199. Section 45(1) of the Act provides meaning on the weight to be afforded to the plan in determining planning applications subject to this part and section 91(2); 'Where an application is made for planning permission, the Council, or as the case may be, the Department, in dealing with the application must have regard to the local development plan, so far as material to the application, and to any other material considerations.'

2.200. All of the proposed turbines fall within the Causeway Coast and Glens Borough Council Area. The following Local Plans are of relevance.

Northern Area Plan (NAP) 2016

2.201. The purpose of the Northern Area Plan 2016 is to inform the general public, statutory authorities, developers and other interested parties of the policy framework and land use proposals that will be used to guide development decisions within the Plan area over the period of the Plan.

2.202. The Northern Area Plan 2016 was adopted by the Department in accordance with the provisions of Part II of the Planning (NI) Order 1991 in 22nd September 2015.

2.203. The Plan was formulated in the context of the strategic and regional planning policy framework provided by Planning Policy Statements and the Department's document "A Planning Strategy for Rural Northern Ireland".

2.204. Planning powers were transferred from the Department to Council in April 2015, however, the legislative powers to allow the Department to adopt the Northern Area Plan 2016 were retained by the Department. The Northern Area Plan 2016 becomes the local development plan for the Council area until the Council adopts its own Local Development Plan, which is at the Preferred Options Paper stage.

2.205. The key objectives of the Plan include:

- To facilitate and promote sustainable development throughout the Northern Plan area in accordance with the Regional Development Strategy;
- To promote the continued development of Coleraine and Limavady as main hubs, and Ballymoney and Ballycastle as local hubs, consistent with their identified roles in the Regional Development Strategy;
- To consolidate and sustain small towns and villages as important rural service centres, in accordance with the Regional Development Strategy;
- To provide opportunities for single houses or small groups of houses and small scale economic and community development that act as a focal points for the local rural community;
- To allocate land for housing development within settlements consistent with the Regional Development Strategy;
- To identify land for housing development, including social housing, at locations that will create compact and more sustainable settlements, with preference for sites within the urban areas;
- To promote development that enhances the character and identify of existing settlements, avoids urban sprawl and protects the countryside;
- To facilitate economic development and the creation and maintenance of employment, consistent with the Anti-Poverty and Social Inclusion Strategy;
- To promote the vitality and viability of town centres;
- To improve access to, and the range of employment, commercial, health, education and community services;
- To promote the integration of public transport, cycle and footpath networks and new development, in order to ease congestion, reduce dependence on the private car, and encourage the use of more sustainable forms of travel, particularly walking and cycling;
- To protect and enhance the coastline, river corridors, mountains and other natural and man-made environs in terms of their character, quality and biodiversity;

- To promote equality of opportunity between persons and groups identified under Section 75 of the Northern Ireland Act 1998 and good relations between persons of different religious beliefs, political opinion or racial groups.

2.206. In addition:

- The Plan proposals constitute considerations that will be taken into account in determining planning applications within the Plan Area. The contents of the contents of the Plan must be read as a whole as often several designations, policies and proposals may be relevant to a particular development proposal.
- Section 6(4) of the Planning Act (Northern Ireland) 2011 provides, 'Where in making any determination under this Act regard is to be had to the local development plan, the determination must be made in accordance with the plan unless material considerations indicate otherwise'.
- The contents of the Plan must therefore be read in conjunction with the relevant contents of regional planning policy publications, supplementary planning guidance documents and with policy publications of other Government Departments.

Emerging Local Development Plans

2.207. Causeway Coast and Glens Borough Council have not yet published their draft Plan Strategy for consultation, however the Preferred Options Paper was issued on the 26th June 2018. Adoption of the plan is estimated to be in Q4 of 2024, however it is noted that delays have been encountered within the Timetable.

2.208. The Preferred Options Paper identifies what the Causeway Coast and Glens Borough Council consider to be the main strategic planning issues affecting the Borough and outlines a range of possible options to address the issues, including the Causeway Coast and Glens Borough Council's preferred option.

2.209. The Preferred Options Paper contains several key issues, which directly and indirectly control the feasibility, viability and location of renewable energy infrastructure and particularly wind turbines. These issues are:

- RN1 – Facilitating Renewable Energy Development Whilst Protecting our Landscapes; and,
- RN2 – The Impact of The Presence of Wind Turbines Outside Settlement Development Limits on Future Settlement Growth.

2.210. The first key issue (RN1) indicates two options for facilitating renewable energy development whilst protecting landscapes:

- Option 1: "Retain the principle of the existing policy framework; This option would assess renewable energy development under the existing policy provision of the SPPS and PPS 18 'Renewable Energy': Policy RE1:

Renewable Energy Development. The SPPS introduced a policy change to Policy RE1 whereby a 'cautious approach' to renewable energy development is applied for designated landscapes of significant value e.g. AONBs and World Heritage Site. This option does not afford total protection to the Borough's most sensitive landscapes. This option seeks to achieve Northern Ireland's renewable energy and carbon emission reduction targets through a reduced dependence on fossil fuels. It also seeks to ensure a diverse supply of energy infrastructure."

- Option 2: "Retain the principle of the existing policy framework and designate areas of constraint within our most sensitive landscapes and provide policy for these areas; This option would provide the same policy context as Option 1 and encourages renewable energy development. However, this option adds increased protection and a stricter policy approach to sensitive and vulnerable landscapes which have been designated due to their landscape value, built heritage or nature conservation assets."

2.211. It is noted that the Council's preferred Option is Option 2.

2.212. The second key issue (RN2) indicates two options in relation to resolving the impact of the presence of wind turbines outside settlement development limits on future settlement growth:

- Option 1: "Identify a buffer around our towns and villages where wind turbines will not be permitted; This option would not permit wind turbine development within identified buffers around towns and villages. This option seeks to protect any potential land for the future growth and development of towns and villages, which may otherwise be curtailed by the presence of wind turbines."
- Option 2: "Do not identify buffers around Settlement Development Limits; This option would not proactively protect any potential future development land surrounding settlement development limits, with applications for wind turbine development assessed on a case-by-case basis."

2.213. It is noted that the Council's preferred Option is Option 1.

2.214. The above options have not yet been fully assessed and it cannot be assumed such policies will be carried forward to an adopted Plan Strategy. Indeed, as set out above, the plan has yet to be independently examined against the tests of soundness or found sound, as required under Section 10 (6) of the 2011 Act.

2.215. The SPPS is clear in setting out the transitional arrangements, in that a transition period will operate until the adoption of a Plan Strategy. Therefore, until the adoption of the Plan Strategy for the relevant council areas the planning authority (in this case DfI) will apply existing regional policies and those contained in the SPPS.

2.216. The SPPS at para 5.73 considers that proposals should only be refused on the basis of prematurity where:

'….development proposals which are individually so substantial, or whose cumulative effect would be so significant, that to grant planning permission would prejudice the outcome of the plan process by predetermining decisions about the scale, location or phasing of new development with out to be taken in the LDP context….'

2.217. Guidance on weight to be afforded to the provisions of an emerging development plan is also set out the in Joint Ministerial Statement 2005 (JMS) which remains a relevant consideration. Whilst the JMS is still material, the contents of the SPPS would be afforded greater weight, where there is conflict identified. In this instance there is not direct conflict with the SPPS. It is our view that the Proposed Development would not prejudice the delivery of policies within the emerging Plan Strategy as it:

- would not prejudice the ability of the Plan Strategy to retain conformity with the RDS
- would not result in an adverse impact on an environmental asset, as demonstrated within this ES;
- would not undermine the rationale behind a proposed Special Countryside Area designation proposed in the emerging plan as the draft policies make provision for exceptions.

2.218. Furthermore, the SPPS is clear at paragraph 6.221 that "moratoria on applications for renewable energy development whilst LDPs are being prepared or updated are not appropriate". For this reason, the Proposed Development can be determined under existing regional policies and the SPPS.

2.219. **Assessment:** Most aspects of local planning policy have been superseded by subsequent regional planning policy. On the basis of the conclusions of the detailed assessments within this ES, there is no conflict with applicable local planning policy.

Other Guidance

Binevenagh Area of Outstanding Natural Beauty Management Plan 2010 - 2020

2.220. The Bineveagh AONB Management Group, in partnership with the Causeway Coast and Glens Heritage Trust (CCGHT) produced a management plan for the AONB. The Management Plan helps everyone with a stake in the landscape respond in ways that enhance the landscape and ensure the AONB remains an area everybody can identify with and enjoy and allow it to continue contributing crucially to the economy of the area.

2.221. The management plan covers a 10-year period and is accompanied by an Action Plan which details how the goals will be attained. The Management Plan were published for the period 2010–2020 and the Five-Year action plan was published for 2017-2022. The purpose of the Management Plan is to conserve and enhance the

landscape quality of the Binevenagh AONB for the benefit of those who live there and those who visit. It reflects the planning policies and guidance for development in the region; provides guidance for organisations and individuals who have an interest in the protection and management of the AONB; and it presents an evidence base and vision that can help in the formulation of planning policy for the area.

2.222. The Management Plan identifies a number of objectives around the themes of the natural beauty or amenities of the AONB; wildlife, historic objects and natural phenomena within the AONB; promotion of public enjoyment of the AONB; and public access to the AONB.

2.223. The Five Year Action Plan 2017-2022 provides some additional detail as to how Objectives will be achieved.

Overall Policy Compliance

2.224. Making an energy infrastructure contribution of the scale proposed (50.4 MW) will assist in the achievement of strategic energy targets and objectives, consistent with a wide range of International, European, UK and Regional level priorities. The rationale for the project in relation to the delivery of renewable is clear.

2.225. There is a strategic qualified national presumption in favour of developing renewable energy projects of this type.

2.226. The established approach to decision making advocated in policy is to balance the wider environmental, economic and social benefits of the project against the environmental impacts, attaching significant weight to the former.

2.227. The SPPS changes this approach insofar as the PPS18 direction to attach significant weight to the benefits is replaced by a discretion for the decision maker to determine the appropriate weight to be attached to the benefits. This must mean that the large scale social, environmental and economic benefits associated with this project are attached significant weight. In weighing the acceptance of the proposals the following must be considered:

- The proposal will offer job creation and economic activity to the regional economy providing catalytic benefits to investment within Northern Ireland.
- Given the 35 year lifetime of the development it is expected that direct operational impacts equate to 35 job years, £3.5 million direct wages and £9.5 million of direct Gross Value Added over the operational phase.
- Both the construction and operational phases will generate increased tax and business rates revenue and the proposal is estimated to involve a capital spend of £31 million.
- Based on rateable values it is calculated that the Proposed Development will increase rateable value by £6.5 million over the project life.
- The amount of electricity that could be produced by the Proposed Development is estimated at 56 GWh per year which is equivalent to the

needs of 16,000 homes each year, or approximately 25 percent of the current housing stock in Causeway Coast & Glens Borough Council area.

- The Proposed Development is also estimated to reduce CO_2 emissions by 23,800 tonnes each year when compared against equivalent non-renewable sources.

2.228. The landscape and visual impact of the windfarm is not unacceptably adverse for the purposes of the SPPS and PPS18 Policy RE1 because the inherent characteristics of the landscape provide the capacity to absorb it. The effects – relative to the qualities that underpin the designation – would not undermine the overall AONB or compromise wider landscape and visual amenity to an unacceptable degree.

2.229. With the discretion to attach significant weight to the wider environmental, economic and social benefits arising from the proposal, and having regard to how the project demonstrates that it will have limited adverse impacts, the project is considered to comply with relevant planning policy because there are no unacceptable adverse effects which are not outweighed by the local and wider environmental, economic and social benefits of the Proposed Development.

References

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Causeway Coast & Glens Borough Council – Local Development Plan 2030 Preferred Options Paper (2018)

Causeway Coast & Glens Heritage Trust - Binevenagh Area of Outstanding Natural Beauty Management Plan 2010 – 2020 (2010)

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Joint Ministerial Statement – Development Plans and Implementation of the Regional Development Strategy (January 2005)

3. Design Evolution and Alternatives

Introduction

3.1 In this chapter a description is given of the site selection process, consideration of alternatives, and design strategies that were adopted in arriving at the Proposed Development described in **Chapter 1: Introduction and Proposed Development**. Firstly, the general design principles adopted by RES are outlined and potential key issues which may affect the design are identified. Thereafter, a description is given of how the turbine layout and infrastructure design evolved in response to constraints identified through the EIA process.

3.2 **Figures 3.1 – 3.3** are referenced in the text where relevant.

Current land use and site context

3.3 The location of the Proposed Development is shown in **Figure 1.1: Site Location**. The Planning Application Boundary (red line) and Land Under Applicant Control (blue line) are shown on **Figure 1.2: Planning Application Boundary**. The Land Under Applicant Control surrounding the main site shown on Figure 1.2 formed the initial preliminary site boundary, which was reduced down through the design process, and is hereinafter referred to as 'the Site'.

3.4 The Site is located in the townlands of Dunbeg and Dunmore, 6.2km north east of Limavady, County Derry / Londonderry, located on lands to the north of A37 and to the west of the existing Dunbeg Wind Farm and lands to the south of A37 adjacent to a disused quarry. The site lies within the Bineveagh Area of Outstanding Natural Beauty (AONB), Dunbeg and Dunmore Wind Farm are located to the north east of the site.

3.5 The Site is currently used for rough grazing of sheep and cattle.

Key Issues and Constraints

Site Selection

3.6 The design of a wind farm is optimised in order to produce a layout that maximises the use of the land available for wind power generation balanced against the overall environmental impact of the development. The optimal layout of a wind farm depends on a range of technical, economic and environmental criteria. There following are site specific factors determining the viability of a wind farm:

- Wind Speeds/Energy Yields: Sufficiently high wind speeds to ensure energy production from the wind turbines that would yield an adequate return on investment;

- Planning: A site which complies with planning policy and in particular, avoids unacceptable effects on areas designated by statutory agencies; maintains appropriate distances from dwellings to avoid unduly impacting local amenity and; avoids impeding or interfering with major electromagnetic transmission and airport communication systems;
- Area of Site: A site must have sufficient area to accommodate the number of wind turbines required for economic viability;
- Access: Adequate vehicular access to a site using existing roads wherever possible to minimise the amount of civil works, particularly during the construction phase;
- Local Terrain and Topography: Terrain and topography affect wind flow across a site and need to be considered in relation to turbine performance, specification and life-span;
- Ground Conditions: A site must have suitable ground conditions for the construction of wind turbine foundations, erection of the machines and the provision of access tracks and cables.

Design Principles

3.7 There are additional factors which also influence the scale and viability of a wind farm including:

- Turbines must be separated by specific distances both perpendicular to, and in line with, the prevailing wind direction to minimise turbulent interaction between the wind turbines (i.e. wake effect). This needs to be considered to balance turbine performance with energy extraction, and to protect the life-span of the turbines. Spacing requirements vary between turbine manufacturers and are also subject to wind conditions;
- Wind turbines have to be located at a distance sufficiently far from occupied residential property to ensure adherence to relevant noise criteria and to ensure that shadow flicker impacts are minimised;
- The implications of locating turbines near environmentally sensitive features and areas (ecology, archaeology, hydrology etc.) need to be carefully considered; and
- Landscape and visual design considerations, including potential cumulative effects, need to be taken into account.

3.8 The apportioning of weight to each element is a site-dependent consideration and results in bespoke design approaches and strategies for each site.

3.9 For the Proposed Development, the upland nature of the Site creates a number of sensitivities that need to be carefully addressed through appropriate design of the wind farm. The following sections identify potential issues and outline how these have been addressed through appropriate design.

3.10 The basis of the design process is the evaluation of the various constraints that have been identified through the environmental surveying that was undertaken at the Site. The constraints identified through these surveys, along with other technical constraints and appropriate buffers are presented in **Figure 3.3: Combined Constraints and Infrastructure** and are discussed in the layout evolution sections of this chapter.

Potentially significant effects

3.11 Following consultation and baseline characterisation of the Site, the following key environmental issues have been identified:

- Landscape and visual, including relationships with neighbouring wind farms
- Archaeology and cultural heritage
- Peatland and vegetation
- Fauna, including ornithology and fisheries
- Geology and the water environment
- Noise and shadow flicker
- Traffic and transport.

3.12 The issues listed above will be considered through design with the aim of designing out significant effects. Where it is not possible to mitigate by design, the issues are considered further as part of this Environmental Impact Assessment (EIA).

Consultation

3.13 Prior to and during the production of this Environmental Statement (ES), RES and the Consultant project team have consulted with various stakeholders and where appropriate incorporated the outcome of this into the various chapters of this ES.

3.14 Throughout the EIA process, continual scoping has occurred to ensure that the ES fully, but concisely, addresses all potentially significant issues.

3.15 Details of consultation undertaken in the preparation of each of the technical chapters of this ES (chapters 4 to 12) are presented in the relevant chapter.

Public Consultation

3.16 RES is committed to finding effective and appropriate ways of consulting with all its stakeholders, including local residents and community organisations, and believes that the views of local people are an integral part of the development process. RES began the engagement process with the local community in March 2024 to facilitate a constructive consultation process which helped RES to understand and address any concerns as the project developed.

3.17 The public exhibition was held on the 11th of April 2024 which included detailed maps and information about the proposals, including: a map of the proposed layout; photomontages representing how the proposed layout would appear from

a range of viewpoints, and Zone of Theoretical Visibility (ZTV) drawings. (A ZTV is a map-based diagram of where and how many wind turbines, or wind farms, would theoretically be visible from all parts of a given area.) RES staff were available for telephone/video conference meetings to answer questions and feedback was encouraged.

3.18 A Pre-Application Community Consultation (PACC) Report has been produced and is available for viewing at the locations listed in the Preface.

Alternatives

3.19 RES considers a range of potential options when selecting and designing wind farm sites. The following sections outline the broad design alternatives that have been considered in terms of the EIA Regulations.

Do-Nothing Alternative

3.20 The "do-nothing" scenario is a hypothetical alternative considered as a basis for comparing the potential significant effects of a development proposal. In the case of the Proposed Development the "do-nothing" scenario would be to have the Site continue to be managed for sheep grazing by the landowners. It is likely that current land management activities such as grazing, would continue and are likely to cause further degradation to the habitats on the Site in the future.

Alternative Sites

3.21 RES has a robust site selection methodology, using a Geographical Information System (GIS) to aid identification of potential wind farm sites.

3.22 The Proposed Development Site meets the criteria listed in section 3.29 of this chapter. The GIS model was used to identify potential constraints which could restrict development, or would need to be addressed in the design process.

Alternative Layout Designs

3.23 There have been several iterations of the turbine and infrastructure layouts. From the outset the following design principles have been employed when making design decisions:

- Mitigation by design should be the principle method of reducing potential environmental impacts
- Utilisation of existing infrastructure should be implemented whenever possible to avoid unnecessary development
- All site infrastructure should be designed as efficiently as possible to reduce the overall extent of development whilst maximising the renewable energy generation potential.

3.24 A key tool in the design process is the combined constraints drawing which integrates all potential constraints that need to be considered in the design process. The finalised combined constraints map is shown as **Figure 3.3**.

3.25 The combined constraints drawing is iteratively updated as new information from surveys, site visits and consultation is received. The following surveys informed the combined constraints drawing and design evolution process:

- Breeding and wintering bird survey
- Ornithological vantage point survey
- Phase 1 habitat survey and National Vegetation Classification (NVC) Phase 2 survey
- Terrestrial fauna surveys
- Fisheries survey
- Peat probing, peat management plan and peat slide risk assessment
- Hydrology assessment
- Archaeology and cultural heritage surveys
- Landscape field survey
- Transport and traffic reconnaissance trip
- Technical and engineering site walkovers.

3.26 The final site layout for the Proposed Development (**Figure 3.2**: Infrastructure Evolution Design 3) reflects the need to optimise the energy yield whilst paying due regard to environmental and technical sensitivities. Wind farm design is an iterative process and is influenced by potential environmental effects identified throughout the EIA process: policy recommendations; environmental, technical, engineering and landscape design considerations; and as a result of feedback from consultees.

3.27 The Design Evolution section of this chapter describes the evolution of the turbine and infrastructure layouts.

Design Evolution

Turbine Layout

3.28 There were three principle iterations of the turbine layout, shown in **Figure 3.1: Turbine Layout Evolution**, which were developed at the following three stages in the project process:

- Initial feasibility/screening stage, when turbines were located based on preliminary constraints only, with baseline environmental surveys underway but not yet completed.
- EIA baseline data stage, when layouts were developed in response to baseline survey information and resulting constraint information.

- Further environmental assessment and refinement, when further, more detailed assessment was carried out on specific issues highlighted and refinements were made to the layout as a result.

Initial Feasibility Stage

3.29 At the beginning of the development process an initial layout was produced to show the maximum potential extent of the development within the space available and in accordance with the design principles and preliminary environmental information, prior to baseline surveys being completed. The layouts were informed by the following constraints:

- Preliminary ecological constraints
- Preliminary watercourse buffers
- Slope
- Separation from housing
- Tip height + 10% to public roads, in accordance with the Best Practice Guidance to PPS 18[1].

3.30 This identified that the Site could potentially accommodate 5 turbines, to be further refined throughout the EIA process. This is **Layout 1 in Figure 3.1.**

EIA Baseline Data Stage

Combined Constraints

3.31 Detailed environmental and technical surveys were completed to characterise the baseline environmental conditions on the Site and associated study areas, as described in more detail in chapters 4 to 12 of this ES. Any constraints to development, or avoidance areas, resulting from the baseline surveys were used to build up the combined constraints drawing.

3.32 Key constraints informing the layout are listed in the following sections. Further details on baseline surveys and mitigation by design are included in each technical chapter (Chapters 4 to 12).

3.33 The final Combined Constraints are shown in **Figure 3.3 Combined Constraints**.

Water Environment and Fisheries

3.34 Following the baseline survey the hydrology consultant recommended watercourse buffers of 50 m and 10 m depending on the sensitivity of the watercourse, which were agreed as appropriate by the fisheries consultant. Potential private water supplies in the area were also identified and buffer of 250m applied.

[1] Best Practice Guidance to Planning Policy Statement 18: Renewable Energy, DOE Planning & Environmental Policy Group, August 2009.

Terrestrial Fauna

3.35 A 25 m buffer was applied to a badger setts identified through the baseline surveys. Note that these are not marked on **Figure 3.3** as their location is confidential.

3.36 All turbines have been positioned to maintain a minimum 50m buffer distance from the tip of the turbine blade to the top of the adjacent habitat feature. This is based on a (blade length of 58.5m, hub height of 91.4m and varying feature heights).

Public Roads and Overhead Electricity Lines

3.37 Buffers were applied to nearby public roads in line with the Best Practice Guidance to PPS18 which recommends a setback distance of at least tip height plus 10% between turbines and roads.

3.38 In keeping with the Energy Networks Association (ENA) L44 Issue 1 dated 2012 "Separation of Wind Turbines- Principles of Good Practice" a buffer of tip height plus %10 was applied to a 33kV overhead line crossing the Site.

Archaeology and Cultural Heritage

3.39 In consultation with the Archaeology and Cultural Heritage consultant the layout of Proposed Development has been designed to avoid significant effects on archaeological heritage assets in conjunction to appropriate mitigation.

3.40 Chapter 5: Archaeology & Cultural Heritage of the ES considers in detail the impact of the Proposed Development on the setting of a number of assets.

Mast in Southern Section of the Site

3.41 Following consultation the mast operators (located in the southern portion of the site) T1 was moved north west to allow sufficient fall-over distance buffer from the mast located in the southern portion of the site, this change was completed from Layout 1 to Layout 2 in **Figure 3.1**.

Peat Assessments

3.42 Following baseline peat probing and peat slide risk assessment, areas of deeper peat were avoided to limit excavation and spoil generation. It was agreed that further assessments were required before the layout could be finalised.

Landscape & Visual

3.43 Zone of Theoretical Visibility (ZTV) visualisations were prepared in order to indicate where all, or part of, the Proposed Wind Farm Development is likely to be visible from. The ZTV is first used to assist the identification of areas with theoretical visibility and the location of viewpoints as part of the baseline landscape and visual assessment. It is then used to aid the assessment of visual effects because the turbines would be the most visible element of the Proposed Wind Farm Development, particularly during the operational period. As described

in earlier sections they are also useful in considering alternative turbine heights and geometries.

3.44 At an early stage of the EIA process a provisional list of viewpoints was created, from which provisional wirelines were generated, which were used to identify any potential landscape and visual issues with the turbine layout, as well as from the effects of the wind farm as a whole.

3.45 The presence of outlying turbines was addressed in the iterative design process and efforts were made to minimise instances where turbines were located at some distance or at noticeably different heights from the main grouping of turbines in order to create a compact layout that minimised the geographical extent and variable height within the Proposed Development whilst also maintaining an evenly spaced layout where turbine heights instances of stacking where also minimised.

3.46 The final turbine layout as shown in Layout 3 of **Figure 3.1** was assessed via a cumulative ZTV (as shown in Chapter 4 Figure 4.8, page 1 of 3) which indicated additional theoretical visibility across only 0.04% of the 30 km Study Area which would not already have theoretical visibility of other turbines in the Keady Cluster, all of which are either operational or consented.

Further assessment and refinement stage

3.47 The turbine layout was reviewed and refined in response to further assessment actions identified by consultant review and from the collaborative site visit, including the following:

- Noise assessment, based on the background noise survey
- Shadow flicker assessment
- Archaeological assessment
- Further ecological assessment
- Further peat stability assessment
- Engineering considerations

Noise and Shadow Flicker Assessments

3.48 Layout 1 was reviewed, it was recommended that T5 was moved south in order to increase the separation distance to houses, reduce noise and shadow flicker impacts. Full details of the noise and shadow flicker assessments are given in Chapters 10 and 12 respectively. Both chapters conclude that with appropriate mitigation there would be no significant effects on surrounding properties.

Water Environment

3.49 In addition to potential noise & shadow flicker constraints in section 3.48 it is noted that in Layout 1 in **Figure 3.1** that T4 is located within the watercourse buffer. Therefore, it was agreed to move T4 out of the T4 out of the watercourse buffer. This change is noted in Layout 1 to Layout 2 in **Figure 3.1**.

Peatland

3.50 An area of deeper peat was encountered in the location in which T4 was positioned in Design 2 of **Figure 3.1**. This resulted in the northern portion of the site having a number of constraints which made it unfeasible to have 5 turbines across the site. It was advised to remove T5 from the layout and reposition T4 out of the areas in which deeper peat were encountered. This change is noted in Layout 2 to Layout 3 in **Figure 3.1**.

Ecology

3.51 In addition to the decision to remove T5 due to noise, shadow flicker and peat constraints, it was also evident that by removing T5 this enabled T1 (which had the highest levels of bat activity) being moved approximately 188m WNW of its original location. This open area away from former treelines and the old quarry is considered to be of much lower risk to bats.

Collaborative Site Walkover

3.52 A second multidisciplinary site walk-over was arranged by RES, involving engineering, ecology, peatland, geology and water environment specialists to collaboratively review and refine the layout, discuss interrelationships and mitigation, resolve potential conflicts and agree actions for further assessment. It was agreed to that by moving T4 west out of the area of deeper peat, it would also result in T4 being located in a flatter area of land, thereby reducing the amount of earthworks necessary. Refinements were made to the infrastructure layout, which are detailed later in this chapter.

3.53 Layout 3 on **Figure 3.1** shows the resulting layout.

Final Turbine Layout

3.54 The final turbine layout is shown in Layout 3 of **Figure 3.1** and consists of 4 turbines of 149.9m tip height. The final layout, including turbines and infrastructure along with the combined constraints is shown in **Figure 3.3**. This demonstrates that every effort was taken to reduce impacts from the proposed development, as although the site could have accommodated 5 turbines, less impacts would be realised with 4 turbines.

3.55 A 50 m micrositing radius was applied to each of the turbines. The extent of this micrositing area was then reduced such that the micrositing avoids any of the combined constraints. The final micrositing areas are included in **Figure 1.3: Infrastructure Layout.**

Infrastructure Design Evolution

3.56 The infrastructure design has evolved through the EIA process as illustrated in **Figure 3.2: Infrastructure Design Evolution**, Designs 1 to 3**.** Design 3 is the final design, which forms **Figure 1.3 Infrastructure Layout**.

Engineering considerations

3.57 The following general principles were taken into consideration when designing the supporting infrastructure:

- Provision of two options for site entrances and associated tracks to enable southern section of proposed development to be accessed via consented Dunbeg South Wind Farm, or separately via a new entrance
- Avoidance of environmental and technical constraints (as shown in **Figure 3.3**)
- Design of the track layout to follow natural contours as far as possible, in order to avoid unnecessary amounts of excavation and reduce adverse hydrological impacts
- Minimisation of the overall length of access track
- Minimisation of the number of watercourse crossings, as far as possible
- Avoidance of steep slope areas to minimise earthworks
- Incorporation of measures to improve the visual appearance of the scheme, including reinstatement of some elements of temporary infrastructure following the construction period, reinstatement of road widening areas, and consultation with the landscape consultant on the position of the control room and substation building.

3.58 As well as the turbine positions, the layout of infrastructure was also a key consideration in the collaborative site walkovers described earlier in this chapter.

3.59 Key adjustments in response to constraints made through the design evolution are summarised in the following sections.

Vegetation and Peatland

3.60 Following the advice of the vegetation and peatland specialist a number of refinements were made to the track layout in order to minimise impacts to blanket bog habitats and deep peat including the following:

- Following the removal of T5 from Layout 2 to Layout 3, T4 was moved west away from areas in which deeper peat (depths greater than 1.5m), the infrastructure track from the northern entrance to T4 was orientated in a way to avoid the areas of deep peat
- Design of site track (Option 2) to avoid wet modified bog in the southern portion of the site (as seen in Design 3 in **Figure 3.2**)

Water Environment

3.61 The location and nature of watercourse crossings were reviewed with the hydrology and fisheries consultants. Following the mitigation detailed in Chapter 8: Fisheries and Chapter 9: Geology & Water Environment,

3.62 A number of refinements were made to avoid and reduce potential effects as far as possible, including the following:

- Reorientation of track from the northern entrance to T4 and movement of temporary construction compound to southern portion of the site to move the compound out of the watercourse buffer within the northern portion of the site.

Site Entrance Location

3.63 The entrance to the northern portion of the site was chosen given the presence of an existing entrance (to a vacant house) and the presence of suitable sightlines, this entrance remained in position from Design 1 to Design 3 (Final Layout).

3.64 In Design 1 (**Figure 3.2**) the site entrance to the southern portion of the site was located in the south eastern portion of the site, however it was noted on a site walkover that to achieve adequate sightlines at this location, significant levels of excavation would have been required to achieve this. Therefore, the site entrance in Design 1 was removed, and subsequently the entrance to the southern portion of the site was located opposite the entrance to the northern portion of the site as demonstrated in Design 2.

3.65 In order to minimise impacts the proposed development, Design 3 was developed, which has an option (Option 1) to use the existing infrastructure from Dunbeg South Wind Farm to enable an entrance to the southern portion of the proposed development. In the unlikely event that the Dunbeg South Wind Farm is not constructed Design 3 (Final Layout) has a second entrance option (Option 2) opposite the entrance to the northern portion of the site.

Wind Farm tracks and Turbine Hardstandings

3.66 The tracks within Design 1 were developed in accordance with the site entrance to the southern section being located in the eastern portion of the site. Following revisions to the site entrance between Design 1 and Design 2, traffic would no longer be accessed from east to west, therefore the understandings at T1 and T2 were reorientated to accommodate the direction change of turbine construction vehicles reaching the locations.

3.67 To enable potential access to the southern section of Dunbeg South Extension from the original consented Dunbeg South site, additional track was added from Design 2 to Design 3 in **Figure 3.2** Infrastructure Evolution. The two additional tracks (Proposed Site Track Option 1) run from T2 to the south west and T1 to the south, heading into the consented track at the consented Dunbeg South Wind Farm. An additional site entrance option (Entrance to Southern Section Option 2) and internal track option (Proposed Site Track Option 2) was added to Design 3 to accommodate that the current proposed development can be accessed and all turbines can be accessed separately, in the unlikely event that Dunbeg South Wind Farm is not constructed and the current proposed development will not be accessed via Dunbeg South. The Proposed Site Track Option 2 was located in a

manner to avoid the habitat constraint identified by the ecologist, located in the southern portion of the site, shown in **Figure 3.3**.

3.68 The track in the northern portion of the site was redesigned from Design 1 to Design 2 following the movement of T4 and T5 between Layout 1 and Layout 2 of **Figure 3.1** Turbine Evolution. Following the removal of T5 as shown in Layout 3 of **Figure 3.1** Turbine Evolution, the track previously connecting T4 & T5 was removed. The track in Design 3 was orientated in such a way to ensure that no permanent hardstandings would be located within the watercourse buffers. In addition, the track was designed to minimise the amount of material to be disturbed as part of the works.

Temporary Construction Compound and Control Building & Substation

3.69 The temporary construction and Control Building & Substation was initially located in the southern portion of the site, near the proposed entrance in the south eastern portion of the site as shown in Design 1 **Figure 3.2** Infrastructure Evolution. However, design evolution resulted in the entrance in south eastern portion of the site being removed from Design 1 to Design 2, and therefore the temporary construction compound and Control Building & Substation was no longer suitable at this location, therefore the Control Building & Substation were relocated.

3.70 In Design 2, the temporary construction compound and control building & substation were located in the northern portion of the site between T4 & T5 as it was determined that at this location the compounds and substation would be less visual. However, given the watercourse constraints identified in section 3.61, the temporary construction compound could not be located in this area. In addition, given that three of the four turbines were located in the southern portion of the site and therefore the majority of works would be completed in the southern section of the site.

3.71 The final location of the Temporary Construction Compound, Control Building and Substation are shown in Design 3. This location was selected given the lack of constraints and relatively flat nature of this area of land, which would therefore limit the amount of earthworks required.

3.72 The buildings will be designed in a manner that is sensitive to the immediate landscape character with regards to location, scale, colour, and choice of materials.

Final Infrastructure Layout

3.73 The final infrastructure layout is shown in Design 3 of **Figure 3.2**. Once finalised, the Planning Application Boundary was drawn, ensuring sufficient space within the boundary for all features.

3.74 The final Infrastructure Layout and combined constraints is shown in **Figure 3.3**.

Other Design Considerations

TV interference

3.75 Wind turbines can potentially interfere with communication systems that use electromagnetic waves as the transmission medium (e.g. television, radio or microwave links). Wind turbines therefore may cause interference to television reception in the proximity of a wind farm, primarily for receptors in the '*shadow*' of the turbines with aerials pointing through the wind farm, causing loss of picture detail, loss of colour or loss of audio. Microwave links can also be affected by the reflection, scattering, diffracting and blocking of the electromagnetic signal caused by wind turbines.

3.76 If the Proposed Wind Farm Development is consented, RES would agree a scheme of assessment and mitigation with the planning authority to be implemented in the case of complaints associated with television reception. Should interference to reception occur as a result of the Proposed Wind Farm Development, a range of viable mitigation measures can be considered, with the most suitable method chosen on a case by case basis. Any necessary work would be undertaken in a timely manner following receipt of a valid complaint and would be funded by the wind farm operator.

Electromagnetic Interference

3.77 RES has consulted with all organisations operating microwave links which could be affected by the Proposed Development and these are listed in **Table 3.1**.

3.78 The proposed Dunbeg South Extension turbines are clear of any microwave links and no objections were raised

3.79 A telecommunications mast situated within the site boundary is operated by Telefonica / Virgin Media O2. There are no concerns regarding electromagnetic interference and only topple distance (110% of tip height) is to be observed, which was incorporated in the layout design accordingly.

Aviation

3.80 Wind turbines can potentially interfere with aviation operators by either physically affecting the safeguarding of an aerodrome by the close proximity of the turbines or through interference with the Air Traffic Control (ATC) radars that direct aircraft in flight. RES has consulted with all relevant organisations which could be affected by the Proposed Wind Farm Development.

3.81 NATS En Route (NERL) supplies air traffic service to all En Route aircraft navigating UK airspace. RES has consulted the published NATS safe-assessment maps which have been produced to indicate if a wind farm development will impact NERL infrastructure. The Proposed Wind Farm Development lies outside the safeguarding

areas which identify need for further consultation with NERL and therefore the Proposed Wind Farm Development will have no impact on NERL infrastructure.

3.82 The Defence Infrastructure Organisation (DIO) consultation response stated that the Ministry of Defence (MOD) had concerns with regards to the Proposed Development given the potential to create a physical obstruction to air traffic movements. To address impact up on low flying given the location and scale of development, the MOD would require that conditions are added to any consent issued requiring that the development is fitted with aviation safety lightning and that sufficient data is submitted to ensure that structures can be accurately charted to allow deconfliction. As a minimum the MOD would require that the individual turbines are fitted with 25cd infra-red (IR) lighting.

3.83 Table 3.1 notes the pre-submission consultation that was undertaken with airport located in close proximity to the Proposed Wind Farm Development; Derry City Airport. Derry City Airport indicated that a full Instrument Flight Procedure (IFP) Safeguarding assessment will be required to establish the exact infringement, its magnitude and any possible actions that could be used to mitigate this infringement, reducing that safety impact.

3.84 As no anticipated detrimental impact upon any aviation stakeholder has been identified it is considered that there will be no additional impact created when considered cumulatively with other existing, consented or proposed wind farms.

Table 3.1: EMI and Aviation Consultation Summary

Consultee	Date of Consultation	Nature and Purpose of Consultation
Atkins Global on behalf of NI Water	February 2024	Check for EMI impact – no concerns
BT	September 2023	Check for EMI impact – no concerns
Joint Radio Company	September 2023	Check for EMI impact – no concerns
Telefonica / Virgin Media O2	February 2024	Check for EMI impact – no concerns as long as topple distance is observed.
Defence Infrastructure Organisation	August 2024	Check for aviation impact – Concerns regarding potential for causing physical obstruction to air traffic. As a minimum, individual turbines should be fitted with 25cd IR lighting. Sufficient data should be supplied to ensure that structures can be accurately charted to allow deconfliction.
Derry City Airport	September 2024	Check for aviation impact – Concerns regarding exact magnitude and infringement and possible actions to mitigate infringement.

Summary

3.85 The final layout of the Proposed Development reflects the need to minimise potential effects on environmental sensitivities whilst optimising the energy yield. Wind farm design is an iterative process, and the design has been influenced by potential environmental effects identified through the EIA process. The proposed layout has evolved in response to policy recommendations, environmental, technical, engineering and landscape design considerations and as a result of feedback from key consultees.

List of Figures

4 Landscape and Visual Impact Assessment

Executive Summary

The Purpose of this Chapter

4.1 This chapter is a Landscape and Visual Impact Assessment (LVIA) of the proposed Dunbeg South Extension Wind Farm (hereinafter referred to as the Proposed Development). An LVIA is a formal part of the Environmental Impact Assessment (EIA) process and the methodology used to prepare this chapter is defined by the requirements of the Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 (hereinafter referred to as the EIA Regulations.) and best practice guidance publications relating both to the LVIA process in general and specifically in relation to wind farm developments (refer to Technical Appendix 4.1 for further details).

4.2 The Proposed Development comprises 4 turbines with rotor diameters of 117 m, hub heights of 91.4 m and overall heights to blade tip of 149.9 m. It is located in the southern part of Binevenagh AONB on the north-facing side of Keady Mountain either side of the A37 road corridor (turbines 1 – 3 are located on the south side and turbine 4 is located to the north). It is located approximately 6.6 km to the north east of Limavady and 10 km to the south west of Coleraine which are the two towns connected by this road corridor, County Derry. It would form a contiguous extension to the consented 9-turbine wind farm, Dunbeg South which is located immediately to the south west, and which has the same turbine dimensions. It would also become part of what this LVIA refers to as, the Keady Cluster of wind farms comprising operational wind farms at Dunbeg and Dunmore, a consented extension to Dunbeg and a smaller single turbine. This cumulative baseline is detailed from paragraph 4.187 and referred to throughout the LVIA. The Study Area for this LVIA covers an area that extends to a 30 km radius from the Proposed Development and is further described in paragraph 4.75).

4.3 The objectives of an LVIA are to:

- Present an objective analysis of the landscape and visual character of a defined area (i.e. the '*baseline conditions*' within the '*Study Area*' for this LVIA) in so far as they relate to the Proposed Development;
- Identify the potential effects of the Proposed Development on these baseline conditions including direct, indirect, permanent, temporary and cumulative effects;
- Clearly distinguish between *landscape effects* and *visual effects* which although closely related are also distinct from each other. The former relates to the effects on the physical landscape as a resource in its own

right. The latter relates to the effects on specific views and general visual amenity as experienced by people (hereinafter referred to as *visual receptors*;

- Propose appropriate mitigation measures to address likely significant effects, where possible, and to assess any residual effects that remain following the implementation of these measures;
- Present all information clearly and objectively with a well-reasoned methodology that is in accordance with best practice guidance and in a manner that will inform the decision-making process.

Statement of Authority

4.4 This LVIA has been prepared by Shanti McAllister Landscape Planning & Design Limited (hereinafter referred to as SMc Ltd) on behalf of the applicant, RES Limited (hereinafter referred to as RES). Shanti McAllister is an independent consultant and Chartered Landscape Architect with over 20 years' experience of preparing LVIAs for major development proposals including many wind farms in Northern Ireland. She is familiar with the site and Study Area from her work on other wind farms within the Study Area, including Dunbeg and Dunbeg South.

4.5 All information presented in this LVIA has been prepared in accordance with a methodology that is derived from a suite of best practice guidance (see Technical Appendix 4.1). A summary of the LVIA process and the key elements of this methodology are provided from paragraph 4.14 and are described in full detail in Technical Appendix 4.2. The identification and objective analysis of the landscape and visual effects of the Proposed Development is made using professional expertise and impartial judgement. The conclusions of the LVIA are based on whether or not the Proposed Development is likely to result in significant effects on the landscape and visual elements of the Study Area. The appropriate weight to be attached to these effects, when weighed against the other effects analysed in the ES, is the responsibility of the relevant planning authority, which in this case is the Causeway Coast and Glens Borough Council (hereinafter referred to as 'the Council' or CCGBC).

Feasibility Appraisal and Design Iterations

4.6 The nature of the Proposed Development has evolved through an iterative design process that has been informed by a careful analysis of the constraints and opportunities presented by the site location and the characteristics of the Proposed Development itself. This process is further detailed from paragraph 3.43 of the LVIA and in Chapter 3: Design Evolution and Alternatives. The final choice of turbine model for the Proposed Development will be selected before construction, with a maximum tip height of 149.9 m. The LVIA assumes that the choice of turbines will closely or exactly match that of the consented Dunbeg South wind farm.

Establishing Baseline Conditions and Analysing Effects

4.7 The Baseline Assessment has considered statutory landscape designations that are contained within current planning policy in Northern Ireland, and which cover the Study Area. The primary policy guidance on the assessment of landscape and visual effects of wind farm development is the Strategic Planning Policy Statement for Northern Ireland (SPPS) which should be read in conjunction with PPS 18 and its Supplementary Planning Guidance (SPG) (refer to paragraph 4.65). In addition, there are a number of guidance documents and Development Plans, which contain relevant statutory planning designations for the Study Area. These documents are analysed in the Baseline Assessment where applicable. It is noted that further changes in planning policy and updates to development plans are expected to take place over the next months and years as Planning Policy Statements, supplementary guidance and existing Development Plans become superseded by the SPPS and emerging Local Development Plans. For the time being, Causeway Coast and Glens Borough Council have published a number of topic papers to guide their emerging Development Plan, and these have been taken into account in this LVIA as an indication of the likely priorities for future planning policy in this Study Area.

Viewpoint Selection Process

4.8 This LVIA began by re-visiting the viewpoint selection process carried out as part of the previous Dunbeg South wind farm LVIA which included a thorough analysis of visibility within a 30 km Study Area and identified locations most likely to experience visibility of the wind farm and contain key visual receptors. This exercise is still of relevance because the Proposed Development would form a contiguous extension to this consented 9-turbine wind farm. This information was used is the Dunbeg South LVIA to carry out a search for provisional viewpoint locations (PVPs) – a total of 51 PVPs were analysed, including 28 which were also used in the previous Dunbeg, Dunbeg Extension or Dunmore Wind Farm LVIAs. It was then used, in consultation with the local planning authority, to compile a shortlist of 27 viewpoints which were analysed in detail as part of the Dunbeg South LVIA.

4.9 Additional analysis of the ZTV for the Proposed Development compared with the consented Dunbeg South wind farm demonstrates that additional visibility of the Proposed Development would be negligible (see Figure 4.8, page 1 of 3). Comparative wirelines, prepared for internal review at an early stage of the LVIA, showed how the Proposed Development would appear alongside other wind farms in the Keady cluster. The following locations and visual receptors remain the key considerations for visual effects of the Proposed Development, but the ZTV and comparative wirelines have demonstrated that visibility from some parts of the Study Area would be negligible and do not warrant more detailed analysis:

- Locations within the three AONBs in the Study Area - Binevenagh, the Sperrins and the Causeway Coast - because these areas are statutorily designated as nationally recognised high-quality landscapes. They are likely

to attract visitors by virtue of this designation and contain various visitor amenity sites and attractions. However, the Sperrin and Causeway Coast AONBs would not experience views of any great magnitude and are, subsequently, no viewpoints are required from these parts of the Study Area. Locations in proximity to the Giant's Causeway World Heritage Site in the far north of the Study Area are not further considered for the same reason;

- Locations from which the Proposed Development would be seen within the wider context of the Binevenagh range of uplands, including locations within the setting for the Binevenagh AONB;
- Locations from public rights of way, scenic drives and cycling routes where viewers are likely to be present for the primary purpose of appreciating scenic views. Such locations might include the Ulster Way network of footpaths including waymarked trails through Springfield Forest and the west side of Keady Mountain, the Binevenagh range of uplands to north, the National Cycle Network including parts of the route which traverse Binevenagh and the Roe Valley, classified scenic driving routes along various parts of the Causeway Coast, Roe Valley and the Binevenagh Scenic Drive which terminates at viewing areas on the summit of Binevenagh Mountain;
- Residential properties and areas of rural settlement in close proximity to the Proposed Development where viewers may be static and obtain views for long periods of time;
- Viewpoints that have been previously used in the assessment of visual effects for the Keady cluster of wind farms because these wind farms are located within the same part of the Study Area as the Proposed Development and are likely to be visible in conjunction with the Proposed Development in most instances;
- Cross-border views from the Inishowen peninsula in County Donegal which is part of the Wild Atlantic Way tourist trail and where a number of scenic designations are identified by the County Development Plan.

4.10 The 27 final viewpoints used in the Dunbeg South LVIA formed the list of PVPs for the Proposed Development. Levels of actual visibility, the nature of visual receptors present at each location, and the overall viability of each viewpoint location were analysed (see Table 4.4.1 below) and shortlisted to 20 locations which included a proportionate number of locations representing typical views of the Proposed Development, key visual receptors and key locations within the Study Area. For ease of analysis these shortlisted viewpoints are categorised similarly to Dunbeg South wind farm:

A. Views from primary and secondary routes, including tourist areas;
B. Views representing residential properties and rural settlement within approx. 5 km of the Proposed Development;

C. Residential properties and settlements within 5 - 15 km of the Proposed Development;

D. Views illustrating the wider landscape setting and visibility of the Proposed Development in the context of the Keady cluster of wind farms.

4.11 A number of PVPs were not shortlisted because they were found to provide no actual view of the Proposed Development. The reasons for this usually arose from differences between theoretical and actual visibility which is explained in Technical Appendix 4.2. Other PVPs were not shortlisted if a more typical view was demonstrated elsewhere, where no safe stopping place was possible to take a photograph or where the viewpoint location would not be easily accessible to the public.

4.12 The preparation of both wirelines and photomontages were proposed to illustrate all shortlisted viewpoint locations within 20 km of the Proposed Development. No viewpoints were shortlisted beyond this distance because, in the previous Dunbeg South LVIA, no significant effects were found to occur from a greater distance and the comparative wirelines which were prepared at an early stage of the LVIA did not suggest that this would be any different with the addition of the Proposed Development.

4.13 A total of 20 final Viewpoints have been selected for consideration in this LVIA. Detailed descriptions of the final Viewpoints are an integral part of the Visual Impact Assessment section of the LVIA (Chapter 4 starting at paragraph 4.125). Their locations are indicated on all map-based Figures (Figures 4.1 – 4.8) and visualisations to accompany the detailed written analysis of these Viewpoints are provided in Figures 4.9 – 4.28.

Overall Significance of Landscape and Visual Effects

4.14 The overall conclusion is that the Proposed Development's location would be contiguous with the consented Dunbeg South wind farm and the rest of the Keady cluster of wind farms which comprises 34 turbines with existing or consented status. Its position in the centre of the Keady cluster would enhance the integrity of this cluster of wind farms by infilling the space between consented elements and the operational wind farms of Dunbeg and Dunmore to the north east. Combined with other strong human factors that currently influence the receiving landscape this means that there would be No Significant landscape effects resulting from the Proposed Development.

4.15 The Proposed Development is generally deemed to have No Significant effects on visual character for similar reasons. Wind energy development is a prominent visual element in all parts of the Study Area and the Proposed Development would have a negligible incremental effect on the manner in which wind energy development is perceived generally across the Study Area. Of the 20 viewpoints that have been analysed none were deemed to experience a significant visual or cumulative visual

effect resulting from the Proposed Development. The overall conclusion of the LVIA is that the Proposed Development is acceptable in landscape and visual terms.

Summary of the Methodology for this Landscape and Visual Impact Assessment

Best Practice Guidance

4.16 An LVIA is a formal assessment, which is carried out as part of the EIA, a process defined by the EIA Regulations. In accordance with these Regulations the LVIA takes an objective approach to the identification of the baseline conditions within an appropriate 'Study Area'. In this instance the Study Area extends to a 30 km radius from the Proposed Development.

4.17 The LVIA methodology used by the author for wind farm projects has been developed in accordance with the EIA Regulations and the suite of available best practice guidance on the preparation of LVIAs in both general terms and specifically in relation to wind energy development. The latter, published by Nature Scotland and the Landscape Institute, has been adapted by the author to suit the Northern Ireland context. A full list of this best practice guidance is provided in Technical Appendix 4.1 and a detailed description of the Methodology is provided in Technical Appendix 4.2. This LVIA must be read in conjunction with these Technical Appendices in order to be properly understood.

4.18 The criteria used to identify and analyse both the nature of landscape and visual receptors (their 'Sensitivity'), the nature of landscape and visual effects ('Magnitude') and the Signficance of these effects are all key LVIA terms which are defined in the Methodology. They are also summarised in this section of the chapter for ease of reference.

The LVIA Process

4.19 The LVIA begins with an assessment of baseline conditions combining existing desktop information, such as maps and documents, with site surveys of the Study Area by an experienced Landscape Architect. A review of relevant planning policies is carried out in order to identify any elements or parts of the Study Area which are recognised for their landscape or visual qualities and any locations that may have been identified by the SPG as being more or less suitable for wind energy development. The baseline assessment also evaluates likely levels of acceptable change for various parts of the Study Area in accordance with current definitions of landscape and visual sensitivity.

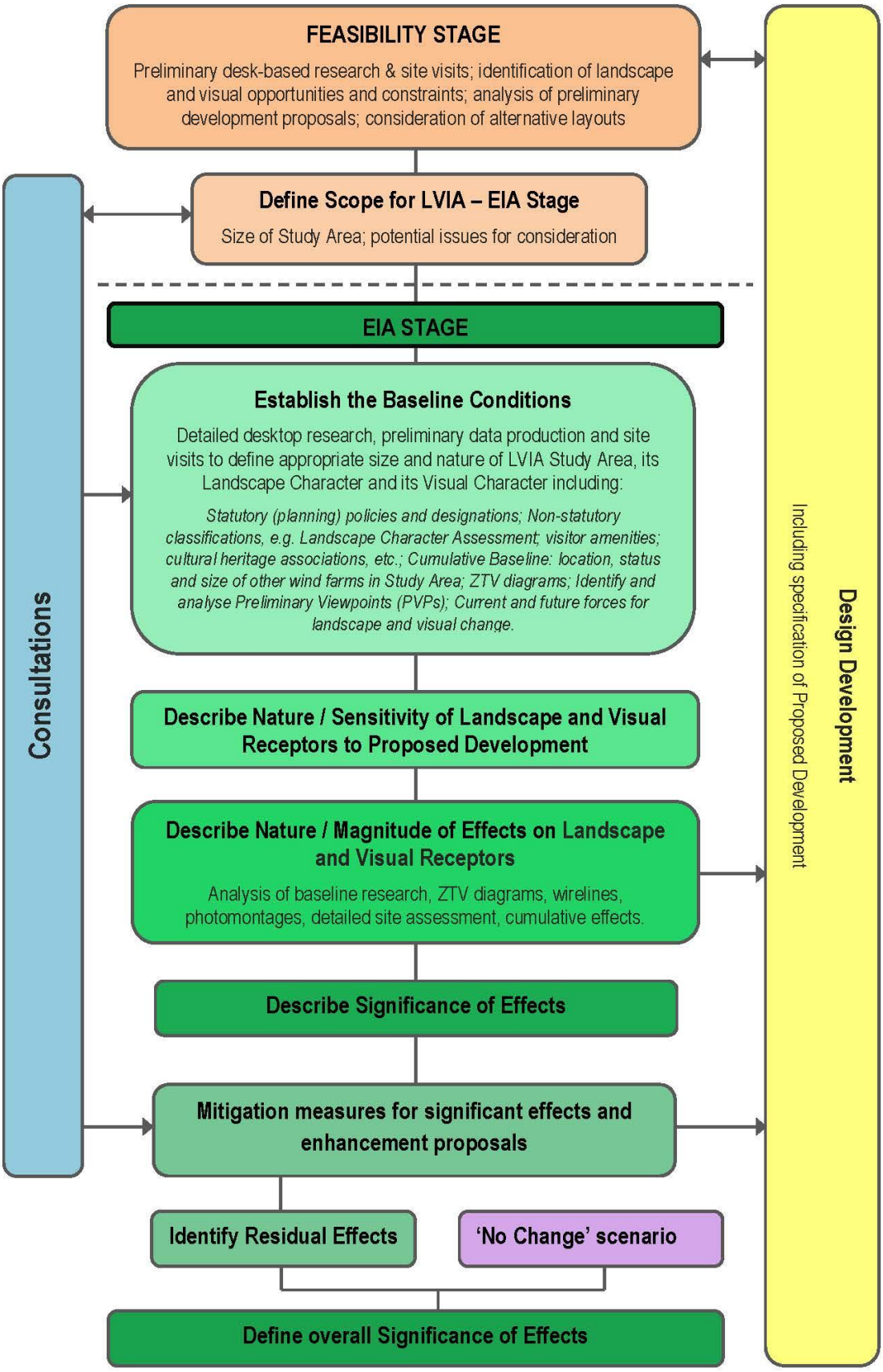
4.20 Potential landscape and visual effects on the baseline conditions are then assessed as separate but linked issues. However, it is noted that all policy guidance and publications providing information on the baseline character of the Study Area deal with landscape and visual elements in combination. To avoid repetition and present an accurate reflection of this baseline information it has been necessary for the LVIA analysis of these publications to reflect this approach. The assessment of both

landscape and visual effects require a combination of quantitative and qualitative evaluation. The magnitude of landscape effects is derived from the extent to which physical changes resulting from the Proposed Development would cause changes in landscape character. Visual effects relate to changes in the composition of views and people's perception of/responses to these physical changes.

4.21 For both landscape and visual effects the Significance of effect is derived from the assessment of Landscape Value, Sensitivity and Magnitude of change and also by using objective professional judgement in relation to site circumstances. It is important to recognise that the landscape is constantly evolving and that opinions on the beneficial or adverse effects of wind farms are highly subjective. Therefore, in order to ensure the that the LVIA presents information objectively, whilst a judgement is made on the significance of effects, no judgement is made on whether these effects are beneficial or adverse.

Plate 4.1 presented on next page…

Plate 4.1: The LVIA Process



Key LVIA Terminology and Assessment Criteria

4.22 The following terms and assessment criteria form the basis for the LVIA. They are fully described in Technical Appendix 4.3 and summarised below.

The Nature of Landscape and Visual Receptors

4.23 The baseline assessment element of the LVIA gathers information on the 'nature' of landscape and visual receptors which is then correlated with the nature of the Proposed Development and its anticipated 'effects' on these receptors in order to draw conclusions on the 'significance' of these effects.

4.24 This LVIA uses the term 'Landscape Sensitivity' to refer to the overall nature of landscape receptors (refer to the landscape attributes described in Technical Appendix 4.3, paragraph 4.18) and their susceptibility to the changes caused specifically by the Proposed Development.

4.25 The consideration of key landscape attributes enables a considered judgement to be made on the level of sensitivity to be apportioned to each defined LCA within the Study Area specifically related to the Proposed Development. The following criteria outline the general principles that are used to inform and guide the assessment of Landscape Sensitivity:

- ***High Landscape Sensitivity:*** A landscape where the majority of attributes are unlikely to withstand change without causing a change to overall landscape character to the extent that it would be difficult or impossible to restore. The frequency and sensitivity of landscape receptors may be high but not exclusively so;
- ***Medium Landscape Sensitivity:*** A landscape with a combination of attributes that is capable of absorbing some degree of change without affecting overall landscape character. There are unlikely to be large numbers of sensitive landscape receptors;
- ***Low Landscape Sensitivity:*** A landscape where the majority of attributes are robust and/ or tolerant of change to the extent that change or development would have little or no effect on overall landscape character. It is likely to be easily restored and the frequency and sensitivity of landscape receptors may be low but not exclusively so.

4.26 Visual effects relate to changes in the composition of views and people's responses to these changes. The nature of visual receptors is determined through the analysis of ZTV diagrams, site assessment and viewpoints representing both typically occurring views within the Study Area and views from specific locations or those likely to be experienced by specific visual receptors (for example, visitors to a specific site). 'Visual Sensitivity' refers to the overall nature of views and viewers (visual receptors) and their likely sensitivity to the changes in views that would be caused specifically by the Proposed Development. The following criteria outline the general principles that are used to inform and guide the assessment of visual sensitivity:

- ***High Visual Sensitivity***: may typically include residents of properties where the main view is orientated towards the Proposed Development, or people undertaking recreation where the landscape within which the Proposed Development is seen is the primary reason for attraction (for example, walkers, cyclist and drivers on scenic routes). Receptors are more likely to be located within a designated landscape and could be attracted to visit more frequently, or stay for longer, by virtue of the view;
- ***Medium Visual Sensitivity***: may typically involve people undertaking active recreational pursuits where the wider landscape within which the Proposed Development is not seen as the primary reason for attraction (e.g. golf, water sports, theme and adventure parks, historic sites, parks and gardens). Receptors are less likely to be located within a designated landscape and could be attracted to visit more frequently or stay for longer by virtue of the facilities and features of the particular attraction rather than by the value of the view;
- ***Low Visual Sensitivity***: may typically include vehicular travellers; outdoor workers (e.g. farm and forestry workers); people in indoor workplaces and community facilities; and residents within larger settlements. Receptors are unlikely to be within a designated landscape and are most likely to be present at a given viewpoint by virtue of some other need or necessity unrelated to the appreciation of the landscape or visual value.

The Nature of Landscape and Visual Effects

4.27 This LVIA uses the term 'Magnitude' to cover assessment of the degree of change that would result from the introduction of the Proposed Development into the baseline landscape and visual context.

4.28 The nature of landscape effects is dependent on the degree of change that would result from the introduction of the Proposed Development in terms of size or scale, geographical extent, duration and reversibility of the proposed change and whether the effects would be experienced directly or indirectly (refer to Technical Appendix 4.3 paragraph 4.28 for further detail). The following criteria outline the general principles that are used to inform and guide the assessment of the Magnitude of landscape effects:

- ***High Landscape Magnitude***: The Proposed Development would be immediately apparent and would result in substantial loss or major alteration to key elements of landscape character to the extent that there is a fundamental and permanent, or long-term, change to landscape character. The change may occur over an extensive area;
- ***Medium Landscape Magnitude***: The Proposed Development would be apparent and would result in loss or alteration to key elements of landscape character to the extent that there is a partial long-term change to landscape character. The change may occur over a limited area;

- ***Low Landscape Magnitude***: The Proposed Development would result in minor loss or alteration to key elements of landscape character to the extent that there may be some slight perception of change to landscape character. The change may be temporary and occur over a limited area;
- ***Negligible Landscape Magnitude***: The Proposed Development would result in such a minor loss or alteration to key elements of landscape character that there would be no fundamental change.

4.29 The nature of visual effects is dependent on factors including, for example, the prominence of the Proposed Development in the view; the number of turbines that would be visible and the geographical extent of turbines in relation to the extent of the view; the angle and relative elevation of the viewpoint in relation to the Proposed Development; and the context within which the Proposed Development will be seen. The following criteria outline the general principles that are used to inform and guide the assessment of the Magnitude of visual effects:

- ***High Visual Magnitude***: The Proposed Development would be a dominant and immediately apparent feature that would affect and change the overall character of the view and to which other features would become subordinate;
- ***Medium Visual Magnitude***: The Proposed Development would form a visible and recognisable new element within the overall view and would be readily noticed without changing the overall nature of the view;
- ***Low Visual Magnitude***: The Proposed Development would form a component of the wider view that might be missed by the casual observer. Awareness of the Proposed Development would not have a marked effect on the overall quality of the view;
- ***Negligible Visual Magnitude***: The Proposed Development would be barely perceptible, or imperceptible, and would have no marked effect on the overall quality of the view.

The Significance of Landscape and Visual Effects

4.30 The EIA Regulations require the LVIA to identify and assess the acceptability of significant effects. Best practice guidance recognises that the significance of effects is not absolute and is related specifically to the Proposed Development. It is also dependent on the relationship between sensitivity and magnitude.

4.31 This LVIA uses the following criteria to inform and guide the assessment of the Significance of Landscape Effects:

- ***Significant Landscape Effects:*** Effects that would occur when the majority of landscape attributes are deemed to be highly sensitive and the magnitude of change would alter landscape character to the extent that it would become defined, or considerably influenced, by the presence of the Proposed Development;

- ***No Significant Landscape Effects (Not Significant)***: Effects would not be significant when the majority of landscape attributes are not deemed to be highly sensitive and where the Proposed Development would have little, or no, effect on existing landscape character. This would also occur where the Proposed Development can be integrated into the existing Study Area without the loss of key landscape attributes. Where the magnitude of effect is higher, but the number and sensitivity of landscape attributes decreases, so landscape character would become less defined by the Proposed Development and more so by other landscape attributes.

4.32 This LVIA uses the following criteria to inform and guide the assessment of the Significance of Visual Effects:

- ***Significant Visual Effects***: Effects that would occur when the majority of visual receptors are deemed to be highly sensitive and the magnitude of change would alter visual character to the extent that it would become defined, or considerably influenced, by the presence of the Proposed Development;
- ***No Significant Visual Effects (Not Significant)***: Such effects would occur when the majority of visual receptors are not deemed to be highly sensitive and where the Proposed Development would have little or no effect on existing views. The Proposed Development would be likely to constitute a minor component of the wider view, which might be missed by the casual observer, and awareness of the Proposed Development would not have a marked effect on the overall quality of the view. Where the Proposed Development is easily noticeable, but the number and sensitivity of visual receptors decreases, so overall visual character would remain less defined by the Proposed Development and more so by other elements of the existing view.

Cumulative Landscape and Visual Effects

4.33 The purpose of the cumulative impact assessment is to measure the incremental effect of the Proposed Development on the Cumulative Baseline rather than to assess the combined effects of all, or some, of the Cumulative Baseline with the Proposed Development[1]. The magnitude of cumulative change is dependent on a number of factors, including the presence of other wind farms and the degree to which these already influence landscape and visual character and the distance between the Proposed Development and other wind farms (see Technical Appendix 4.2, paragraphs 4.60 and 4.65 for further detail).

4.34 There are existing and consented wind farms as well as single turbines in other parts of the 30 km Study Area and these are considered to form part of its baseline character which informs the assessment of landscape and visual effects, particularly

[1] Scottish Natural Heritage (March 2012), 'Assessing the Cumulative Impacts of Onshore Wind Energy Development s' paragraphs 7 and 55, paraphrased from the GLVIA para 7.12

the analysis of effects on viewpoints for this LVIA. Proposed wind farms are also considered but may be afforded less weight when assessing the incremental effects of the Proposed Development because their status is less certain. The additional cumulative effects of the Proposed Development when considered with other wind farms in the cumulative baseline are assessed from paragraph 4.187.

4.35 Cumulative landscape effects relate to the incremental degree of change to the existing landscape character or physical fabric of the Study Area that would result from the introduction of the Proposed Development over and above that of the Cumulative Baseline. The following criteria outline the general principles that are used to inform and guide the assessment of the Magnitude of Cumulative Landscape Effects:

- ***High Cumulative Landscape Magnitude***: The introduction of the Proposed Development to the Cumulative Baseline would result in substantial incremental loss of, or major alteration to, key elements of landscape character to the extent that there would be a fundamental and permanent, or long-term, change to landscape character. The change may occur over an extensive area;
- ***Medium Cumulative Landscape Magnitude***: The introduction of the Proposed Development to the Cumulative Baseline would result in the incremental loss of, or alteration to, key elements of landscape character to the extent that there would be a partial long-term change to landscape character. The change may occur over a limited area;
- ***Low Cumulative Landscape Magnitude***: The introduction of the Proposed Development to the Cumulative Baseline would result in minor incremental loss of, or alteration to, key elements of landscape character to the extent that there may be some slight perception of change to landscape character. The change may be temporary and occur over a limited area;
- ***Negligible Cumulative Landscape Magnitude***: The introduction of the Proposed Development to the Cumulative Baseline would result in such a minor incremental loss of, or alteration to, key elements of landscape character that there would be no fundamental change to landscape character.

4.36 The significance of cumulative landscape effects is dependent on landscape sensitivity, the magnitude of cumulative change, and the relationship between these two factors. The following criteria outline the general principles that are used to inform and guide the assessment of the significance of cumulative landscape effects:

- ***Significant Cumulative Landscape Effects***: Effects that would occur when the majority of landscape attributes are deemed to be highly sensitive and the incremental effects of the Proposed Development would alter landscape character to the extent that it would become defined or considerably influenced by the presence of wind farms, taking account of cumulative baseline conditions;

- ***No Significant Cumulative Landscape Effects (Not Significant):*** Such effects would occur when the majority of landscape attributes are not deemed to be highly sensitive and where the Proposed Development would have little or no incremental effect on the existing landscape character. Where the Proposed Development can be integrated into the existing cumulative baseline, without the loss of key landscape attributes, cumulative landscape effects would also be deemed as Not Significant. This level of significance would also occur where the Proposed Development may have a greater magnitude of effect, but its incremental effects would not cause the landscape character to become more defined by wind farms than it currently is, or to become more defined by wind farms than by other landscape attributes.

4.37 Cumulative visual effects relate to the degree to which wind energy developments feature in particular views or sequences of views, and the resulting effects of this upon visual receptors. This LVIA considers simultaneous and sequential cumulative visual effects that may arise within the Study Area and in relation to the selected viewpoints. The LVIA principally considers the degree to which the Proposed Development would contribute to wind energy development becoming a significant or defining characteristic of visual character. The following criteria outline the general principles that are used to inform and guide the assessment of the Magnitude of cumulative visual effects:

- ***High Cumulative Visual Magnitude***: The Proposed Development would increase the scale of wind turbines in the landscape to a level at which the view would become dominated by wind farms;
- ***Medium Cumulative Visual Magnitude***: The Proposed Development would result in a noticeable increase in turbines, but this increase would not result in wind farms being the dominant feature of the view;
- ***Low Cumulative Visual Magnitude***: The Proposed Development would be visible but would constitute a component of the view that might be easily missed by the casual observer and/ or would not contribute to the overall prominence of wind farms within the view;
- ***Negligible Cumulative Visual Magnitude***: The Proposed Development would be barely perceptible, or imperceptible, and/ or would have no effect on the perception of wind turbines within the view.

4.38 The following general principles are used to inform and guide the assessment of the Significance of Cumulative Visual Effects:

- ***Significant Cumulative Visual Effects***: Effects that would occur when the majority of visual receptors are deemed to be highly sensitive and the addition of the Proposed Development to the cumulative baseline would result in the view becoming defined, or considerably influenced, by wind turbines;

- ***No Significant Cumulative Visual Effects (Not Significant)***: Such effects would occur when the majority of visual receptors are not deemed to be highly sensitive and where the Proposed Development would have little or no incremental effect on existing views. The Proposed Development is likely to constitute a barely perceptible, or imperceptible, component of the wider view, which might be missed by the casual observer. Awareness of the Proposed Development would not have a marked effect on the overall quality of the view. Where the Proposed Development may be a noticeable addition to views containing wind farms in the cumulative baseline, but it would not cause the overall visual character of the view to become defined by wind turbines rather than by other elements of the existing view the overall effects would also be deemed to be Not Significant.

Description of the Proposed Development

4.39 The Proposed Development is located on agricultural land on the north-facing slope of Keady Mountain in the southern part of Binevenagh AONB approximately 6.6 km to the north east of Limavady and 10 km to the south west of Coleraine. It comprises 4 wind turbines with a maximum blade tip height of 149.9 m. The A37 road corridor, which links Coleraine and Limavady runs through the wind farm. Three of the turbines (T1 – T3) would be located on the south side of the road and one (T4) to the north.

4.40 The Proposed Development would form a contiguous extension to the consented Dunbeg South wind farm which is a 9-turbine development also located on the north-facing side of Keady Mountain and directly to the south of the Proposed Development. They would have the same turbine dimensions and, it is anticipated, the same model of turbines to maximise visual consistency. It would also be located in the centre of, what this LVIA refers to as, the Keady cluster of wind farms. This comprises two operational wind farms at Dunbeg and Dunmore with a total of 21 turbines and blade tip heights of 125 m located approximately 0.8 km to the north east of the Proposed Development, a consented 3-turbine extension to Dunbeg, also with 125 m blade tips located adjacent to T4, and a 61 m high single turbine located approximately 200 m to the north of T1.

4.41 A detailed description of the Proposed Development is provided in Chapter 1 of the ES, including the turbines, infrastructure, sub-station, site access arrangements, site layout, construction methods and anticipated programme of construction work. The construction period will be approximately 18 months and the visual effects of construction traffic and work on site will be short term and experienced only in close range views.

4.42 During the operational phase of the Proposed Development, anticipated to be 35 years, the landscape and visual effects would primarily relate to the presence of the turbines themselves as described and analysed in the following section of this LVIA. Day-to-day site activity would be minimal and there would be no further discernible

changes to the landscape or visual character of the site resulting from site maintenance activities.

4.43 Following the cessation of the sites function as a wind farm, all above-ground structures would be dismantled and removed from site (unless further consent has been given to extend the operational life of the wind farm or replace the turbines) in accordance with an agreed decommissioning and restoration plan which will be agreed with the local planning authority prior to decommissioning of the wind farm.

Feasibility Appraisal, Design Evolution and Iteration

4.44 The nature of the Proposed Development has evolved through an iterative design process that has been informed by a careful analysis of the constraints and opportunities presented by the site and its characteristics. This process is further detailed in Chapter 3: Design Evolution and Alternatives. The turbine layout that is presented in the EIA is the result of this iterative design process.

4.45 The cumulative ZTV (Figure 4.8, page 1 of 3) indicates additional theoretical visibility across only 0.04% of the 30 km Study Area which would not already have theoretical visibility of other turbines in the Keady Cluster, all of which are either operational or consented. This additional visibility is, in practice, virtually indiscernible on the ZTV diagram.

Consultation

4.46 Consultation and discussion between RES and the Council has taken place throughout the project and through the notification of intention to submit an Environmental Statement, copies of which are provided in Volume 4 Appendix 1.1. The Department are obliged to consult with other statutory consultees who would have an interest in the likely landscape and visual effects of the Proposed Development, and it is understood that they consulted directly with the Department of Agriculture, Environment and Rural Affairs: Northern Ireland Environment Agency (NIEA) although no scoping response relating to landscape and visual issues has been received to date.

4.47 An in-person public exhibition was held in April 2024, with the information also being present online, to present and discuss the Proposed Development with interested parties from the local and wider community. A 30 km Cumulative blade tip ZTV diagram was produced to illustrate the relationship and additional visibility of the Proposed Development alongside other wind farms in the Keady cluster overlaid with the AONB boundaries within the Study Area and proposed Viewpoint locations. Wirelines and photomontages of eight viewpoints were presented to illustrate how the Proposed Development would appear from some of the key locations/ key visual receptors in the surrounding area (Viewpoint 2, 6, 7, 9, 13, 14 and 17), refer to Technical Appendix 4.4).

4.48 A number of concerns were raised during the consultation process:

- There are too many wind turbines within this area;
- How will the proposed development actually benefit the local community;

- You have not engaged with any local community groups;
- Further development of wind turbines across Keady Mountain is preposterous, this is within an area of outstanding natural beauty;
- There are many birds of prey in the area.

4.49 Every effort has been made to address the comments that were received during the public exhibition in relation to landscape and visual effects in this LVI and they are considered in the detailed analysis of landscape and visual effects in this chapter.

Baseline Assessment

Legislation and Planning Policy

4.50 Chapter 2 of the ES deals comprehensively with planning policy as it relates to the Proposed Development, including relevant aspects of the '*Regional Development Strategy 2035*', the '*Strategic Planning Policy Statement for Northern Ireland*' (SPPS) and the Department of Enterprise, Trade and Investment (DETI) '*Onshore Renewable Electricity Action Plan 2013-2020*'. The latter notes that clustering wind farms is an approach that will best limit the potential adverse effects of onshore wind energy developments, and this is noted to be of particular relevance to the consideration of landscape and visual effects considered in this LVIA.

4.51 The primary policy guidance on the assessment of landscape and visual effects of wind farm development is the SPPS which should be read in conjunction with Planning Policy Statement 2 (PPS 2), Planning Policy Statement 18 (PPS 18) it's Supplementary Planning Guidance (SPG) and Best Practice Guidance (BPG)[2]. Further changes in planning policy and updates to development plans are expected to take place over the next few months and years as Planning Policy Statements, supplementary guidance and existing Development Plans become entirely superseded by the SPPS and emerging Local Development Plans. For the time being, Causeway Coast and Glens Borough Council have published a number of topic papers to guide their emerging Development Plan, and these have been taken into account in this LVIA as an indication of the likely priorities for future planning policy in this Study Area.

Strategic Planning Policy Statement for Northern Ireland (SPPS): Planning for Sustainable Development

4.52 The SPPS sets out strategic subject policies, including for renewable energy, and is intended to provide core principles to underpin the delivery of the new two-tier planning system where local councils have primary responsibility for the

[2] Department of the Environment Northern Ireland (September 2015) 'Strategic Planning Policy Statement for Northern Ireland (SPPS): Planning for Sustainable Development' , (2013) 'Planning Policy Statement 2: Natural Heritage); (2009) 'Planning Policy Statement 18: Renewable Energy' and (August 2010) 'Wind Energy Development in Northern Ireland's Landscapes, Supplementary Planning Guidance to Accompany Planning Policy Statement 18 'Renewable Energy'; (2009) 'Best Practice Guidance to Planning Policy Statement 18: Renewable Energy'

implementation of development control. However, for the transitional period whilst Local Development Plans are being prepared, the existing suite of Planning Policy Statements, supplementary and best practice guidance and relevant provisions within the *'Planning Strategy for Rural Northern Ireland'* will remain in place.

4.53 The aim of the SPPS is to facilitate sustainable development based on three overarching principles: supporting rural regeneration; promoting economic growth; and promoting environmental sustainability. The latter principle includes for the protection of landscape character as well as a reduction in greenhouse gas emissions. The mitigation and adaptation to the effects of climate change is a key principle in the SPPS which notes that the promotion of renewable energy systems is one of the means by which the planning system will achieve this principle.

4.54 'Subject Polices' for Renewable Energy are covered in paragraphs 6.214 - 6.234 of the SPPS but the SPG is also noted as remaining in place. The SPPS retains the European Landscape Convention's definition of 'landscape' to mean "*an area, as perceived by people, whose character is the result of the action and interaction of natural and / or human factors*"[3]. The SPPS also recognises that Northern Ireland has significant renewable energy resources, and that the renewable energy industry makes an important contribution to sustainable development and investment in the region. Renewable energy also reduces our dependence on imported fossil fuels and benefits our overall health, well-being and quality of life. "*The aim of the SPPS in relation to renewable energy is to facilitate the siting of renewable energy generating facilities in appropriate locations within the built and natural environment in order to achieve Northern Ireland's renewable energy targets and to realise the benefits of renewable energy without compromising other environmental assets of acknowledged importance*." (SPPS paragraph 6.218).

4.55 The strategic regional objectives of the SPPS are to ensure that environmental, landscape and visual amenity impacts are adequately addressed, and that natural and cultural heritage features are adequately protected. However, the SPPS also expects that the emerging Local Development Plans will support a diverse range of renewable energy developments whilst taking account of both local circumstances and the wider recognised benefits of renewable energy. Whilst the SPPS advises that a cautious approach should be applied to proposals within designated landscapes which are of significant value, and their wider settings where it may be difficult to accommodate renewable energy developments without detriment to the regions cultural and natural heritage assets, it also notes that *"It will not necessarily be the case that the extent of visual impact or visibility of wind farm development will give rise to negative effects; wind farm developments are by their nature highly visible yet this in itself should not preclude them as acceptable features in the landscape. The ability of the landscape to absorb development depends on careful siting, the*

[3] Definition of landscape used in the European Landscape Convention (2000, Article 1.a) Council of Europe and 'Northern Ireland's Landscape Charter' (January 2014) NIEA

skill of the designer, and the inherent characteristics of the landscape such as landform, ridges, hills, valleys, and vegetation." (SPPS paragraphs 6.230 - 231).

Planning Policy Statement 2: Natural Heritage

4.56 Policy NH 6 of PPS 2 states that permission will only be granted for new development in AONBs where it is of an appropriate design, size and scale for the locality and meets three criteria including; siting that is sympathetic to the special character of the AONB in general and also the particular locality; it respects or conserves features of importance to this character and; it respects vernacular styles and materials.

4.57 PPS 2 notes that "*the quality, character and heritage value of the landscape of an AONB lies in their tranquillity, cultural associations, distinctiveness, conservation interest, visual appeal and amenity value*" (PPS 2, paragraph 5.15). It refers to LCAs and AONB Management Plans for further information. A Management Plan and Five-Year Action Plan have been published for the Binevenagh AONB and are taken into account from paragraph 4.85 of this LVIA.

Planning Policy Statement 18: Renewable Energy

4.58 The aim of PPS 18, which is broadly aligned with that of the SPPS, is "*to facilitate the siting of renewable energy generating facilities in appropriate locations within the built and natural environment in order to achieve Northern Ireland's renewable energy targets and realise the benefits of renewable energy*" (PPS 18, section 3.1). Policy RE1 states that proposals must demonstrate that they "*would not have an unacceptable impact on visual amenity or landscape character through: the number, scale, size and siting of turbines; that the Proposed Development has taken into consideration the cumulative impact of existing turbines, those which have permissions and those that are currently the subject of valid but undetermined applications*". It is noted that the more recently published EIA Regulations do not require consideration of proposed wind farms due to the unknown nature of their status.

Best Practice Guidance to accompany PPS 18

4.59 The BPG provides technical information and potential considerations in relation to planning applications for wind energy projects. It refers to the SPG for guidance on the landscape and visual analysis process and advice on the indicative type of development that may be appropriate, but it is not prescriptive. The BPG notes that "*There are no landscapes into which a wind farm will not introduce a new and distinctive feature. Given the Government's commitment to addressing the important issue of climate change and the contribution expected from renewable energy developments, particularly wind farms, it is important for society at large to accept them as a feature of the Region for the foreseeable future.*" However, it also notes that the locations of developments should be carefully considered in order to reduce their impact and aid integration into the local landscape even though they may be highly visible. (BPG section 1.3.18 - 19).

4.60 The BPG reiterates the SPPS in its recognition that visibility doesn't necessarily equate with levels of acceptability and notes that there are three considerations when considering the capacity of a landscape to accommodate wind farm development (BPG 1.3.21):

- The degree of impact the Proposed Development will have on the existing character of the landscape;
- The sensitivity of the character of the landscape, and;
- The extent to which this impact can be modified and reduced by design.

4.61 The BPG also refers to the inherent characteristics of a landscape, such as landform and vegetation, the careful siting and skilful design of developments all playing an important role in the ability of a landscape to absorb development. Turbine layouts must also be appropriate to the local landform and landscape characteristics; groups of turbines can normally appear acceptable as single isolated features in open, undeveloped landscapes whereas rows of turbines may be more appropriate where there are formal field boundaries within flatter agricultural landscapes. Wind farms should not appear visually confusing in relation to the character of the landscape and should ideally be separate from surrounding features to create a simple image (sections 1.3.22 & 1.3.26).

4.62 In relation to visual impact the BPG notes that wind farms in an open landscape setting are likely to be prominent features at distances below 2 km, and relatively prominent at up to 5 km. Between 5 – 15 km they are more likely to be seen as part of the wider landscape and prominent only in clear visibility. Beyond 15 km they are only likely to be seen in clear visibility and as a minor element in the landscape (section 1.3.25).

4.63 It is noted that Nature Scotland's best practice guidance in relation to the siting and design of wind farms has been updated since the BPG was published and no longer refers to specific distances in relation to visual prominence (see Technical Appendix 4.1, paragraph 4.3). Their research has found that other factors such as weather conditions, time of day/year, angle of view, and composition of other elements in the view, all contribute to the assessment of visual effects and visual prominence, and this is also considered in the assessment of visual effects.

Supplementary Planning Guidance to accompany PPS 18

4.64 The SPG is intended to provide broad strategic guidance on appropriate locations for wind energy development based on the definition of Landscape Character Areas (LCAs) within the Northern Ireland Landscape Character Assessment (NILCA). It advises that the detailed assessment of the nature of a wind farm's effects on landscape character should be dealt with on a case-by-case basis via an LVIA. The SPG itself is non-prescriptive with regards to turbine heights and groupings. Its assessment of landscape sensitivity is intended to provide broad guidance but not to exclude development. Rather it places an onus on developers to demonstrate, via

the EIA process, that wind farms can be developed without unacceptable effects on LCAs as a whole.

4.65 The SPG recommends a 20-30 km radius Study Area for medium or large commercial height turbines, which has informed the selection of a 30 km Study Area for this Development. The SPG includes recommendations that are specific to the potential effects of wind energy developments on the character of individual LCAs. The SPG as it relates to the Proposed Development is analysed starting at paragraph 4.98.

4.66 The assessment of Landscape Value and Sensitivity for some LCAs is altered from the SPG where detailed site survey in relation to this LVIA has revealed variations in particular areas. This is in accordance with the SPG, which states that, "*It should be noted that within many LCAs there is considerable variation in sensitivity levels across the area, reflecting the fact that the LCAs are broad character or identity areas. The overall sensitivity level is therefore the level that prevails over most of the LCAs geographic area. Localised areas of higher or lower sensitivity may also exist and these are generally identified in the sensitivity descriptions within each LCAs assessment sheet. The overall sensitivity level of a LCA is indicative of the relative overall sensitivity level of each LCA. A high sensitivity level does not necessarily mean that there is likely to be no capacity for wind energy development within the LCA and conversely a low sensitivity level does not mean that there are no constraints to development*" (SPG section 2.3).

Emerging Council Policy

4.67 Changes in planning policy and updates to development plans are expected to take place over the next few months and years as Planning Policy Statements, supplementary guidance and existing Development Plans become superseded by emerging Local Development Plans, which will be primarily informed by the SPPS. The SPPS (at paragraph 1.10) sets out transitional arrangements where this is the case to ensure continuity of planning policy and decision making and notes that decisions should be taken in line with the SPPS and relevant PPSs until such time as a plan strategy for the whole council area has been adopted.

4.68 Causeway Coast and Glens Borough Council have not yet published their draft Plan Strategy and adoption, although currently estimated to be in the last quarter of 2024, is expected to be further delayed. The Council have, however, published a number of topic papers to guide their emerging Development Plan and these have been taken into account in this LVIA as an indication of the likely priorities for future planning policy in this Study Area. '*Discussion Paper 4: Landscape Character*', published in November 2015 in which they note key points in relation to planning for future development within the Council area. They define their approach to landscape planning as being a strong forward-looking action to enhance, restore or create new landscapes (section of 2.6 of Discussion Paper 4). Their emphasis will reflect that of the SPPS which is to protect special landscapes from inappropriate development and will take account of landscape character. They also note that the SPPS recommends that the principle of clustering, consolidating and grouping new and established

developments together is a means to achieve sustainable development and mitigate potential adverse cumulative effects on scenic landscapes which can result from a sporadic approach to siting new developments.

Analysis of the Proposed Developments Effects on Planning Policy

4.69 Although the Proposed Development is located within the Binevenagh AONB, which is an environmental asset of acknowledged importance (the Proposed Developments effects on the AONB are analysed starting at paragraph 4.85) the Proposed Development is in an appropriate location within the AONB and is located in accordance with the main stipulations of relevant planning policies and guidance.

4.70 The SPPS, which is the overarching policy document, recognises that renewable energy is a beneficial type of development provided it is appropriately located. The SPPS also reiterates the European Landscape Convention's definition of landscape as being a result of both natural and human factors. This site conforms to these policy stipulations because it is largely characterised by human-influences including quarrying and agricultural activities on site and in adjacent areas, and it is bounded by large areas of coniferous forestry, a primary road corridor and an established cluster of (existing and consented) wind farms.

4.71 The Council define their approach to landscape planning as forward-looking and reflective of the SPPS principle of clustering and consolidating existing developments in order to realise the benefits of renewable energy projects whilst also minimising the extent of cumulative effects on sensitive features within the Study Area, such as the Binevenagh AONB's key characteristics that are described later in this section, and sensitive visual receptors that are described from paragraph 4.87.

4.72 PPS 2, Policy NH6 notes that the special qualities of AONB's include tranquillity but this is not a characteristic of this specific location with the Binevenagh AONB due to the human factors described above. It also lists cultural associations, distinctiveness, conservation interest, visual appeal and amenity value as other special qualities. The evidence of long-standing use of the site and surrounding landscape for activities such as farming, quarrying and forestry have lessened its landscape quality and condition, and hence its cultural and conservation interests and visual appeal (notwithstanding any factors that may be considered in Chapter 5: Archaeology and Cultural Heritage and Chapter 6: Ecology) and it has no specific amenity value because it is private land without public access. The site is located within the AONB as, as such, has visual appeal as part of the AONB. However, it does occupy a small part of the overall AONB and will not be visible from many other parts of the AONB and will rarely appear as a separate entity to the Keady cluster of wind farms as a whole.

4.73 PPS 18 and its Best Practice Guidance are generally promotive of wind energy development, again in appropriate locations, and note that the capacity of a landscape to accommodate such development is dependent on the existing character of the landscape, which in this case is already influenced by farms and also by a

number of other dominant human factors which reduce the sensitivity of the receiving landscape character. Furthermore, through a process of iterative design, the Proposed Development has been refined to minimise its effects on key landscape and visual features such as the summit of Keady Mountain. It has minimal visibility from many parts of the three AONBs which are located within the Study Area. The SPGs guidance on landscape character considerations for wind energy development in LCA 36 Binevenagh Uplands is considered in further detail starting at paragraph 4.88.

Baseline Landscape Character Assessment and Analysis of Effects

The Site and the Study Area

4.74 The Study Area for this LVIA extends to a radius of 30 km from the centre of the Proposed Development (indicated on all map-based figures in Section 4, Volume 3 of the ES). It encompasses coastal parts of Counties Antrim and Derry and a small part of northern County Tyrone in Northern Ireland and also includes the Inishowen Peninsula in County Donegal.

4.75 The proposed site is a rising undulating upland area of rough grazing land located on the northern slope of Keady Mountain. It forms one side of a broad saddle of land which sits around the Curly River corridor between Keady and Binevenagh mountains. There is much evidence of human influence on the site which is scattered with indentations highlighting historic quarrying activities and a number of steep-sided drainage ditches and streams which run from the summit of Keady under the A37 road corridor and then into the Curly River which is located to the north.

4.76 The proposed site flanks the A37 with 3 turbines located to the south and one turbine located to the north of the road corridor. This is a busy trunk road linking the towns of Coleraine and Limavady in Co. Derry. The edge of the road corridor is largely defined by a wide hard shoulder area and post and wire fencing. The most elevated section of the road, near the edge of Springfield Forest, already passes through the centre of the Keady cluster of wind farms; the existing Dunbeg and Dunmore wind farms are located to the north within the saddle of land around the Curly River. There is a 3-turbine extension o Dunbeg, located directly to the north of the road corridor and the consented 9-turbine Dunbeg South wind farm would be located to the south. Elevated and panoramic views of the flat lowlands around the Foyle Estuary and Roe Valley can be obtained when travelling in a south-western direction along the A37 towards Limavady. These views are framed by the Inishowen peninsula in Co. Donegal. When travelling in the opposite direction towards Coleraine there are views of the side slopes of Binevenagh and Keady Mountains with the Curly River valley in between but these views quickly become dominated by forestry until the road corridor starts to descend towards the village of Macosquin on the outskirts of Coleraine.

4.77 Coniferous forestry covers an extensive part of the foreground landscape to the north, south and east. Springwell Forest has a hard angular form along the south

eastern boundary of the site and also borders the A37 road corridor to the east and south, beyond which the forestry extends as Cam Forest around Rigged Hill in the south. Ballyhanna and Binevenagh Forests and Grange Park Wood clad much of the uplands to the north. There is also a Christmas tree farm on the upper part of Bolea Road directly to the north of existing Dunbeg wind farm.

4.78 There are a number of quarry sites located on the Binevenagh range of uplands, mostly on the east-facing slopes overlooking Coleraine around Macosquin, Croaghan and Cam Forest. There are also quarries on the west and south-west facing slopes around Craiggore mountain, Donald's Hill, Smulgedon near Drumsurn village and Gortnamoyagh Forest. Some sites are active, and some are no longer in use but remain noticeable features in the landscape. The nearest site is located on the west-facing side of Keady Mountain, approximately 1 km from the Proposed Development. It is prominent in views when travelling along the A37, B66 and from the countryside around Limavady.

4.79 The site is located in the south eastern part of the Binevenagh AONB and within the Binevenagh LCA as defined in the NILCA, both of which are described in detail below. There are no statutory designations of relevance to the LVIA within or immediately adjacent to the site other than the AONB. The Ulster Way runs through Springwell Forest and continues to the north and south of the site through the AONB. There are likely to be views of the Proposed Development from this section of the Ulster Way in places where the track emerges from coniferous forest. The Causeway Coastal Route is a defined scenic route which stretches along the Antrim and Derry coastline and there are also likely to be views towards the Proposed Development from some parts of this route. There are picnic sites and parking areas located along the A37 and the B201 from where the Proposed Development may also be visible.

4.80 The summit of Keady Mountain is 337 m above sea level and the more prominent summit of Binevenagh rises to 385 m. It is marked by a television relay antenna near its peak. The proposed turbines would be located between 196 m AOD (proposed turbine T4 to the north of the A37 road) and 260.44 m AOD (proposed turbine T2 which is located in closest proximity to the consented Dunbeg South Wind Farm to the south west where the nearest turbine would be located at approximately 276 m AOD). The location of all of the proposed turbines avoids higher slopes and is positioned around the road corridor between the existing and consented elements of the Keady cluster. This minimises its effects on the summit of Keady Mountain, it's visibility from other parts of the AONB and its prominence within views that also include the wider expanse of the Binevenagh range of hills which continue southwards to form the Sperrins and Sperrin foothills. Both the Sperrins and Binevenagh are designated as Areas of Outstanding Natural Beauty.

4.81 The nearest settlements are the medium-sized towns of Limavady and Coleraine and the small village of Macosquin to the west of Coleraine. There are no settlements or residential dwellings adjacent to the Proposed Development but there are a number of individual houses scattered along the lower parts of the A37 and the adjacent tertiary road network, particularly at the base of the Curly River valley and on the

lower slopes of Binevenagh. There are more rural dwellings and farmsteads throughout the lowland slopes to the west of the proposed site which give this part of the Study Area a more managed pastoral character.

Landscape Designations

4.82 The European Landscape Convention (2000) requires member states to recognise that all landscapes can have value, and this value may vary from person-to-person. Statutory designations are one of the criteria used to assess the Significance of effects on landscape character and visual amenity in an objective manner. Whilst it is recognised that all landscapes have some subjective importance, particularly for those who live and work in them, or use them for leisure, designation gives an indication of a landscape's 'value to society'. Landscapes are designated by statute, and policies for their protection, use, and management are included in Proposed Development Plans, usually following a consultation process (which seeks to reach a consensus opinion, thereby reducing subjectivity). The national, regional and local designations that have been identified as being relevant to the landscape and visual character of this Study Area are described in the following paragraphs and illustrated in Figure 4.1.

4.83 Statutory landscape designations are contained within the current planning policy and guidance which cover the Study Area. The primary designated landscape within the Study Area is the Binevenagh AONB and policy guidance in relation to this designation is contained within the SPPS, PPS 2, PPS 18 and SPG which are described in the preceding paragraphs. The nature of the Binevenagh AONB and the effects of the Proposed Development on this landscape are analysed below. Other AONBs and statutorily designated landscapes within the Study Area are analysed in subsequent paragraphs. As noted previously the draft Local Development Plan Strategy is at too early a stage for its proposed policies to be afforded weight.

Binevenagh Area of Outstanding Natural Beauty

4.84 AONBs are the principal landscape conservation designation in Northern Ireland. The designation gives statutory recognition to the high scenic quality and distinctive landscape character of an area and the need to ensure that sensitive conservation measures take place to preserve these qualities alongside measures to allow public access and enjoyment of the area. The needs of local communities, including their social and economic well-being, is a key management objective, although development deemed to be detrimental to environmental quality is not permitted within AONBs. The landscape around AONBs performs an important function by providing context, particularly in view to and from the AONB and from key approach routes.

4.85 There are three AONBs within the Study Area for the Proposed Development. The Sperrin and Causeway Coast AONBs are located between 12 km and 20 km to the north east and south respectively and the potential effects of the Proposed Development on these areas is described in subsequent paragraphs. The Binevenagh

AONB is regarded as the primary designation to be considered in this LVIA because the Proposed Development and a large proportion of representative viewpoints are located within it. Its landscape characteristics, including their potential sensitivity to the Proposed Development, and the potential nature, or Magnitude of effects on this AONB are described below. The sensitivity, magnitude and significance of visual effects on receptors located within the AONB are described and analysed in the assessment of Visual Effects.

4.86 There are several documents which provide descriptions of the key characteristics of the Binevenagh AONB, and which have been referred to when writing this LVIA[4]. This includes both a Management Plan and Action Plan for the AONB which were published some years ago and have since expired but which have not, to the best knowledge of the author, been updated and which therefore remain of some relevance. The descriptions of the six LCAs that are located within the AONB boundary provide the most detailed information on landscape and visual characteristics of each part of the AONB. LCA 35 Magilligan Lowlands and LCA 36 Binevenagh cover the majority of the AONB but there are also peripheral parts of the LCA 33 Lough Foyle Alluvial Plains and LCA 37 Roe Basin which form the south western fringes of the AONB, and LCA 38 Eastern Binevenagh Slopes and LCA 34 Coleraine Farmland, which form the eastern fringes.

4.87 LCA 36 comprises a long finger of uplands which terminates the northern end of the AONB at the summit of Binevenagh Mountain and which also stretches as far as the fringes of the Sperrin AONB at its southern tip. Binevenagh Mountain has dramatic cliffs overlooking the north Antrim coast which the Council's Discussion Paper 4 specifically highlights as a dramatic feature within the AONB which is visible from miles around. This is also described as being one of the primary features of the AONB: the "*severe skyline of the cliffs at Binevenagh make a breath-taking contrast with the outstanding expanse of Magilligan Strand and Binevenagh cliffs*"[5]. The Proposed Development is located approximately 7.3 km from the summit of Binevenagh Mountain near the south western edge of the AONB and in the central part of LCA 36. It is not visible from this location (see PVP 11, Technical Appendix Table 4.4.1). Nor does it have a close physical or visual relationship with the summit or in views where the strong contrast between the summit and the adjacent low-lying agricultural landscape within the Lough Foyle Alluvial Plains (LCA 35) can be appreciated. This is evident in the series of viewpoints which have been selected to represent the Proposed Development within the context of the wider AONB and Binevenagh uplands (see Category D viewpoints described from paragraph 4.177).

4.88 This is a relatively accessible AONB which can be experienced by tourists and visitors, travelling on the scenic coastal railway between Coleraine and Derry, driving along

[4] Causeway Coast and Glen Heritage Trust (June 2010) 'Binevenagh AONB Management Plan 2010 – 2020' and (June 2010) 'Binevenagh AONB Action Plan 2010 – 2015'; Council Coast and Glens Borough Council (25th November 2015) 'Discussion Paper 4: Landscape Character'; NIEA (August 2010) 'Supplementary Planning Guidance to Accompany Planning Policy Statement 18, Renewable Energy'; Northern Ireland Landscape Character Assessment Series

[5] ttps://www.daera-ni.gov.uk/articles/binevenagh-aonb

the Causeway Coast Scenic Route, using the National Cycle Network on the secondary and tertiary road network and walking on the Ulster Way which covers upland and coastal areas and the River Bann corridor. There is also a gliding club at Bellarena, one of only two such clubs in Ireland. The visibility of the Proposed Development from visitor attractions within the AONB was considered as part of the viewpoint selection process and the assessment of effects in this LVIA. The Baseline Assessment, including the assessment of PVPs and initial site assessment, found very little visibility from visitor attractions within the AONB including, for example the Lough Foyle mud flats which are a designated RAMSAR site and which are accessible as a visitor amenity site via Ballykelly (see Viewpoint 19 starting at paragraph 4.189 and Figure 4.27) or from important heritage sites within this AONB, namely Hezlett House, Castlerock town, and Downhill Estate.

4.89 Although the Proposed Development is not located within the core of the Binevenagh AONB it is recognised that the proposal is within the AONB and that the site has merit in terms of its contribution to the landscape and visual character of the wider AONB. The layout and position of the Proposed Development has, therefore been designed to minimise its effect on the AONB as a whole. This has been achieved by locating it away from the core area containing the majority of visitor attractions and iconic landscape features. It is also located in the centre of a cluster of existing and consented wind farms and is neither highly visible from the rest of the AONB nor from other parts of the Study Area with good views to the core part of the AONB. These are considered to be the summit / escarpment of Binevenagh and the lowlands below this escarpment.

4.90 The proposed site is used as rough grazing land and is not a publicly accessible amenity. Adjacent areas are frequently dominated by large coniferous plantations with degraded field boundaries and are suffering from increasing amounts of coniferous forestry, which the NILCA identifies as the most detrimental force of landscape change in this LCA. There is also a history of quarrying in this part of the AONB with active and former quarry sites located to the north-east, east and south-east around Macosquin, Croaghan and Cam Forest, the west-facing side of Keady Mountain, and to the south around Craiggore, Donald's Hill, Smulgedon and Gortnamoyagh. The Proposed Development reinforces the existing character of the site and immediately adjacent landscape and is less detrimental to the overall landscape character of the AONB than forestry or quarrying because it will not have permanent presence. Whilst forestry and quarry both leave permanent marks on the landscape, wind farms are considered to be long term temporary rather than permanent developments which will ultimately be removed and the sites reinstated back to their previous uses. The site of the Proposed Development does not contribute significantly to the iconic value attributed to the summits and escarpments in the Binevenagh AONB. Neither does it contain significant visitor amenity facilities that are likely to attract the most sensitive receptors – the main tourist attractions and scenic routes are generally located to the north overlooking the coast.

Other Areas of Outstanding Natural Beauty

4.91 There are two other AONBs within the 30 km Study Area. The Causeway Coast AONB is located at some distance - approximately 18 km to the north east – from the Proposed Development but it contains a number of nationally important coastal landscape features and tourist attractions, and the internationally recognised Giant's Causeway World Heritage Site. It was considered during the PVP selection process for the consented Dunbeg South wind farm. The wireline that was prepared for the preliminary viewpoint selected to represent potential views from this part of the Study Area was reviewed in the desktop analysis for the Proposed Development which concluded that there would be no significant effects either in landscape or visual terms because the Proposed Development is so far removed from this AONB. Effects on this AONB are not further considered in this LVIA for this reason.

4.92 The Sperrin AONB is located approximately 12 km to the south of the Proposed Development. Significant adverse visual effects on the Sperrin AONB were one of Northern Ireland Environment Agency's (NIEA) recommended reasons for refusal of the 14-turbine Dunbeg Wind Farm. However, a viewpoint within the Sperrin AONB was assessed for this development which demonstrated that Altahullion and Rigged Hill wind farms were already visible from this location and the cumulative effect of Dunbeg, which would be a more distant feature, would in fact be largely obscured from view by Keady Mountain and would have no significant landscape or visual effects. The ZTV diagrams that have been prepared for this LVIA virtually no visibility aside from one or two blade tips from the highest ground. Viewpoint 24 in the consented Dunbeg South LVIA was reviewed because it was selected to illustrate typical views from these parts of the AONB. However, it was not selected for detailed analysis in this LVIA because the preliminary wireline demonstrated that the Proposed Development was likely to be a barely discernible element in the middle of the Keady cluster of wind farms when viewed from this distance. Furthermore, many of the highest parts of the Sperrins would be located at greater distances from the Proposed Development than Benbradagh and are often not as easily accessible. has been shortlisted for assessment and illustrates very limited intervisibility between the Proposed Development and the Sperrin AONB. Viewpoint 20 (paragraph 4.182 and Figure 4.28) is presented to represent typical views from more accessible road corridors around the northern edge of the Sperrin AONB in proximity to Dungiven.

Other Statutorily Designated Landscapes in the Study Area

Giant's Causeway World Heritage Site

4.93 The Giant's Causeway is the primary tourist attraction in Northern Ireland and there are other visitor amenities along the coastline which benefit from their proximity to this site. It is designated as a World Heritage Site (WHS) by UNESCO (United Nations Education, Scientific and Cultural Organisation) because it is deemed to be a site of outstanding universal value. Whilst the designation affords no additional statutory planning controls, planning policies do place great weight on the need to protect them for future generations. These are the areas of 'distinctive', 'supportive' and

'connective' settings defined in the Causeway Coast Management Plan. The Proposed Development is located some distance from the WHS and its setting and there will be no significant effects on its landscape character. No viewpoints have been selected in this part of the Study Area for the same reasons described in relation to the Causeway Coast AONB.

Register of Historic Parks, Gardens and Demesnes

4.94 The Register identifies sites that are considered to be of exceptional importance within Northern Ireland, which have historic significance, and which may also contribute to local landscape character. It is maintained by NIEA Built Heritage. Inclusion on the Register affords sites protection through the SPPS and Planning Policy Statement 6 (PPS6)[6] which requires NIEA to make comment on the protection of such sites as part of the planning consultation process. The SPPS states that permission would not be granted for development that would harm the overall character of site's integrity, overall quality or setting and its contribution to local landscape character should be maintained where possible.

4.95 There are a large number of registered sites located within the Study Area particularly around the urban areas of Derry, Limavady, Coleraine, Ballymoney and the Causeway coastline. However, few are likely to have views of the Proposed Development due to screening factors such as surrounding built development, high levels of tree cover and flat topography in low lying areas, the fact that the Proposed Development is often screened in wider views by the summits of Keady and Binevenagh, surrounding forestry and because it is closely related to a larger group of existing turbines. Therefore, no registered sites have been identified for detailed landscape and visual assessment because there are none which are likely to experience significant effects resulting from the Proposed Development.

Statutory designations in County Donegal

4.96 Parts of the uplands on the Inishowen peninsula are designated as Areas of High or Especially High Scenic Amenity in the County Donegal Development Plan because they are deemed to be the most sublime natural landscapes or be of significant value and unique to their locality and therefore having limited capacity to accommodate development. Views and prospects of special amenity value and interest are also identified from a number of these areas looking in the direction of the Proposed Development. However, the Proposed Development is located approximately 20 km from County Donegal within a cluster of existing and consented wind farms. It would not be an easily discernible element of views and would have no effects on the character of any of these designations. For this reason, no viewpoints have been shortlisted in Co. Donegal and the potential effects on landscape and visual character would be of such negligible magnitude that they are not considered further.

[6] Department of the Environment (March 1999) 'Planning Policy Statement 6: Planning, Archaeology and the Built Environment'

Non-Statutory Landscape Classifications

The Northern Ireland Landscape Character Assessment

4.97 The NILCA classifies the landscape into six broad regions and 130 smaller areas of distinct and separate character called Landscape Character Areas (LCAs). The SPG accompanying PPS 18 provides further broad guidance on these regions and LCAs including the overall sensitivity of LCAs specifically in relation to wind energy developments. The descriptions of landscape character in this LVIA are based on the NILCA and the SPG. They are also inextricably linked to the description of the key characteristics of the Binevenagh AONB and some elements of the subsequent LCAs have already been analysed in the preceding sections.

4.98 There are 20 LCAs, of which 6 are located within the Binevenagh AONB, and four Seascape Character Areas (SCAs) within the Study Area. The Proposed Development is located within LCA 36 Binevenagh and would therefore have a direct physical effect on small part of this area, which is described in detail below. The Proposed Development may also have a potential indirect effect on the setting of parts of a further 3 LCAs which are in close proximity to it, or which contain viewpoints used in this LVIA. These LCAs are listed in Appendix 4.3. There are a further 17 LCAs and 4 SCAs which have not been assessed in detail because, following the Baseline Assessment and site surveys, they are unlikely to be significantly affected by the Proposed Development. In particular, LCAs on the periphery of the Study Area and the ZTV, and those which do not contain viewpoints have not been subject to a detailed assessment. These LCAs and SCAs are also listed in Appendix 4.3.

4.99 The SPG accompanying PPS 18 provides further broad guidance on the LCAs that are defined in the NILCA, including their overall sensitivity, specifically in relation to wind energy developments. Broad landscape character issues to be considered in relation to wind farm development in the North West are provided in section 3.3.2 of the SPG:

- Effects on skylines along the Foyle valley: the Proposed Development is unlikely to be visible from this area;
- Effects on the wild character of some landscapes, and effects on the landscape character, scenic value and setting of the Sperrins of any development in the Sperrin Foothills LCA; the Proposed Development is not located within the Sperrin Foothills and the ZTV indicates that there is minimal potentially visibility within the Sperrins AONB with the exception of small areas of visibility on higher summits. However, these would be located in excess of 25 km from the Proposed Development, are relatively inaccessible and the Proposed Development would be indiscernible from the existing Keady cluster of wind farms from such distance;
- Effects on transport corridors and important tourist routes: A series of viewpoints (Category A Viewpoints) have been selected to illustrate sequential views along the A37 and B201 road corridors between Limavady

and Coleraine and from the Binevenagh Scenic Drive to the north west of the Proposed Development and the Roe Valley and Causeway Coast scenic routes further to the north west and south west. These effects are described in detail from paragraph 4.128;

- Cumulative effects with trans-boundary development in Co. Donegal: There is a cluster of existing and consented wind farms on the Inishowen Uplands which may be sequentially visible from some parts of the Study Area which are unlikely to result in significant visual effects. They are further considered in the cumulative impact assessment starting at paragraph 4.152.
- General principles for the spacing between wind farms, the layout, siting and design of wind farms are given. Of particular relevance to the Proposed Development are:
- Large-scale landscapes, where the turbines are likely to be in proportion with the landscape, are likely to be of lower sensitivity than small-scale landscapes. The Proposed Development would be located on the side slope of Keady Mountain which forms part of a saddle of land within the large expanse of the Binevenagh range of hills. It would not be a dominant additional feature;
- Elevated upland landscapes can accommodate larger turbines and the broader the upland the greater the capacity. Larger horizons tend to diminish the perception of height. The Binevenagh range stretches in a long broad arc from the north Antrim Coast to the Sperrin range in the southwest and its escarpments are visible in its full extent mostly from western parts of the surrounding landscape;
- Landscapes that do not form distinctive backdrops tend to be less sensitive. The Proposed Development's position within a lower-lying saddle of land and on the side slope of a secondary hill within the Binevenagh range means that it does not make as prominent a contribution to the overall Binevenagh range as Binevenagh itself or summits and uplands within the range, such as Benbradagh and Rigged Hill which have very distinctive profiles;
- Development that is well set back from upland edges will be less prominent in the landscape than development that is close to edges and convex landform may also provide partial screening for turbine structures. The Proposed Development is located on a side slope around the A37 road corridor, away from the summit of Keady Mountain and is surrounded on three sides by higher ground and forestry so it is screened in close to medium range views to the east, and in many views to the north and south;
- Commercial forestry also introduces a man-made influence on landscapes that may otherwise seem natural, thereby reducing sensitivity. There are large expanses of coniferous forestry across the Binevenagh range, including

Springwell Forest to the south and east and Ballyhanna Forest with Grange Park Wood to north and west of Dunmore Hill. The landscape surrounding the Proposed Development is also influenced by other man-made elements including several quarries, television aerials, roads, two existing and two consented wind farms. Its relationship to the latter is in accordance with the Councils aim to cluster and consolidate developments in single locations in order to minimise cumulative effects as highlighted in their Discussion Paper 4: Landscape Character (see footnote to paragraph 4.87).

Landscape Character Area 36: Binevenagh

4.100 The SPG's assessment of the Binevenagh LCA, within which the Proposed Development is located, briefly summaries its landscape characteristics, defines its overall sensitivity to wind energy and its capacity to accommodate certain turbines groups and heights.

The SPG's description of Key Landscape and Visual Characteristics and Values

4.101 The SPG describes the Binevenagh LCA as a dramatic cliff-like escarpment stretching between the north coast and the Sperrin Mountains, but it is more accurate to describe it as a series of escarpments, summits, plateaux and valleys. The AONB's core areas, as described on the NIEA website, are Binevenagh Mountain and the coast between Portstewart and Magilligan Strand[7]. It is the visual contrast between Binevenagh and the lowland areas that is one of the key characteristics of this AONB. This contrast is best appreciated from the Magilligan area directly below Binevenagh where the escarpment at the northern end of Binevenagh is fully visible. The Proposed Development is not visible from this part of the Study Area. The contrast can also be appreciated in medium to long range views from the north-west where one can appreciate how the full profile of the Binevenagh range stretches into the Sperrin Mountain range to the south west. From these latter views the Proposed Development would often be visible on the skyline. However, it would form a small part of extensive, often 360° views and would be located within a lower saddle of land between taller summits and in the midst of the Keady cluster of wind farms. Rigged Hill wind farm is also already more visible on a taller and more prominent plateau to the south. This wind farm is a well-established element of the landscape character in this area and precedes the Binevenagh AONB designation. A re-powering scheme for 7 turbines with 137 m tip heights has recently been consented on this site which will be more prominent because the turbines are substantially larger than the existing ones, which have a tip height of 56.5 m.

4.102 The SPG identifies Binevenagh Mountain as one of the most dominant physical and visual features of the AONB alongside the summits of Keady Mountain, Donald's Hill and Benbradagh. The Proposed Development is not located in proximity to the summit of Keady Mountain, and in many instances will be screened by the rising

[7] ttps://www.daera-ni.gov.uk/articles/binevenagh-aonb

profile of Keady Mountain. Therefore, it will not significantly affect the overall legibility or visual continuity of the Binevenagh profile.

4.103 Within proximity to the Proposed Development the physical landscape is in poorer condition and is less sensitive than the core parts of the AONB which are noted in the various designation documents. The SPG describes the area as wild and tranquil. However, very little of this LCA is untouched by human influence. There are extensive conifer plantations within this part of the AONB, which the SPG recognises as detractive to landscape and visual quality. Whilst forestry may be regarded as a temporary land use the reality is that it is often a longstanding feature with impacts on the physical landscape that remain evident long after its removal. The Forest Service has confirmed that forestry policy as set out in the '*Northern Ireland Forest Strategy for Sustainability and Growth*' (March 2006) requires areas of forestry to be maintained and expanded where possible. In accordance with this policy Springwell Forest, Cam Forest and Grange Park Wood will continue to be managed and replanted by the Forest Service on a cyclical basis. Non-intensive management of rough grazing areas has created a sense of degradation rather than wildness. There is a proliferation of individual dwellings throughout the countryside in this part of the AONB with a mix of styles and buildings materials which are not in keeping with the historic vernacular. This part of the AONB is also dissected by the busy A37 trunk road which runs directly through the site taking large volumes of traffic between Coleraine and Derry.

The SPG's description of Landscape Value of LCA 36: Very High

4.104 In broad terms this LCA is of very high value because it is a distinctive and extensive upland landscape containing lowlands to east and west. However, conifer plantations are a detractive man-made feature on many upper slopes, and it is not in optimum condition. A more detailed consideration of the proposed site and adjacent areas has concluded that it is of lesser physical value than the overall LCA. It is characterised by large coniferous plantations, degraded field boundaries, quarry workings and areas of open moorland. It does not contribute significantly to the iconic value attributed to the summits and escarpments in the Binevenagh AONB. Neither does it contain significant visitor amenity facilities to attract the most sensitive visual receptors.

The SPG's description of Landscape Sensitivity to the Proposed Development

4.105 The SPG states that overall sensitivity to wind energy development in the Binevenagh LCA is high to medium. "*Much of this landscape is of extreme sensitivity due to its iconic, landmark character and very wide visibility*". Commercial development at the northern or southern ends is deemed by the SPG to be unacceptable. "*However, lower and less prominent sections of the escarpment and areas where there is extensive forestry may be somewhat less sensitive to commercial wind development*" (page 134). The Proposed Development is located in accordance with the recommendations of the SPG. Whilst it is within an AONB, which it is accepted is

overall a highly sensitive landscape, it is not located on one of the prominent west-facing summits (Binevenagh, Keady, Donald's Hill and Benbradagh) which form a key part of the wider landscape setting and which the SPG infers should be avoided. Rather, it is located on the lower slopes of Keady Mountain in the midst of the Keady cluster of wind farms, comprising of the existing and consented wind farms at Dunbeg, Dunmore and Dunbeg Extension to the north of the road corridor, and the consented Dunbeg South wind farm and a single turbine to the south. These have already deemed to be in an acceptable location within the AONB and accepted to be of lower sensitivity than the core parts of Binevenagh or its extremities. Furthermore, the proposed site is also surrounded by a large amount of coniferous forestry which serves to reduce the sensitivity of this part of the AONB.

The SPG's description of Key Location, Siting, Layout and Design Considerations

4.106 The Proposed Development meets the locational criteria of the SPG, specifically:

- Turbines may be accommodated in appropriate locations because of large-scale strong horizontal form of escarpment;
- The lower central section of the LCA is better suited than the northern or southern ends;
- Siting within forestry in these locations may also be appropriate;
- Impacts on distinctive skylines of Binevenagh, Keady, Donald's Hill or Benbradagh should be avoided as well as impacts on features of natural and cultural heritage interest and recreational resources. The proposed turbines have purposefully been located away from the summit of Keady.

Other Non-Statutory Landscape Classifications

4.107 A review of other relevant non-statutory landscape classifications has also been carried out as part of this LVIA. These classifications identify landscapes or elements within the landscape that are recognised as being important by virtue of being marketed as attractions or identified in non-statutory documentation in the public realm, but which have no protection in law. These classifications are illustrated on Figures 4.1 and 4.2. Information on them in drawn from a number of websites[8] providing relevant descriptive information which is used in conjunction with Ordnance Survey maps to plot the locations of visitor attractions and including the Ulster Way, National Cycle Network, and scenic drives in the Study Area, and to aid the selection of viewpoints (Figure 4.3).

Rights of Way, Cycle Routes, and Scenic Drives

4.108 The Ulster Way is a 1000 km long circular walking route which covers the most scenic parts of Ulster. It is divided into 'Quality Sections', which provide largely off-road way-marked access for walkers in highly scenic areas, and 'Link Sections', which are mainly along roads and are not generally way-marked. A section of the Ulster Way

[8] http://www.walkni.com, www.cycleni.com, www.sustrans.org.uk

long distance footpath runs from the south of the Study Area, through the Sperrin AONB before continuing towards the north Derry coast via the Binevenagh AONB. The route then continues northeast, generally following the coastline to the edge of the Study Area. The Proposed Development is located approximately 1km due west of the Ulster Way.

4.109 The National Cycle Network provides cyclists with marked scenic routes across the province. Within this Study Area there are routes linking Binevenagh to the Roe Valley, the Loughermore Hills, and the Glenelly Valley in the Sperrins; Loughermore to Dungiven; the northern and central parts of the Sperrins; and a route along the Northern edge of the Sperrins, Faughan River Valley, Derry and the banks of the River Foyle. At its closest point the route comes within approximately 5km of the Proposed Development.

4.110 Several scenic routes are signposted on roads within the Study Area:

- The Causeway Coastal Route is the closest route to the Proposed Development and is one of the most popular scenic routes in Northern Ireland. It stretches along the coast, from Belfast Lough to Lough Foyle and covers over 80 miles of coastline includes a number of heritage sites, AONBs and the Giant's Causeway WHS. It also includes the Roe Valley way marked route and Binevenagh Scenic Drive in the central part of the Study Area. The ZTV indicates that there is potential visibility from many parts of this route (Figure 4.1) and Viewpoints 1 – 6, 10, 11 and 16 represent views from scenic driving routes;
- The Inishowen 100 route around the Inishowen Peninsula, part of which runs along the north western edge of the Study Area. However, preliminary site assessment indicated that the existing Keady cluster was not easily discernible in views from sea level at such a distance and, therefore, no viewpoints were shortlisted in this part of the Study Area;
- The North Sperrins Route is an 80 km circular route including the B40 and B64 in the south eastern part of the Study Area. However, the ZTV indicates very little visibility, and it is therefore not considered further in this LVIA.

Blue Flag Beaches

4.111 Blue Flags are awarded to European beaches and marinas across Europe that have particularly high environmental standards and facilities. There are several Blue Flag beaches within Co. Derry and Co. Donegal which are popular tourist destinations. However, receptors on these beaches are usually located at sea level and the focus of their views is not inland. The he Proposed Development would have no significant impacts on these beaches, and they are not considered further in this LVIA.

National Trust Properties

4.112 Whilst these are not statutorily designated, the National Trust manages landscapes and buildings which have significant cultural value, and which are often prominent

landscape features. There are a number of such properties and landscapes within the Study Area but preliminary ZTVs and site assessment work indicated no visibility from many of these sites and the following are not further considered in this LVIA for this reason: Giant's Causeway WHS; Hezlett House; Downhill Estate; Castlerock; Martello tower at Magilligan; C18th private residences: at Bellarena and Fruithill.

Baseline Visual Character Assessment and Analysis of Effects

Visual Character of the Study Area

4.113 The Study Area comprises several ranges of hills with broadly north-west to south-east alignments. Each range of hill has its own distinctive profile, and they markedly divide the areas of broad rolling lowlands between them. Most of these ranges of hills contain clusters of existing, consented and proposed wind farms, which are indicated on Figure 4.4 and the cumulative ZTVs (Figure 4.8) and described from paragraph 4.217. Working from left to right across the Study Area these hill ranges are as follows:

- Inishowen: this is a long range of hills on the north west boundary of the Study Area which physically contains the lowland area of Co. Donegal adjacent to Lough Foyle and which frame long range views to the north west;
- The Binevenagh escarpment is a basalt plateau with a distinctive profile of vertical cliff faces, which are a significant landmark particularly from surrounding lowland areas of Magilligan, the Foyle Estuary and Co. Donegal. From the proposed sites exposed location lying in a saddle of land between the Binevenagh escarpment and the summit of Keady Mountain long distance views can be obtained of Inishowen to the north west;
- Loughermore Hills: a small - medium sized range of hills located between the River Faughan and River Roe corridors in the west of the Study Area. Loughermore Forest is a large coniferous plantation covering a large proportion of these hills. It also contains a large and longstanding cluster of existing wind farms at Altahullion and Glenconway (referred to as the 'Loughermore cluster' in this LVIA);
- Sperrin Mountains and outlying hills: This is the largest upland mass which covers the south western quarter of the Study Area, and which forms the Sperrin AONB. The Sperrins are the highest peaks at its centre and there are a large number of secondary hills surrounding these which are contiguous with the Slievekirk and Binevenagh ranges of hills;
- Long Mountain is a single long thin-profiled hill to the east of the River Bann corridor. It provides a setting for the main road between the south of the province and the north Antrim coast. Garves wind farm is a prominent feature on Long Mountain and there are two other consented wind farms in proximity to it, collectively referred to as the 'Long Mountain cluster' in this LVIA.

4.114 The highest quality views from the Binevenagh AONB are usually wide-angle views and views orientated towards the coast and to the north and west over the Foyle Estuary and Inishowen. In views of the AONB from surrounding lowland areas to the west and north-west it is often the sheer extent of these views, rather than the quality of the foreground landscape, which affords them high scenic value. Individual elements of these views are subordinate features. These include several large existing wind farms. In medium to long range views the Proposed Development is unlikely to be easily perceptible as an additional element within the centre of the established Keady cluster and would not detract from the overall quality of the physical landscape character or visual amenity.

4.115 The Binevenagh escarpment frames views from the lowlands to the north and west but there are very few instances from these lowlands where the entire profile of the Binevenagh range is visible and it is never visible in this manner for long periods of time. Vegetation, topography, built development and changes in the direction of views as the road corridor changes direction all serve to break up views of the profile. On the approach to settlements and within settlements along this route views are nearly always focused within the settlements themselves.

4.116 The Causeway Coast train journey between Coleraine and Derry is a popular tourist route. This journey takes approximately 45 minutes each way and the train travels in the general direction of the Proposed Development when travelling towards Coleraine from Derry. In both directions of travel views vary according to the position of passengers in relation to windows and the side of the train on which they are sitting. However, in general the sea-side is the most popular side of the train to sit on because the main points of interest on the journey are the sea and coastline framed at different points of the journey by the Inishowen peninsula in Co. Donegal, the Magilligan lowlands in Co. Derry, and the escarpment on the northern face of Binevenagh. Views in the direction of the Proposed Development are less likely to feature although the presence of the existing Dunbeg and Dunmore wind farms does provide a point of interest between Binevenagh and Keady mountains. Overall, the visual experience of journeys in both directions is characterised by a series of transitory views. The Binevenagh escarpment is only visible for a very short period of time and not simultaneously with the Keady cluster of wind farms. There are very few views of the entire profile of Binevenagh and there is only a period of a few minutes when views from the land-side of the train are focused on these wind farms. During this short period uninterrupted views are obtained intermittently for a matter of seconds. Foreground vegetation and buildings filter views and distract the eye. Based on these findings it is surmised that the Proposed Development will not be an easily discernible element in views from trains.

The Zone of Theoretical Visibility

4.117 ZTV diagrams have been produced at a radius of 15 km and 30 km from the Proposed Development based on the proposed turbine dimensions and illustrating both hub and blade-tip visibility (Figures 4.5 and 4.6). Reverse blade tip ZTVs (Figure 4.7) have

been produced to clearly illustrate areas where there would be no theoretical visibility of the Proposed Development. These diagrams are the starting point for the baseline visual assessment and were also used to assist the selection of viewpoints. They illustrate the theoretical visibility of the Proposed Development as a standalone development, unrelated to any other wind farms in the Study Area. They indicate that, within a 15 km radius from the Proposed Development, 38.60% the Study Area is likely to have some theoretical hub height visibility of the Proposed Development and 61.73% blade tip visibility. This would increase to 45.54% hub height visibility within a 30 km radius, but blade tip visibility would reduce to 56.21%.

4.118 The reverse ZTVs (Figure 4.7) illustrate the screening effects of higher ground in other parts of the Study Area. Within a 15 km radius the rising slopes and summit of Binevenagh to the north of the Proposed Development, Keady Mountain to the south and the hills that are covered by Springwell Forest around the A37 to the east create substantial areas of 'visual shadow', i.e. areas which would have no visibility of the Proposed Development. This is particularly widespread across the Magilligan Lowlands and coastline below the northern end of the Binevenagh range, extending as far as Inishowen and across much of the southern half of these uplands. In the southern half of the Study Area, at distances between 10 – 30 km, the Loughermore hills, Sperrin Mountains and foothills create other extensive areas of visual shadow. The 15 km Reverse ZTV illustrates that 38.27% of the Study Area would have no theoretical visibility of the Proposed Development. This would increase to 43.79 % within the 30 km Study Area.

4.119 However, it is noted that the ZTVs only take account of bareground topography and the large areas of forestry on several upland areas, including those directly to the east of the site, would further increase levels of screening. The theoretical visibility indicated to the east of the Proposed Development would be decreased by this forestry as well as local drumlin topography of the farmland in this part of the Study Area and other above-ground elements such as built development and vegetation cover. This is demonstrated by the absence of any viable viewpoints being identified in this part of the Study Area (this is adequately represented by Viewpoint 1, Figure 4.9). The Proposed Development is also likely to be difficult to discern with the naked eye in long distance views particular from low level viewpoints where its scale will be diminished by the scale of wider views and its location within an established cluster of wind farms.

Table 4.1 - Zone of Theoretical Visibility of the Proposed Development

ZTV Diagram	No. of turbines theoretically visible	% of Study Area with visibility	
15 km hub height Figure 4.5 (page 1/ 2)	**1**	**7.58 %**	**Total % of 15 km Study Area with theoretical hub height visibility = 38.60 %**
	2	**9.80 %**	
	3	**2.07 %**	

ZTV Diagram	No. of turbines theoretically visible	% of Study Area with visibility	
	4	19.15 %	
	0 turbines	61.40 %	
15 km blade tip Figure 4.5 (page 2/2)	1	4.76 %	Total % of 15 km Study Area with theoretical blade tip visibility = 61.73 %
	2	20.19 %	
	3	4.33 %	
	4	32.45 %	
Reverse blade tip Figure 4.7 (page 1/2)	0 turbines	38.27 %	
30 km hub height Figure 4.6 (page 1/ 2)	1	5.44 %	Total % of 30 km Study Area with theoretical hub height visibility = 45.54 % Percentage of Binevenagh AONB with visibility = 31.32 %
	2	17.51 %	
	3	2.69 %	
	4	19.90 %	
	0 turbines	54.46 %	
30 km blade tip Figure 4.6 (page 2/2)	1	2.36 %	Total % of 30 km Study Area with theoretical blade tip visibility = 56.21 % Percentage of Binevenagh AONB with visibility = 41.62 %
	2	10.42 %	
	3	3.77 %	
	4	39.66 %	
Reverse blade tip Figure 4.7 (page 2/2)	0 turbines	43.79 %	

Desk-based selection of Provisional Viewpoint Locations

4.120 This LVIA began by re-visiting the viewpoint selection process carried out as part of the previous Dunbeg South wind farm LVIA which included a thorough analysis of visibility within a 30 km Study Area and identified locations most likely to experience visibility of the wind farm and contain key visual receptors. This exercise is still of relevance because the Proposed Development would form a contiguous extension to this consented 9-turbine wind farm. This information was used in the Dunbeg South LVIA to carry out a search for provisional viewpoint locations (PVPs) – a total of 51 PVPs were analysed, including 28 which were also used in the previous Dunbeg, Dunbeg Extension or Dunmore Wind Farm LVIAs because this provided a useful means of assessing cumulative visual effects of the Proposed Development in particular. This selection was used, in consultation with the local planning authority, to compile a shortlist of 27 viewpoints which were analysed in detail as part of the Dunbeg South LVIA.

4.121 Additional analysis of the ZTV for the Proposed Development compared with the consented Dunbeg South wind farm demonstrates that additional visibility of the

Proposed Development would be negligible (see Figure 4.8, page 1 of 3). Comparative wirelines for these 27 locations, prepared for internal review at an early stage of the LVIA, showed how the Proposed Development would appear alongside other wind farms in the Keady cluster. These draft wirelines were used as working documents and are not reproduced in this LVIA.

Initial site assessment and viewpoint 'shortlisting'

4.122 The 27 final viewpoints used in the Dunbeg South LVIA formed the list of PVPs for the Proposed Development. Levels of actual visibility, the nature of visual receptors present at each location, and the overall viability of each viewpoint location were analysed (see Table 4.4.1 below) and shortlisted to 20 locations which included a proportionate number of locations representing typical views of the Proposed Development, key visual receptors and key locations within the Study Area. For ease of analysis these shortlisted viewpoints are categorised similarly to Dunbeg South wind farm. PVPs were not shortlisted if they were found to provide no actual view of the Proposed Development. The reasons for this usually arose from differences between theoretical and actual visibility which is explained in Technical Appendix 4.2. A summary analysis of all PVP locations and the rationale regarding shortlisting is provided in Technical Appendix 4.4, Table 4.4.1. For ease of analysis these shortlisted viewpoints were categorised as follows:

A. Views from primary and secondary routes, including tourist areas;
B. Views representing residential properties and rural settlement within approx. 5 km of the Proposed Development;
C. Residential properties and settlements within 5 - 15 km of the Proposed Development;
D. Views illustrating the wider landscape setting and visibility of the Proposed Development in the context of the Keady cluster of wind farms.

Final Viewpoint Selection

4.123 A total of 20 final Viewpoints have been selected for consideration in this LVIA. Detailed descriptions of the final Viewpoints are an integral part of the Visual Impact Assessment section of the LVIA (Chapter 4 starting at paragraph 4.127). Their locations are indicated on all map-based Figures (Figures 4.1 – 4.8) and visualisations to accompany the detailed written analysis of these Viewpoints are provided in Figures 4.9 – 4.28.

4.124 Whilst it is noted that the primary concern is often the visual effect of the Proposed Development on close-range viewpoints, the baseline assessment, including the viewpoint selection process, identified a number of key visual receptors including; residents of rural properties and settlements located in close proximity to the Proposed Development but also elsewhere in the Study Area; tourists on scenic routes, footpaths and cycle routes throughout the Study Area; receptors located within the AONB but also those located at greater distances with views illustrating the wider landscape setting and visibility of the Proposed Development in the context

of the established Keady cluster of wind farms. Planning policy guidance recognises that wind farms will, by their nature, often be clearly visible from close range viewpoints but that this will not necessarily equate to adverse visual effects. Therefore, the final Viewpoints presented in this LVIA are intended to represent typical views of the Proposed Development that are likely to be obtained in different parts of the Study Area, from key locations and by key visual receptors. They have been grouped into categories so that the different types of views, receptors, and specific areas they represent can be accurately described and understood without unnecessary repetition (see Table 4.4.1 below).

4.125 The viewpoints have been grouped into four categories (Categories A – D as listed in paragraph 4.125 above) so that the different types of views, receptors, and specific areas they represent can be accurately described and understood without unnecessary repetition. These categories have been further subdivided for the purposes of the detailed viewpoint descriptions below, in particular to provide detailed descriptions on the manner in which views are experienced when travelling through various parts of the Study Area that are located within 0 – 15 km of the Proposed Development.

Category A: Views from primary and secondary transport routes, including tourist areas

A1: Views from the A37 road corridor between Coleraine and Limavady

Description of Existing and Predicted Views

4.126 Category A1 includes Viewpoints 1 - 6 which are illustrated in Figures 4.9 – 4.14. Viewpoints 1 and 2 represent views along the approach from Coleraine town. Viewpoint 1 is located in the hard shoulder of the road near the village of Macosquin approximately 6.93 km to the north east of the Proposed Development. It illustrates that whilst the existing elements of the Keady cluster of wind farms is sometimes clearly visible to the right-hand side of the road corridor, it is frequently screened by roadside vegetation and its prominence is reduced by the relatively narrow proportion of the overall view which it occupies. The consented elements of the Kedy cluster are not visible from this location. The road corridor and agricultural land in the foreground and middle distance of the view are dominant and the large expanse of forestry across the centre of this view is also a strong visual feature. Overall, this view is characterised by manmade influences, including fast and frequently busy traffic movement on the road corridor. Views are generally transient in nature. It is not located within the AONB boundary.

4.127 The blade tips of turbines 2, 3 and 4 of the Proposed Development are theoretically visible from this location but, in practice would be largely screened by forestry and are unlikely to be discernible features, particularly from vehicles travelling at speed along the road as the majority of visual receptors would be. Taking account of the cumulative baseline that is visible in Viewpoint 1, i.e. clear visibility of the Keady cluster and the increasing prominence of this cluster of wind farms as one travels

along the A37 to other viewpoints in this category the Proposed Development, where it does become more visible, would be seen as a coherent part of this established wind farm cluster rather than a prominent additional visual feature.

4.128 As one moves towards Viewpoint 2 from Viewpoint 1 the forestry in the foreground becomes a more dominant feature on the southern side of the view and screens views towards the Proposed Development. The northern side of the A37 becomes less agricultural and is characterised by rough grazing land on which the existing Keady cluster of wind farms are located adjacent to the road corridor and in front of Binevenagh. Beyond these turbines there are views of the 'back' side of Binevenagh Mountain to the north (i.e. there are no views of the iconic cliffs of Binevenagh that are one of the key AONB characteristics) and westwards across the Foyle estuary to Inishowen. Views from this location are more remote but the A37 is still a dominant feature both physically and visually. Field boundaries and roadside verges are not well managed, and the landscape is not in optimum condition despite wider views being scenic in nature.

4.129 Viewpoints 3 – 6 represent the changing nature of visibility when travelling towards the proposed site from Limavady. Viewpoint 3 is located in closest proximity to the Proposed Development, in the A37 hard shoulder approximately 0.6 km to the west. This view would become apparent when travelling westwards from Viewpoint 2 where the Proposed Development straddles the road corridor and from where 3 of the four proposed turbines would be prominent additions to the existing cluster. All turbines would become visible in their entirety for this short section of the road corridor. The bases of most turbines would be visible against a rising backdrop of the rough grazing land on the site and the edge of the adjacent Springwell Forest. This section of this viewpoint is almost entirely characterised by man-made factors and human-influences on landscape character. The existing and consented elements of the Keady cluster of wind farms is located to both sides of the Proposed Development and the A37 road corridor, and extending well beyond the angle of view that is illustrated in Figure 4.11. The summit of Keady Mountain would not be visible and there are no views further west than the immediate foreground which is occupied by the consented Dunbeg South wind farm. Therefore, the Proposed Development would not affect any appreciation of the Sperrin AONB or the southern section of the Binevenagh uplands which are not perceptible from this viewpoint. Furthermore, although clearly visible at close range, the Proposed Development would not become a dominant feature in this viewpoint because it would be seen as an integral part of the Keady cluster which is already the dominant feature on the north side of the road corridor where it appears in front of Binevenagh Mountain, and adjacent to wider views towards Inishowen. Lough Foyle and the Roe Valley. The consented elements would increase the number of turbines in this part of the view and also to the southern side of the A37 where the 9 turbines of the consented Dunbeg South wind farm would be clearly visible at a distance of only 0.46 km at its nearest point. The Proposed Development would occupy a small and visually contained proportion of the

view either side of the road corridor and would not encroach upon more scenic parts of the wider landscape.

4.130 When approaching the Keady cluster from the direction of Limavady, there are no safe opportunities to stop and appreciate static views until one is in proximity of Viewpoint 3. Viewpoints 4 and 5 are therefore not located on the A37 but on side roads from where views towards the Proposed Development can be partially obtained through gaps in this vegetation and/ or from safer but arbitrary, stopping points. The screening effect of Keady Mountain and the location of turbines away from its summit can be appreciated from these viewpoints. From these locations it appears to be contiguous with the rest of the Keady cluster, but the majority of the turbines are screened from view and the Proposed Development is not an easily discernible feature.

4.131 Viewpoint 6 is located approximately 5 km to the south west of the Proposed Development in a layby at the side of the A37 near the junction with the B66 Ringsend Road from where Keady Summit is prominent but where forestry screens most of the existing cluster of Dunbeg turbines. The hub and rotors of turbine 4 and the blades of turbine 1 would be partially visible, above the lower slopes of Keady Mountain but would be intermittently screened by roadside vegetation and the majority of the Proposed Development would be entirely screened by intervening topography.

4.132 From Viewpoints 3 – 6, when travelling towards Limavady, there are existing clusters of wind farms present along one part of the Inishowen skyline and a large cluster of existing wind farms at Loughermore. However, despite their size, neither are prominent features from these viewpoints due their distance. They would not be simultaneously visible with the Proposed Development without needing to alter one's direction of view because there are large separation distances between these various wind farms.

Sensitivity of Visual Receptors: Medium to Low

4.133 The A37 is a busy part of the primary road network between two large towns and the majority of visual receptors will be travelling in fast-moving vehicles. These types of viewers are generally considered to be of low sensitivity (refer to the Methodology criteria in Appendix 4.2). However, with the exception of Viewpoint 1, these viewpoints are located within the AONB so many travellers are likely to be using this road to experience scenic views and may utilise the frequent laybys and hard shoulder areas to stop and appreciate such views. Taking account of the presence of the Keady cluster, which in all instances exerts a relatively strong influence on the character of views from these locations, the sensitivity of receptors in Viewpoints 2 – 6 is therefore deemed to be Medium.

Magnitude of Visual Effect including Cumulative Effects: Medium to Negligible

4.134 The most attractive views from this part of the Study Area are north-westwards towards Inishowen. There is no visibility of the Proposed Development when looking in this direction from Viewpoint 1. Such views are obtained briefly from Viewpoint 2

where the Proposed Development would appear in front of views towards Inishowen, and then continuously on approach to Viewpoint 3 and from Viewpoints 3 to 6 when travelling away from the Proposed Development. Therefore, whilst the Proposed Development may be prominent in the foreground when travelling along the A37 in proximity to Viewpoint 2, this would occur only briefly, and it would not impinge or encroach upon views into the wider landscape in most instances. If travelling eastwards from Limavady towards Coleraine the Proposed Development would appear in the middle of the Keady cluster without forming a prominent new visual element. It would be positioned behind viewers as they travel towards Limavady beyond the location of Viewpoint 3.

4.135 The magnitude of visual effects on Viewpoints 1, 4, 5 and 6 is deemed to be Negligible because the Proposed Development would be barely or only partially visible form these locations. This would increase to a medium magnitude of effect from Viewpoints 2 and 3 where the turbines would be closer and more prominent than existing elements of the Keady cluster. However, when consented elements of the Keady cluster are taken into account (Dunbeg Extension and Dunbeg South) the magnitude of effect from these viewpoints would decrease to low because the Proposed Development would not be a prominent new visual element once these wind farms are present in the landscape.

4.136 Furthermore, magnitude of visual effect along the A37 depends somewhat on the direction of travel. In static views and westward-facing views the Proposed Development would have a lesser magnitude of effect because a greater proportion of the wider view would also be experienced without being impinged upon by the proposed turbines. Only if travelling eastwards, and for a relatively short time period, would the Proposed Development become a major feature of the view. It would also be located within the section of this viewpoint that is most heavily characterised by human factors, including close proximity to the Keady cluster of wind farms, and it would not impinge on the most scenic parts of the view, which are directed to the wider landscape in the north-west. The Proposed Development would occupy a relatively small part of the overall view which, from this location, is extensive. The Proposed Development would not alter the overall nature of views from this location.

Significance of Visual Effect: Not Significant

4.137 The number of turbines in the Proposed Development is far less than those in the existing elements of the Keady cluster which are already a visually dominant feature in proximity to the A37 road corridor. The extent of this cluster would be substantially increased once the consented wind farms are constructed and, when taking this into account, the Proposed Development would form a relatively minor addition to the cluster. It would be located in the centre of the cluster, around the A37 road corridor and would not increase the geographical extent of the cluster in any direction. Only if travelling from the east towards the Proposed Development would it have a medium magnitude of effect, but it would still be experienced in the

context of other wind farms. In all other instances the visual effects on Category A viewpoints are not deemed to be of low to negligible magnitude and the sensitivity of visual receptors is medium to low. Despite being clearly visible in some close-range views, the Proposed Development would form a relatively small element within the Keady cluster and in relation to wider views. There are also many parts of the road corridor from which it would not be clearly visible.

A2: Views from the secondary B201 road corridor between Coleraine and Limavady

Description of Existing View and Predicted Views

4.138 Category A2 includes Viewpoints 7 and 8 which are illustrated in Figures 4.15 – 4.16. Similarly to the A37, the B201 connects Coleraine to Limavady and, although a secondary route, it is still a relatively busy road with fast-moving traffic but with fewer laybys than the A37. Hence, the majority of views, and particularly views to features located in the foreground, are transitory in nature because they are obtained primarily from vehicles. The B201 runs parallel with the A37 but at a greater distance from the Proposed Development.

4.139 Viewpoint 7 is located approximately 2.20 km to the north of the Proposed Development at the base of Binevenagh Mountain but all views northwards towards Binevenagh are screened by the adjacent mass of coniferous trees (Ballyhanna Forest). There are clear views in a southerly direction across an open expanse of poor-quality rough grazing land in the foreground, which is dominated by part of the existing Keady cluster of wind farms on the left hand (eastern) side of the view. This cluster of wind farms is not visible in its entirety from this location but becomes closer and more visible if travelling eastwards for a short section of this road. It becomes less of a feature of views when travelling westwards where views face away from the cluster. There are some views into the wider landscape around the Loughermore Hills and the existing cluster of wind farms here, but these are not a prominent feature due to their distance from this viewpoint. The A37 road corridor is not a prominent feature either - it can be identified by some linear sections of vegetation running across the centre of the viewpoint photograph, but this would not be discernible in transitory views.

4.140 The consented turbines of Dunbeg Extension and, Dunbeg South and a consented single turbine in the quarry within Springwell Forest would be located to the south west of the existing Keady cluster. Together they would appear to form a contiguous development with all the turbines appearing to be of broadly similar proportions when viewed from this distance. The single turbine between the two wind farm developments would be slightly incongruous because it would be smaller than the other turbines. However, it would also be located behind the other turbines and therefore be a secondary vertical element with less of a visual relationship with the other turbines than it would have to the quarry and stark outline of the forestry that surrounds the quarry which are already visually detractive elements in this part of the view.

4.141 The Proposed Development would be visible on the side slope of Keady Mountain against a rising backdrop of rough grazing land and in front of Springfield Forest which covers part of the skyline. Two of the proposed turbines would be positioned behind Dunbeg Extension and the other two would be located relatively equidistant between Dunbeg Extension and Dunbeg South and would thus have the effect of linking the two consented developments and creating a more coherent layout overall. The two consented wind farms would, when constructed, become the dominant elements in this view although they would not alter the overall composition or character of the view which already comprises of broad upland areas with rough grazing land and large clusters of wind turbines. The existing elements of the Keady cluster already create this character in the foreground, and the Loughermore cluster repeats this character in the wider landscape to the west. The Proposed Development would not increase the geographical extent of wind turbines that would be visible in the nor encroach on or influence the character of views into the wider landscape to the west.

4.142 Viewpoint 8 is located further away from the Proposed Development – 5.57 km to the north east - on a more inhabited/ developed part of the road corridor. The foreground landscape here is more complex, with undulating topography, built development and forestry visible across all parts of the view. From this direction, the Proposed Development would be located beyond the existing Keady cluster and directly in front of the consented Dunbeg South turbines. There would only be partial visible of the upper parts of turbines 2 and 3 and the blade tip of turbine 1. Turbine 4 would be screened by intervening topography and the extensive coniferous forestry which covers all upland areas visible from this location. There is also a single turbine located on farmland in the middle distance which would appear in front of the Keady cluster and there would be a relatively dense clustering together of turbines on this part of the skyline. However, the overall scale and extent of the view means that this is not the dominant visual feature. Whilst the Proposed Development would slightly increase the massing of turbines it would not do so substantially and would not increase the lateral extent of turbines that would be visible along the skyline. Neither would it be an easily discernible individual feature.

Sensitivity of Visual Receptors: Low

4.143 Viewers present at Viewpoint 7 will primarily comprise travellers in fast-moving vehicles or workers tending the adjacent rough grazing land. Both receptor groups are deemed to be of low sensitivity. The types of viewers present at Viewpoints 8 may, in addition, include residents who are generally deemed to be of High sensitivity. However, the Proposed Development is unlikely to be a discernible feature from these viewpoints and the landscape in Viewpoint 8 is already complex and characterised by forestry and built development. Therefore, in this instance, visual receptors represented by Viewpoint 8 are also deemed to be of Low Sensitivity.

Magnitude of Visual Effect including Cumulative Effects: Low to Negligible

4.144 The Proposed Development would be readily noticeable but contiguous with, and of a similar scale and form as, the existing Keady cluster of wind farms when seen from

Viewpoint 7. It would not change the overall nature of the view which is already characterised by a large cluster of wind farms in the foreground landscape. The nature of effects would therefore be of Low magnitude. From Viewpoint 8 the Proposed Development would be partially visible and would not increase the overall extent of turbines. The increased density of turbines would be confined to a small section of the view and is unlikely to be noticeable to the general observer, particularly in transitory views. Therefore, the magnitude of visual effect is therefore deemed to be Negligible.

Significance of Visual Effect: Not Significant

4.145 In both Category A2 viewpoints the sensitivity of visual receptors is Low and the magnitude of effects ranges from Low to Negligible. The Proposed Development would not affect the overall quality of the view from Viewpoint 7 or impinge on the most scenic parts of the view which are located in the wider landscape to the west. The Proposed Development would not be an easily discernible feature of Viewpoint 8.

A3: Views from Scenic Driving Routes

Description of Existing View and Predicted Views

4.146 Category A3 includes Viewpoints 9 - 11 which are illustrated in Figures 4.17 - 4.19. Viewpoint 9 is located on the lower part of the scenic drive on Bishop's Road approximately 4.19 km to the north west of the Proposed Development. There are no views of the summit or sea from this location but there are very attractive and panoramic south-westward facing views encompassing the rest of the Binevenagh range of hills, the northern-facing edge of the Sperrin Mountains, the Loughermore Hills and the Roe Valley. There are a number of rural properties located along this road, and elsewhere in the foreground landscape, which are generally orientated to take advantage of these aforementioned views. The foreground comprises of pastoral fields defined by clumps of trees and hedgerows. It is reasonably attractive despite not being in optimum condition - many of the hedgerows are in decline and field are often rush-infested. The lower slopes of Binevenagh and Keady Mountain to the north and north east are covered by large swathes of coniferous forestry and rougher grazing land, as are most other uplands visible from this viewpoint. There is also a prominent quarry site on the west-facing side of Keady Mountain, which is visible in profile from this viewpoint. There is a smaller quarry with a consented single turbine within Springwell Forest located behind turbine 1 in the Proposed Development and between the consented elements of the Keady cluster.

4.147 There are also clusters of turbines in several parts of this view which are all of a similar size in terms of the number of turbines. Twenty four of the 34 existing and consented Keady cluster turbines are visible in the eastern (left-hand) section of Viewpoint 10 above a ribbon of houses on the Stradreagh Road. The remaining turbines are partially screened by this and by the lower slopes of Binevenagh. The Proposed Development would be located at a similar distance from this viewpoint as

the rest of the Keady cluster in the current gap between the two consented wind farms. The existing cluster of wind farms on the Loughermore Hills is visible at a distance of approximately 16 km. A consented wind farm at Ballyhanedin would be located to the left of this cluster at a distance of approximately 21.7 km but would appear to be contiguous from this direction and distance. Together these wind farms would form a cluster of 57 turbines. An existing wind farm at Evishagaran (14 turbines) would be visible at a distance of approximately 14 km on the east side of Benbradagh Mountain which forms one of the several distinctive ridgelines in the Binevenagh range of uplands.

4.148 The Keady cluster of wind farms, including the Proposed Development, quickly becomes less visible when travelling north on Bishops Road towards the summit of Binevenagh but becomes more visible when descending this road towards Limavady. Due to its location between Dunbeg Extension and Dunbeg South, the Proposed Development would have the effect of linking these two consented developments thus creating a more coherent layout to Keady cluster overall without being a prominent feature in its own right. It would also not impinge upon the most attractive parts of this viewpoint which are the wider views along the rest of the Binevenagh uplands and to the south west.

4.149 Viewpoints 10 and 11 represent views and visual receptors located on scenic driving routes and near visitor amenities in the lowlands to the west of the Proposed Development. Views from this part of the Study Area also show the Proposed Development in relation to the summit of Binevenagh and the spine of uplands that run through the centre of the AONB.

4.150 Viewpoint 10 is located approximately 9.52 km from the Proposed Development on a tertiary road junction. It would not be a usual place to stop and appreciate a static view, but it does provide an indication of the types of views that would be obtained when travelling to and from the Roe Valley Country Park and along the National Cycle Network. The foreground comprises of a richly vegetated flat pastoral landscape with rural dwellings throughout. It is relatively extensive in scale and is framed to the east and west by long ranges of uplands. East-facing views from the valley are framed by a long crescent-shaped arc of hills stretching from north to south and including Binevenagh, Keady, Rigged Hill, Donald's Hill and Benbradagh which merge with the Glenshane slopes and the Sperrins in the south west. Views in a westerly direction are framed by the Inishowen uplands in Co. Donegal. Views are frequently screened or filtered by the low-lying nature of the topography in the foreground combined with high levels of trees and hedgerows particularly along the tertiary road network. The framing of views by upland areas is a key characteristic of the Roe Valley but individual features on these uplands have less prominence that the overall extent and profile of these hills.

4.151 The Keady cluster of wind farms is located between the summits of Binevenagh and Keady and the consented Dunbeg South wind farm would appear would be partially visible beyond the summit of Keady which serves to screen most of the turbines. A group of 2 single turbines are visible on the lower slopes of Rigged Hill to the right

hand side of the view, and the existing Rigged Hill wind farm is a prominent and longstanding skyline feature located slightly to the south of these (the consented Rigged Hill Re-Power wind farm is visible on the skyline illustrated by the wireline in Figure 4.18 but the existing turbines are beyond the angle of view included in this Figure). The blade tips of turbines 1 and 4 would, in theory, be visible from this location but, in practice, would be indiscernible whether considered as a standalone development or in conjunction with the consented turbine which would be located in front of it.

4.152 Viewpoint 11 is located on the primary road network – the A2 – which forms part of the Causeway Coast scenic driving route between Limavady and Magilligan approximately 8.30 km to the east of the Proposed Development. The foreground is similar to that of Viewpoint 10, but with a more open and geometric character than the Roe Valley and there are denser clusters of houses along the primary road network and the outskirts of Limavady. Traffic on this road tends to be fast-moving and there are few formal stopping places. Viewpoint 11 represents the types of glimpsed views that may be obtained when looking from the side windows of cars travelling along the A2 and also the views of residents in dwellings located along the road corridor. The Proposed Development would appear in between the existing and consented elements of the Keady cluster above the foreground houses in the centre of the view illustrated in Figure 4.19. It would not be a prominent addition to the view, but it would serve to connect the two sides of the Keady cluster, thus creating a more coherent layout overall. From Viewpoint 11, as with Viewpoint 10, there are also extensive views to the Inishowen uplands which the Proposed Development would have no effect on.

Sensitivity of Visual Receptors: High to Low

4.153 The key visual receptors in and around Viewpoint 9 will be tourists on the scenic driving route and residents of rural properties. Both are regarded as highly sensitive and will experience clear views of the Proposed Development. Visitors may well stop to appreciate the panoramic south-westerly views from this section of the scenic drive and residents will experience static views in the same direction.

4.154 In both viewpoints 10 and 11 there would be a range of visual receptors including general road users and agricultural workers who are considered to be of low sensitivity, but also road users of higher sensitivity due to their presence on scenic driving routes. Residents of rural properties present in and around Viewpoint 10 would be of high sensitivity. Residents in and around Viewpoint 11 would be of medium sensitivity where they are in closer proximity to an urban settlement and busy road corridor.

Magnitude of Visual Effect including Cumulative Effects: Low to Negligible

4.155 The Proposed Development would be a visible but not prominent feature despite being located in relatively close proximity to Viewpoint 9, especially when considered alongside the consented elements of the Keady cluster. It would not increase the

duration for which wind farms would be visible when travelling along Bishops Road to and from the summit of Binevenagh nor would it increase the lateral extent of turbines across this section of the Binevenagh uplands. Furthermore, it would not introduce a completely new element to the view, nor would it change the overall character of this section of the foreground which already contains a large cluster of existing and consented wind farms. The wider landscape is highly attractive due to the panoramic nature of views and the crescent-shaped arc of Binevenagh uplands that frame more distant views towards the Sperrins, and across the pastoral Roe Valley landscape towards the Loughermore Hills. Large clusters of wind farms are already characteristic features in parts of this view and do not detract from its overall scenic qualities. The Proposed Development would have a similar simple turbine layout to the adjacent Keady cluster and would remain detached from the west-facing edge of Keady Mountain which forms the setting and frame for the extensive panoramic views that are available across the rest of the view. For these reasons there is deemed to be a Low magnitude of effect on Viewpoint 9.

4.156 From Viewpoint 10 the Proposed Development would be effectively screened by the summit of Keady Mountain and the overall magnitude of effect is Negligible. From Viewpoint 11 the Proposed Development would be visible in between the two halves of the Keady cluster and in the context of a foreground landscape that is more heavily influenced by suburban housing development and the primary road network. It does not interfere with the appreciation of Binevenagh, and in particular the north-facing escarpment overlooking the Magilligan lowlands which are the core feature of the AONB. The overall magnitude of effect on Viewpoint 11 is Low.

Significance of Visual Effect: Not Significant

4.157 Residents along the lower sections of Bishops Road, represented by Viewpoint 9, are considered to be highly sensitive and there would be a significant effect on one part of static views obtained by these receptors. However, the magnitude of effect is low due to the existing character of the part of the landscape within which the Proposed Development would be located and its relationship with the consented wind farms in the Keady cluster. The effects on the whole view obtained from this viewpoint are not deemed to be significant.

4.158 There are a range of visual receptors present in viewpoints 10 and 11 and most are not highly sensitive. Those of the highest sensitivity are also likely to experience transitory views from parts of the tertiary road network where there are few natural stopping places, or from a lowland pastoral landscape where views are often filtered be high levels of vegetation cover. From both viewpoints the Proposed Development would form a small part of more extensive views in several directions. Its close proximity to the existing Keady cluster of wind farms would mean that it would not change the overall character of the parts of either viewpoint which are already characterised by this cluster of wind farms, and nor would it be clearly visible from Viewpoint 10, nor easily discernible as a standalone development from Viewpoint 11. The overall effects on both viewpoints are also deemed to be Not Significant.

Category B: Views from residential properties and rural settlement within approximately 5 km of the Proposed Development

Description of Existing View and Predicted Views

4.159 Category B includes Viewpoints 12 - 15 which are illustrated in Figures 4.20 – 4.23 and which have been selected to represent views from roads with residential properties and settlement clusters in the rural landscape around the Proposed Development. With the exception of Viewpoint 12, the Keady cluster of wind farms is already a prominent or characteristic feature of these views, and, in Viewpoint 12, the consented elements of the cluster would become prominent. However, these views are also typically wider in their extent, encompassing views towards the southern side slopes of Binevenagh, pastoral lowlands in the Roe Valley (Viewpoint 15 is located in this area), and also longer-range views in a north-westerly direction towards Inishowen and Lough Foyle. Many properties are orientated to take advantage of these more extensive scenic parts of the view rather than being orientated towards the Proposed Development or the existing Keady cluster which are located on higher ground in the opposite direction to the most scenic parts of the view.

4.160 The foreground landscape in all these viewpoints has an agricultural character with medium sized fields divided by hedgerows and fences. Viewpoint 12 on the section on Bolea Road close to the site (it is located approximately 2.80 km to the west) has small-scale fields, a high level of tree cover and a narrow road corridor from which views are often constrained. Adjacent properties along this part of the Bolea Road often have more elevated and open aspects but are also usually orientated to take advantage of views to the north-west. Views from properties further along the Bolea Road to the north east of Viewpoint 12 are likely to gain clearer views of the Keady cluster whilst properties located at the bottom of Bolea Road are unlikely to obtain clear views in this direction.

4.161 In Viewpoints 13 and 14 tree cover tends to be concentrated around properties and farmsteads rather than between fields and often serves to screen or filter views from these properties. Viewpoint 15, which is located near the edge of Limavady town approximately 6.09 km to the south west of the Proposed Development, is in a flatter valley landscape with higher levels of tree cover generally which provides only glimpsed views in the direction of the Proposed Development which is, itself, largely screened from view by the intervening side slope of Keady Mountain.

4.162 In addition to clear views of the Keady cluster of wind farms, Viewpoints 13 and 14 would also have views of the Loughermore cluster of wind farms to the south west and distant views to wind farms on Inishowen in clear weather conditions. However, neither cluster are prominent features of views from this location. The quarry on the west-facing slope of Keady is a close range and prominent feature in both of these views as is traffic moving along the A37 road corridor at the base of the mountain. Therefore, whilst these are rural locations within the AONB, neither are particularly remote nor free of visually detractive features.

4.163 The existing elements of the Keady cluster are not easily discernible from Viewpoint 12 – all but some blade tips are screened from view by woodland surrounding the Curly River which is located at the end of the road corridor illustrated in Figure 4.20. In this viewpoint the consented Dunbeg South wind farm would become the most dominant feature in this direction because the slope of Keady Mountain on which it is located is the main feature in east-facing views from this location. The Proposed Development would be located at the lower end of the slope and would become a visible but less prominent addition to the consented turbines.

4.164 The Proposed Development would be located similarly in Viewpoints 13 and 14 but, in these viewpoints, the existing wind farms are more clearly visible, and the Proposed Development would infill the space on the lower Keady slopes between the existing and consented elements of the Keady cluster thus creating a more coherent layout to the Keady cluster overall without being a prominent feature in its own right. It would not encroach on the summit or western-facing profile of Keady Mountain which is prominent in wider views of the Binevenagh uplands from elsewhere in the Study Area.

4.165 In Viewpoint 15 the Proposed Development would be only partially visible beyond the side slope of Keady. The hub and blades of turbine 4 would be visible and the blades of turbine 1 partially visible although largely screened by one of the consented Dunbeg South turbines which would be located in front. It would not be an easily discernible feature in its own right and particularly not when viewed in conjunction with consented elements of the Keady cluster. Furthermore, there are few locations in this part of the Study Area that offer similar views in safe stopping places along the road network and views tend to be focussed towards the north and west rather than in the direction of the Proposed Development.

Sensitivity of Visual Receptors: High to Medium

4.166 Receptors from all these viewpoints are likely to include residents of rural properties, associated road users and agricultural workers. Whilst the latter are considered to be of low sensitivity, residents are considered to be of high sensitivity. In proximity to Viewpoint 15, which is located at a cricket club, but which also represents the other receptor groups mentioned above, sensitivity would be lower because views towards the Proposed Development are more constrained and do not tend to be the main point of focus. Overall, receptors around Viewpoint 15 are deemed to be of medium sensitivity.

Magnitude of Visual Effect including Cumulative Effects: Low to Negligible

4.167 There would be a Low magnitude of effect from Viewpoints 12, 13 and 14 where the Proposed Development would occupy a small proportion of the overall view in between other wind farms in the Keady cluster, which is already a characteristic feature of views. From Viewpoints 13 and 14 in particular there are more extensive views in other directions. The Proposed Development would not alter the overall nature of these views, but it would serve to create a more coherent layout to the Keady cluster as a whole. There is limited visibility of the Proposed Development

from Viewpoint 15 which also features much wider and clearer views in several other directions. Therefore, the magnitude of visual effect on Viewpoint 15 is Negligible.

Significance of Visual Effect: Not Significant

4.168 Visual receptors are considered to be highly sensitive in Viewpoints 12, 13 and 14 but the magnitude of effects is low. The Proposed Development would not be a dominant feature in these views that are already characterised by a cluster of wind farms. Receptors would experience views of the Proposed Development in close proximity to existing and consented wind farms and as part of a more extensive view which, in other parts, does not include and is not influenced by close range views of the Proposed Development. The effects on Viewpoint 15 are also considered to be Not Significant because the Proposed Development would only be partially visible by receptors that are generally of lesser sensitivity (medium) and in the context of more extensive and far-reaching views in most other directions. The Proposed Development would not be a clearly visible element of views in and around this location.

Category C: Views from residential properties and settlements within 5 - 15 km of the Proposed Development

Description of Existing View and Predicted Views

4.169 Category C includes Viewpoints 16 and 17 which are illustrated in Figures 4.24 and 4.25. They represent views from rural properties and areas of settlement within the countryside at a greater distance from the Proposed Development than Category B viewpoints.

4.170 Viewpoint 16 is located at a tertiary road junction with the A2 which is part of the Causeway Coast scenic drive approximately 8.34 km to the south west of the Proposed Development. There are a number of rural properties orientated in the general direction of the Proposed Development in order to take advantage of the attractive panoramic views formed by the Binevenagh uplands although views from most parts of the road corridor are limited by roadside vegetation and the lack of any hard shoulder or laybys where one may stop to appreciate views into the wider landscape. The uplands frame views across the flatter lowlands in the foreground which feature extensive pastoral land, high levels of tree cover but also industrial buildings at the edge of Limavady. The latter is a prominent feature in the middle portion of the view, which is illustrated in Figure 4.24, and which appears directly below the site of the consented Dunbeg South wind farm. The majority of the Keady cluster is clearly visible almost in its entirety to the left/ north of the Proposed Development and the consented Dunbeg South wind farm and single turbine would be visible on the higher side slope of Keady Mountain to the right/ south. The northern end of the cluster extends beyond / behind the side slopes of Binevenagh whilst Dunbeg South extends along the side slope of Keady Mountain. Both are contained by higher ground to the north and south which limits their effects on the wider landscape and in particular the profile of the Binevenagh uplands. The Proposed Development would be clearly

visible on the lower slopes in between the existing and consented wind farms in the middle distance and would appear as a contiguous extension connecting the northern and southern sides of the cluster. There are other wind farms visible on higher sections of these uplands including the existing Rigged Hill and consented Re-Power wind farms and some consented turbines in the Garvagh cluster.

4.171 Viewpoint 17 is located at the edge of Drumsurn village approximately 8.91 km to the south-west of the Proposed Development. Drumsurn is a small village which backs onto part of the Binevenagh range of uplands below Rigged Hill and Donald's Hill and the wider north- south part of this view is framed by other sections of the same uplands. The foreground and middle distance of most other parts of views from Drumsurn are occupied by extensive lowland farmland, as shown in Figure 4.25. There are also distant views towards Inishowen which are beyond the angle of view illustrated by this Figure but lowland landscape features such as field, hedgerows and belts of broadleaved woodland are the most prominent features in this part of the Study Area. This viewpoint is overlooked by Rigged Hill wind farm which is a longstanding and distinctive landscape characteristic. The Re-Power scheme for this wind farm will be substantially more prominent because the turbines will increase from 56.5m to 137 m tip heights with rotors of 37 m diameter increasing to 120 m. There are no other wind farms prominent in this view but there are two single turbines on the horizon equidistant between Rigged Hill and the Proposed Development. They may be more noticeable due to their faster blade rotation but will be partially screened by woodland in the foreground. The consented Dunbeg South turbines and single turbine 2 are partially visible above the skyline from this location but the rest of the Keady cluster of wind farms is not visible from this location. The blade tips of proposed turbines 2 and 3 are theoretically visible from this location but, in practice, they would be screened by forestry on the profile of Keady Mountain.

Sensitivity of Visual Receptors: Medium

4.172 Receptors at Viewpoint 16 are deemed to be of medium sensitivity because, although residential properties are more likely to be orientated in the general direction of the Proposed Development, their views are already characterised by other wind farms, including the adjacent Keady cluster, and by industrial development which will be viewed in the foreground of any views towards the Proposed Development. Road users will be on a scenic driving route and will experience transitory views whilst moving at speed in a different direction to the Proposed Development and views from many other parts of the road corridor will be screened by roadside vegetation.

4.173 Receptors at Viewpoint 17 comprise of road users on the tertiary road network and residents of the village. They are deemed to be of medium sensitivity to the Proposed Development in question because the Proposed Development would only be partially visible and would not be located within the main portion of the view.

Magnitude of Visual Effect including Cumulative Effects: Low to Negligible

4.174 Viewpoint 16 is deemed to experience a Low magnitude of visual effect because the Proposed Development would be visible as an integral part of the Keady cluster but would not change the overall nature of the view, which already features several wind farms, industrial development and a busy road corridor. Furthermore, many views along this section of road are effectively screened by roadside vegetation, thereby preventing the type of clear views that are represented by this viewpoint. Viewpoint 17 is deemed to experience a Negligible magnitude of visual effect because views are orientated in a different direction and the Proposed Development would not be a discernible feature.

Significance of Visual Effect including Cumulative Effects: Not Significant

Category D: Views illustrating the wider landscape setting and visibility of the Proposed Development in the context of the Keady cluster of wind farms

Description of Existing View and Predicted Views

4.175 Category D includes Viewpoints 18 - 20 which are illustrated in Figures 4.26 – 4.28. Viewpoint 18 is located adjacent to Dunmore Wind Farm approximately 2.10 km from the Proposed Development. It has been selected to represent the appearance of the Proposed Development from an elevated viewpoint within the saddle of land between Keady and Binevenagh mountains where there are outward views from the AONB into the wider landscape and including the foreground character that is created by the existing Keady cluster. The other viewpoints that are included in this category have been selected to illustrate views towards this same area where the Proposed Developments relationship with the Keady cluster, the summits of Keady and Binevenagh and the fuller range of Binevenagh uplands within the context of the wider Study Area can be appreciated.

4.176 Viewpoint 18 is dominated by the existing Dunmore and Dunbeg wind farms which are located on rough grazing land in the foreground and against the backdrop of rising land formed by Keady Mountain and Springwell Forest. The consented Dunbeg Extension and Dunbeg South wind farms would be visible beyond this and would cover much of the visible side slope of Keady Mountain when viewed from this location. From this elevated location there are also extensive panoramic views across the western part of the Study Area stretching from the southern edge of the Binevenagh uplands (which can be seen to the right-hand side of Keady Mountain) across the Roe valley towards the Loughermore hills (which are located to the right of centre in the angle of view illustrate in Figure 4.26) and across to Derry and Donegal in the north west (not included within the angle of view illustrated by Figure 4.26). The existing cluster of wind farms at Loughermore is clearly visible on the summit of Loughermore and the consented Ballyhanedin wind farm would be visible to the left-hand side of this. There may also be visibility of other wind farms in Co. Donegal in clear weather conditions. Views in other directions from this location are contained to the foreground by rising land and forestry immediately behind Viewpoint 18.

4.177 The Proposed Development would be visible within the centre of the Keady cluster. It would marginally increase the density of turbines in the centre of the cluster because three of the four proposed turbines would appear in front or behind already consented turbines. However, this visual effect would change as one travels along the road corridor and the angle of view alters. The Proposed Development would not extend the visibility of turbines beyond the confines of the established Keady cluster. Nor would it impinge upon views into the wider Study Area which includes parts of the Roe Valley and Loughermore Hills. The existing Dunmore turbines would remain the most dominant visual feature because they are at such close range to this viewpoint.

4.178 Viewpoint 19 is located in the Magilligan floodplain which is located to the north of the summit of Binevenagh summit. The contrast between these two areas is one of the key features of the AONB. The foreground is characterised by very flat, exposed and intensively managed farmland interspersed with rural dwellings, farmsteads and shelterbelts of trees. The Binevenagh range of uplands forms a broad profile of hills that stretches from north to south across the view and which frame the lowlands. In the opposite direction, there is a similarly flat foreground created by the sea in Lough Foyle framed in a similar manner by the mountains in Inishowen. Because of the expansive nature of the foreground and the distance to both sets of uplands the latter appear low on the horizon and are visually subordinate to the foreground landscape.

4.179 The skyline of Binevenagh Mountain including its summit and side slope is generally clear of vertical man-made elements with the exception of large forestry plantations. The rest of the uplands are punctuated by existing and consented wind farm developments separated by areas of undeveloped skyline and other large areas of forestry. The Keady cluster of wind farms is located in the saddle of land between Keady and Binevenagh, some distance from the escarpment at its northern end. The Proposed Development would be located in the centre of this cluster connecting the northern and southern parts of the cluster, thus creating a more coherent layout overall. At the southern base of Keady there are two single turbines, and beyond this there is a prominently located wind farm on the Rigged Hill plateau (right-hand side of the view illustrated in Figure 4.27). There will also be partial views of other existing and consented wind farms in the Garvagh cluster to the far right of Rigged Hill.

4.180 Viewpoint 20 is located 15.26 km to the south of the Proposed Development on the B64 road corridor on the outskirts of Dungiven town. It has been shortlisted as a viewpoint in this LVIA to represent long range views from the edge of the Sperrin AONB in the southern part of the Study Area. It has been used as an alternative to a viewpoint on the Ulster Way on Benbradagh Mountain which was used in the consented Dunbeg South LVIA because it is more representative of typical views from this part of the Study Area. The foreground landscape is pastoral in nature with a complex mix of elements including fields, rural properties, farmstead, hedgerows and shelter belts. The broad arc of the Binevenagh uplands stretching between Binevenagh Mountain in the far north and Benbradagh in the south physically enclose

the foreground landscape. There are two single turbines prominently located in the foreground against the upland backdrop of Keady Mountain in the centre of this view. The upper parts of the consented Dunbeg South wind farm would protrude partially above this part of the skyline but would not be easily discernible at this distance and in the context of the complexity of the foreground landscape. There are also existing and consented wind farms that are more visible at closer range to this viewpoint on other parts of the skyline including Rigged Hill Re-Power, Craiggore and Smulgedon. The Proposed Development would be barely discernible to the right-hand side of Dunbeg South. Only the blade tips of t2 are likely to be discernible from this location but not easily and, from other locations in proximity to this viewpoint this visibility is likely to be frequently screened by intervening landcover elements as well as the topography of Keady Mountain.

Sensitivity of Visual Receptors: Low - High

4.181 Receptors at Viewpoint 18 are deemed to be of Low sensitivity because they are likely to comprise mostly of general road users, farmers and wind farm personnel in close proximity to existing wind farms in the Keady cluster and their views are already dominated by these turbines. Receptors at Viewpoint 19 are deemed to be of High Sensitivity because they are likely to be present at this location for outdoor recreation or appreciation of the scenery. Receptors at Viewpoint 20 are deemed to be primarily of medium sensitivity due to their location within a complex landscape which includes a range of manmade influences and a number of other wind farms which form more prominent visual features at closer range than the Proposed Development.

Magnitude of Visual Effect: Negligible to Low

4.182 The magnitude of effect on Viewpoint 18 is deemed to be Low because this view is already dominated by the existing turbines and would be further influenced by the consented elements of the Keady cluster. The Proposed Development would be positioned within the centre of this cluster and would have very little effect on the character or quality of this view, but it would be clearly visible because it is located at relatively close range to this viewpoint.

4.183 The magnitude of effect on Viewpoint 19 is deemed to be Negligible because there are already wind farms located along the profile of these hills and, whilst the Proposed Development will reinforce this characteristic it would serve to link the northern and southern parts of the Keady cluster without increasing the overall extent of the cluster. The magnitude of visual effect on Viewpoint 20 is also deemed to be Negligible because it would be barely visible above the skyline.

Significance of Visual Effect: Not Significant

4.184 There would be no significant effects on any of these viewpoints because in all instances the Proposed Development would not alter the existing character of these views. In respect of Viewpoint 18 visual receptors are of Low sensitivity, the foreground is already dominated by the Keady cluster, and the wider landscape also

features clusters of wind farms on upland areas. The latter is also the case for the other viewpoints. In Viewpoint 20 the Proposed Development would be barely discernible.

Table 4.2: Summary of Visual Effects on Viewpoints

Viewpoint		Approx. distance to nearest turbine (km)	Visual Prominence	Sensitivity of key visual receptors	Magnitude of visual effect including cumulative effects	Significance of visual effect including cumulative effects
A: Visibility from primary and secondary transport routes, including tourist areas						
A1: Views from the A37 road corridor between Coleraine and Limavady:						
1	A37 near Macosquin Figure 4.9	6.93 km	Not clearly visible	Low	Negligible	Not Significant
2	A37 parking layby near Dunbeg wind farm Figure 4.10	0.60 km	Prominent	Medium	Medium	Not Significant
3	A37 near Dunbeg, Broad Road upper Figure 4.11	1.14 km	Visible	Medium	Medium	Not Significant
4	Keady Mountain near A37 Figure 4.12	2.17 km	Visible	Medium	Negligible	Not Significant
5	Gortgarn Road near junction with A37, Broad Road middle Figure 4.13	4.05 km	Not clearly visible	Medium	Negligible	Not Significant
6	Parking layby on A37, Broad Road lower near B66 junction Figure 4.14	5.09 km	Not clearly visible	Medium	Negligible	Not Significant
A2: Views from the secondary B201 road corridor between Coleraine and Limavady						
7	Windyhill Rd West Figure 4.15	2.20 km	Visible	Low	Low	Not Significant
8	Ballinarees Orange Hall, Windy Hill Road Figure 4.16	5.57 km	Visible	Low	Negligible	Not Significant
A3: Views from Scenic Driving Routes						
9	Binevenagh Scenic Drive near Lisnagrib Figure 4.17	4.19 km	Visible	High	Low	Not Significant
10	Dogleap Road, Roe Valley Country Park environs	9.52 km	Not visible	High	Negligible	Not Significant

Viewpoint		Approx. distance to nearest turbine (km)	Visual Prominence	Sensitivity of key visual receptors	Magnitude of visual effect including cumulative effects	Significance of visual effect including cumulative effects
	Figure 4.18					
11	A2 Scenic Route near Seacoast Road Garden Centre Figure 4.19	8.30 km	Visible	Medium	Low	Not Significant
B: Views from residential properties and rural settlement within approximately 5 km of the Proposed Development						
12	Bolea Road middle Figure 4.20	2.80 km	Visible	High	Low	Not Significant
13	Drumalief Road off B201 Figure 4.21	3.52 km	Visible	High	Low	Not Significant
14	Bolea Road near Deramore Presbyterian Church Figure 4.22	3.79 km	Visible	High	Low	Not Significant
15	Drummond Cricket Club, Drumsurn Road Figure 4.23	6.09 km	Not clearly visible	Medium	Negligible	Not Significant
C: Views from residential properties and settlements within 5 km - 15 km of the Proposed Development						
16	Seacoast Rd near Ballykelly Figure 4.24	8.34 km	Visible	Medium	Low	Not Significant
17	Drumsurn Village at Fir Avenue Figure 4.25	8.91 km	Not clearly visible	Medium	Negligible	Not Significant
D: Views illustrating the Proposed Development within the wider landscape setting and in the context of the Keady cluster of existing, consented and proposed wind farms						
18	Bolea Road upper near Dunmore site entrance Figure 4.26	2.10 km	Visible	Low	Low	Not Significant
19	Bank bird hide and railway crossing near Ballykelly Figure 4.27	13.30 km	Visible	High	Negligible	Not Significant
20	Outskirts of Dungiven Figure 4.287	15.26 km	Not clearly visible	Medium	Negligible	Not Significant

The Cumulative Baseline and Analysis of Effects

4.185 The Cumulative Baseline refers to all existing, consented and proposed wind farms within the 30 km Study Area and any existing and consented wind farms beyond this distance that are visible within the final viewpoint selection. There are a total of 32 wind farms considered to be part of the Cumulative Baseline for this LVIA, of which 21 are existing, 9 are consented and 3 are proposed. Any single turbines within 5 km of the Proposed Development that are either existing or subject to a valid planning consent (i.e. within the past five years) and where they are of a comparable size to commercial wind turbines (with an overall minimum blade tip height of 50 m) are also indicated on the wirelines for the final Viewpoints (Figures 4.9 – 4.28). There are two such turbines, the details of which are listed in Tables 4.5.1 below together with full details of all wind farms that have been considered. Other single turbines may be visible in the baseline photography where they are existing elements within views. Full details of all wind farms and single turbines included in the Cumulative Baseline are provided in Technical Appendix 4.5.

4.186 In many instances other wind farms in the cumulative baseline are located in visually and / or physically distinct clusters. This often reflects landscapes, ground conditions and wind speeds that are favourable for wind energy development and also a general principle that is implemented by planning authorities to consolidate and group new and established developments together as a means to achieve sustainable development and mitigate potential adverse cumulative effects on scenic landscapes which can result from a sporadic approach to siting new developments (see the Council's Discussion Paper 4: Landscape Character referenced in footnote to paragraph 4.87). This LVIA has grouped and named clusters of wind farms within the Study Area for ease of reference and because it allows for a better understanding of their interrelationships. These clusters are referred to in Table 4.3 and illustrated in Figure 4.5.

Table 4.3: Summary of Cumulative Baseline

Name of Cluster	Included wind farms	No. of Existing and Consented Turbines in cluster
Keady cluster	Dunbeg, Dunmore, Dunbeg Extension, Dunbeg South, Single Turbine 3 ** The Proposed Development would be located in this cluster which would create a cluster of 38 turbines*	34*
Central Binevenagh Cluster	Craiggore, Rigged Hill, Rigged Hill Re-Power, Single Turbine 2, Smulgedon ***There would be 28 turbines reducing to 25 when Rigged Hill is replaced by the Re-Powering scheme.*	28**

Name of Cluster	Included wind farms	No. of Existing and Consented Turbines in cluster
Carntogher Cluster	Brishey (proposed), Brockaghboy, Brockaghboy Extension, Corlacky Hill, Evishagaran	44
Inishowen Cluster	Aught, Crockahenny, Flaughland, Glackmore I & II, Three Trees	33
Long Mountain Cluster	Garves, Glenbuck I & II, Long Mountain	21
Loughermore Cluster	Altahullion I & II, Barr Cregg, Glenconway, Glenconway II, Monnaboy	60
Wind Farms not in a cluster	Ballyhanedin, Cam Burn, Cam Burn Tip Increase (proposed), Cloonty, Magheramore (proposed)	18

Cumulative Landscape Effects

4.187 The primary cumulative landscape effects of the Proposed Development would occur in LCA 36, Binevenagh, which is also located within the Binevenagh AONB. The key characteristics of the AONB, which have already been analysed in detail, are the juxtaposition between the prominent escarpment at the northern end of Binevenagh Mountain overlooking the flat Magilligan lowlands. The Proposed Development is physically detached from this part of the AONB and is positioned in a lower-lying saddle of land between the southern side of the base of Binevenagh Mountain and Keady Mountain. The landscape character of this part of the Binevenagh AONB is already dominated by manmade influences in terms of land uses such as forestry, quarrying, wind energy, telecommunications masts and extensive rough grazing land. Given its location within this type of landscape and its close relationship with the surrounding wind farms in the Keady cluster the Proposed Development is not judged to cause a significant change to the condition or quality of the physical landscape character either within the AONB or LCA 36.

4.188 The Study Area comprises of a series of broad upland ranges of hills which are separated from each other by lowland landscapes which are often pastoral in character and well-vegetated. Clusters of wind farms located on these upland areas are a relatively common landscape characteristic of the whole Study Area (Figure 4.4) but there are sufficient separation distances between these clusters to ensure they are not the dominant characteristic. This is in accordance with general advice provided in the SPG that elevated upland landscapes can accommodate larger turbines and the broader the upland the greater the capacity. Larger horizons tend to diminish the perception of height. In this Study Area the fact that many viewpoints are elevated in nature means that very broad panoramic views occur frequently and, from certain directions / in certain viewpoints, often incorporate both simultaneous and sequential views of several clusters of wind farms. The Proposed Development

would be located within the Keady cluster rather than on an outer edge and would therefore, neither increase the lateral extent of the cluster or its separation distances with other clusters of wind farms in the Study Area. Neither would it encroach onto elements of the landscape that are not already characterised by wind farm development or other man-made features.

Cumulative Visual Effects

4.189 ZTV diagrams for the Cumulative Baseline are illustrated by the following figures. All ZTVs are calculated using theoretical blade tip visibility in order to consider the highest possible levels of visibility and cover a radius of 30 km from the centre of the Proposed Development unless otherwise stated. Refer to the LVIA methodology in Technical Appendix 4.2 for further details.

4.190 Figure 4.8, page 1/3 shows the cumulative ZTV with the Keady cluster of wind farms which includes the existing Dunbeg and Dunmore wind farms, two consented wind farms including the 3-turbine Dunbeg extension and the 9-turbine Dunbeg South wind farms as well as a smaller single turbine located near the quarry on Keady Mountain. The Proposed Development would be located in the centre of this cluster and the ZTV diagram illustrates how this location serves to limit any additional visibility. The Proposed Development would be theoretically visible alongside other turbines in the Keady cluster across 56.17% of the Study Area but would create additional visibility across only 0.04% of the 30km Study Area. These latter areas are virtually indiscernible on the ZTV diagram. There is 6.57% of the Study Are where other wind farms in the cluster would be visible but the Proposed Development would not These primarily include parts of the seascape to the north and the Inishowen coastline and uplands, parts of the Roe Valley to the north east of Limavady and lower hill slopes directly to the south east (although visibility from here is, in reality, likely to be screened by forestry). Theoretical visibility of the Keady cluster is also shown to extend into some parts of the Sperrin AONB. However, Viewpoint 20 clearly illustrates that this would be very limited, and the Proposed Development would be a barely discernible feature from this part of the Study Area (refer to Figure 4.28). The rest of the Keady cluster is theoretically visible across 62.74% of the Study Area in total.

4.191 Figure 4.8, page 2/3 shows the cumulative ZTV for the Proposed Development in conjunction with all existing and consented wind farms in the Cumulative Baseline (see Technical Appendix 4.5). It clearly illustrates the conclusion that has already been made in relation to cumulative landscape effects – that clusters of wind farms are a characteristic feature on uplands in all parts of the Study Area. Existing and consented wind farms are already theoretically visible across 93.86% of the Study Area and there would be no parts of the Study Area (0%) where the Proposed Development would increase overall theoretical visibility.

4.192 Figure 4.8, page 3/3 shows the cumulative ZTV for the Proposed Development in conjunction with other proposed wind farms in the Cumulative Baseline, of which there are 3 (see Technical Appendix 4.5). Cam Burn Tip Increase is the nearest,

located approximately 8 km to the south east. It would comprise 4 turbines and replace the consented Cam Burn wind farm if it were to be consented but would be screened from views in conjunction with the Proposed Development by intervening uplands and areas of forestry. Brishey wind farm is located on the western side of Benbradagh in proximity to Viewpoint 20, approximately 15 km to the south. Magheramore is a 6-turbine wind farm located approximately 22 km to the south. This ZTV indicates that the Proposed Development would be visible across 54.19% of the Study Area where there is already visibility of other proposed wind farms. However, none of the 20 representative viewpoints show simultaneous visibility because the separation distances between these other wind farms and the Proposed Development are relatively wide. There may be some instances where viewers could experience views of the Proposed Development in one direction and another proposed wind farm in a different direction, but detailed site analysis suggests that this is unlikely except for Brishey wind farm which, if consented, would be viewed as part of the Carntogher cluster, and also in sequence with the Garvagh cluster. There would be theoretical visibility of the Proposed Development in only 2.02%of the Study Area where there would not be theoretical visibility of another proposed wind farm, but these areas correlate with parts of the Study Area where there would already be visibility of the Keady cluster.

Table 4.4: The Proposed Development's Cumulative Zone of Theoretical Visibility

ZTV Diagram	No. of turbines theoretically visible (blade tip)	% of Study Area with visibility		
Cumulative ZTV: Keady cluster (30 km radius, blade tip) Figure 4.8 (page 1/3)	0 turbines visible	37.22 %		
	Visibility of Keady cluster where there is no visibility of the Proposed Development	6.57 %	Total % of Study Area where other wind farms in the Keady cluster are theoretically visible = 62.74 %	
	Visibility of the Proposed Development together with the Keady cluster	56.17 %		Total % of Study Area where the Proposed Development is theoretically visible = 56.21 %
	Additional visibility of the Proposed Development	0.04 %		
Cumulative ZTV: Existing and Consented Wind Farms (30 km radius, blade tip) Figure 4.8 (page 2/3)	0 turbines visible	6.14 %		
	Visibility of other wind farms where there is no visibility of the Proposed Development	37.65 %	Total % of 30 km area where other wind farms are theoretically visible = 93.86 %	
	Visibility of the Proposed Development together with other wind farms	56.21 %		Total % of 30 km area where the Proposed Development is theoretically visible = 56.21 %
	Additional visibility of the Proposed Development	0 %		
Cumulative ZTV: Proposed Wind Farms (30 km radius, blade tip) Figure 4.8 (page 3/3)	0 turbines visible	26.09 %		
	Visibility of other wind farms where there is no visibility of the Proposed Development	17.70 %	Total % of 30 km area where other wind farms are theoretically visible = 73.40 %	
	Visibility of the Proposed Development together with other wind farms	49.51 %		Total % of 30 km area where the Proposed Development is theoretically visible = 56.21 %
	Additional visibility of the Proposed Development	6.70 %		

4.193 The presence of existing and consented wind farms, particularly those in the Keady cluster, are described as an integral part of the baseline views from the final viewpoints. The Proposed Development would be located in the midst of this cluster, infilling a small gap between existing and consented elements and serving to create a more cohesive layout overall without increasing the lateral extent of the cluster. The turbines will be of the same scale as the consented Dunbeg South wind farm and will not extend the spread of turbines beyond the saddle of land between Binevenagh and Keady Mountain summits. In some instances, there would be stacking of some of the proposed turbines with existing and consented turbines in the Keady cluster, but the visual effects of this stacking would not be of such magnitude as to affect the overall significance of visual effects or substantially alter the existing landscape or visual character. Of the 20 Viewpoints that have been analysed in detail (and these have been selected to represent typical views across the Study Area) none would experience significant cumulative effect resulting from the Proposed Development.

4.194 There are also no viewpoints where the Proposed Development would have a significant visual effect or cause the Keady cluster to become substantially more visible. It would not impinge upon views into the wider landscape and nor would it alter the overall character of the foreground which is already considerably influenced by the Keady cluster. Overall, the cumulative effects of the Proposed Development, both in terms of landscape and visual effects is deemed to be Not Significant.

Information Gaps

4.195 Cumulative data on Donegal wind farms has not been recently verified and efforts to contact Donegal County Council in this regard have been unsuccessful. The data used has been taken from information held for previous LVIA submissions, including most recently Dunbeg Extension.

4.196 There are minor anomalies between the turbine coordinates held for Dunbeg and Dunmore wind farms and the appearance of these turbines in some viewpoint photographs versus wirelines. This is thought to be due to micrositing of turbines which is a usual part of wind farm construction. It does not affect the outcome of this LVIA.

Future Baseline – The 'No Change' Scenario

4.197 Under the "no change" scenario, were the Proposed Development not to be constructed, it is anticipated that the site would be continued to be used in much the same manner as it currently is. However, the existing landscape and visual character of the site and the wider Study Area will continue to be influenced by human activity which is constantly changing the landscape and it is important that

the implications of these changes are considered and understood so that the intrinsic qualities of the landscape are retained and enhanced rather than destroyed or compromised. The key trends are identified in the NILCA and are also implied by the existing character of the Study Area:

- There are existing wind farms throughout the Study Area, and wind farms are likely to be developed across Counties Antrim, Derry and Donegal based particularly on the number of consented wind farms in the cumulative baseline. Some of these are likely to be intervisible with the Proposed Development. It is likely that the current trend of developing cleaner renewable energy sources will continue and become more environmentally acceptable given the predicted effects of climate change;
- Climate change is likely to have the biggest implications on the landscape and its users in the future. Broadly, it is characterised by a general increase in unpredictable weather conditions which will inevitably impact upon all areas of life. River levels are likely to rise and there will be an associated loss of buildings in the flood plain. There will be a loss of habitats associated with the erosion of river banks and lough shores which support unique combinations of plants and animals. Migrant species, in particular birds, may also be affected and warmth-loving species will gradually replace those currently adapted to colder climates. Flooding will become more frequent and cause damage to the interiors and structures of buildings. Land that is particularly prone to flooding will become undevelopable;
- Demographic change is creating the need for a large number of additional dwellings in the countryside which creates pressures on infrastructure. In particular the rural landscape at the edge of existing settlements, such as those around Limavady and Coleraine will continue to experience pressure for built development and ribbon development along road corridors such as the B201 may increase. In the open countryside the presence of derelict buildings signifies a loss of traditional built vernacular and a loss of biodiversity and vegetation associated with a decline in the management of rural field boundaries and farmland;
- Continued expansion of the road network in the study area is likely to occur alongside built development. Improvements to existing secondary roads are also likely (e.g. straightening, widening and increased signage) will have cumulative negative impacts on local landscape character by eroding local patterns and causing the loss of roadside trees, hedgerows, stonewalls and bridges;
- There is an ongoing trend towards the amalgamation of small farms with the associated loss of traditional buildings and vernacular features, loss of hedgerows and trees to create larger fields. This is having a detrimental impact on the general quality and condition of the rural landscape character. There is also a trend, however, for farmers to diversify into more

traditional farming techniques, husbandry of traditional breeds, and the provision of tourist attractions and accommodation. This often has positive landscape impacts. Current forestry grant schemes encourage farmers to plant more broadleaved trees for amenity and wildlife benefits and in the future this should strengthen the character of farmed landscapes. However, converting fields to coniferous plantations or selling it for housing development will continue to be a detrimental force, particularly if wetter weather renders areas of rough grazing land unviable for livestock;

- Commercial forestry on a large scale is detrimental to landscape character as it conceals the intricate pattern of the landscape and often occupies visually prominent positions in upland areas. Peat cutting alters the undulating topography and creates abrupt and artificial changes in level. This activity, particularly as it has become mechanised, also destroys natural vegetation and habitats. Where land becomes too wet to farm forestry is likely to become an attractive alternative. This may provide the opportunity to continue the current shift from coniferous plantations to broadleaved forestry which will in turn have a potentially positive impact on landscape character, visual amenity and ecological function;
- Agriculture is one of Northern Ireland's major industries. Pasture is likely to remain the dominant agricultural land-use, but warmer temperatures will also enable spring cereal crops to be grown as well as an increase in the use of pesticides.

Mitigation and Enhancement Proposals

Mitigation Proposals

4.198 Mitigation proposals in response to landscape and visual effects include:

- The exterior surfaces of the turbines will be painted in a recessive, non-reflective light grey colour to minimise their visual prominence against the sky in most weather conditions;
- Ancillary facilities, such as the control building, substation and energy storage compounds, have been designed in a manner that is sensitive to the immediate landscape character with regards to location, scale, colour, and choice of materials. These facilities have also been sited in close proximity to existing farm buildings to avoid being prominent in key long-range views, as identified by of the viewpoints in this LVIA;
- There is potential that the site entrance to the southern section of the site could be shared with the consented Dunbeg South wind farm which is located directly off the A37 (Broad Road) and utilises an existing farm access point adjacent to a derelict farm building and associated agricultural enclosures. The site entrance will be widened to accommodate both construction traffic and abnormal indivisible loads (AILs) during construction. Once operational

the site entrance will closely resemble the existing frontage with strengthened field boundaries. Due to the physical and visual relationship with existing built structures the amendments to the site entrance will improve the frontage adjacent to the site entrance.

Residual Effects

4.199 Potential landscape and visual effects were addressed the iterative design development. This resulted in the Proposed Development as it is now presented and therefore potentially significant effects have been avoided prior to the LVIA being carried out as part of the EIA. Beyond this, the proposed mitigation measures will help to minimise the effect of certain aspects of the Proposed Development. The physical condition of the site boundary will be enhanced through more regular maintenance, and this will also have an effect on visual quality and experience when travelling past the site on the A37. However, there would be no resulting change in the overall significance of effects. Therefore, the residual effects are the same as those already identified.

Overall Significance of Landscape and Visual Effects

4.200 The LVIA process has thoroughly analysed the nature of landscape and visual receptors present within the Study Area including those occurring at close, medium and long range in accordance with best practice guidance on LVIA, wind energy development in Northern Ireland, and emerging Council policies and objectives in relation to the Study Area. The Binevenagh AONB designation was considered to be the key designation within the Study Area. Landscape and visual receptors within the AONB were also regarded as being of greater sensitivity by virtue of their location in addition to any other characteristics that might otherwise make them sensitive to changes in their views (for example, statically located views from residential properties or scenic attractions). The presence of the Keady cluster of existing and consented wind farms which surrounds the Proposed Development was a key consideration in the assessment of landscape and visual effects, including cumulative effects.

4.201 The overall conclusion is that the Proposed Development's location within the same part of the landscape as the Keady cluster, and the other strong human factors that currently influence this landscape mean that there would be No Significant landscape effects resulting from the Proposed Development. The Proposed Development is deemed to have No Significant effects on visual character for the same reasons.

4.202 Wind energy development is a prominent visual element in all parts of the Study Area and the Proposed Development would have a negligible incremental effect on the manner in which wind energy development is perceived generally across the Study Area. Of the 20 viewpoints that have been analysed, none were deemed to experience a significant visual effect resulting from the Proposed Development. The Proposed Development would be visible on the side slope of Keady Mountain, often

against a rising backdrop of rough grazing land and in conjunction with the busy A37 road corridor in close range views. It would also always be seen in conjunction with other wind farms in the Keady cluster which are either existing or consented. The proposed turbines would be positioned relatively equidistant between Dunbeg Extension and Dunbeg South and would thus have the effect of linking the two consented developments and creating a more coherent layout to the Keady cluster overall. However, its location within the cluster, rather than on an outer edge means the Proposed Development would not alter the overall composition or character of either the physical landscape or views. There is also a repeated pattern of wind farm clusters throughout upland parts of the 30 km Study Area, including other parts of the Binevenagh range of hills.

4.203 All policy documents (the SPPS, PPS 18 and its best practice and supplementary guidance) recognise that wind farms may be prominent elements in close range views but that this does not necessarily equate to unacceptable development. Taking into account that none of the 20 viewpoints assessed as part of the LVIA are deemed to experience significant effects, and that no significant landscape effects have been identified, the LVIA concludes that the Proposed Development is acceptable in landscape and visual terms.

5 Archaeology & Cultural Heritage

Introduction

5.1 This Archaeology and Cultural Heritage Assessment of the Dunbeg South Wind Farm Extension, hereinafter referred to as 'the Development', has been prepared by Gahan and Long on behalf of RES. The Development will involve construction of 4 wind turbines (maximum tip height 149.9m) and associated ancillary works (Figures 5.1 and 5.2). Full details can be found in Chapter 1: Introduction and Proposed Development.

5.2 This archaeological impact assessment has been compiled by Chris Long. Chris Long has a BSc Hons in Archaeology with Palaeoecology and an MSc in Environmental Management, specialising in the preparation of environmental impact assessments (EIA). He has worked as a professional archaeologist for over 20 years and has undertaken numerous large and small scale excavations throughout Ireland. Since establishing Gahan and Long, he has overseen the production of a high volume of archaeological impact assessments for a wide variety of development types including numerous wind farms.

5.3 This chapter is supported by:

- Technical Appendix 5.1: Known regionally important archaeological monuments within 5 km of the Development;
- Technical Appendix 5.2: Known locally important archaeological monuments within 5 km of the Development;
- Technical Appendix 5.3: Known industrial heritage sites within 5 km of the Development;
- Technical Appendix 5.4: Known historic buildings within 5 km of the Development;
- Technical Appendix 5.5: Known defence heritage sites within 5 km of the Development;
- Technical Appendix 5.6: Department for Communities: Historic Environment Division publication: '*Guidance on Setting and the Historic Environment*'

- Figures 5.1-5.13 are referenced in the text where relevant.

Legislation & Planning Policy

5.4 This impact assessment was undertaken using the planning guidelines as set out in the Planning Policy Statement (PPS) 6, Planning, Archaeology and the Built Heritage and Section 6 of The Strategic Planning Policy Statement for Northern Ireland (SPPS). This document sets out the Northern Ireland Environment Agency's (now Department of Communities: Historic Environment Division, (DfC:HED)) planning policies relating

to the protection and conservation of archaeological remains and features of the built heritage.

5.5 Particular reference was paid to sections BH1, BH2, BH4 and BH11 within PPS6, which deal with the Preservation of Archaeological Remains of Regional Importance and their Settings, the Protection of Archaeological Remains of Local Importance and their Settings, Archaeological Mitigation and Development Affecting the Setting of a Listed Building respectively.

Potential Impact on the Setting of Archaeological Sites

The setting of a monument relates to its relationship with the landscape both in historical terms and in its modern-day guise. The Department for Communities: Historic Environment Division publication: '*Guidance on Setting and the Historic Environment*' provides guidance notes on managing change in the historic environment for use by planning authorities and other interested parties. The guidance includes a definition of setting, identifies those key aspects of setting which can contribute to the significance of a heritage asset, and outlines a three-stage process for assessing the impacts of change upon setting.

Planning Policy

5.6 Planning Policy Statement PPS 6 Planning, Archaeology and the Built Heritage (PPS6) and Section 6 of The Strategic Planning Policy Statement for Northern Ireland (SPPS) set out the Department of the Environment's (DOE) planning policies for the protection and conservation of archaeological remains and features of the built heritage and advises on the treatment of these issues in development plans. Policy BH1 of PPS 6 considers the preservation of archaeological remains of regional importance and their settings. It states that "The department will operate a presumption in favour of the physical preservation in situ of archaeological remains of regional importance and their settings. These comprise monuments in State Care, scheduled monuments and other important sites and monuments that would merit scheduling. Development which would adversely affect such sites of regional importance or the integrity of their setting will not be permitted unless there are exceptional circumstances."

5.7 ".....the Department will pay particular attention to the impact of the proposal on:

- the critical views of, and from the site or monument;
- the access and public approaches to the site or monument; and
- the understanding and enjoyment of the site or monument by visitors."

5.8 Policy BH2 of PPS 6 considers the preservation of archaeological remains of local importance and their settings. It states that:

5.9 "Development proposals which would adversely affect archaeological sites or monuments which are of local importance or their settings will only be permitted where the Department considers the importance of the proposed development or other material considerations outweigh the value of the remains in question".

5.10 The Department considers a number of factors in assessing the local significance of archaeological sites and monuments. These factors should be viewed as indicators which contribute to a wider judgement based on the individual circumstances of a case and may include one or more of the following:

- appearance: distinctive features in the landscape/townscape or local landmarks;
- quality: well-preserved or extensive buried remains;
- folklore/historical interest: association with a person or event in local tradition or legend;
- group value: one of a number of locally important sites; and
- rarity: a locally rare example.

5.11 Policy BH6 of PPS 6 considers the protection of Parks, Gardens and Demesnes of Special Historic Interest. It states that:

5.12 "The Department will not normally permit development which would lead to the loss of, or cause harm to, the character, principal components or setting of parks, gardens and demesnes of special historic interest. Where planning permission is granted, this will normally be conditional on the recording of any features of interest which will be lost before development commences".

5.13 In assessing proposals for development in or adjacent to parks, gardens and demesnes of special historic interest particular attention will be paid to the impact of the proposal on:

- the archaeological, historical or botanical interest of the site;
- the site's original design concept, overall quality and setting;
- trees and woodland and the site's contribution to local landscape character;
- any buildings or features of character within the site including boundary walls, pathways, garden terraces or water features; and
- planned historic views of or from the site or buildings within it.

5.14 Policy BH11 considers development affecting the setting of a listed building. It states that "the Department will not normally permit development which would adversely affect the setting of a listed building. Development proposals will normally only be considered appropriate where all the following criteria are met:

- The detailed design respects the listed building in terms of scale, height, massing and alignment
- The works proposed make use of traditional or sympathetic building materials and techniques which respect those found on the building; and
- The nature of the use proposed respects the character of the setting of the building."

5.15 Whilst the policy criteria is not strictly applicable to wind farm developments, the overarching aim of this policy has been considered with respect to the character and

quality of the setting; and the extent to which the Development and the listed buildings will be seen in juxtaposition.

5.16 This archaeological impact assessment has been produced in full compliance with the above policy documents.

Scope of Assessment

5.17 The scope of this report is to assess the potential impact of the Development on the known and potential archaeological and cultural sites within the site itself and its wider landscape. To facilitate the assessment of the wider landscape a 5 km search radius has been utilised. The assessment of the Development will look at both the potential physical impact upon any known or potential sub-surface archaeological features within the Site Boundary, hereinafter referred to as 'the Site' and will further assess the impact upon the setting of those monuments of regional importance within the wider search area.

Assessment Methodology

Baseline Characterisation

Study Area

5.18 The study area included the Site itself and also the wider historical landscape. To facilitate the assessment of the wider landscape a 5 km search radius has been utilised. All search radii extend from a central point within the Planning Application Boundary. The assessment of the Development will look at both the potential physical impact upon any known or potential sub-surface archaeological features within the Site and will further assess the impact upon the setting of those monuments of regional importance within the 5 km search area.

Desk Study / Field Survey

5.19 A detailed desktop survey was undertaken for the Site and the wider landscape. This entailed a review of the Sites and Monuments Records, the Industrial Archaeological Records, the Historic Buildings Archive, Historic Gardens Records and the Defence Heritage Records, which are maintained by DFC:HED.

5.20 An inspection was undertaken of the Site by a qualified archaeologist. The purpose of the site inspection was to assess the archaeological potential of surviving sub-surface strata within the Site.

5.21 In addition to the inspection of the Site, each of the sites of regional importance for which visual impact analysis is required was also visited. The objective of this inspection was to establish the surviving nature of the monuments and assess the potential for localised features to affect the extent of the inter-visibility with the Site. The assessment of the visual impact of the Development will be made using a combination of wireframes and photomontages.

5.22 For the purposes of assessing the impact upon the setting of monuments of regional importance, this assessment considers the stipulations in PPS6 Policies BH1 & BH11 and also The Department for Communities: Historic Environment Division publication: '*Guidance on Setting and the Historic Environment*' provides guidance notes on managing change in the historic environment for use by planning authorities and other interested parties. The guidance includes a definition of setting, identifies those key aspects of setting which can contribute to the significance of a heritage asset, and outlines a three-stage process for assessing the impacts of change upon setting.

5.23 The specific factors used to assess the effects of the Development on the historic assets in question are contained within Appendix 5.6. The parameters with which to assess the magnitude of change and significance of impact are those detailed in sections 5.29 and 5.30.

Sensitivity Criteria

5.24 The main thresholds of archaeological importance defined in PPS 6 are Regional Importance and Local Importance.

5.25 Sites of Regional Importance comprise State Care Monuments, Scheduled monuments and other important sites and monuments which would merit scheduling.

5.26 Sites of Local Importance are those that are not scheduled, but have significance within a regional or local context. This may, for example, apply to their importance to regional or local history, or they may be the only local example of a monument type. Also included within this are other archaeological sites, findspots, sites identified from aerial photographs, sites identified from OS Memoirs whose locations are unknown and sites of now destroyed monuments. Such sites may comprise component parts of a landscape rich in archaeological monuments, and thereby gain greater significance.

Magnitude of Effect

5.27 Table 5.1 provides definitions for the assessment of potential magnitude of change on cultural heritage resources following the construction of the Development.

Table 5.1: Consideration of the scale, extent of change, nature and duration of effect are important in determining the magnitude of change.

Level of Magnitude	Definition of Magnitude
High	Total loss or major alteration to key elements/ features/ characteristics of the baseline conditions such that post development character/ composition/ attributes will be fundamentally changed.
Medium	Partial loss or alteration to one or more key elements/ features/ characteristics of the baseline conditions such that post development character/ composition/ attributes will be partially changed.
Low	Minor loss of or alteration to one or more key elements/ features/ characteristics of the baseline conditions. Change arising from the loss / alteration will be discernible but underlying character/ composition/ attributes will be similar to pre development circumstances /patterns.
Negligible	Very minor loss or alteration to one or more key elements /features /characteristics of the baseline conditions. Change barely distinguishable, approximating to the "no change" situation.

Significance Criteria

5.28 Table 5.2: An assessment of importance and magnitude can then be undertaken to determine how significant an impact is.

Table 5.2: parameter for assessing level of EIA significance

		IMPORTANCE		
		Lesser	**Local**	**Regional**
MAGNITUDE	**Negligible**	No Change	No Change	No Change
	Low	Slight	Slight	Moderate
	Medium	Slight	Moderate	Substantial
	High	Moderate	Substantial	Substantial

Baseline Conditions

The Site

5.29 A detailed site walkover of the proposed application site was conducted by a qualified archaeologist. The site inspection focused on the locations of the turbine bases and those known archaeological monuments within the development area.

5.30 The proposed development site is split into two sections divided by the A37 road. The southern section consists of upland pasture and slopes upwards to the south towards a commercial tree plantation (plate 1).

Plate 1: looking east across the southern half of the site.

5.31 The area of each turbine base was inspected and no evidence of any archaeological features was identified within them or their immediate vicinity. No evidence of any archaeological features (other than those previously known) was identified throughout the remainder of this area site.

5.32 The northern half of the site consists of a mixture of upland and improved grazing (plate 2).

5.33 The area of each turbine base was inspected and no evidence of any archaeological features was identified within them or their immediate vicinity. No evidence of any archaeological features (other than those previously known) was identified throughout the remainder of this area site.

Plate 2: looking northeast across the northern half of the site.

5.34 The desk top survey identified one archaeological monument within the red line boundary for the development (Figure 5.3). This monument LDY 02:17 is incorrectly located in NISMR map viewer and is not actually located within the site.

5.35 The 1st edition OS map (1830s) shows the application site to have consisted of open land potentially used for upland grazing and with no evidence of historic development (Figure 5.4). The 2nd edition OS map (1850s) shows a similar picture with some field divisions now evident (Figure 5.5).

5.36 The desktop survey identified no sites relating to the Industrial Heritage Records, (IHR), Historic Buildings Records, Battle Sites, Historic Gardens Register, Defence Heritage Records or battle sites within the proposed application boundary

Archaeological sites and monuments within 5 km of the Site

5.37 The desktop survey has indicated that 74 locally important recorded archaeological sites (inclusive of those within the application boundary) are located within a 5 km radius of a central point within the Planning Application Boundary (Figure 5.3). In addition 8 regionally important sites were also identified within this search area (Figure 5.6).

5.38 Details of the 74 locally important monuments are given in Appendix 5.2, while details of those monuments of regional importance are given in Appendix 5.1. None of these archaeological monuments will be directly physically impacted upon by the Development.

Industrial Heritage records

5.39 A review of the Industrial Heritage Records (IHR) was conducted for the 5 km search radius from a central point within the Planning Application Boundary. This review has revealed total of 13 Industrial Heritage sites within the 5 km search area (Figure 5.7). See Appendix 5.3 for full details.

5.40 These Industrial Heritage sites will not be directly physically impacted upon by the Development.

Historic Buildings

5.41 A review of the Historic Buildings Records was conducted for the 5 km search radius from a central point within the Planning Application Boundary. This review revealed that no listed buildings are located within the Site. A total of 17 HBR sites were identified within the 5 km search area (Figure 5.8). Of these, 14 of the sites are record only and are not listed buildings. Details of the HBR sites can be found in Appendix 5.4. The Historic Buildings will not be directly physically impacted upon by the Development.

Battle Sites

5.42 A review of the battle sites database was conducted for the 5 km search radius from a central point within the Planning Application Boundary. This review identified no battle sites within the search area.

Historic Gardens

5.43 A review of the Register of Historic Parks and Gardens was conducted. This review identified one known historic garden within the 5 km search area (Figure 5.8). This is Drenagh Estate (L-006). The demesne is part walled and dates from the early 18th century. The present house was built in 1837 (Listed HB02/11/002), which sits amidst lawns. There are fine woodland, parkland and shelter belt trees. The ground within the demesne is undulating, descending to the Castle River running to the south of the house and to the Curly River to the north and east. Neither river is used as an ornamental feature. The terrace presently overlooks what has become dense woodland, including exotics and rhododendrons. Two formal gardens were laid out by Frances Rhodes – The "Moon Garden", an enclosed area influenced by both Chinese and Arts and Crafts garden design, and the "Orbit Garden", planted with shrubs, trees and herbaceous material. An area south-east of and adjacent to the house had a late 20th Century ornamental garden, which is now grassed. The walled garden is used for nursery planting.

5.44 This historic garden will not be directly physically impacted upon by the Development.

Defence Heritage

5.45 A review of the Defence Heritage Records was undertaken. This consists of a record of structures and sites related to WWI, WWII and Cold War defences within Northern Ireland. It includes pill boxes, airfields and communication centres. This review has revealed that there are 33 recorded defence heritage sites located within the 5 km search area (Figure 5.9). Details of the defence heritage sites can be found in Appendix 5.5. The defence heritage sites will not be directly physically impacted upon by the Proposed Wind Farm Development.

Identification of Historic Assets for Visual Impact Analysis

5.46 A total of 8 regionally important monuments, and 3 listed buildings were identified within the within the 5km search area. These monuments were subject to varying levels of analysis to establish those which required further visual impact analysis. In the first instance, they were then plotted on a Zone of Theoretical Visibility map. This map is produced using topographical information and provides an indication as to how much of the Development will be visible from the surrounding area. The ZTV does not take into consideration potential screening from very localised topography, vegetation or other development. The site inspections also established whether any localised features such as vegetation or agricultural buildings screened the monuments from the proposed wind farm development. On the basis of this, 6 monuments and 1 historic garden were identified as being inter-visible with the Development. Table 5.4 details these monuments and specifies the reasoning for those monuments not requiring further analysis.

Table 5.4: Monuments identified as being inter-visible with the proposed wind farm development.

SMR No	Site Type	Montage	Reason For no Montage
LDY 06:05	Rath	Yes	
LDY 06:09	Fortification	Yes	
LDY 10:06	Rath	No	Screened by vegetation
LDY 10:07	Cairn and enclosure	No	No intervisibility
LDY 10:10	Counterscarp rath	Yes	
LDY 10:11	Rath	No	No intervisibility
LDY 10:14	Sweat House	No	Screened by vegetation
LDY 10:16	Wedge Tomb	Yes	

SMR No	Site Type	Montage	Reason For no Montage
Garden No	**Garden Name**	**Montage**	**Reason For no Montage**
L-006	Drenagh	No	This application is partially screened by the approved turbines from the Dunbeg South WF. The EIA for the approved turbines established that there would be no impact on the setting of Drenagh estate.
HB02/11/019	67 Windyhill Road	No	Screened by vegetation
HB02/11/020	77 Bolea Road	No	Screened by vegetation
HB03/13/008	Formoyle Parish Church	No	Screened by vegetation

Likely Significant Effects

5.47 The likely significant effects of the Proposed Wind Farm Development fall into two categories:

- Direct physical impacts upon previously unknown sub-surface archaeological remains
- Direct visual impact upon the setting of monuments of regional importance which are inter-visible with the Proposed Wind Farm Development

Construction Effects

5.48 The desktop survey and site inspection have revealed that the proposed Site is located within an area of archaeological interest. While the Site contains no known monuments, 74 monuments were identified within a 5km radius of the it.

5.49 Given the extent of archaeological sites within the wider area, it is likely that previously unknown archaeological deposits could survive within the Site. Such remains may be identified during the construction phase of the development. Should this occur, and given the nature of the proposed development, any such remains may be substantially, adversely impacted upon. This effect is not considered significant in EIA terms and would be significantly reduced through the implementation of an appropriate mitigation strategy.

Operational Effects

Impacts upon the setting of regionally important monuments

LDY 06:05

5.50 The monument LDY 06:05 consists of a rath. The montage shows that three turbines within the Development will be visible (Figure 5.10). The nearest turbine will be located at a distance of approximately 3.8km. The monument has no public access and is not visible from any of the infrastructure routes approaching it. Raths are

defended farmsteads dating to the Early Medieval period (c 500-1100 AD) and are typically (although not exclusively) constructed within locally high areas to provide views of any approaches to it. The main approaches to this monument are from the south-southwest while the Development will be located to its southeast. The construction of the Development will result in a very minor change in the existing baseline conditions of the setting of the monument in that it will introduce a view of the Development in an otherwise rural viewpoint. The view of the development places it centrally within the consented Dunbeg South wind farm. This minor change of the baseline characteristics will have a negligible effect upon the public understanding and enjoyment of it. The introduction of the proposed wind farm development into the local landscape will not have a significant impact upon the setting of monument LDY 06:05.

5.51 Cumulatively the view towards the Development shows that it is contained within the vista across existing and consented wind farms. This results in a no change effect upon the setting of the monument. The introduction of the Development will have no significant cumulative impact upon the setting of the monument.

LDY 06:09

5.52 The monument LDY 06:09 consists of a fortification. It is located on the top of Sconce Hill, a small hill located to the northeast of the proposed wind farm development. The montage shows that all four turbines will be fully visible from the monument (Figure 5.11). The nearest turbine will be located at a distance of approximately 4.3km. The montage shows that the views towards the proposed wind farm place it centrally within the view from the monument towards an existing wind farm. The introduction of the Development will not alter the existing baseline conditions and as such will have no further effect upon the setting of the monument LDY 06:09.

5.53 Cumulatively the view towards the Development shows that it is contained within the vista across existing and consented wind farms. This results in a no change effect upon the setting of the monument. The introduction of the Development will have no significant cumulative impact upon the setting of the monument.

LDY 10:10

5.54 The monument LDY 10:10 consists of a counterscarp rath which is located on the fringes of the existing Dunmore Wind Farm. The montage shows that three turbines within the Development will be visible (Figure 5.12). The nearest turbine will be located at a distance of 575m. Raths are defended farmsteads dating to the Early Medieval period (c 500-1100 AD) and are typically (although not exclusively) constructed within locally high areas to provide views of any approaches to it. In this instance the approaches to the monument are from the west, along the valley created by Keady Mountain and the high ground to the north of the Bolea Road, along which the monument has extensive views. The Development will be visible on the southern fringes of this vista. The monument will have a direct line of site with the

Development which will be visually contained within the consented Dunbeg South wind farm. The construction of the Development will result in a very minor loss in the existing baseline conditions of the setting of the monument in that it will introduce additional turbines into the view from this monument. The impact of the additional turbines is significantly reduced by their positioning within the spread of the consented Dunbeg South wind farm. The area to the immediate east of the monument consists of an existing wind farm development. These turbines overshadow the monument and significantly impact upon its setting. The introduction of the Development into the local landscape will not have a significant impact upon the setting of the monument LDY 10:10.

5.55 Cumulatively, the introduction of the Development will result in an increase in the visible extent of wind farm developments from the monument. In the current setting of the monument, existing turbines are located in close proximity to it from the north through to the southeast. This will have a minimal effect upon the already compromised setting of the monument.

LDY 10:16

5.56 The monument LDY 10:16 consists of a wedge tomb. It is located on the south facing slope of the valley created by the Curly River to the north of the Development. The montage shows that all nine turbines will be fully visible from the monument (Figure 5.13). The nearest turbine is located at a distance of 1.9km. The monument survives as facade 5.4m across of 5 stones with a central horizontal sill stone facing southwest. The chamber immediately behind the facade has largely collapsed but further towards the rear of the cairn a capstone 1.5m x 1.4m is still in situ. The surviving cairn is 5.7m southwest-northeast x 5.2m southeast-northwest. The photomontage indicates that two of the turbines will be visible from the monument. The positioning of the turbines is such that there are not visible in the critical view of the monument. This lies to the southwest along the orientation of the chamber and in the direction the façade faces. The monument is not accessible to the public and is not visible from any of the road infrastructure approaching it. The construction of the Development will result in a very minor loss in the existing baseline conditions of the setting of the monument. The introduction of the Development into the local landscape will not have a significant impact upon the setting of the monument LDY 10:16.

5.57 Cumulatively, the introduction of the Development will result in an increase in the visible extent of wind farm developments from the monument. In its current setting the existing Dunmore wind farm is located the northeast/east of the monument with the consented Dunbeg Extension wind farm to the north-southeast and Dunbeg South wind farm to the southeast. As the photomontage shows, the Development turbines will fill in the gap between the Dunbeg Extension and Dunbeg South wind farms creating a more concentrated block and reducing the existing cumulative impact of the existing and consented turbines.

Decommissioning Effects

5.58 The decommissioning of the Development will have no physical effect on archaeology or cultural heritage. The decommissioning will reverse any impacts placed upon the setting of regionally important monuments by the operation of the Development.

Summary

Table 5.5: Summary of significant effects upon the setting of regionally important monuments and listed buildings.

Site	Monument Number	Likely Significant Effect	Mitigation	Residual Effect
84	LDY 06:05	Very minor loss of baseline conditions resulting in negligible effect on setting of monument	N/A	Negligible effect on setting of monument
85	LDY 06:09	Very minor loss of baseline conditions resulting in negligible effect on setting of monument	N/A	Negligible effect on setting of monument
100	LDY 10:10	Very minor loss of baseline conditions resulting in negligible effect on setting of monument	N/A	Negligible effect on setting of monument
103	LDY 10:16	Very minor loss of baseline conditions resulting in negligible effect on setting of monument	N/A	Negligible effect on setting of monument

Mitigation

5.59 A desktop survey and site inspection have that the Site is situated within an area of archaeological interest, with a number of recorded archaeological sites located within a 5 km radius of the Site. It is possible therefore that previously undiscovered, surviving archaeological material may exist sub-surface within the development area, which may be negatively impacted upon by the Development. Therefore, during the construction phase, archaeological mitigation will be required.

5.60 Prior to construction commencing, an archaeological programme of works should be presented to and approved by the Local Planning Authority in consultation with DfC:HED. This approved programme should be incorporated into a pre-build Construction Method Statement, prepared by the Applicant. The written scheme should specify the methodology and timetable for a programme of work covering the investigation and evaluation of archaeological remains within the Planning Application Boundary, for mitigation of any impacts through excavation or recording and preservation of the remains in situ.

5.61 The programme of works should include the following recommendations:

- Archaeological monitoring of the removal of topsoil for the footprint of the development should be conducted.
- The topsoil will be excavated using a back acting machine fitted with a toothless bucket and under strict archaeological supervision. It will be excavated to the level of undisturbed subsoil or archaeological strata, whichever is highest. The test trenches will be a minimum of 1.8 m wide.
- Those carrying out site works should work closely with the archaeologist and provide all necessary access and other arrangements. Care will need to be taken to avoid over excavation. The advice of the archaeologist on-site should be adhered to regarding this.
- It is recommended that each excavating machine should be watched by at least one archaeologist at all times (1:1 ratio). This means that sufficient archaeological staff will need to be on site to provide this cover. Work should not begin on site until this cover has been set up.
- The archaeologist must be given every reasonable aid by contractors to enable the archaeological work to be carried out. Contractors may need to use differing work practices on site than usual to enable the archaeologist to identify any archaeological features and complete the work. This must be catered for and adhered to.
- DFC:HED be consulted to agree the appropriate course of action in the event of the discovery and identification of any archaeological remains, which may include preservation in situ or excavation and recording.
- Any unexpectedly significant or complex discoveries, or any other unexpected occurrences or conditions, which might affect the agreed project work or its timetable, should be notified immediately to the client and the DFC:HED. Revised arrangements will be required and the archaeologist must organise a site meeting with the client and DFC:HED to agree a course of action. No further archaeological work should take place upon the features requiring extra time until the meeting has been held and appropriate arrangements agreed. In the meantime, site works may continue on other areas within the site.
- It is recommended that on completion of site works, the archaeologist should undertake post-excavation works, including artefact processing and analysis, sample processing, specialist reports and report writing. Once any post-excavation work is completed the archaeologist must prepare a full report on the results to publication standard.
- At all stages of the archaeological site works, the DFC:HED Inspector should be kept informed.

RESIDUAL EFFECT

5.62 Following the implementation of the recommended mitigation strategy, the Development will have no residual effects upon any upstanding or sub-surface

archaeological features within the proposed application boundary or its wider landscape.

CUMULATIVE EFFECTS

5.63 The introduction of the Development will have no cumulative effect upon any upstanding or sub-surface archaeological features within the proposed application boundary. Any cumulative effects will relate to the setting of those monuments of regional importance which have been identified above (table 5.5). An assessment of the cumulative effect on each monument has been undertaken. This established that the introduction of the Development into the landscape will result in a negligible effect upon the setting of those monuments.

SUMMARY

5.64 It is proposed to construct a 4 turbine wind farm to be known as the Dunbeg South Wind Farm Extension on land to the immediate north and south of the A37, east of Limavady. A desk top survey and site inspection have been conducted for the area of the Development and its wider landscape extending out to an approximate radius of 5km.

5.65 The desk top survey and site inspection identified no known monuments within the area of land ownership. Looking beyond the site, the study identified 74 known archaeological monuments within the 5km search radius.

5.66 Given the extent of archaeological sites within the wider area, it is likely that previously unknown archaeological deposits could survive within the site. Such remains may be identified during the construction phase of the development. Should this occur, and given the nature of the proposed development, any such remains may be substantially, adversely impacted upon. This effect is not considered significant in EIA terms and would be significantly reduced through the implementation of the recommended mitigation strategy.

5.67 An assessment was made on the potential impact of the Development upon the setting of historic buildings, regionally important monuments and historic gardens. Through analysis of ZTV information, wireframes and site inspections a total of 4 monuments were identified for further assessment. An assessment of these sites established that the introduction of the Development into the landscape will have a negligible-slight effect upon their setting.

6 Ecology

Introduction

6.1 This chapter constitutes the ecology and nature conservation assessment for the Environmental Impact Assessment of the Proposed Development located at Broad Road, Limavady, hereinafter referred to as 'the Site'. The site occupies the lower, northern slopes of Keady Mountain, between approximately 140 and 230m OD. The southern limit of the site is marked by the conifer plantation of Springwell Forest and Curly River flows along the northern limit. The present proposed layout for four turbines has evolved. This study addresses the potential impacts of the proposal to erect the turbines and associated access tracks and infrastructure on the habitats of the study area, centred on the proposed infrastructure layout, as shown in **Figure 6.1** – (Phase 1) Habitat survey map.

6.2 Blackstaff Ecology Ltd was commissioned by RES Ltd to undertake an Ecological Impact Assessment (EcIA) for this proposed wind farm extension. The Site was re-visited in 2024 in response to the emergence of a frozen layout for the proposed extension. The JNCC[1] Phase 1 survey of the Site was augmented by a Phase 2 National Vegetation Classification (NVC) survey of the proposed access track routes, crane pad locations and turbine sites and was carried out in order to provide detailed records of habitat types that would be affected by the proposed scheme.

Statement of Authority

6.3 Initial vegetation surveys and habitat assessments were carried out by Dr Brian Sutton. Quadrat surveys in support of the habitat survey were carried out by Karl Hamilton. Common lizard, smooth newt and bat surveys were carried out by Catriona Porter and Jazmin Creaney. Philip Leathem produced the figures to accompany the impact assessment. The report was reviewed by Cormac Loughran.

6.4 Brian Sutton was awarded a PhD in Environmental Science by the University of Ulster. Prior to working at Blackstaff Ecology, he worked as a member of the Habitat Survey Team of the Environment and Heritage Service (now the Northern Ireland Environment Agency) for two years. Following this, he worked as a consultant ecologist for AECOM Ltd for 15 years, carrying out habitat, bird and mammal surveys for a wide range of governmental and private clients. He has produced numerous EcIAs and PEAs, both during his time at AECOM and for Blackstaff Ecology. He has carried out HRA, both at Screening and Appropriate Assessment level, for numerous schemes, at a range of scales, from small private developments to major infrastructure projects. He has also prepared Strategic Environmental Assessments

[1] JNCC 2010: Handbook for Phase 1 Habitat Survey -a technique for environmental audit. Joint Nature Conservation Council, Peterborough

for a number of government plans. Brian has been a Principal Ecologist at Blackstaff Ecology for the past seven years.

6.5 Karl Hamilton has a BSc (Hons) in Environmental Biology from the Queen's University of Belfast, after which he took up the post of Senior Reserve warden and Biodiversity Officer for the Wildfowl Wetlands Trust within Northern Ireland. This role included hands-on management of a variety of terrestrial and aquatic habitats, surveying and monitoring of flora and fauna, managing volunteers and work placements, and surveying designated sites to inform a large-scale wetland and grassland habitat recreation project. In 2010 Karl commenced his career in ecological consultancy as a freelance ecologist, engaging in contract and sub-contract work throughout Northern Ireland and the Republic of Ireland, undertaking primarily Preliminary Ecological Assessments, Protected Species Surveys, Invasive Species Surveys and Ecological Impact Assessments. In 2020 Karl joined Blackstaff Ecology as Senior Ecologist. He also regularly provides training courses in a wide range of biological subjects for environmental NGOs, statutory organisations and other ecologists.

6.6 Philip Leathem is a GIS/Ecological Technician who has worked in the environmental sector for the past 9 years. Philip's role as a technician includes the maintenance, monitoring and deployment of a suite of automated bat detector units (SM2 Bat+, SMZC's, Anabat Express', Anabat Chorus' and Song Meter Mini Bats) which are used during static (bat) monitoring. In addition to the above role, Philip is also a GIS Technician and has considerable experience in the production of Figures for Environmental Statements.

6.7 Catriona Porter has an MSc in Animal Behaviour and Welfare (Distinction) from Queen's University, Belfast. She has several years of experience within the nature conservation sector through extensive volunteering including organisations such as UK Overseas Territories Conservation Forum, Ulster Wildlife and the RSPB. Catriona has 8 months experience within the ecological consultancy sector, beginning in April 2021 where she assisted with carcass trials on a windfarm with Allen and Mellon Environmental. Since joining Blackstaff in May 2021 she has been involved in projects in Northern Ireland and the ROI and has gained experience in both survey techniques and ecological report writing concerning bats, newts, badgers and biodiversity checklists (BDCs). Catriona has conducted approximately one dozen bat roost potential (BRP) surveys on trees and buildings, thirty emergence/re-entry surveys, two endoscope surveys and seventy-six carcass searches for single wind-turbines (SWTs). She has conducted eight badger surveys, six BDCs and twenty-five newt surveys. Catriona is in the process of obtaining CIEEM membership.

6.8 Jazmin Creaney has a BSc in Zoology and has undertaken further courses including Animal Conservation, GIS and Environmental Management. She has a range of experience in conducting field surveys both locally with organisations including BTO, The National Trust and TetraTech, and abroad through her time monitoring elephant behaviour and habitat damage in South Africa. Since joining Blackstaff Ecology in July 2021, Jazmin has gained significant experience in bat emergence and re-entry surveys, utilising bat detectors and thermal imaging equipment. She has also assisted

with bat transects and static detector surveys for a large Leisler maternity roost supporting >100 individuals during her time with TetraTech. Jazmin is in the process of obtaining qualifying membership with CIEEM.

6.9 This report has been reviewed (and all surveys planned) by Cormac Loughran, a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM). Cormac has worked professionally as a Consultant Ecologist for over 16 years. He holds an MSc (Distinction) in Environmental Management from the University of Ulster and has extensive experience in a broad range of flora and fauna surveys. He has undertaken and/or coordinated a wide range of ecological surveys and associated impact assessments for over 20 renewable energy projects. Cormac is also an experienced field naturalist and prior to his consultancy work, he worked as a ranger on a number of important nature reserves. As a result, he also has considerable habitat management experience across a broad range of habitats in including broadleaved woodland, wetland, grassland and wet and dry heathland.

Wildlife legislation, Policy and Guidance

6.10 This report has been informed by the following key legislation, policy and guidance.

International Treaties, Conventions & Directives

Bonn Convention of the Conservation of Migratory Species of Wild Animals (June 1979)

6.11 The Convention carries obligations to conserve wild plants, birds and other animals, with emphasis on endangered and vulnerable species and their habitats. The provisions of the Convention underlie the EC Habitats Directive as well as the UK's wildlife legislation.

Bern Convention on the Conservation of European Wildlife and Natural Habitats (September 1979)

6.12 The Convention carries obligations to conserve wild plants, birds and other animals, with emphasis on endangered and vulnerable species and their habitats. The provisions of the Convention underlie the EC Habitats Directive as well as the UK's wildlife legislation.

UN Biodiversity Convention (The Rio Convention) (June 1992)

6.13 The Convention provides a framework for international action to protect species and habitats. The UK's overall goal under the Convention is to conserve and enhance biological diversity within the UK and to contribute to the conservation of global biodiversity through all appropriate mechanisms.

Convention on Biological Diversity (93/626/EEC) (CBD)

6.14 The Convention requires contracting parties, in accordance with its conditions and capabilities, to develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes. It also requires contracting parties to integrate, as

far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectorial and cross sectorial plans, programmes and policies.

EC Council Directive on the Conservation of Natural Habitats of Wild Fauna and Flora (92/43/EEC) (The Habitats Directive)

6.15 Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the EU Habitats Directive) is transposed into law in Northern Ireland by the Conservation (Natural Habitats, etc.) Regulations 1995 (as amended), the Habitats Regulations.

6.16 The Habitats Directive covers habitats and non-avian species of fauna of nature conservation importance and in danger of disappearance, for which the European Commission (EC) has responsibility in view of the proportion of their global range. Habitats are listed and detailed on Annex I of the Directive.

6.17 To conserve these habitats, listed on Annex I of the directive, and species, listed and described on Annex II, a European network of Special Areas of Conservation (SAC) is being established.

6.18 As the Habitats Directive encapsulates a presumption in favour of maintaining Annex I habitats in good conservation status wherever they occur, prior assessment is therefore required to determine whether any areas of habitat within a development site meets the criteria for recognition as Annex I habitat types.

6.19 The Directive also requires appropriate assessment of any plan or project not directly connected with or necessary to the management of a Natura 2000 site, but likely to have significant effects upon a Natura 2000 site, either individually or in combination with other plans or projects.

Annex 1 Habitats

6.20 Northern Atlantic wet heaths (H4010) with *Erica tetralix*, European dry heaths (H4030), Transition mires and quaking bogs (H7140), Alkaline fens (H7230) and Blanket Bog (H7130) are listed in Annex 1 of the EU Habitats Directive and this indicates that they are protected habitats. 'Active' blanket bog is classified as a priority habitat.

6.21 The main aim of the Habitats Directive is to promote the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats listed in Annex 1 at a favourable conservation status, introducing robust protection for those habitats of European importance (i.e. priority habitats, such as 'active' blanket bog).

Domestic Legislation

6.22 The proposed development has been reviewed in relation to local planning policy specific to geology and the water environment. A detailed planning policy and legislation review is included within **Chapter 2: Planning Policy**.

Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 (as amended)

6.23 The Regulations give effect to requirements relating to the designation of protected sites under the Birds Directive and Habitats Directive. The Regulations provide for the protection and management of European Sites and place obligations on all competent authorities to have regard to the requirements of the Habitats Directive. The Regulations also provide for the protection of species of European importance.

Bats

6.24 All bat species found in Northern Ireland are listed under Appendix III of the Bern Convention and Annex IV of the EC Habitats Directive. In addition, bats and their habitats are listed under Appendix II of the Bonn Convention; therefore, there is an obligation to protect the habitat of bats, including links to important feeding areas. Bats are protected in Northern Ireland under the Conservation (Natural Habitats) Regulations (Northern Ireland) 1995, (as amended).

6.25 In relation to European protected species, it is an offence if:

- They are deliberately captured, injured or killed;
- These animals are disturbed in such a way as to significantly affect their ability to survive, breed, or rear/nurture their young, or in a way that affects the local distribution or abundance of that species;
- A breeding site or resting place of these species is damaged or destroyed, even if this is unintentional and/or when the animal is not present;
- Access to a structure or place used by these species for protection or shelter is intentionally or recklessly obstructed.

6.26 This legislation applies to all life stages of these species, and a European protected species licence is required to carry out any activity that would otherwise involve committing an offence.

Amphibians

6.27 Native amphibians (smooth newt *Lissotriton vulgaris* and common frog *Rana temporaria*) are protected under the Conservation (Natural Habitats) Regulations (Northern Ireland) 1995, (as amended), making it an offence to:

- Capture, kill or injure smooth newt; and
- Sell or advertise for sale common frog, frog spawn or smooth newt.

Environment (Northern Ireland) Order 2002

6.28 The Order provides for the designation, management and protection of Areas of Special Scientific Interest (ASSIs). ASSIs may be designated for important geology and land forms as well as for wildlife and habitats. The legislation repeals Part VI of the Nature Conservation and Amenity (Northern Ireland) Order 1985.

Nature Conservation and Amenity Lands (Northern Ireland) Order 1985 (as amended)

6.29 The Order provides for the establishment of National Nature Reserves (NNRs), Nature Reserves (NRs) and Marine Nature Reserves (MNRs). It also provides for the designation and formulation of proposals for National Parks and Areas of Outstanding Natural Beauty (AONBs).

The Wildlife (Northern Ireland) Order 1985 (as amended)

6.30 The Order prohibits the intentional killing, taking or injuring of certain wild birds or wild animals; or the intentional destruction, uprooting or picking of certain wild plants. It also allows for the establishment of Wildlife Refuges (akin to Nature Reserves) for the special protection of certain species of rare plants or animals.

Badger

6.31 Badger Meles meles receives protection under Schedules 5, 6 and 7 of the Wildlife (NI) Order 1985 (as amended). This makes it an offence to:

- Intentionally or recklessly kill, injure or take a Badger;
- Intentionally or recklessly damage or destroy, or obstruct access to, any structure or place that Badgers use for shelter or protection;
- Intentionally or recklessly damage or destroy anything which conceals or protects such any such structure; or
- Intentionally or recklessly disturb a Badger while it is occupying a structure or place which it uses for shelter or protection.

6.32 In addition, any person who knowingly causes or permits to be done an act which is made unlawful by any of these provisions shall also be guilty of an offence.

Protected Plant Species

6.33 The Wildlife (NI) Order 1985 (as amended) also provides some measure of protection to all wild plants; certain species, listed within Schedule 8 of the Order, receive special protection e.g. Bluebell. This makes it an offence to:

- Intentionally pick, uproot or destroy any wild plants listed within this Schedule, or even collect their flowers or seeds;
- Sell these plants or their seeds if taken from the wild;
- Uproot any wild plants not listed within Schedule 8 intentionally, except on your own land or with permission from the landowner.

6.34 Additionally, persons who knowingly cause or permit to be done an act which is made unlawful by any of these provisions shall also be guilty of an offence.

Invasive Non-native Species

6.35 Schedule 9 of the Wildlife (NI) Order 1985 (as amended), and the Invasive Alien Species (Enforcement and Permitting) Order (Northern Ireland) 2019 state that it is an offence to intentionally:

- Keep, including in a contained holding, an invasive alien species;
- Breed, including in a contained holding, an invasive alien species;
- Transport an invasive alien species to or from Northern Ireland to or from any place within Great Britain, or within Northern Ireland, except where such transportation is of species to facilities in the context of eradication;
- Place an invasive alien species on the market;
- Permit to reproduce, grow, or cultivate, including in a contained holding, an invasive alien species; or
- Release an invasive alien species into the environment.

The Environmental Liability (Prevention and Remediation) Regulations (Northern Ireland) 2009

6.36 The Regulations implement Directive 2004/35/EC and require those carrying out certain activities to prevent, limit and remediate significant environmental damage to protected species, natural habitats, ASSIs, surface water, ground water and land. Operators of activities such as discharges to water sources and water impounding are liable for any significant environmental damage, regardless of whether they intended to cause the damage or were negligent.

Wildlife and Natural Environment Act (Northern Ireland) 2011

6.37 The Act makes provision about biodiversity; amends the Wildlife (Northern Ireland) Order 1985 and Part 4 of the Environment (Northern Ireland) Order 2002; abolishes game licences and game dealers' licences; prohibits hare coursing events and amends the Game Preservation Act (Northern Ireland) 1928.

Planning Policy

Regional Development Strategy (RDS) 2035: Building a Better Future

6.38 The Strategy takes account of European and national policies which would have an influence on the future development of Northern Ireland. The Strategic Planning (Northern Ireland) Order 1999 requires Northern Ireland Departments to have regard to the Regional Development Strategy in exercising any functions in relation to development. There are two types of Strategic Guidance: Regional Guidance (RG) and Spatial Framework Guidance (SFG). RG applies to everywhere in the region and is presented under the three sustainable development themes of Economy, Society and Environment.

6.39 RG 9 - RG 12 (Environment) have been adjusted to meet obligations under the Habitats Regulations. Of relevance to the Development is RG 11: Conserve, protect and, where possible, enhance our built heritage and our natural environment. This Strategy Guidance refers to the need to;

6.40 Sustain and enhance biodiversity in line with the objective of the Northern Ireland Biodiversity Strategy to halt the loss of indigenous species and habitats. By protecting

existing, or creating new, ecological or wildlife corridors particularly in our cities and towns we can provide valuable help to arrest the decline in biodiversity.

6.41 Identify, establish, protect and manage ecological networks. Ecological networks, including the protection of priority species, are needed to maintain environmental processes and help to conserve and enhance biodiversity. A well-established ecological network, including designated sites, should provide the habitats needed for ecosystems and species populations to survive in an increasingly human dominated landscape. Such networks could also be of amenity value if linked to the green infrastructure provided by walking and cycle routes to heritage and other recreational interest.

Strategic Planning Policy Statement for Northern Ireland (SPPS)

6.42 In addition to reiterating the statement made in PPS18 (below) the SPPS States:

'Active peatland is of particular importance to Northern Ireland for its biodiversity, water and carbon storage qualities.'

and

'Renewable energy reduces our dependence on imported fossil fuels and brings diversity and security of supply to our energy infrastructure. It also helps Northern Ireland achieve its targets for reducing carbon emissions and reduces environmental damage such as that caused by acid rain.'

Planning Policy Statement 18: Policy RE1

6.43 Policy RE1 States:

'The wider environmental, economic and social benefits of all proposals for renewable energy projects are material considerations that will be given significant weight in determining whether planning permission should be granted'.

'Development that generates energy from renewable resources will be permitted provided the proposal, and any associated buildings and infrastructure, will not result in an unacceptable adverse impact on:

(a) public safety, human health, or residential amenity;

(b) visual amenity and landscape character;

(c) biodiversity, nature conservation or built heritage interests;

(d) local natural resources, such as air quality or water quality; and

(e) public access to the countryside.

…..

Where any project is likely to result in unavoidable damage during its installation, operation or decommissioning, the application will need to indicate how this will be minimised and mitigated, including details of any proposed compensatory measures, such as a habitat management plan or the creation of a new habitat. This matter will need to be agreed before planning permission is granted.

…..

Any development on active peatland will not be permitted unless there are imperative reasons of overriding public interest.'

Planning Policy Statement 2 - Policy NH5

6.44 Policy NH 5 - Habitats, Species or Features of Natural Heritage Importance, states:

Planning permission will only be granted for a development proposal which is not likely to result in the unacceptable adverse impact on, or damage to known:

- *priority habitats;*
- *priority species;*
- *active peatland;*
- *ancient and long-established woodland;*
- *features of earth science conservation importance;*
- *features of the landscape which are of major importance for wild flora and fauna;*
- *rare or threatened native species;*
- *wetlands (includes river corridors); or*
- *other natural heritage features worthy of protection.*

A development proposal which is likely to result in an unacceptable adverse impact on, or damage to, habitats, species or features may only be permitted where the benefits of the proposed development outweigh the value of the habitat, species or feature. In such cases, appropriate mitigation and/or compensatory measures will be required.

PPS 21 Sustainable Development in the Countryside

6.45 PPS 21 aims to, *"Manage development in the countryside in a manner consistent with achieving the strategic objectives of the Regional Development Strategy for Northern Ireland 2025." Objectives include to "Conserve the landscape and natural resources of the rural area and to protect it from excessive, inappropriate or obtrusive development and from the actual or potential effects of pollution," and to "Promote high standards in the design, siting and landscaping of development in the countryside."*

Northern Ireland Biodiversity Strategy

6.46 A new strategy has just been published by the DoE entitled, Valuing Nature – A Biodiversity Strategy for Northern Ireland to 2020 (01st July 2015). This document describes 20 targets arising from the 2010 Convention on Biological Diversity (CBD) which was held in Noyoga, Japan during October 2010. A key decision at the Convention was the adoption of a new ten-year strategic plan to guide international and national effort to save biodiversity. The strategic plan, or the Aichi Target, adopted by the meeting is the overarching, internationally agreed, framework on biodiversity. The 20 Aichi Targets form the basis for the Implementation Plan for the NI Biodiversity Strategy. The CBD fully adopted the ecosystem services approach that stresses the need to look at maintaining the functionality of ecosystems as key to protecting biodiversity and delivering benefits for humanity.

Sustainable Development Strategy for Northern Ireland

6.47 The Strategy sets out the Government agenda for ensuring that sustainable practice becomes an integral part of development policy in Northern Ireland. The following six principles of the strategy continue to echo those developed from the previous strategy, and are as follows;

- Living within Environmental Limits;
- Ensuring a Strong, Healthy, Just and Equal Society;
- Achieving a Sustainable Economy;
- Promoting Good Governance;
- Using Sound Science Responsibly;
- Promoting Opportunity and Innovation.

6.48 The strategic objective most relevant to this development is: Ensuring reliable, affordable and sustainable energy provision and reducing our carbon footprint.

UK and Northern Ireland Biodiversity and Habitat Action Plans

6.49 The UK Biodiversity Action Plan (UKBAP) and equivalent Northern Ireland Habitat Action Plan, as well the internal NIEA Guidance Document, have been consulted regarding what constitutes ‘active’ blanket bog.

6.50 The UKBAP indicates that ‘active’ peatlands include the EU Habitats Directive priority habitat 'active' blanket bog, the definition of ‘active’ being given as 'still supporting a significant area of vegetation that is normally peat forming'. The UKBAP indicates that the principal vegetation (NVC) types covered and so defined as Blanket bog are M1, M2, M3, M15, M17, M18, M19, M20 and M25, together with their intermediates.

6.51 The Northern Ireland Habitat Action Plan (NIHAP) provides a similar definition of the habitat type, The NI HAP notes the EC Habitats Directive definition of what constitutes ‘active’ bog, and note the following in respect of relevant NVC types: -

‘Within Northern Ireland, blanket bog encompasses a range of plant communities that are similar to those identified in the National Vegetation Classification (NVC) of Great Britain (Rodwell, 1991). NVC descriptions and codes are given to associations of plants that are characteristic of particular environmental and management conditions. Plant communities that are typical of natural blanket bogs include the bog pool communities M1 to M3, M17 Scirpus cespitosus - Eriophorum vaginatum blanket mire, M18 Erica tetralix - Sphagnum papillosum raised and blanket mire and M19 Calluna vulgaris - Eriophorum vaginatum. A number of additional NVC communities are characteristic of the extensive areas of blanket bog which have been subject to some disturbance such as drainage or peat-cutting. These include M15 Scirpus cespitosus - Erica tetralix wet heath, M20 Eriophorum vaginatum blanket and raised mire, M25 Molinia caerulea - Potentilla erecta mire, together with their intermediates. Other wetland plant communities, such as flush M10 Carex dioica- Pinguicula vulgaris mire and poor-fen M6 Carex echinata-Sphagnum recurvum/auriculatum mire, are often closely associated with blanket bog. For the purposes of this plan, these are treated as an integral part of the blanket bog habitat.’

6.52 The UKBAP, NIHAP and European Commission (2007) Interpretation Manual of European Union Habitats has been utilised in the current report to determine whether peatlands are 'active' and hence require consideration in policy and impact assessment terms.

Guidance on Species/Habitats of Conservation Concern

Red Data Book

6.53 Vascular plant species that are rare and/or threatened on an all-Ireland or European scale have been identified as Red Data Book (RDB) species (Curtis & McGough, 1988).

Northern Ireland Species of Conservation Concern

6.54 NIEA has produced a list of Northern Ireland Priority Species (NIPS) and Species of Conservation Concern (SOCC), which includes Biodiversity Action Plan species, not all of which are Red Data Book species. Rarity is also a criterion for inclusion in the list. NIEA is also in the process of identifying vascular plant species that are of conservation concern as the NI response to the adoption by the UK of the Global Strategy for Plant Conservation (Palmer, 1994). The proposed list will be comprehensive and include species that are near threatened as well as those protected by the Wildlife Order or listed as NIPS and SOCC. This process of evaluation of the current list of species of conservation concern is on-going.

Local Biodiversity Action Plans (LBAPs)

6.55 Local Authorities have been able to employ Biodiversity Officers, with financial aid from NIEA, since 2004. Their duties include raising awareness of biodiversity issues within local areas, and the development of LBAPs as a means of conserving and enhancing biodiversity at a local scale.

NIEA Internal Guidance Note on Active Peatland

6.56 The Northern Ireland Environment Agency (NIEA) provide internal guidance to their personnel indicating the site conditions, and which NVC types, may indicate that blanket bog is 'active'. In terms of NVC communities, the Guidance states: -

'The list below indicates the NVC classifications that could be active. In these habitats, the full details of quadrats surveyed will be needed to aid identification of active peatland. They should be provided within the environmental statement (ES).

NVC classifications which are likely to be found in active peatland:

- *M1 Sphagnum auriculatum bog pool community*
- *M2 Sphagnum cuspidatum/recurvum bog pool communities*
- *M3 Eriophorum angustifolium bog pool community*
- *M17 Scirpus cespitosus - Eriophorum vaginatum blanket bog*
- *M18 Erica tetralix- Sphagnum papillosum raised and blanket mire*
- *M19 Calluna vulgaris-Eriophorum vaginatum blanket mire*
- *M20 Eriophorum vaginatum blanket mire*

- *M25 Molinia caerulea-Potentilla erecta mire'*

6.57 Other criteria from the Guidance, including site-specific characteristics which could indicate the presence of 'active' peat include:

- *Sphagnum is present*
- *If the surface is spongy underfoot*
- *Deep peat is present (>0.5m)*
- *Intact peat is present or the hydrology is still intact*
- *E. vaginatum/ angustifolium is present in significant quantities with some Sphagnum*
- *The typical range of blanket bog and raised bog species is present as indicated within the interpretation manual*
- *There is a hummock and pool topography*

6.58 Consideration of this Guidance is essential in the design and layout of wind energy projects to ensure compliance with Planning Policy.

Scope of Assessment

Ecological Impact Assessment

6.59 The assessment is based on a study area which encloses the access tracks, crane pads, turbine sites and associated works areas. The study area extends ~25 m beyond the likely limits of construction. The entire area within the Site Boundary was surveyed to establish the main habitat types present, and the results were presented in the Phase 1 Habitat Map. The reduced survey area described in the present report takes into account the results of this earlier survey and avoids considerable areas of habitats of conservation value identified at that time. Sites designated for their nature conservation features within a radius of 10 km of the site boundary (**Figure 6.1**) were also considered to assess potential remote effects on valuable ecological site-based receptors.

6.60 The aim of EcIA is therefore to describe and assess potential significant effects upon ecological receptors within the application site and zone of ecological influence within the wider environment, as applicable. This is achieved by informed decision-making in accordance with published methodologies and after collecting a range of primary survey data across the site of the proposed development. Identification and evaluation of likely significance of effects associated with the Proposed Development during construction, operation and decommissioning phases permit recommendation of appropriate mitigation measures to avoid and/or reduce the predicted adverse effects of the proposed development on the recorded ecological receptors identified as part of the baseline survey.

6.61 The baseline survey, characterisation of the environment and the likely significance of effects of the Proposed Development on non-avian fauna, ornithology, fisheries (aquatic ecology) and the water environment are reported upon in **Chapter 7: Ornithology, Chapter 8: Fisheries** and **Chapter 9: Geology & Water Environment**.

Assessment Methodology

Baseline Characterisation of the Study Area

6.62 The study methodology uses both desktop and field survey methods in order to assess the potential impact on the local ecological and nature conservation interest.

Consultation

6.63 Consultation was undertaken with the statutory and non-statutory organisations listed below regarding the proposed scope of the EcIA; the location of any statutory and non-statutory designated nature conservation sites that have the potential to be impacted by the Development; identification of potential ecological receptors; the existence of any ecological records within 2km of the Site Boundary.

- Centre for Environmental Data & Recording (CEDaR);
- DAERA Natural Environment map viewer;
- National Biodiversity Network (NBN);

6.64 Biological records were obtained from CEDaR and NBN.

6.65 NIEA normally requires the identification of the ecological baseline of the area that will be affected by the scheme and the identification of areas which are likely to be of high conservation value or particularly vulnerable to impact from the proposed scheme. NIEA requires that the EIA should cover both habitats and species of flora and fauna, especially protected species, and that it should cover both the site and its surroundings, in all seasons.

6.66 The developer is required to consider the potential impact of the scheme on designated sites. Where there is a potential for impacts on a European protected site (SPA, SAC) the developer will be responsible for informing a HRA as mandated by Article 6 of EC Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora ("the Habitats Directive").

6.67 The consultation and desk study identified those ecological receptors most likely to be impacted by the proposed wind farm. Particular attention is paid to identifying Northern Ireland or European priority habitat and protected species.

Habitat and Species Survey Methodology

Phase 1 Habitat Survey

6.68 The purpose of Phase 1 habitat survey is to identify those habitats of conservation interest that might place a constraint on the placement of the infrastructure of a proposed wind farm. The site was visited by Brian Sutton on 08.08.23, 23.09.23, 08.10.23 and 02.11.23. Habitats of the proposed development site were allocated to the JNCC Phase 1 Habitat (JNCC 2010) classification. Notes were made of the main plant species, and other species that are indicative of the condition and management of the habitat.

6.69 Phase 1 Habitat survey methodology is intended for the auditing of habitats and is generally accurate and of wide application. It is noted also that habitat types may

frequently merge, grade from one to another, or form complex mosaics. Frequently encountered habitat mosaics in Ireland include various mixtures of grassland/pasture types, heathlands and blanket bogs. Mosaics and transitional, modified and degraded habitats can be difficult to assign to any one Phase 1 Habitat category yet may have very different sensitivities and implications for project planning and assessment.

6.70 The Phase 1 surveys were carried out along walked transects that attempted to include the variations in habitat types that were present across this extensive site. Features that indicated the potential for active peat formation were noted and, in particular, the extent and type of moss cover were noted, with an emphasis on the prevalence or absence of Sphagnum species. The presence of *Succisa pratensis*, the food plant of the marsh fritillary butterfly, which is fully protected under the Wildlife (Northern Ireland) Order, 1985, was noted where encountered.

6.71 The area covered by the Phase 1 Habitat survey extends to the landholding within which the frozen extension layout is located and is illustrated in **Figure 6.2**. Target notes are provided in **Appendix 6.1** and the location of Target note locations are presented in **Figure 6.4**.

National Vegetation Classification (NVC) Survey

6.72 The NVC is a system of classifying natural plant communities in Britain according to the species they contain and provides a standardised methodology for detailed environmental assessments. The methodology is repeatable and incorporates the use of quadrat sampling within which the types and relative abundance of plant species is recorded. From these results, plant community types can be classified.

6.73 The survey method employed at Dunbeg South Extension was based on the NVC survey methodology described by Rodwell (Volumes 1 to 5, 1991 to 2000), which provides for the detailed classification and map-based survey of a wide range of plant communities found in Britain. The NVC describes communities in Britain, while often relatively depauperate communities in the island of Ireland have developed as a result of isolation from potential colonisers and under a generally more oceanic climate. Consequently, NVC types, while widely applicable to vegetation communities present in Northern Ireland, may vary significantly from those described for Britain in species composition and frequency.

6.74 Plant species were identified and recorded using the keys and nomenclature of Stace (2010) for higher plants and Atherton et al. (2010) for bryophytes (mosses and liverworts).

6.75 NVC survey requires the placement by eye of 2m x 2m squares to include either locally typical vegetation or to record the local variation in community type. All herbaceous and bryophyte species present within the square were recorded and their percentage cover noted. This approach allows subsequent analysis using the MAVIS program. Sward height and evidence of grazing pressure were recorded and, where appropriate, peat depth was measured. Irish Grid References were recorded for all quadrats sampled.

6.76 A Phase 2 NVC survey of 43 quadrats was carried out by Karl Hamilton on 15.05.24 and 17.05.24 following the adoption of the frozen turbine layout. Habitats on the site are generally extensive and Phase 1 descriptions are appropriate for these large-scale features. Quadrat locations are provided in **Figure 6.3** and quadrat descriptions are provided in **Appendix 6.2**.

Active Peat Assessment

6.77 Peatland habitats within the site were assessed to determine whether there were any areas of 'active' blanket bog present. The criteria used included the following:

- criteria provided in the NIEA Guidance note (2012);
- the presence and condition of NVC communities;
- particularly the presence and condition of artificial drainage;
- past and present land management practices which have the potential to damage the habitat, including: peat cutting, burning, vegetation topping, sheep grazing, etc.

Bat Survey Methodology

6.78 NIEA recommends different types of guidance for bat surveys, depending on the type of proposal. In the case of the proposed development this includes the SNH guidance (Aug 2021) entitled '*Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation*'. Therefore, this guidance was used when arriving at the appropriate level of survey effort (for both automated and manual surveys) at the windfarm. They (NIEA) also have their own guidance, based on the SNH guidance referred to above. This is entitled; Guidance on Bat Surveys, Assessment & Mitigation for Onshore Wind Turbine Developments – Version 1.1 NIEA, Natural Environment Division, March 2024.

6.79 A desk study was undertaken in order to plan survey work and provide context for this assessment. The desk study included a review all the available information on bats relevant to the proposed wind farm and considered the various factors that influence risk to the species at a site. This included:

- The use of aerial imagery (a ground truthing site visit), topographical maps of the proposed site to identify features of potential value to bats.
- The collation of relevant bat information within 10 km of the proposed wind energy site, including species and roost records and the proximity of national and internationally designated sites for bats.
- Particular efforts were made to identify locations with the potential to house significant roosts, such as barns and other buildings.
- The location of other wind energy developments, including the number of turbines and their size, within the surrounding 10km in order to inform an assessment of cumulative pressure.

6.80 Collins (2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (4rd edition) was also considered during survey design and the subsequent survey effort.

6.81 It was noted that:

- Habitat quality is poor for bats on the site due to the presence of largely low-quality foraging habitat for bats (semi-improved grassland) across the majority of the site. There are some areas of moderate quality foraging habitat, namely the rivers and stream valleys and the adjacent coniferous plantations.
- The site has an exposed aspect;
- The site is not proximal to sites designated for bats; and,
- No buildings or other structures known to support bats are extant on the site[2].

6.82 Based upon this information, and upon the factors noted in the aforementioned SNH Guidance, the site was deemed to be of 'medium quality' for bats and the following survey standard was implemented in accordance with SNH Guidelines.

- Survey Area of up to 200m plus the rotor radius from the proposed turbine locations;
- Ten consecutive nights of static monitoring per turbine location during each season (spring/summer/autumn) using broadband passive recorders.

6.83 A detailed survey of potential roosting features within 200m of the application site boundary was carried out during 2023.

6.84 A ground level tree assessment (GLTA) was carried out of the trees within the vicinity of the proposed extension. Features on trees that are capable of supporting roosting bats were examined, where available. These features include snags, lifted bark and splits in trunks and branches.

6.85 Three brick structures present within the nearby quarry were assessed in accordance with BCT guidelines. Results of the bat survey are provided in **Appendix 6.3**.

6.86 Overall, the site is identified as being of Moderate-risk due to the presence of river corridors and coniferous forestry plantations in the wider surrounding area.

Automated Bat Activity Surveys

6.87 Automated passive monitoring was also undertaken during spring (15 Apr – 15 Jun), summer (15 Jun – 15 Aug) and autumn (15 Aug – 15 Oct) 2022 (**Appendix 6.3** and **Figure 6.5: Static monitoring locations**). Several (calibrated) broadband ultrasonic bat detectors (Anabat Chorus & Song Meter Mini Bat) were placed to record for a minimum of ten nights at numerous locations across the site on a seasonal basis, including at all 4 potential turbine locations (and previous fifth location before removed from proposed development) and a number of 'paired' habitat features. Each static detector was programmed to automatically operate during set time periods to record bat activity between dusk and dawn each night.

6.88 The SNH 2021 guidance states that;

[2] within 200m plus rotor radius of the proposed turbine locations.

''Where developments have more than ten turbines, detectors should be placed within the developable area at ten potential turbine locations plus a third of additional potential turbine sites up to a maximum of 40 detectors for the largest developments''.

6.89 At Dunbeg South Extension, 5 proposed turbines were monitored (prior to the decision that only 4 turbines would be installed), which yielded over 270 nights of recording time (May to September inclusive). This was done in order to allow for alterations to the proposed turbine layout (which often occur during the assessment process) and to allow for equipment failure or damage.

6.90 Detectors were placed with the microphone directed at a 90° angle towards the area to be monitored (e.g., the proposed turbine location or adjacent habitat feature). Whenever possible microphones were placed on a fence post or pole. This helps to prevent recording extraneous noises and places the microphone closer to or within the flight path of the bats; this tends to provide higher quality recordings.

6.91 AnalookW and Kaleidoscope Pro UK was used to undertake analysis of data collected during automated passive monitoring. Bat activity was measured using the number of files containing a bat call or bat call sequence irrespective of length, for a complete night of recording. Passive monitoring enables determination of species composition and temporal activity patterns between different times of year and different times of night at a fixed-point location. Bat activity indices (for all survey types) are provided in the survey results, included in **Appendix 6.3**.

Otter Survey

6.92 The Curly River passes around 420m to the north of the proposed development area. Minor tributary rills flowing in the vicinity of the site are unlikely to provide significant food resources for otters and are unlikely to be used by the species. It is considered unlikely that the open habitats of the site are suitable for the location of otter holts and a dedicated otter survey was not carried out.

Badger Survey

6.93 A badger survey was carried out by Karl Hamilton on 21.03.24, extending to 30m outside the red line boundary of the site. Badger activity elsewhere in the site was also recorded during initial walkover surveys.

Viviparous Lizard Survey

6.94 Thirty artificial refugia, consisting of black waterproof material, were deployed across the site. They were checked on 20.03.24 and 11.06.24 for the presence of lizards or indications of lizard use. Locations of refugia and results are provided in the Lizard Report presented in **Appendix 6.4**.

Smooth Newt Survey

6.95 An initial site walkover survey on 20.03.24. encountered eight ponds, which were assessed and recorded for their potential to support smooth newts. Pond descriptions

and co-ordinates are provided in **Appendix 6.5**. Three ponds were investigated using eDNA sampling techniques as an alternative to torchlight surveys (due to accessibility and health & safety concerns in the old abandoned quarry).

6.96 Samples were analysed by Sure Screen Scientifics Ltd for smooth newt eDNA using established assay protocols. DNA extracted from water samples were tested using species-specific molecular markers. The process is described in greater detail in the eDNA report in **Appendix 6.5**.

Marsh Fritillary

6.97 The larval food plant of marsh fritillary, devil's-bit scabious is scarce across the site and was encountered at a low cover in a single quadrat (out of 43 examined) within the red line boundary of the proposed works. With this low occurrence of the food plant it was not considered necessary to undertake a dedicated survey for evidence of larval presence.

Ecological Impact Assessment

6.98 The assessment of the impact of a scheme on a species or habitat must consider the conservation value of the species or habitat. This assessment of the potential impact of the Development on the conservation interest of the construction area and associated access routes adopts the Guidelines for Ecological Impact Assessment in the UK (CIEEM 2018[7]).

6.99 The objective of the EIA process, in relation to the natural environment, is to undertake sufficient assessment to identify and quantify any significant impacts on the natural environment likely to arise from turbine construction, operation and eventual decommissioning. Following identification of the final infrastructure layout, the baseline ecological (or biodiversity) conditions in the Site are described, based on information provided by consultees, background sources of information and the results of dedicated surveys carried out for the scheme.

6.100 As a means of achieving this objective, ecological constraints on development of the scheme at international, national, regional and local levels are identified and assessed. This includes the main ecological features that should be avoided or that could affect the design of the scheme or delay progress.

Sensitivity Criteria

6.101 Potential significant impacts are assessed according to the ecological value of a site, which is derived from the criteria outlined below. The sensitivity (importance) of a receiving habitat is defined by its position in a hierarchy of site importance and conservation value. This hierarchy extends, highest to lowest, from International, National, Regional, Local, to negligible importance. This range of values is expressed in the protection afforded a site by international and national legislation, and in planning policy at a more local level (Table 6.1).

6.102 The biodiversity value of a site, is measured by such factors as:

- animal or plant species, subspecies or varieties that are rare or uncommon, either internationally, nationally or more locally;
- endemic species or locally distinct sub-populations of a species;
- ecosystems and their component parts, which provide the habitats required by the above species, populations and/or assemblages;
- habitat diversity, connectivity and/or synergistic associations (e.g. networks of hedges and areas of species-poor pasture that might provide important feeding habitat for rare species);
- notably large populations of animals or concentrations of animals considered uncommon or threatened in a wider context;
- plant communities (and their associated animals) that are typical of valued natural/semi-natural vegetation types, including examples of naturally species-poor communities;
- species on the edge of their range, particularly where their distribution is changing because of global trends and climate change;
- species-rich assemblages of plants or animals; and
- typical faunal assemblages that are characteristic of homogeneous habitats.

6.103 The secondary value of a site can be as part of a corridor or a series of stepping stones that facilitate the migration, dispersal and genetic exchange of wild species, or as a buffer zone that protects a valued site from adverse or beneficial environmental impacts.

Magnitude of Effect

6.104 This relates to the magnitude of the impacts on the features during the construction, operation and decommissioning phases. The magnitude of ecological impacts is assessed by considering the change in the ecology of a site that will arise because of the direct and indirect effects of a development on that ecology. Factors to be considered when considering the magnitude of an impact are outlined in Table 6.2. The criteria for determining the magnitude of impact are listed in Table 6.3. Both direct and indirect impacts, and the duration of these impacts are examined.

Significance Criteria

6.105 This relates to the significance of impacts on species and habitats of conservation importance, based on their presence as determined by survey. Factors to be considered when assessing the ecological significance of impacts are outlined in Table 6.4. Taking the factors in Table 6.4 into account the significance of an impact may be broadly categorised according to Table 6.5.

Table 6.1: Criteria for assessing ecological sensitivity/importance at a geographic scale

Value/Importance	Criteria
Internationally important sites (very high conservation value)	*World Heritage Sites identified under the Convention for the Protection of World Cultural & Natural Heritage, 1972.* *Biosphere Reserves identified under the UNESCO Man & Biosphere Programme.* *Wetlands of International Importance designated as Ramsar Sites under the terms of the Convention on Wetlands of International Importance Especially*

Value/Importance	Criteria
	as Waterfowl Habitat (the Ramsar Convention) formulated at Ramsar, Iran, in 1971. *Special Protection Areas (SPAs) designated in accordance with the 1979 European Communities Directive on the Conservation of Wild Birds (79/409/EEC): The Birds Directive. This Directive requires member states to take measures to protect birds, particularly rare or endangered species as listed in Annex I of the Directive, and regularly occurring migratory birds.* *Special Areas of Conservation (SACs and cSACs) designated in accordance with the 1992 European Commission Habitats Directive 92/43/EEC (1992): The Habitats Directive. This Directive requires member states to establish a network of sites that will make a significant contribution to conserving habitat types and species identified in Annexes I and II.* *Other sites maintaining habitats and/or species listed under the Birds and/or Habitats Directives (see above).* *Sites hosting significant populations of species annexed under the Bonn Convention.* *Sites hosting significant populations annexed under the Bern Convention.* *Biogenetic Reserves (UNESCO Man and the Biosphere Programme).*
Nationally important sites (high conservation value)	*Areas of Special Scientific Interest are the principal national designation for sites of nature conservation interest. They are notified under Section 28 of the Environment (NI) Order 2002 and are chosen by virtue of any of their flora, fauna, geological, or physiographic features to represent the best national and regional example of natural habitat, physical landscape features or sites of importance for rare or protected species.* *National Nature Reserves (NNRs) and Marine Nature Reserves (MNRs) are designated under the Environment Order.* *Sites maintaining UK Red Data Book species that are listed as being either of unfavourable conservation status in Europe, of uncertain conservation status or of global conservation concern. Sites maintaining species listed in Schedules 1, 5 and 8 of The Wildlife (NI) Order 1985, as amended.*
Regionally important sites (medium conservation value)	*Sites that reach criteria for Local Nature Reserve but do not meet ASSI selection criteria.* *Sites of Local Importance for Nature Conservation (SLNCIs) are recognised by Planning Service and are intended to complement the network of nationally and regionally important sites. SLNCIs receive special consideration in relation to local planning issues.* *Sites supporting viable areas or populations of priority habitats/species identified in the UK Biodiversity Action Plan or smaller areas of such habitat that contribute to the maintenance of such habitat networks and /or species populations.* *Sites maintaining habitats or species identified in Regional Biodiversity Action Plans based on national rarity or local distribution.* *Other sites of significant biodiversity importance (e.g. sites relevant to Local Biodiversity Action Plans).*
Local (lower conservation value)	*Sites not in the above categories but with some biodiversity interest. Examples of lands of lower ecological value include; intensive agricultural lands and coniferous forestry.*
Negligible conservation value	*Sites with little or no local biodiversity interest.*

Table 6.2: Factors to be considered when assessing magnitude of ecological impacts

Parameter	Description
Extent	The area over which an impact occurs.
Duration	The period required for a feature to recover or be replaced following an impact. Duration of an activity may have a shorter duration than the impact of the activity.

Reversibility	A permanent impact is one from which recovery is unlikely within a reasonable timescale. A temporary impact is reversible either through natural recovery or because of mitigation.
Timing and frequency	In some cases, an impact may only occur if it occurs during a critical season or part of a species' life-cycle, and may be avoided by careful scheduling of work activities. Frequency of an activity may also affect the magnitude of its impact by reinforcement of the impact.

Table 6.3: Criteria for assessing magnitude of ecological impact

Significance	Description
Severe adverse	The development fails to satisfy the subject environmental objective and results in major fundamental deterioration of the environment at national and international levels of importance. Proposed development activities will result in a major alteration to the baseline ecological conditions, resulting in fundamental change and major environmental deterioration. Large adverse impacts are attributed to any significant adverse impact on habitat and species (or other valued ecological receptors) identified as being of International significance. Highly significant impact, warrants refusal of planning permission.
Major adverse	The proposal (either on its own or in-combination with other proposals) may adversely affect the site, in terms of coherence of its ecological structure and function, that enables it to sustain the habitat, complex of habitats and/or the population levels of species of interest.
Moderate adverse	The site's integrity will not be adversely affected, but the effect on the site is likely to be significant in terms of its ecological objectives. If it cannot be clearly illustrated that the proposal will not have an adverse effect on integrity, then the impact should be assessed as a major adverse.
Minor adverse	Neither of the above applies, but some minor adverse impact is evident. (In the case of Natura 2000 sites a further appropriate assessment may be necessary if detailed plans are not yet available).
Negligible	Very minor alteration to one or more characteristics, features or elements.
Neutral	No observable impact in either direction.

Table 6.4: Factors to be considered when assessing ecological significance of impacts

Factor	Defining criteria
Site integrity	*Extent to which site/ecosystem processes will be removed or changed.* *Effect on the nature, extent, structure and function of component habitats.* *Effect on the average population size and viability of component species, size and viability of component species.*
Conservation status	*Habitats: conservation status is determined by the sum of the influences acting on the habitat and its typical species that may affect its long-term distribution, structure and functions as well as the long-term survival of its typical species within a given geographical area.* *Species conservation status is determined by the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within a given geographical area.* *Conservation status may be evaluated for any defined study area at any defined level of ecological value. The extent of the area used in the assessment will relate to the geographical level at which the feature is considered important.*

Probability of expected outcome	*Known or likely trends and variations in population size/habitat extent.* *Likely level of ecological resilience.*

Table 6.5: Significance of impacts

Significance	Description
Severe adverse	The proposal (either on its own or with other proposals) is likely to adversely affect the integrity of a European or nationally designated site, in terms of coherence of its ecological structure and function, across its whole area, that enables it to sustain the population levels of species of interest, or is likely to adversely affect the numbers, distribution or viability of a species or population of conservation concern. A major change in a site or feature of local importance may also enter this category.
Major adverse	The integrity of a European or nationally designated site will not be adversely affected, but the effect on the site is likely to be significant in terms of its ecological objectives. If, in the light of full information, it cannot be clearly illustrated that the proposal will not have an adverse effect on integrity, then the impact should be assessed as very large adverse.
Moderate adverse	The proposal may adversely affect the integrity of a locally important conservation site, or may have some adverse effect on the numbers, distribution or viability of a species or population of conservation concern.
Minor adverse	None of the above applies, but some minor negative impact is evident. (In the case of Natura 2000 sites a further appropriate assessment may be necessary if detailed plans are not yet available).
Neutral	No observable impact in either direction.
Minor beneficial	The development partly satisfies the subject environmental objective and partly contributes to the environmental context. Proposed development activities will result in minor improvements to baseline ecological conditions and should result in minor environmental gains. Slight beneficial impacts can be attributed to benefits to any valued ecological receptors. Environmental gains which can easily be achieved through standard practices.
Moderate beneficial	The development satisfies the subject environmental objective and contributes to the environmental context. Proposed development activities will result in recognisable improvements to baseline ecological conditions and will result in notable environmental gains. Moderate beneficial impacts can be attributed to benefits to any valued ecological receptors where improvements are expected to be significant. Environmental gains which require detailed design consideration – potentially employed to offset slight/moderate adverse impacts elsewhere.
Major beneficial	The development satisfies the subject environmental objective and results in a major contribution to the environmental context. Proposed development activities will result in quantifiable improvements to baseline ecological conditions and will result in significant environmental gains. Large beneficial impacts are only attributed to substantial benefits to valued ecological receptors identified as being of National or International importance and where such benefits will result in the consolidation and/or expansion of areas of habitats or ensure the security and/or expansion of viable populations of species. Environmental gains which require very detailed design consideration – potentially employed to eliminate and offset potential significant adverse impacts elsewhere.

6.106 Cumulative impacts may also arise. Other projects that have been included in the cumulative impact assessment are:

- Wind farm projects which have received planning consent; and
- Other development projects with valid planning permissions, and for which formal EIA is a requirement or for which non-statutory EIA has been undertaken. Other projects should be included as appropriate, subject to consultation with DOE Planning and other statutory bodies. The cumulative impacts of different projects are assessed against the significance criteria outlined in **Table 6.6**.

Table 6.6: Criteria for assessing the significance of cumulative effects

Significance	Effects
Severe	Effects that the decision-maker must consider as the receptor/resource is irretrievably compromised.
Major	Effects that may become key decision-making issue.
Moderate	Effects that are unlikely to become issues on whether the project design should be selected, but where future work may be needed to improve on current performance.
Minor	Effects that are locally significant.
Not Significant	Effects that are beyond the current forecasting ability or are within the ability of the resource to absorb such change.

Baseline Conditions

Consultation and Desk Study Results

DAERA map viewer - Designated Sites

Lough Foyle Ramsar site

6.107 The site is approximately 7.25km to the south east of the boundary of the Lough Foyle Special Protection Area (SPA) and Ramsar site and the coincident boundary of the Lough Foyle Area of Special Scientific Interest (ASSI).

6.108 The designated site qualifies under Criterion 1 of the Ramsar Convention because it is a particularly good representative example of a wetland complex including intertidal sand and mudflats with extensive seagrass beds, saltmarsh, estuaries and associated brackish ditches. This is a particularly good representative example of a wetland, which plays a substantial hydrological, biological and ecological system role in the natural functioning of a major river basin which is located in a trans-border position.

6.109 The site qualifies under Criterion 2 because it supports an appreciable assemblage of rare, vulnerable or endangered species or sub-species of plant and animal. A range of notable fish species have been recorded for the Lough Foyle estuary and the lower reaches of some of its tributary rivers. These include allis shad *Alosa alosa*, twaite shad *A. fallax fallax*, smelt *Osmerus eperlanus* and sea *lamprey Petromyzon marinus*, all of which are Irish Red Data Book species. In addition, important populations of Atlantic salmon Salmo salar migrate through the system to and from their spawning grounds.

6.110 It qualifies under Criterion 3 by supporting a diverse assemblage of wintering waterfowl which are indicative of wetland values, productivity and diversity. These include internationally important populations of whooper swan *Cygnus cygnus*, light-bellied Brent goose *Branta bernicla hrota* and bar-tailed godwit *Limosa lapponica*. Additional wildfowl species which are nationally important in an all-Ireland context are red-throated diver *Gavia stellata*, great crested grebe *Podiceps cristatus*, mute swan *Cygnus olor*, Bewick's swan *C. columbianus*, greylag goose *Anser anser*, shelduck *Tadorna tadorna*, teal *Anas crecca*, mallard *Anas platyrhynchos*, wigeon *A. penelope*, eider *Somateria mollissima*, and red-breasted merganser *Mergus serrator*. Nationally important wader species are oystercatcher *Haematopus ostralegus*, golden plover *Pluvialis apricaria*, grey plover *Pluvialis squatarola*, lapwing *Vanellus vanellus*, knot *Calidris canutus,* dunlin *C. alpina*, curlew *Numenius arquata*, redshank *Tringa totanus* and greenshank *T. nebularia*.

6.111 The site fulfils Ramsar criterion 6 because it supports species/populations occurring at levels of international importance. Qualifying species/populations (as identified at designation) are whooper swan, light-bellied Brent goose, and bar-tailed godwit

River Roe and Tributaries SAC

6.112 The SAC boundary includes the Curly River, including the stretch that marks the boundary of the habitat survey area. The SAC boundary is approximately 420m to the north of Proposed Development red line boundary, at the foot of a flat to low gradient slope. The Habitats Directive Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site are **"Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation" and "Old sessile oak woods with Ilex and Blechnum in the British Isles." The** Annex II species that is a primary reason for selection of this site is **Atlantic salmon *Salmo salar*. Otter *Lutra lutra* is an** Annex II species present as a qualifying feature, but is not a primary reason for site selection.

Binevanagh SAC

6.113 The Binevenagh SAC is located 5.5km to the north west of the proposed development. The Annex I habitats that is a primary reason for selection of this site is **"Calcareous rocky slopes with chasmophytic vegetation."** Binevenagh is the only designated site representing this habitat in Northern Ireland. Annex I habitats that are present as qualifying features, but are not primary reasons for selection of this site are the European priority habitat **"Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)" and "Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*)".**

River Roe and Tributaries ASSI

6.114 The boundary of the ASSI coincides with that of the River Roe and Tributaries SAC. River Roe and Tributaries ASSI has been designated an ASSI because of the physical features of the river and its associated riverine flora and fauna. The area

encompasses approximately 87km of watercourse and is notable for the physical diversity and naturalness of the river banks and channels, especially in the upper reaches, and for the richness and naturalness of its plant and animal communities, in particular the population of Atlantic salmon, which is of international importance, and for the extent of the Northern Ireland priority habitat "Upland Oakwood".

Gortcorbies ASSI

6.115 The Gortcorbies ASSI is located approximately 0.5km to the west of the site. The wet grasslands at Gortcorbies comprise one of the largest areas of species-rich wet grassland in Northern Ireland. The vegetation is dominated by wet grassland of the purple moor-grass and rush pastures type, with occasional small areas of flushed grassland.

Other designations

6.116 There are no SLNCIs or woodlands listed in the Northern Ireland Ancient Woodland Inventory within 250m of the proposed development.

Desktop study

6.117 Interrogation of the online NBN Atlas produced 293 records, including 88 bird, 94 fungi, 39 bryophyte and 15 flowering plant records. The only record of a NI Priority Species was of marsh fritillary butterfly, last recorded in 1980.

6.118 Two CEDaR records of Northern Ireland priority species within 1km of the site were restricted to two records of dark-leaved willow *Salix myrsinifolia*.

Site Overview

6.119 The landholding within which the proposed wind farm extension is located is on the northern flank of Keady Mountain, descending from a maximum height of approximately 290m OD to approximately 140m OD at the Curly River. The site is bisected by the A37 Broad Road, which provides a useful boundary between the northern (Target Notes TN1-29) and southern parts (TN30-66) of the site. Target notes are provided in **Appendix 6.1** and shown in **Figure 6.4**.

6.120 Lands to the south of Broad Road rise on gentle to moderate slopes towards the south and are generally dominated by unenclosed rush pasture. Communities are generally dominated by sharp-flowered rush *Juncus acutiflorus*, and over much of the area this results in a rather uniform aspect. Small flushes occur rarely and these may support dense Sphagnum carpets. Occasional well-marked, low amplitude ridges, likely of morainic origin, descend the slope and are more often dominated by grasses. Minor rills flow in the depressions between ridges. Parts of the slope show low cut faces that record past peat-cutting (TN3), but a more extensive area of cutover occupies a broad, often saturated, terrace towards the southern end of the site (TN7).

6.121 Part of the floor of a disused hard rock quarry has been largely colonised by scrub and young trees. A small, planted belt of conifers is present towards the west of the

site. A large pond, supporting typical aquatic floating and emergent aquatic vegetation is also present in this area.

6.122 Lands between Broad Road and Curly River are generally gently sloping or flat but are traversed by a well-marked ridge. The greater part of this area also supports rush pasture, with fields towards the eastern end of the site almost uniformly dominated by sharp-flowered rush. Rush pasture along the local farm track also supports much rosebay willowherb Chamerion angustifolium and scrub is also encroaching on this area. Marshy grassland is also present along the shallow slopes along the banks of a minor tributary of the Curly River.

6.123 The ridge stands out with low-diversity semi-improved grassland extending over the feature (TN13). Fields near the western boundary of the site have been variably improved, merging into rush pasture around field edges and along watercourses. Lands to the north of the Curly River, within the site ownership boundary but outside the footprint of the proposed wind farm extension are generally under agricultural grassland but are remote from the provisional turbine location, are not hydrologically connected to the extension area and were not examined closely. Acid grassland approaching Broad Road generally supports few forbs, but these include devil's-bit scabious, which is relatively frequent, but local, along the open banks of a minor drain.

6.124 A mainly defunct hedgerow lines Broad Road and a minor stream that marks the western boundary of the site is lined with scrub. Much of the bank of the Curly River is also lined with a belt of scrub. A narrow conifer belt extends along the eastern flank of the well-marked ridge.

6.125 The following account will provide brief descriptions of the occurrence and distribution of Phase I habitat types, followed by a more detailed differentiation of habitats, based on NVC Phase II quadrat data, in the immediate vicinity of proposed turbine locations, where these could be determined.

Phase I Habitat Types

6.126 The broad habitat types differentiated by Phase I methodology are described below.

South of Broad Road

A1 Coniferous woodland

6.127 A belt of Sitka spruce *Picea sitchensis* is present near the track leading into the site from Broad Road (TN10).

A2 Scrub

6.128 Much of the disturbed ground in the vicinity of the quarry has been colonised by scrub species, often dominated by grey willow *Salix cinerea*, but with gorse *Ulex europaeus* frequent in more open locations (TN 1, 6, 7). Self-seeded Sitka spruce is occasional (TN4), with, rarely, ash Fraxinus excelsior and sycamore *Acer pseudoplatanus*. Ground flora is generally grass-dominated and is marshy in places.

B1 Acid grassland

6.129 Acid grassland is present around the margins of, and interfingers with, scrub in the vicinity of the quarry (TN 2, 6). Forbs may be frequent but of low diversity and patches of heather Calluna vulgaris occur in places. Disturbed ground and slopes to the west of the quarry also support species-poor acid grassland (TN 8, 12, 15).

6.130 Generally restricted areas of the open habitats on the slopes to the south of the site support species-poor acid grassland, often with much mat grass Nardus stricta (TN 17, 26, 29). The tops of morainic ridges that extend downslope generally support species-poor acid grassland, with much mat grass and purple moor-grass *Molinia caerulea*, dispersed patches of hare's-tail cottongrass *Eriophorum vaginatum* and soft rush *Juncus effusus* (TN 22, 24, 25). Acid grassland invariably grades over short distances into rush-dominated marshy grassland.

B5 Marshy grassland

6.131 A fenced field in the north west of this part of the site supports marshy grassland on gentle slopes, dominated by sharp-flowered rush *Juncus acutiflorus*, sown in parts with perennial rye-grass *Lolium perenne*. Forbs and mosses are rather sparse but include species typical of acid substrates (TN 11).

6.132 Linear belts that formerly consisted of planted conifers towards the west of the site are recorded by frequent stumps; these areas are now dominated by rushes (TN14, 18).

6.133 The upper slopes of the site are dominated by extensive rush pasture with hare's-tail cottongrass frequent over large areas (TN 19, 21, 26). Forbs are of low diversity, typical acidophilous species and mosses are generally scarce. Sphagnum species are generally restricted to occasional hummocks or minor spreads of *S. capillifolium*, although a more diverse sphagnum flora is present in a restricted area on lower gradients towards the north of the site (TN 28).

E1.7 Wet modified bog

6.134 A cutover basin to the south of the quarry supports grassland dominated by hare's-tail cottongrass, or co-dominant with grasses, and sphagnum species are often abundant (TN 16).

E2.1 Acid flush

6.135 Occasional sphagnum-dominated flushes are present on the southern slopes of the site (TN 23, 24).

F1 Swamp

6.136 A broad band of great reedmace swamp extends around much of the pond to the west of the quarry (TN 9).

F2.1 Marginal vegetation

6.137 A band of open water horsetail *Equisetum fluviatile* separates marginal swamp from open water in the pond to the west of the quarry (TN 9).

G1 Standing water

6.138 Minor pool on the quarry floor supports a range of wetland species (TN 3).

6.139 A significant pond to the west of the quarry supports abundant bog pondweed *Potamogeton polygonifolius* (TN 9).

G2 Running water

6.140 The western boundary of the site is a minor stream, often rush-choked (TN 13). Minor rills often mark the foot of morainic ridges and are often choked with rushes or support much bog pondweed (TN 20).

I2.1 Quarry

6.141 The quarry floor consists of hard standing that is used for occasional motor sports (TN5). The quarry face is generally bare rock and patches of bare surface on steep disturbed slopes are the result of slippage (TN4).

J1.4 Introduced shrub.

6.142 A belt of rhododendron *Rhododendron ponticum* is present near the road side boundary (TN 1, 27).

North of Broad Road

A1 Semi-natural woodland

6.143 A small stand of mature birch *Betula pubescens* near the Curly River may be of semi-natural origin (TN 41).

A1 Coniferous woodland

6.144 A stand in the grounds of an abandoned farmhouse is likely of planted origin (TN 46). A Sitka spruce plantation occupies part of a glacial ridge that extends northwards from the Curly River (TN 56).

A2 Scrub

6.145 Linear gorse and bramble *Rubus fruticosus* scrub lines the boundary stream along the western edge of the site and extends into adjacent fields in places (TN35, 38). The western part of the Curly River is also lined with a belt of scrub with occasional mature birch (TN 40). Scrub in the grounds of an abandoned farmhouse also includes mature trees that are likely of planted origin (TN 46). Localised patches of gorse (TN 44) and willow (TN32) scrub also occur.

B4 Improved grassland

6.146 Fields along the western side of the site are generally under improved agricultural grassland, often dominated by perennial rye-grass (TN 31, 33, 34, 43, 47, 50). An irregular area of improved grassland immediately to the north of Broad Road grades into marshy grassland (TN 60).

B5 Marshy grassland

6.147 Much of the eastern part of the site (TN 54, 58, 59, 62) and grounds immediately to the south of the Curly River (TN 38, 51) are dominated by species-poor purple moor-grass-dominated grassland. Rush species are generally sparse in these areas and forbs

dispersed and generally of low diversity. A field towards the north west corner of the site supports a slightly more diverse flora (TN 39).

6.148 Rush-dominated marshy grassland is present in parts of the fields towards the western end of the site (TN 32, 36, 45). Extensive fields along the eastern end of the site are generally dominated by rush pasture (TN 61, 65) but purple moor-grass-dominated marshy grassland is also present in places in a rush/moor-grass mosaic. The dominant rush vegetation grades into moor-grass-dominated marshy grassland towards the Curly River (TN 62).

B6 Poor semi-improved grassland

6.149 Restricted areas of semi-improved grassland are occasional in otherwise marshy grassland (TN 52). Much of the upper slope and top of the morainic ridge supports species-poor acidic grassland (TN 55).

E1.8 Dry modified bog

6.150 A cut face marks the edge of a slightly elevated ridge, along a fenced field boundary, that retains a narrow band (to 10m wide) of residual bog vegetation, dominated by heather and hare's-tail cottongrass (TN63).

F1 Swamp

6.151 A broad belt of yellow flag *Iris pseudacorus* lines both banks of a minor stream near its discharge into the Curly River (TN 42).

G2 Running water

6.152 Minor streams flow along the western (TN 35) and eastern (TN 65) site boundaries and through the centre of the site (TN 42, 53) before discharging into the Curly River (TN 48), which forms the northern boundary of the surveyed area.

J2.1 Intact hedge

6.153 A short, residual length of outgrown birch and bramble hedge separates two fields in the centre of the site (TN 49).

J2.2 Defunct hedge

6.154 A gappy, mainly hawthorn, hedge lines Broad Road (TN 30).

Invasive non-native species

6.155 Rhododendron can be invasive but at present is confined to the southern boundary of Broad Road. Occasional Sitka spruce seedlings occur to the south of Broad Road.

Phase 2 NVC survey

6.156 Quadrats were described for locations within the likely area of disturbance associated with construction of the extension. Quadrat data and accompanying photographs are provided in **Appendix 6.2**. The NVC communities identified during the survey are listed below:

- M20 *Eriophorum vaginatum* blanket and raised mire
- M23 *Juncus effusus/acutiflorus-Galium palustre* rush-pasture
- M25 *Molinia caerulea – Potentilla erecta* mire
- MG10 *Holcus lanatus-Juncus effusus* rush-pasture

- U5 *Nardus stricta-Galium saxatile* grassland
- W23 *Ulex europaeus-Rubus fruticosus* scrub

6.157 NVC quadrats confirmed that the greater part of the site supports rush-dominated marshy grassland habitats.

Northern Ireland Priority Habitats

6.158 Hedgerows and rivers, including headwater streams such as those that discharge into the Curly River, are listed as priority habitats (DAERA 2015).

6.159 Rush pasture and/or purple moor-grass-dominated marshy grassland are ubiquitous throughout the site. However, these habitats are, in the main, species-poor and do not therefore conform to the purple moor-grass and rush pasture priority habitat. Slightly increased species diversity in a field near the Curly River (TN39) approaches the criteria for the habitat but lacks many of the forb indicator species. This area is distant from the proposed turbine locations and associated infrastructure.

Plants of additional conservation interest

6.160 The near-obligate food plant (devil's-bit scabious Succisa pratensis) of the marsh fritillary butterfly *Euphydryas aurinia* is present locally at a low density as an occasional component of the rush pasture on site. The plant is rare within the red line boundary of the site, occurring at low cover value in a single quadrat (of 43 quadrats). The insect is fully protected in Great Britain and Northern Ireland under the Bern Convention (Annexe II) and EC Habitats and Species Directive (Annexe II). The Wildlife (Northern Ireland) Order 1985 Schedule 5 protects the species at all times and Schedule 7 makes it an offence to sell live or dead specimens.

6.161 No examples of bog myrtle *Myrica gale* (food plant for the larvae of the argent and sable moth *Rheumaptera hastata*, a UK priority species) were found on the site.

Active Peat Assessment

6.162 Peat-forming species, principally terrestrial species of Sphagnum and cottongrass species, are generally minor components of vegetation communities across the site. A restricted area of cutover to the south of Broad Road supports a discontinuous sphagnum cover and locally dense hare's-tail cottongrass (TN16); however, much of the Sphagnum cover is of species of low peat-forming potential (*S. cuspidatum, S. palustre, S. denticulatum*). It is likely that peat formation here is patchy at best and is not at a significant scale. This area is outside the red line boundary of the site and the proposed development is unlikely to have either direct or indirect effects on the Sphagnum-rich habitat.

Fauna

Bat Survey

6.163 An extensive Sitka spruce plantation is present within 150m of Turbines T2 and T3. The characteristics of trees along the plantation edge were sampled. Trees were generally <0.5m diameter, although some trees along the edge appeared more mature, likely the result of higher ambient light values. Sampled random trees within

the plantation had some areas of flaking bark but these were not sufficiently developed to create PRFs.

6.164 All other trees on the site assessed were as having negligible PRF due to their diameter (generally <0.5) and lack of suitable features. Trees consisted largely of willow scrub, with rhododendron, Sitka spruce and hawthorn within roadside hedgerows. Details of sampled trees are shown in Table 6.7.

Table 6.7: GLTA in vicinity of proposed extension.

No.	Species	Suitability	Height (m)	Alive (Y/N)	Diameter (m)	PRFs Present (Y/N)
TG1 (plantation)	*Picea sitchensis*	NONE	18	Y	0.6	N
T1	*Salix sp.*	NONE	4	Y	0.3	N
T2	*Salix sp.*	NONE	4	Y	0.6	N
T3	*Salix cinerea*	NONE	6	Y	0.4	N

6.165 Brick and concrete structures in the quarry within the site boundary were assessed for their bat roost potential (BRP). Structure 1 within the site quarry was categorised as Negligible to Low BRP; Structure 2 was categorised as Negligible BRP; and Structure 3 was categorised as Negligible to Low BRP.

Automated Passive Monitoring

6.166 Automated passive monitoring was undertaken at the site across spring, summer and autumn during 2023. Monitoring took place at 5 potential turbine locations (see **Figure 6.5 – Static Monitoring Locations**).

6.167 Across the three seasons (spring, summer & autumn), automated monitoring was carried out for 30 nights (estimated total hours = 2160 hours (based on an average of eight hours recording per night (although night length varies across the survey season)). Bat species recorded during automated passive monitoring included; common pipistrelle, soprano pipistrelle, pipistrelle spp., Nathusius pipistrelle, Leisler's bat, Myotis species. (*Myotis daubentonii, M. nattereri* and *M. mystacinus*) bat are the most difficult species to identify and are therefore collectively referred to as Myotis bats (Russ 19993 & Russ 2012[4])), as well as a few records for brown long-eared bat.

6.168 **Appendix 6.3** contains Bat Activity Indices (BAI) for the static surveys, broken down by proposed turbine location. These indices are based on the total number of files (containing a recording) of each species, divided by the total number of survey hours for that location.

[3] Russ, J. (1999) *The Bats of Britain and Ireland, Echolocation Calls, Sound Analysis and Species Identification*, Alana Ecology Ltd, Shropshire.
[4] Russ, J. (2012) *British Bat Calls, A Guide to Species Identification*, Pelagic Publishing, Exeter.

Table 6.8: Description of levels of bat activity (adopted from Mathews et al., 2016)

Description	Bat Activity Index	Interval between passes
Negligible	<1	>60 minutes
Low	1 – 5	12 – 60 minutes
Moderate	5 – 12	5 – 12 minutes
High	12 – 60	1 – 5 minutes
Near-constant	>60	<1 minute

6.169 Activity levels were moderate or above across 15.3% (23 out of 150 nights total) of the monitoring period. Nineteen of the 23 nights of moderate (or higher) were in Spring. Ten of these nights were high.

6.170 There were 28 nights of moderate activity recorded during spring, summer and autumn. There were 32 nights of high activity recorded at turbines T1, 3, 5-10, 12 recorded during the summer and autumn monitoring period.

6.171 Bat activity was high during Spring, with greatest activity recorded for common and soprano pipistrelle, but with significant activity by Leisler's bat. Activity levels during summer and autumn were generally low. Results of static monitoring are provided in **Appendix 6.3**.

Badger Survey

6.172 A single hole disused sett was located outside the site red line boundary. A single hole active sett, with associated trails, was found in acid grassland remote from the proposed works. Details are provided in Table 6.9. Badger trails were also found in dense rhododendron shrubs along the southern boundary of Broad Road.

6.173 Habitats within the site are generally assessed to be suboptimal for the species, dominated as it is by marshy grassland. Dense scrub near the edge of Broad Road may provide more suitable habitat and shelter for the species but is remote from likely disturbance arising from the proposed works.

Table 6.9: Badger sett descriptions

Sett no.	Sett location	Description
1	274928 426208	Active Badger sett c.35cm wide x 20cm high, oriented to south with clear tunnel and small quantity of bedding outside.
2	274964 425932	Disused Badger sett entrance c.25cm in diameter, oriented to south-south-east with lack of spoil or trail. Grass growing around burrow perimeter.

Sett 1

Sett 2

Common Lizard Survey

6.174 No lizards were found during visits to artificial refugia. However, potential lizard scat was found at 3 locations (Table 6.9), all remote from areas likely to be disturbed during construction or operation of the proposed extension. Lizard survey data are provided in **Appendix 6.4**.

Table 6.10: Evidence of common lizard in vicinity of proposed extension

Refugia no.	Easting	Northing	Date	Habitat
R4	274644.7	426086.8	23.04.24	Acid grassland/scrub mosaic, outside site red line
R21	274648.5	426026.6	23.04.24	Acid grassland/scrub mosaic, outside site red line
R23	274687.4	426158	23.04.24	Acid grassland/scrub mosaic, outside site red line

Smooth Newt Survey

6.175 Eight ponds were identified, although some were connected, all to the south of Broad Road. Pond descriptions are provided below.

Pond 1, IGR C74495 26186

6.176 A sizeable pond directly adjacent to the road / gate access. Trees lining the south, east and north sides. Western side is open. Marginal vegetation contains rush cover. Shaded from east and south trees, shade at 10.3 0am covered approximately 1/3 of pond. Centre of pond / far sides could not be surveyed from the bank due to dense vegetation. The pond is likely a permanent water body. Moderate - good invertebrate quality. 2 waterfowl flushed from the area. No evidence of fish. Moderate - good terrestrial habitat. Macrophyte cover was difficult to ascertain and may reach 20% but it was unclear if this is in part debris from bank vegetation. Banks are sloped steeply and ground is uneven with brambles scrub so a nocturnal torch survey would probably only be feasible from the western bank.

HSI = 0.7727 (Good)

Pond 2 IGR C74522 26159

6.177 Another sizeable pond several metres to the south of Pond 1 but connected. It contains high macrophyte cover: at ~90%. Trees present north and south. East and

west banks unobstructed. Shade from surrounding vegetation ~15-20%. Moderate - good invertebrate presence. Probably permanent or rarely dry. No evidence of fish. 2 waterfowl flushed from site. East and west banks accessible for survey. Suitable terrestrial habitat. Frog spawn present on the banks.

HSI = 0.6851 (Average)

Pond 3 IGR C74522 26123

6.178 Several metres to the south of Pond 2 with good adjacent terrestrial habitat, much rush cover and fallen tree debris. Trees present to the east and south. Banks accessible from west and north and east sides. Frog spawn present. Macrophyte cover ~60%. No evidence of fish. 2 waterfowl flushed from site. Shade ~15-20. Moderate invertebrate presence. Slow flow of water into southern end.

HSI = 0.5727 (Below Average)

Pond 4 IGR C74587 26041

6.179 5 teal flushed from the pond. Frogspawn present. Good invertebrate presence. Good terrestrial habitat. Trees lining west southeast banks, parts of which are accessible. Very large pond, likely permanent. Shade ~30%.. Macrophyte cover ~80%.

HSI = 0.7716 (Good)

Pond 5 IGR C74606 26049

6.180 Tree cover on all sides. Good invertebrate presence with several species noted. Macrophyte cover ~85%. Good terrestrial surrounding habitat. Shade ~20%. Frog spawn present on bank. No evidence of fish. Waterfowl flushed nearby. Pond probably permanent. Small corner surveyable at SSW, but northern bank likely accessible from Pond 1 and Pond 2.

HSI = 0.7528 (Good)

Pond 6 IGR C74793 25948

6.181 Very long pond formed in partially excavated site track. Macrophyte cover 90-100% however may in part be floating debris. Good - moderate invertebrate. Shade ~10%. No evidence of fish presence however waterfowl have been noted nearby. Likely permanent or rarely dries out. Good surrounding vegetation.

HSI = 0.718 (Good)

Pond 7 IGR C74650 26042

6.182 Likely to sometimes dries out. Macrophyte cover ~80% but difficult to ascertain how much is floating debris. Shade ~70%. No evidence of fish but waterfowl recording in surrounding area. Surrounding terrestrial habitat good, with brambles, scrub, grazed grass and rushes. Tree cover on all sides.

HSI = 0.5396 (Below Average)

Pond 8 IGR C74624 26028

6.183 Suitable surrounding habitat with some bramble and rush cover, but better wider surrounding habitat. No evidence of fish presence. Waterfowl noted in surrounding area. Shade ~60%. Macrophyte cover ~10%. Poor invertebrate diversity.

HSI = 0.4638 = Poor

6.184 Four ponds were assessed to have a good habitat suitability index (HSI), two to have below average HSI and one a poor HSI. Samples of water that were taken from Ponds 1, 4, 5 and 6 for eDNA analysis provided a negative result for Pond 1 and positive results for Ponds 4, 5 and 6.

Assessment of Impacts

General

6.185 Having defined the ecological baseline characteristics of the study area, it is necessary to describe the potential resultant scheme-related changes to the baseline and to assess the impact on valued ecological resources (CIEEM 2018)[5]. The process of identifying impacts refers to aspects of ecological structure and function on which a resource feature depends. Examples of aspects of ecological structure and function to consider when predicting impacts include (CIEEM 2018):

- Available resources (Territory: hunting/foraging grounds; shelter and roost sites; breeding sites; corridors for migration and dispersal; stop-over sites);
- Stochastic processes (Flooding, drought, wind blow and storm damage, disease, eutrophication, erosion, deposition and other geomorphological processes, fire and climate change);
- Ecological processes (Population dynamics: population cycles; survival rates and strategies; reproduction rates and strategies; competition; predation; seasonal behaviour; dispersal and genetic exchange; elimination of wastes. Vegetation dynamics: colonisation; succession; competition; and nutrient-cycling);
- Human influences (Animal husbandry, cutting, burning, mowing, draining, irrigation, culling, hunting, excavations, maintenance dredging, earth shaping, ploughing, seeding, planting, cropping, fertilising, pollution and contamination, use of pesticides and herbicides, introduction of exotics, weeds and genetically modified organisms and disturbance from public access and recreation, pets and transport);
- Ecological relationships (Food webs, predator-prey relationships, herbivore-plant relationships, herbivore-carnivore relationships, adaptation and dynamism);
- Ecosystem properties (Fragility and stability, carrying capacity and limiting factors, productivity, community dynamics; connectivity; source/sink; numbers in a population or meta-population, minimum viable populations; sex and age ratios; patchiness and degree of fragmentation);
- Ecological role or function (decomposer, primary producer, herbivore, parasite, predator, keystone species);

[5] Chartered Institute of Ecology & Environmental Management (CIEEM) (2018) *The Guidelines for Ecological Impact Assessment in the UK and Ireland*.

6.186 Impacts on ecosystem structure and function are assessed by reference to the following parameters:

- Positive or negative impacts, with international, national and local policies increasingly pressing for projects to deliver positive biodiversity outcomes
- Magnitude, or size of an impact, which in the case of habitat may be coincident with extent
- Extent over which an impact is felt
- Duration of time over which the impact is expected to last prior to recovery or replacement of the resource or feature
- Reversibility, or whether an impact is permanent or temporary
- Timing and frequency of an activity, which may have different impacts depending on, for example, the season during which it is carried out.

6.187 EIA legislation requires the enumeration of significant negative or positive impacts of an activity on ecological features. An ecologically significant impact is here defined as an impact on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a given geographical area (CIEEM 2016). The significance of an impact depends on the importance of a receptor as defined in **Table 6.1** and on the magnitude of the impact on that receptor as defined in **Table 6.2**. Receptor impacts may be averaged against each other to assess the significance of the impact of the scheme on the site's natural environment, but in some cases a single receptor, for example an internationally important species or habitat, may be of sufficiently critical importance that the magnitude of impact on that single receptor defines the significance of the impact on the site. The following narrative assesses the significance of the impact of the Development.

Construction Phase

6.188 Activities that may be associated with construction of the Development and that may generate impacts on the natural environment near the proposed scheme include:

- Disturbance of designation features/sites;
- Disturbance to protected species;
- Construction of hard surfaces for access roads, turbine bases and construction platforms;
- Construction on new ground, leading to habitat and population constriction and/or fragmentation;
- Storage of materials and plant, and construction of site compounds;
- Environmental incidents and accidents (e.g. spillages, noise and emissions;
- Excavation works;
- Removal and redistribution of topsoil and subsoil;
- Provision of temporary access routes;
- Disruption or modification of drainage;
- Vegetation clearance; and
- Implementation of landscape design

6.189 The significance of the potential effects of the proposed scheme on valued ecological receptors during the construction phase has been assessed and outlined in the following sections.

Effects on designated sites

6.190 The proposed extension is approximately 420m upslope of the River Roe and Tributaries SAC. In consideration of the type and scale of works associated with construction of the wind farm extension, there are unlikely to be any effects on the protected site or its conservation objectives. Other protected sites are remote from the proposed scheme and there are no pathways for effects on these sites. The potential impact on protected sites is likely to be of negligible magnitude and neutral significance.

Permanent loss of habitats due to land take

6.191 The footprint of wind farm infrastructure will involve permanent land-take, due to the construction of new access track, and the construction of substation and control building, four crane pads and four turbine bases (see Chapter 1, Introduction and Proposed Development).

6.192 The design of the wind farm layout has evolved in part by taking into account the location of NI Priority Habitats and the NIEA, Natural Heritage, Development Management Team Advice Note – Active Peatland and PPS18.

6.193 The location of all four turbines and the route of the access tracks have been chosen, as far as is possible, to minimise impacts to habitats of conservation significance.

6.194 The habitats within the red line boundary of the site are almost exclusively dominated by rush pasture, with minor elements of purple moor-grass marshy grassland and species-poor acid grassland. Rush and moor-grass habitats are universally species-poor and are not within the definition of the purple moor-grass and rush pasture priority habitat. The potential impact on marshy grassland habitats is likely to be of minor adverse magnitude and minor adverse significance.

Northern Ireland Priority Habitats

6.195 Priority habitats are infrequent in the vicinity of the proposed works. There may be a minor loss of hedgerow at the existing site entrance to the north of Broad Road in order to accommodate access for turbine components. This potential loss is of minor adverse magnitude and minor significance.

6.196 Six crossings of minor watercourses will be required during construction of site access tracks. These will be achieved by construction of culverted crossings. Disturbance of stream/rill beds has the potential to release silt and construction materials into the streams at crossing points. Stream beds are generally well-vegetated and flows in these headwater streams are likely to be low. Culverting works are unlikely to release significant amounts of silt into the watercourses and any released is likely to be intercepted by in-stream vegetation within short distances. The potential for

effects arising from crossing construction is likely to be of minor adverse magnitude and minor significance.

Plants of additional conservation interest

6.197 Devil's-bit scabious is scarce within the proposed works footprint, occurring at low cover value in a single quadrat (out of 43 examined). The potential impact on marsh fritillary is likely to be of neutral magnitude and neutral significance.

Active peat

6.198 There is unlikely to be any effect on active blanket bog. The only area of potentially active peat is outside the red line boundary of the site and is of small and patchy extent. The Sphagnum community here is largely of non-peat-forming species. There is unlikely to be any effects on the hydrology of this area of wet modified bog, which is located on more or less level ground. The potential impact on active peat is likely to be of neutral magnitude and neutral significance.

Bats

6.199 Construction activities have the potential to remove foraging habitat or reduce its value, and to disrupt flight-lines. Studies in Britain indicate that most bat activity is near habitat features. Activity declines with distance from features such as treelines and woodland edge and is generally not significant at distances greater than 50m[6]. This decline occurs both when bats are commuting and when foraging, although the decline is greater when animals are commuting. The potential impact of loss of feeding habitats may vary seasonally, with greater impact during the summer, and lower impact during migration.

6.200 Moderate numbers of bats were recorded foraging over the proposed turbine locations, while the likely main bat foraging and commuting routes along hedgerows and plantation edges have all been avoided during the emplacement of infrastructure.

6.201 The other main potential impact on bat populations that may arise due to construction is the loss of roost sites. However, no roosts were identified on the site during survey, and no potential roosting location were found within 200m from the nearest turbine. Therefore, this impact will not arise at the Development. The magnitude of construction activities on bats is likely to be neutral, and the significance of the impacts will be neutral.

Badger

6.202 Potential conflicts with badgers arising from construction include damage to setts, disturbance at setts, and removal of foraging areas and displacement of foraging or breeding animals. Construction works may present additional hazards to badgers, with a potential for entrapment within excavations, accidental injuries on

[6] The evidence in Britain is that most activity is in close proximity to habitat features. Activity was shown to decline when measured at fixed intervals up to 50m away from treelines and at varying intervals up to 35m from treelines (Verboom & Spoelstra 1999; Downs & Racey 2006).

construction plant or materials, diversion from traditional trails by plant and site compounds and exposure to oils and other toxic materials.

6.203 There is also the potential risk of displacement of sensitive animals unaccustomed to high levels of anthropogenic activities. However, no active badger setts have been identified within the red line site boundary survey area or within 25m of the boundary. Potential impacts are of minor adverse magnitude and minor significance during construction.

Common lizard

6.204 Construction of infrastructure will remove habitat that is apparently appropriate for this species and cause disturbance leading to displacement of animals over a limited area of the site. It also has the potential to impact the habitat feature/requirements that lizards need within suitable habitat; this includes areas for basking, foraging, diurnal shelter and hibernation. However, no definitive records of this species were derived from the common lizard survey of the site. Possible records of scat in refugia were from outside the red line boundary of the site. The recorded use of the site by this species indicates that these impacts have the potential to be of minor adverse magnitude and of minor significance.

Smooth newt

6.205 The major potential adverse effect of construction is likely to be removal of terrestrial habitat for this species. Smooth newts may travel up to 2km from their natal water but generally require habitats that provide shelter for foraging and hibernation. A standoff buffer zone of 200m has been applied around ponds with HSI of >0.5, The nearest construction to waters likely to support newts is an access track spur at around 80m to the west, in marshy grassland habitat that does not provide substantial shelter for the species. Denser rush cover and wet ground is present south-west of Ponds 4 and 5 and WSW of Pond 6 and may provide vegetative cover used by smooth newt which have dispersed from breeding ponds.

6.206 Newts may also be adversely affected by pollution of natal waters by high silt loads, hydrocarbons and cement-based liquors. The distance of proposed works from ponds on the site indicate that this impact is unlikely. Since works will be within travelling distance of ponds for newts, but with sub-optimal terrestrial habitat, impacts have the potential to have minor adverse magnitude and minor significance.

Operational Phase

6.207 Characteristics of wind farms that may generate impacts on the natural environment in the vicinity of the proposed scheme include:

- Occupation of former semi-natural habitats by turbines and associated infrastructure;
- Occupation of a swept volume of air space by turbine rotors;
- Vehicular use of access routes; and
- Improved access to remote sites.

6.208 Many of the impacts on biological receptors noted for the construction phase are also relevant during the operational phase. However, effective land take is reduced following the construction phase, as temporary site compounds and vehicle and plant running surfaces are returned to their former vegetation cover, and disturbance pressures arising from human presence along the route are significantly reduced.

6.209 Impacts on valued ecological receptors are outlined below.

Habitats

6.210 There is limited NI Priority Habitat present within the zone of influence. Therefore, no adverse effects on vegetation communities and habitats are anticipated during the operation of the Development.

Bats

6.211 The main potential impacts on bats during the operational phase arise from collision with rotors and from 'barotrauma', the potentially-fatal injuries that occur as a result of bats flying through air of rapidly changing atmospheric pressure in the immediate vicinity of a moving blade. The turbines have been located away from the habitat features that many species of bat use as flightlines or as a focus for foraging.

6.212 There is potential for loss of foraging area because bats may avoid a turbine site. Alternatively, there is some evidence that bats may be attracted to turbines (Kunz et al 2007[7]), possibly because insects may congregate in these locations as a response to the heat radiating from the structures (Ahlén 2003[8]). This effect is most likely to occur in calm conditions, or at low wind speeds, when collision risk for bats is likely to be at its highest.

6.213 A further possible operational impact is that ultrasound emissions from turbines may interfere with bats' echolocation capabilities[9]. The literature addressing this effect is sparse and it is likely that impacts on Irish bat species is limited (European Commission 2010[10]).

6.214 Seasonal variation in impacts of operational turbines on bats in Ireland is at present not fully understood. Movement of bats over long distances within a limited time period may produce a concentration of animals that are available for collision. Studies have shown that there is a peak in mortality in late summer and autumn during dispersal and migration, and that migrating species are most susceptible (Rodrigues et al 2008[11]). However, it is not known to what extent Irish bats migrate, which species, if any, are involved, whether migration is on a broad or narrow front,

[7] Kunz, T.K., Arnett, E.B., Erickson, W.P., Alexander, A.R.H., Johnson, G.D., Larkin, R.P., Strickland, M.D., Thresher, R.W. & Tuttle, M.D. (2007) Ecological impacts of wind energy development on bats: questions, research, needs and hypotheses. – Frontiers in Ecology and the Environment 5: 315-324.R.

[8] Ahlén, I. (2003) Wind turbines and bats – a pilot study. – Report to the Swedish National Energy Administration, Dnr 5210P-2002-00473, P-nr P20272-1.R.

[9] LONG, C.V., LEPPER, P.A. and FLINT, J.A., 2011. Ultrasonic noise emissions from wind turbines: potential effects on bat species. IN: 10th International Congress on Noise as a Public Health Problem (ICBEN2011), 24th-28th July 2011, London. Proceedings of the Institute of Acoustics, 33 (3), pp. 907 - 913

[10] European Commission (2010) Guidance on wind energy development in accordance with the EU nature legislation. European Commission, Brussels.

[11] Rodrigues, L., Bach, L., Duborg-Savage, M-J., Goodwin, J. & Harbusch, C. (2008) Guidelines for consideration of bats in wind farm projects. – EUROBATS Conservation Series No. 3, UNEP/EUROBATS Secretariat, Bonn.

and whether there are discernible migration routes. It has been suggested that collisions during migration may be exacerbated because echolocation is not used in order to save energy (Keeley et al 2001[12]).

6.215 Late summer and autumn are also the period during which there may be increased activity associated with finding mates, and differentiating between migration and mating-related causality of mortality at turbines is problematic (Cryan and Barclay 2009[13]). Research into Leisler's bat in Ireland (Boston, 2008[14]) showed that this species does not migrate long distances between summer ranges and hibernation sites. Leisler's have been shown to hibernate within Ireland and do not appear to migrate in numbers on a broad front. This is likely to significantly reduce the collision risk for this species in the Irish context. However, in the absence of definitive data for all species, it is not possible to assess the likelihood, and hence the significance, of collision risk during putative migration periods. Table 6.11 outlines the potential vulnerability of bat populations to onshore wind turbines.

Table 6.11: Level of potential vulnerability of populations of British bat species. (Adapted from Wray et al., 2010) (SNH 2019[15])

Relative abundance	Scotland[16]	Collision risk		
		Low	Medium	High
	Common species			Common Pipistrelle Soprano Pipistrelle
	Rarer species	Brown long eared bat Daubenton's bat Natterer's bat		
	Rarest species	Whiskered bat Brandt's bat		Nathusius' Pipistrelle Noctule bat Leisler's Bat[17]

6.216 In the absence of mitigation, bats flying along edge habitats would be potentially in close proximity to the rotor swept areas during foraging and commuting activity. This could potentially result in bat fatalities. Therefore, under the precautionary principle (and without mitigation) this project has the potential to have a moderate adverse impact magnitude, of major adverse significance during the operational phase. As a result, detailed mitigation by design has been developed and implemented.

6.217 All turbines have been positioned to maintain a minimum 50m buffer distance from the tip of the turbine blade to the top of the adjacent habitat feature. This is based on a (blade length of 58.5m, hub height of 91.4m and varying feature heights).

[12] Keeley, B., Uogretz, S. & Strickland, D. (2001) Bat ecology and wind turbine considerations. –pp135-141 in Schwartz, S.S. (2001, ed) Proceeding of the National Avian-Wind Power Planning Meeting IV, Carmel, CA, May 16-17, 2000.
[13] Cryan, P.M. and Barclay, R.M.R. (2009) Causes of bat fatalities at wind turbines: hypotheses and predictions. Journal of Mammalogy, 90(6):1330–1340.
[14] Boston (2008) Molecular ecology and conservation genetics of the Leisler's bat (*N. leisleri*) in Ireland. Unpublished PhD Thesis.
[15] Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation (SNH January 2019).
[16] No Northern Ireland specific table is present in the 2019 SNH guidance, therefore the table for Scotland is used here as the species assemblage is closest to what is present in Ireland.
[17] According to Bat Conservation Ireland Leisler's bat is a relatively common species in Ireland.

6.218 The results of bat activity surveys confirmed that most and foraging is along linear features such as watercourses and edges of adjacent industrial tree monoculture plantations. The infrastructure layout has taken account of bat activity along these features and turbines have been sited to avoid these areas.

6.219 With mitigation, and based on currently available data on all species of (Irish) bat species, the impact magnitude can be reduced to neutral significance during the operational phase of the Development.

Badger

6.220 The use of access tracks will be mainly limited to single-vehicle journeys for maintenance and there will be minimal collision risk to badgers. There will be no additional impacts on badgers as a result of the operation of the Development. There is likely to be neutral impact on magnitude and significance during the operational phase.

Common Lizard

6.221 The use of access tracks will be mainly limited to single-vehicle journeys for maintenance, and there will be minimal traffic risk to lizards. There will be no additional impacts on badgers as a result of the operation of the Development. There is likely to be neutral impact on magnitude and significance during the operational phase.

Smooth newt

6.222 The use of access tracks will be mainly limited to single-vehicle journeys for maintenance, and there will be minimal traffic risk to newts. There will be no additional impacts on newts as a result of the operation of the Development. There is likely to be neutral impact on magnitude and significance during the operational phase.

Decommissioning Phase

6.223 Impacts associated with decommissioning a wind farm bear many similarities to those arising during construction. Many of the work processes are similar and plant and vehicle movements are likely to be at a similar scale. It is assumed that decommissioning will require the removal of all above ground structures; the removal of all underground structures to one metre below ground level; and reinstatement of disturbed areas.

Habitats

6.224 Two types of activities have the potential to disrupt and damage vegetation communities and peatland habitats during decommissioning. These are:

- Removal of above-ground infrastructure; and
- Laydown of waste demolition materials or spillages or leaks of fuels from decommissioning plant.

6.225 The types of decommissioning effects are as follows:

- Disruption/damage to peatland vegetation, compaction/rutting of the peat surface and disruption of peat hydrology that supports peatland vegetation; and
- Contamination of the peat surface and peatland vegetation with demolition waste materials or spilled/leaked fuels.

Species of Conservation Concern

6.226 Impacts on protected mammals and herpetofauna during decommissioning are likely to be of a similar scale and nature to those that occurred during construction and are unlikely to be significant.

Impact Assessment

6.227 Each of these impacts is described and assessed below and the unmitigated impacts, mitigation measures and residual impacts are summarised in Tables 6.12 and 6.14.

Table 6.12: Potential Effects upon Ecological Receptors (Prior to Mitigation)

Impact	Nature of Effect	Magnitude	Significance
Construction			
Designated Sites / Watercourses	Statutory: River Roe & Tributaries ASSI/SAC; and Lough Foyle ASSI/SPA There is low significant potential for waterborne pollution and increased sediment loading during the construction phase in the absence of mitigation	Negligible	Neutral
Loss of habitat	Construction will require the removal of, predominantly, marshy grassland habitats of low conservation interest	Minor	Minor Adverse
NI Priority habitats	There may be a minor loss of hedgerow at the entrance to the north of Broad Road Minor streams will be disturbed with potential increase in silt load during construction of stream crossings.	Negligible Minor	Minor Adverse Minor Adverse
Bats	Disturbance of European Protected Species during construction activities	Neutral	Neutral
Badger	Temporary disturbance of foraging areas from construction works possible	Minor	Minor Adverse
Common lizard	Temporary displacement and disturbance from construction works and loss of habitat	Minor	Minor Adverse
Smooth newt	Pollution of natal waters from disturbed peat and construction liquids and materials. Disturbance of terrestrial habitats.	Minor	Minor adverse
Operational			
Designated Sites / Watercourses	Statutory: River Roe and Tributaries ASSI/SAC Water pollution, sediment	Negligible	Neutral

Impact	Nature of Effect	Magnitude	Significance
	loading, is extremely unlikely during the operational phase		
Marshy grassland	There will be no additional disturbance of marshy grassland habitats during the operational phase.	Neutral	Neutral
NI Priority habitats	There will be no additional disturbance to hedgerows and watercourses	Neutral	Neutral
Bats	Potential collision of European Protected Species with turbine blades (or barotrauma) during the operational phase	Moderate adverse	Major Adverse
Badger	Operational effects unlikely	Neutral	Neutral
Common lizard	Loss of habitat for the operational lifetime of the wind farm	Negligible to Neutral	Neutral
Smooth newt	Disturbance of newts or their breeding habitats is unlikely	Neutral	Neutral
Decommissioning			
Designated Sites / Watercourses	Statutory: River Roe & Tributaries ASSI/SAC; There is low significant potential for waterborne pollution and increased sediment loading during the decommissioning phase in the absence of mitigation	Negligible	Neutral
Marshy grassland	Removal of turbines and associated infrastructure will permit reinstatement of impacted areas of this habitat.	Minor	Minor Adverse
NI Priority habitats	There is a potential for silts and demolition pollutants to enter minor streams during decommissioning.	Minor	Minor Adverse
Bats	Disturbance of European Protected Species during decommissioning activities unlikely	Neutral	Neutral
Badger	Temporary disturbance from decommissioning works possible	Minor	Minor Adverse
Common lizard	Temporary disturbance from decommissioning works probable	Minor	Minor Adverse
Smooth newt	Temporary disturbance from decommissioning works probable	Minor	Minor Adverse

Design Evolution and Mitigation

6.228 The purpose of what is broadly classed as mitigation is to maintain the conservation value of a development site as far as is possible, and to exploit opportunities to enhance the site's conservation value wherever possible. This can be achieved by (CIEEM 2018):

- avoiding negative ecological impacts - especially those that could be significant;
- reducing negative impacts that cannot be avoided; and

- compensating for any remaining significant negative ecological impacts.

6.229 The aims of mitigation can be best achieved by choosing locations that allow sites or features of conservation value to be avoided. Avoidance and impact reduction techniques relate to reducing the footprint of the development and any ancillary works as far as is practicable. Measures required to address ecological concerns described in this ES during the construction phase will be implemented by an Ecological Clerk of Works (ECoW) as detailed in the outline Construction Environmental Management Plan (oCEMP) in Technical **Appendix 1.5** and will be incorporated within a Construction Environmental Management Plan), which will be submitted to and agreed with the Department at the pre-construction stage. Avoidance and impact reduction measures include:

- No turbine rotors are within 50m from the edge flight-lines such as streams and shelterbelts), which is the minimum stand-off distance from blade tip to the nearest habitat feature likely to be used by bats, (Natural England 2014).
- Consideration will be given to the provenance of fill materials for roads, in terms of the similarity of their physicochemical properties (particularly pH) to the present substrate.
- The contractor will prepare a CEMP prior to construction activities to provide a method statement for working practices that will include measures, among others, to prevent adverse impacts on rivers and other watercourses. Please also refer to the SUDS design Statement in Technical Appendix in Chapter 9.
- A “no access” buffer will be implemented along sensitive watercourses to prevent damage to banks and to prevent disturbance of riparian habitats, apart from the narrow corridor required during construction.
- Access of all machinery and personnel will be limited to the working area corridor.
- Site compounds and stores have been sited away from any features of conservation interest, including watercourses. Any of these features in close proximity to the works or to compounds will be fenced to prevent damage by plant or stored materials.
- Dust suppression filters and appropriate wetting of running and work surfaces will be used to prevent masking of vegetation outside construction corridors, where appropriate.
- Appropriate speed limits will be imposed to reduce the potential for dust production.
- Excavations left unattended overnight should be ramped in at least one location to allow mammals to avoid becoming trapped.
- It is also recommended that, to minimise the risk of suspended sediment entrainment in surface water run-off, the site drainage system should only be carried out during periods of low rainfall and therefore minimum run-off rates.

6.230 Of particular importance for the maintenance of habitats and associated fauna is the institution of good management practices that prevent the discharge of silt and pollutants into the local drainage system. Containment measures will include:

- Where works near or in watercourses are unavoidable, working practices will include standard methods designed to minimise sedimentation and pollution, and measures will be put in place before the works begin to ensure containment of any released sediments. These may include silt containment booms or sediment barriers, as appropriate. Land stripping will be done in stages to minimise the potential for concentrated, long-lasting pulses of silt to discharge into watercourses. All filtration systems will be monitored frequently, and they will be replaced before they become ineffective.
- Material storage compounds have been located remote from any watercourse. Surface water run-off high in suspended solids should be contained and treated prior to discharge to any watercourse. All storage tanks should be bunded and should be sited remotely from any watercourse. Works should incorporate the relevant Pollution Prevention Guidelines. Additionally, a Pollution Incident Response Plan should be put in place as part of the Construction Management Plan.
- Water should be pumped from turbine bases during construction either to areas of ground capable of absorbing the water or to settlement ponds prior to discharge. Any discharged water must be free of cementitious products.
- All tracks and drains should be maintained and monitored to ensure that surface water flow is directed as designed, and that ponding and blockages are prevented.

6.231 Further details about the proposed SuDS are included in Technical Appendix 9.1.

6.232 Avoiding or mitigating impacts arising from construction-initiated alterations of drainage patterns and infiltration regimes is of importance for preventing damage to both aquatic and terrestrial habitats. It must be appreciated that hydrological characteristics of peatland and the habitats that they support are inextricably linked, and that changes in hydrological regime will lead to changes in these habitats. No areas of blanket bog are within the red line of the proposed works. The site hydrological regime is considered in detail in Chapter 9: Geology & the Water Environment and measures outlined there will be carried out in order to maintain the limited areas of conservation interest on the Site.

6.233 Sympathetic management of the wind farm habitats during the operational phase will provide the greatest opportunity for enhancing the conservation value of the Site, and should be regarded as compensatory mitigation for the permanent land take required for the new turbines and infrastructure.

Habitat Specific Mitigation

6.234 Habitat mitigation measures are not required at this site. The site supports mainly rush-dominated habitats that are widespread across Northern Ireland and the site outside the actual construction areas will continue to be rush-dominated. Mitigation

will consist largely of generic, standard, good construction working practices and controls described in the CEMP. Site specific measures that will be taken are addressed here.

6.235 Adverse effects during the construction phase that were assessed to be potentially significant and require mitigation are:

- Loss of semi-natural marshy grassland habitats;
- Mobilisation of silt and introduction of water-borne pollutants to watercourses;
- Excavation of turbine bases and cable trenches, potentially severing hydrological routing and causing dewatering of areas of soils.

6.236 The prime mitigation to reduce to an absolute minimum any disturbance or damage to vegetation, over and above the strict controls provided in the CEMP, is habitat restoration and vigorous supervision by the ECoW of all activities and at all stages of the Development.

Species Specific Mitigation

Bats

6.237 As the design of the windfarm evolved, T5 was removed from the layout and the remaining 4 turbines were repositioned. This resulted in T1 (which had the highest levels of bat activity) being moved approximately 188m WNW of its original location. This open area away from former treelines and the old quarry is considered to be of much lower risk to bats. T3 is approximately 146m from the edge of the nearby coniferous forestry plantation. While the data collected on bats was for the old location, which was some 105m from the edge. Again this is considered to be a betterment.

6.238 BCT recommend one dusk emergence survey for structures of Low BRP, to be carried out between May and August. Use of night vision aids (NVAs) is recommended. Alternatively, at height inspection to better assess depth of identified PRFs / at height endoscopic inspection under license could be undertaken.

6.239 The buffer zones feature willow scrub of negligible roost suitability, PRF-NONE hawthorn hedgerows and PRF-NONE to PRF-I (under the precautionary principle) coniferous plantation blocks. No PRF-M trees were recorded. BCT do not recommend further survey effort for trees which may lend BRP only to individual or low numbers of opportunistic bats. No further survey effort is recommended for trees.

6.240 Following the precautionary principle, and due to the presence of several species of bat know for open-air foraging (i.e. considered at risk from turbine associated mortality; Leisler's bat (*N. leisleri*) high risk; and Common pipistrelle (*P. pipistrellus*); Soprano pipistrelle (*P. pygmaeus*) medium risk) a Bat Monitoring & Mitigation Plan (BMMP) has been recommended.

6.241 Monitoring, (in the form of bat mortality surveys), will be undertaken for the first 3-years (post-consent (if approved)) and will be reviewed annually to determine whether remedial action is required to mitigate the effects of the Development on

bats. In the event that a bat carcass if found, NIEA NED will be immediately contacted in order to discuss/agree the implementation of mitigation measures.

6.242 The BMMP will be agreed with NIEA/The Council and monitoring will be undertaken in years 1, 2 & 3 and will be reviewed after each survey period to determine whether remedial action is required to mitigate the effects of the Development on bats. At the end of year 5, the data will be reviewed to determine whether monitoring should continue.

Frequency of searches and number of turbines to be searched

6.243 It is recommended that systematic searches should be conducted within a 150m x 150m grid centred on the turbine being monitored. Two search periods are recommended, spring (based on the results of the automated monitoring) with a second round during either summer or autumn. Three turbines will be searched during each visit, and these will be selected at random across the year (Table 6.13).

6.244 Searches will be conducted at 2 to 4-day intervals (based on National Bats and Wind Turbines study recommendations). Data must be obtained from the turbine operators on whether or not the target turbine was operational on the night preceding the search, with the surveying protocol being adjusted as necessary if the turbines were either non-operational or were not rotating because of a lack of wind.

6.245 To maximise the duration of monitoring during each season, whilst maintaining low carcass removal rates, it is recommended that surveying should be split into blocks as illustrated below. This is the spring schedule, which will be repeated during summer or autumn (and alternated across the three years of the programme).

Table 6.13: Summary of proposed schedule for carcase searches (spring).

Days 1-10	Days 11-20	Days 21-30	Days 31-40	Days 41-50	Days 51-60
Initial 'sweep' then survey alternate days (d2, d4, d6, d8, d10)	*No Survey*	*Initial 'sweep' then survey alternate days*	*No survey*	*Initial 'sweep' then survey alternate days*	*No survey*

Bat Carcass (Mortality) Searches

6.246 Bat carcass searches will be undertaken using a specialist ECoW (and dog handler); and will only take place the morning after optimal conditions for bats have occurred. These are defined as;

- <5m/s ground wind speed,
- >10^{o}C of temperature (1 hour after dusk),
- no rain, and
- after a warm day of similar settled conditions (i.e. the dusk should have a peak in bat activity in the area).

6.247 Carcass searches will commence one hour after dawn to minimise the potential for carcass removal by predators.

6.248 This approach has been selected to maximise the likelihood of finding bat carcasses, which is essential in enabling predicted bat mortality to be accurately estimated. Bat carcasses will be collected (if found) to enable accurate species identification using DNA where required.

Meteorological Data

6.249 Simultaneous daily collection of meteorological data including wind speed, temperature, and precipitation will be undertaken at the turbine location, alongside bat carcass searches to identify the effect on levels of bat activity at the turbine.

Feathering

6.250 All turbine blades shall be "feathered" when wind speeds are below the "cut-in speed" of the operational turbines. This shall involve pitching the blades to 90 degrees and/or rotating the blades parallel to the wind direction to reduce the blade rotation speeds below two revolutions per minute while idling. This will substantially reduce the risk of bats being struck by idling blades, and will reduce the spatial extent of low-pressure vortices in the wake of the blades (i.e. will substantially reduce the potential for barotrauma to occur).

Operational Curtailment

6.251 In the event that a bat casualty is found, curtailment will be immediately employed for the relevant turbine. In such an instance, the BMMP must then be extended for a further 2 years from the time the casualty. If at any point a bat casualty is found, the BMMP should be revised by a suitably qualified ecologist and any changes agreed with NIEA. The BMMP should continue until the windfarm is found to consistently result in zero casualties.

6.252 Operational curtailment will initially involve raising the cut-in speed from 2.5m/s – 3m/s up to 5m/s. This will be applied at night, between 30 minutes before sunset to 30 minutes after sunrise. This increased cut-in speed will initially apply between 01 May and 15 October. For the remainder of the year the manufacturer's cut-in speed will be applied.

Provision for Curtailment Changes

6.253 The above curtailment parameter will be reviewed annually with use of bat casualty searches. If at any point a bat carcass is found, indicating that the current curtailment programme is proving ineffective at negating bat casualties, these parameters will be expanded. They will then continue to expand incrementally should further bat casualties be found, and will continue to do so until bat casualties reach an acceptable level i.e. none. Expansion of the curtailment parameters will initially focus on windspeed. This will occur in increments of 0.5m/s. Further monitoring must be undertaken to assess whether these changes to curtailment parameters are negating bat casualties or continuing to be ineffective, as referenced above. The curtailment parameters will never revert back to those during which casualties were

found. It is important that the relevant turbine i.e. those with imposed curtailment continues to be operate only within the site-specific environmental parameters which have been found to cause zero bat casualties.

Searcher Efficiency Trials

6.254 Carcasses of similar size and colour to a bat e.g. laboratory mice will be dropped from waist height at randomly selected points within the search area under turbines, on days when casualty searches are taking place and prior to searches occurring. Different locations will be selected for the carcasses during each visit so that scavengers do not become familiar with feeding locations. Care should be taken to avoid creating a super-abundance of prey, i.e. deploying too many carcasses in one search plot. At least one hour will pass between depositing the carcasses and beginning the searcher efficiency trial. The person deploying the carcasses (Tester) will not be involved in the search and will not reveal to the Seeker the exact number or location of carcasses deployed.

6.255 If completing searcher efficiency trials for dog-led search teams, particular care should be taken to avoid transferring human scent to the specimen for example searching too soon after deployment whereby dogs may follow footstep scent trails. In such instances at least one hour is recommended to pass between deployment and the search beginning.

Scavenger Removal Trials

6.256 In order to determine the rate at which carcasses are removed, a scavenger removal trial will also be completed.

6.257 A carcass (of similar size and colour to a bat) will be left under two different turbines in the wind farm each season. The carcasses will be placed out around dusk, and transference of human smell will be avoided. Carcasses will not be left under turbines if and when searches are being carried out at these turbines.

6.258 The carcasses will be monitored through the use of a motion-activated remotely operated camera for up to 10 days (battery life is affected by weather and the number of times the camera is triggered and is not entirely predictable). A second visit will be made to the site to check the cameras and change the batteries to ensure we can assess the scavenging rates over a three-week period. Assessing rates over a shorter timeframe would not enable a true test of scavenging removal rates to be made (Mathews et al., 2016). Different habitat types will be selected for the trials to ensure a robust evaluation of scavenging rates can be made.

6.259 The methods used in the Matthews (2016) study involved daily visits, rather than camera traps, to check corpses for the first seven days, but the use of camera traps will be more resource efficient and should also indicate the time at which the corpse was taken as well as the species of scavenger in most cases.

6.260 Different locations will be selected for the carcasses during each visit so that scavengers do not become familiar with feeding locations, and the cameras will be repositioned accordingly.

Estimating Actual Mortality Rates

6.261 The numbers of observed bat carcasses recorded during the study will be corrected taking into account the area searched, scavenger rates and searcher efficiency results. Various researchers have proposed different approaches to data correction including Korner-Nievergelt et al. (2011), Korner-Nievergelt et al. (2013), Bispo et al. (2012), and Lintott et al. (2016). The most up to date formula for estimating the total number of carcasses present will be applied to the data collected at the end of the survey season.

Automated Acoustic Monitoring

6.262 Automated acoustic monitoring (a static detector survey) will be undertaken concurrently with the casualty searches above. The monitoring will provide post-construction insight to bat activity levels across the site and help to identify any changes from the pre-construction survey. It will enable the appointed ECoW responsible for reviewing the BMMP each year to determine whether the way bats use the site has changed, and whether the risk level remains high or should be downgraded. For example, if bat activity at the turbine locations significantly reduces following construction, accompanied with zero bat casualties, it may be appropriate to reduce the windfarm's risk level of turbine associated casualties. Completing static detector monitoring at the same time as the casualty searches will also help to determine key risk periods in a site-specific context.

6.263 The number of recording nights will be 30. This follows the latest NIEA guidance for medium-risk sites: "30 nights of surveys at the proposed turbine locations with at least 10 consecutive nights in each season (spring, summer and autumn) plus an additional 20 nights in summer or other high-risk period. Paired detectors should be used when a significant habitat feature is present within 100m + rotor radius of any turbine."

Remedial measures

6.264 The trigger threshold for remedial measures will be linked to 'significance' in line with the CIEEM guidelines for EcIA. Remedial measures will be triggered by an impact predicted to be of significance to bats at the Local level or greater.

6.265 For geographic context, the local level is considered to represent the site boundary plus a 15km radius. A significant effect would be triggered where the level of bat mortality is considered to reduce the ability of the bat population at the Local scale to sustain a viable and stable population, as informed by monitoring.

6.266 The requirement for and design of remedial measures will depend upon the findings and conclusions of monitoring and specific measures will be developed as appropriate to mitigate and significant impact predicted (those considered significant to bat populations at the Local scale or above). Where significant impacts are predicted, potential remedial options may include, but are not limited to, the feathering of individual turbines.

Smooth newt

6.267 Parts of the 200m buffer zone around natal ponds support dense rush and wet habitats that may support terrestrial smooth newts. Sections of this site track option 2 pass closely by this potential overwintering habitat and the alternative track route is recommended to reduce the area of suitable habitat affected by track construction. The latter site track also passes through the area of suitable habitat south of Pond 6, for which staged vegetation clearance is recommended.

6.268 Should any smooth newt be found during construction, they will be translocated to a minimum distance of 30m from construction activities by a suitably qualified ecologist, under NIEA licence. The receptor area will be habitat considered suitable for smooth newt by the appointed ecologist. Details of any such translocation must be recorded and submitted to Council / NIEA

6.269 Mitigation is not required for unsuitable habitat within overlapping areas of the 200m protective buffer zone and the development RLB, nor for habitat separated from the identified ponds by the A37 Broad Road.

Other species

6.270 Evidence of badger activity and possible evidence of lizard presence are both sufficiently remote from the proposed works that there are unlikely to be any significant impacts on these species arising from the works. No further surveys are required for these species.

Residual Impacts

6.271 For habitats, a minor adverse effect is likely as the result of permanent removal of marshy grassland habitats. These rush-dominated habitats are frequent across Northern Ireland; the habitats in the vicinity of the Dunbeg South Extension are species-poor variants of the habitats and their loss will be of low significance. Improvements to hedgerows will be a minor beneficial effect. Table 6.14 provides details of the residual impacts arising from the scheme.

Table 6.14: Summary of Residual Impacts after Mitigation and Enhancement

Impact	Ecological Impact Significance without Mitigation	Mitigation and Enhancement	Ecological Impact Significance with Mitigation
Construction			
Designated Sites	*Neutral*	*Avoidance during infrastructure design and SuDS drainage management (Appendix 9.1) Instream works will be limited to crossings of minor streams/rills.*	*Neutral*
Watercourses	*Minor*	*Disturb stream beds as little as possible during construction of crossings.*	*Minor*

Impact	Ecological Impact Significance without Mitigation	Mitigation and Enhancement	Ecological Impact Significance with Mitigation
Marshy grassland	*Minor*	*Limit extent of works as much as possible and reinstate adjacent lands with material from the site*	*Minor*
Hedgerows	*Minor*	*Reinstate any removed hedge and infill hedges adjacent to the site with species of local provenance*	*Minor*
Temporary disturbance to bats	*Neutral*	*There will be a minor reduction in the availability of foraging area. None require.*	*Neutral*
Temporary disturbance to badgers	*Minor*	*None required; a single disused badger sett found within 25m of the construction area. The site is generally suboptimal for the species.*	*Neutral*
Temporary disturbance to common lizard	*Minor*	*None required; the species may be present at low densities in the general area, but possible evidence for the species was remote from the works.*	*Negligible to Neutral*
Temporary disturbance to smooth newt	*Minor*	*None required; natal ponds are distant from the works and terrestrial habitat provides little shelter.*	*Negligible to Neutral*
Operational			
Designated Sites	*Neutral*	*Application of the SuDS drainage management and CEMP*	*Neutral*
Watercourses	*Minor*	*None required; minor streams will become re-vegetated except at culvert locations.*	*Minor*
Marshy grassland	*Minor*	*Infrastructure areas will remain unvegetated*	*Minor*
Hedgerows	*Minor*	*Reinstate any removed hedge and infill hedges adjacent to the site with species of local provenance*	*Beneficial*
Potential collision of bats with turbine blades	*Major adverse*	*The proposed turbine layout was amended to ensure a minimum stand-off distance of 50 m (Natural England TIN051) to all habitat edges (shelterbelts and natural watercourses) which will be maintained through the lifetime of the Development. A Bat Monitoring and Mitigation Plan (BMMP) will be implemented under the Precautionary Principle.*	*Neutral*
Disturbance to badgers	*Neutral*	*None required, no active badger setts found within 25m of the construction area.*	*Neutral*
Disturbance to common lizard	*Minor*	*None required; the species may be present at low densities in the general area, but possible evidence for the species was remote from the works..*	*Neutral*
Disturbance to smooth newt	*Minor*	*None required; natal ponds are distant from the works and terrestrial habitat provides little shelter.*	*Neutral*
Decommissioning			

Impact	Ecological Impact Significance without Mitigation	Mitigation and Enhancement	Ecological Impact Significance with Mitigation
Designated Sites / Watercourses	*Neutral*	*SuDS and standard Pollution Prevent Guidelines will be adhered to during decommissioning.*	*Neutral*
Marshy grassland	*Minor*	*Site restoration and enhancement according to the CEMP.*	*Beneficial*
Temporary disturbance to bats	*Neutral*	*No mitigation required. Decommissioning will remove potential hazards for bats.*	*Beneficial*
Temporary disturbance to badgers	*Neutral*	*No mitigation required as no active setts were recorded in the area and disturbance to this species is likely to be minimal.*	*Neutral*
Temporary disturbance to common lizard	*Neutral*	*No mitigation required as no impact during the decommissioning phase is considered likely.*	*Neutral*
Temporary disturbance to smooth newt	*Neutral*	*No mitigation required as no impact during the decommissioning phase is considered likely.*	*Neutral*

Cumulative Impacts

6.272 The potential for a cumulative impact between proposed and operational wind farms arises principally if species from the same population are using more than one of the sites. The likelihood of this can be assessed through an analysis of the species assemblage and by examining the likely range and territory size of those species.

6.273 The area over which a cumulative impact may be felt should also be considered, and in the present case, wind farms within a radius of 15km have been identified. However, Dunbeg, Dunbeg South and Dunmore are considered to be the only wind farms likely to have the potential to have a significant cumulative effect.

6.274 The following sections assess the potential cumulative impacts, as a result of the Development with other proposed and operational wind farms, where relevant.

Designated sites

6.275 Wind farms have the potential to have an adverse impact on the quality of downstream waters and on the diversity and conservation value of aquatic ecosystems, in this case the River Roe and Tributaries SAC. Flow of peat- and silt-laden water from a number of wind farms within a restricted catchment has the ability to increase these impacts cumulatively to a level that could reduce fish and invertebrate populations and diversity. Measures to retain surface water on site and to enable infiltration to groundwater at acceptable rates are required at all wind farm sites, as standard best practice. This includes the implementation of detailed mitigation arising from the development of a CEMP (Construction Environmental Management Plan). Since it is considered that the protected site is sufficiently buffered from the proposed extension to result in negligible effects of minor

significance, cumulative effects on this receptor are also considered to be not significant,

Habitats

6.276 There is a potential for the works associated with provision of the access track network required by wind farm developments to have effects on peatland hydrology, particularly in uplands and the upland fringes. Peatlands generally are important both because they are generated by and support valued specialised vegetation, and as natural carbon stores.

6.277 The Development will result in a loss of habitats of low conservation interest and peat-forming communities are absent from the site. Restricted areas of habitat of higher conservation value have been avoided and their interest maintained. The loss of habitats is considered to be not significant because the degraded peatland habitats of marshy grassland are widespread both locally and regionally. Cumulative effects on habitats are considered to be not significant.

Bats

6.278 Bat activity recorded at the turbine locations during the 2023 survey season was high during spring at Turbine 1 but was generally low at other times and at other locations. It is likely significant that Turbine 1 location is close to the only significant bodies of standing water on the site. In contrast, activity levels at the adjacent habitat features were low and at times negligible. The likely main bat commuting routes have been avoided during the emplacement of infrastructure.

6.279 Outcomes which must be considered are whether the cumulative impact of wind farm developments will adversely affect the distribution of these species of European conservation concern, and whether there will be population-scale effects on any bat species. The most contentious species issue currently is the extent to which bats may be at risk of collision with turbines. There is potential for bats to forage across more than one wind farm and to be subject to at least the potential of an increased risk of collision.

6.280 The development therefore has the potential to increase bat mortality resulting from collision and barotrauma, and this impact is likely to be additive to similar impacts arising from the operation of other wind farms, at both local and regional scales. The absence of data relating to bat life cycles and to the intensity and spatial variation of activities during different parts of those life cycles means that there is difficulty in determining the significance of the cumulative impacts on bat species. It is likely that the significance of cumulative impacts will also vary between species, depending on inter alia local and regional abundance of different species, prey preferences, preferred flight height, preferred foraging habitat, degree of attraction to or deflection from turbines, extent of migratory behaviour, swarming characteristics and variability of behaviour in response to varying weather conditions. Bat behaviour and collision risk are likely to be highly site-specific during much of the annual cycle,

but more generalised patterns, such as those relating to migration, may be superimposed on these local factors.

6.281 Cumulative effects of multiple wind farms on bat populations are unclear. The effects of wind farms on bat populations is dependent on a wide variety of factors including the turbine layout, the species of bats present, existing environmental conditions and the mitigation measures proposed at each wind farm (or individual turbine). Therefore, a clear understanding of the patterns of bat activity at individual wind farms is essential.

6.282 The pattern of bat activity at the site and surrounding area was used to inform the final layout and recommend mitigation, in the form of precautionary stand-off distances to habitat features, and the maintenance of buffers for the 30-year lifetime of the wind farm).

6.283 It is assumed that these stand-off distances were also applied to existing wind farms and were included in the ecological assessment of the wind farms. The cumulative impact of the proposed extension is not considered to alter the existing predicted impacts; therefore, the cumulative impact is considered to be not significant.

Badger

6.284 It is not anticipated that the Development will have a measurable impact on local badger social groups and the wind farm will therefore not contribute to any cumulative impacts that may be detectable from the operation of other wind farms in the local area. The cumulative impact on badgers is considered to be not significant.

Common lizard

6.285 It is not anticipated that the Development will have a measurable impact on local badger social groups and the wind farm will therefore not contribute to any cumulative impacts that may be detectable from the operation of other wind farms in the local area. The cumulative impact on badgers is considered to be not significant.

Smooth newt

6.286 It is not anticipated that the Development will have a measurable impact on smooth newts and the wind farm will therefore not contribute to any cumulative impacts that may be detectable from the operation of other wind farms in the local area. The cumulative impact on newts is considered to be not significant.

Trans-boundary effects

6.287 Potential trans-boundary effects of the Development on designated sites and on mobile species (i.e. bats) were assessed. The effects are considered to be the same as those described in the relevant sections (i.e. cumulative effects). Trans-boundary effects are therefore not considered to be significant. Potential trans-boundary effects of the Development on Annex 1 migratory bird species are assessed in **Chapter 7 – Ornithology**.

Conclusions

6.288 There is limited use of the proposed development area and its immediate vicinity by badger, common lizard and smooth newt. An abandoned single hole sett was found adjacent to the site boundary but habitats over the greater part of the site are likely to be suboptimal for the species and no signs of recent badger presence were found in the vicinity of the proposed works. Effects on these species are unlikely and no measures are needed to mitigate effects.

6.289 There will be no effects on designated conservation sites and there will be limited impacts on Northern Ireland priority habitats. These will be restricted to removal of a short length of hedgerow, to be replaced following construction, and culverting of short lengths of minor streams.

6.290 The mitigation measures specified in Table 6.13 will be adhered to, ensuring that any potential impacts to bats will be negligible. In conclusion and based on current knowledge the site poses little risk to bats or bat populations; however, a BMMP has been recommended as a precaution.

6.291 The potential effects of the Development on ecological receptors have been assessed and it is concluded that with the implementation of appropriate mitigation measures the effects would be reduced to a minor adverse or neutral effect that would not adversely affect the ecological integrity of the site and the wider area.

6.292 An assessment of cumulative effects on the habitats and fauna of the area was also undertaken, and it is concluded that there is a not significant impact from these effects.

6.293 Cumulative impacts may also arise. Other projects that have been included in the cumulative impact assessment are:

6.294 The approved (but not yet built, 9 turbine) Dunbeg South Windfarm (to which this project is an extension of); as well as the two existing operational wind farms in the immediate vicinity of the proposed extension. The 14 turbine Dunbeg wind farm is approximately 550m to the east and the seven turbine Dunmore wind farm is 1.3km to the north east. All three (existing and approved) occupy similar upland habitats to those in the vicinity of the proposed extension.

6.295 No other outstanding planning applications in the vicinity of the proposed extension are listed on the Northern Ireland Planning Portal.

References

6.296 References have been inserted as footnotes within the body of the document.

Abbreviations

AONB	Area of Outstanding Natural Beauty
ARGUK	Amphibian and Reptile Groups of the UK

ASSI	Area of Special Scientific Interest
BSBI	Botanical Society of the British Isles
CEDaR	Centre for Environmental Data and Recording
CIEEM	Chartered Institute of Ecology and Environmental Management
CNCC	Council for Nature Conservation and the Countryside
EC	European Commission
EcIA	Ecological Impact Assessment
EIA	Environmental Impact Assessment
HRA	Habitat Regulations Assessment
HSI	Habitat Suitability Index
IROPI	Imperative Reasons of Overriding Public Interest
JNCC	Joint Nature Conservation Committee
LHP	Larval Host Plant
MNR	Marine Nature Reserve
NBN	National Biodiversity Network
NIBG	Northern Ireland Bat Group
NIEA	Northern Ireland Environment Agency
NIPS	Northern Ireland Priority Species
NNR	National Nature Reserve
NR	Nature Reserve
PPS	Planning Policy Statement
SAC	Special Area of Conservation
SLNCI	Sites of Local Nature Conservation Importance
SPA	Special Protected Area
UWT	Ulster Wildlife Trust

7. Ornithology

Introduction

7.1 This chapter assesses potential effects of the Proposed Development on bird communities. The principal objectives of the chapter are:

- To outline the scope of the assessment;
- To describe the methodologies used in completing the assessment;
- To describe the baseline bird communities;
- To describe the potential effects on these bird communities and to assess the significance of these effects;
- To detail any mitigation or compensation measures that may be required and to describe any residual effects remaining after the implementation of these measures.

7.2 The ornithology assessment is supported by:

- Figures 7.1 - 7.6;
- Figure 7.7 (INCLUDED IN CONFIDENTIAL APPENDIX);
- Technical Appendices 7.1 - 7.14;
- Technical Appendix 7.15 (INCLUDED IN CONFIDENTIAL APPENDIX);
- Photographic Plates (INCLUDED IN CONFIDENTIAL APPENDIX).

7.3 The Figures and Technical Appendices are referenced in the text as necessary and listed in full at the end of the chapter. Where relevant the Environmental Statement (Ornithology Assessment) for the immediately adjacent Dunbeg South Wind Farm (consented) is also referenced in the chapter.

Statement of Authority of the Author

7.4 The ornithology assessment and associated survey work has been completed by David Steele:

- Professional qualifications - B.Sc. (2i Honours), Zoology, University of Aberdeen (1988);
- Professional experience – 36 years working as a professional ornithologist / fieldworker throughout Great Britain and Ireland including for NatureScot (formerly Scottish Natural Heritage), the Royal Society for the Protection of Birds (in Shetland and Northern Ireland) and the British Trust for Ornithology. During this time has gained experience of a wide range of survey methodologies including surveys of breeding seabirds (e.g. surveys of arctic terns, skuas, black guillemots and red-throated divers in Northern Scotland), ship and aircraft-based surveys of seabirds-at-sea around the entire British coastline, water-bird surveys (e.g. winter surveys of Scottish sea-lochs and Wetland Bird Survey Counts), long-term survey and monitoring of merlins and

hen harriers in all the main upland areas of Northern Ireland, Common Birds Census (on lowland farmland in Co. Antrim), Breeding Bird Surveys and surveys for breeding waders (Brown and Shepherd and field-by-field methodologies) at locations throughout Northern Ireland. For the last 22 years working as a freelance consultant in Northern Ireland and has completed ornithology assessments for 21 on-shore wind farm proposals and has also completed training for vantage point survey methodology and collision risk modelling.

Legislation & Planning Policy

7.5 The ornithology assessment has been carried out with reference to the following key pieces of legislation and planning policy:

- The Wildlife (Northern Ireland) Order 1985 (as amended) which describes general protection measures for wild birds and in particular Schedule 1 to the Order which details those species that have special levels of protection;
- Annex 1 of the EC Birds Directive which details those bird species which are of particular conservation concern in Europe, and which should be subject to special measures concerning their habitats in order to ensure they maintain a favorable conservation status;
- Planning Policy Statement (PPS) 2 (Natural Heritage) for Northern Ireland, in particular Policy NH2 (species protected by law), Policies NH3 and NH4 (sites of conservation importance) and Policy NH5 (species and features of natural heritage importance).

Scope of Assessment

General Effects of Wind Farms on Birds

7.6 On-shore wind farms can potentially effect birds in two main ways – by displacement of birds around the turbine array (leading to indirect habitat loss) or by creating a risk of direct mortality due to collisions with the turbines. Direct habitat loss from wind farms is usually relatively small scale compared to other sorts of developments and in most cases is unlikely to be significant for bird communities[1].

7.7 The ornithology assessment therefore focuses on assessing potential displacement effects and (where relevant) collision mortality effects of the Proposed Development. The assessment considers the potential effects on the bird communities found within the Site Boundary (hereafter referred to as "the Site" and in defined surrounding buffer areas. Where relevant, the assessment also

[1] Percival, S. (2005): Birds and wind farms, what are the real issues? (British Birds 98 / 4)

considers potential cumulative effects resulting from other existing, consented or proposed wind farms in the vicinity of the Proposed Development.

Bird Species Requiring Assessment

7.8 All wild birds are subject to a general level of protection through the Wildlife and Countryside Act (Wildlife Order in Northern Ireland) and the EU Birds Directive but in line with the current NatureScot (formerly SNH) guidance only some bird species should generally be of concern in relation to wind farms:

- Birds on Annex 1 of the EU Birds Directive;
- Birds on Schedule 1 to the Wildlife and Countryside Act (Wildlife Order in Northern Ireland);
- Regularly occurring migratory species;
- Species listed on the non-statutory lists of Birds of Conservation Concern (BOCC) for the United Kingdom and the island of Ireland.

7.9 The NatureScot guidance recommends that assessment of the effects of a wind farm on birds will normally be limited to those species included within the above categories. Additionally, NatureScot is of the view that passerine species are not significantly impacted by wind farms[2]. However, all bird species (including passerine species) need to be considered in relation to the general levels of statutory protection afforded by the Wildlife (Northern Ireland) Order[3].

Consultation

7.10 To date no ornithology consultations have been received in relation to the Proposed Development.

Assessment Methodology

Baseline Surveys

7.11 Baseline surveys were carried out in line with the current published guidance for bird survey methods to inform impact assessments for on-shore wind farms[4]. The different methodologies employed during the field surveys are described in further detail below.

Brown and Shepherd Surveys (Breeding Period)

7.12 Surveys for breeding birds have been completed during two consecutive breeding periods (breeding seasons of 2023 and 2024) as summarized in Table 7.1. Four survey visits were completed in each year and the surveys spanned the period from

[2] Scottish Natural Heritage (2017): Recommended bird survey methods to inform impact assessment of on-shore wind farms (SNH Guidance Note)

[3] NIEA: The Wildlife Law and You in Northern Ireland (Northern Ireland Environment Agency Biodiversity Series Booklet)

[4] SNH (2014 and 2017): Recommended bird survey methods to inform impact assessment of on-shore wind farms (Guidance Notes, May 2014 and March 2017)

late March to early July. Further details of the survey visits are provided in Technical Appendix 7.1.

7.13 All surveys were completed using time-budgeted area-based counts, specifically the four-visit Brown and Shepherd method recommended by NatureScot. This method is suitable for surveying breeding wader species (curlew, snipe and lapwing) and also red grouse. NatureScot do not generally recommend survey of moorland passerines, however, on sites where breeding waders are present only in small numbers then it is possible to include passerines in the Brown and Shepherd method and thereby provide a wider picture of the overall diversity of breeding birds within the Site and surrounding area.

7.14 The principal target species for the surveys were the three breeding wader species however as these were not expected to be present in large numbers (and the Site is also relatively small in extent) then passerine species were also included. The surveys extended to at least a 500 m extent around the Proposed Development. All land with access permissions (including the Site and also some adjacent land) was walked through, with additional coverage into other areas (depending on the habitat) by appropriate periods of scanning with binoculars.

Curlews

7.15 The survey area for curlew extended to at least a 1 km extent around the Proposed Development. As there were no access permissions for much of this additional area the survey coverage was achieved by three methods: (1) by scanning the additional area with binoculars during the Brown and Shepherd survey visits (any areas with access permissions were also walked through); (2) during the vantage point surveys by carefully scanning areas of potential curlew habitat and also by listening for calling or singing birds and (3) by looking for curlews from public roads while moving around within the wider surrounding area of the Site.

Table 7.1: Summary of Brown and Shepherd Survey Visits (Breeding Period)

Baseline Period	Survey Dates	No. of Survey Visits Completed
Breeding Period 2	Mar to Jun 2024	4
Breeding Period 1	Apr to Jul 2023	4

Brown and Shepherd Surveys (Non-Breeding Period)

7.16 Surveys for birds during the non-breeding (winter and migration) period have been completed by way of six survey visit during a single non-breeding period (spanning October 2023 to March 2024) as summarized in Table 7.2. Further details of the survey visits are provided in Technical Appendix 7.1. The surveys were completed using the same Brown and Shepherd (time-budgeted area-based count) method as employed for the breeding bird surveys and extended over the same area (to within at least a 500 m extent around the Proposed Development. The results of the surveys indicate that one season of non-breeding period surveys should be

adequate for this Site and is likely to be representative of bird activity within the Site and surrounding buffer area during the non-breeding period.

Table 7.2: Summary of Brown and Shepherd Survey Visits (Non-Breeding Period)

Baseline Period	Survey Dates	No. of Survey Visits Completed
Non-Breeding Period 1	Oct 2023 to Mar 2024	6

Vantage Point Surveys

Vantage Point Survey Effort

7.17 An assessment of activity by raptors and other relatively large aerial species (e.g. migrating swans and geese) was completed from a single vantage point during a fifteen month period from April 2023 to June 2024 as summarized in Table 7.3. During the fifteen month survey period at least six hours of vantage point coverage was achieved in each survey month and at least 36 hours survey effort (the recommended minimum) was achieved in each of the two breeding periods. Further details of the individual vantage point watches and a summary of survey effort by month are provided in Technical Appendix 7.2.

7.18 During the non-breeding period survey effort was increased significantly above the recommended minimum 36 hours and this (along with the survey results) indicates that one season of non-breeding period vantage point surveys should be adequate for this Site and is likely to be representative of bird activity within the Site and surrounding buffer area during the non-breeding period.

Table 7.3: Summary of Vantage Point Survey Effort

Baseline Period	Survey Dates	VP Hours Completed
Breeding Period 2	Mar to Jun 2024	36
Non-breeding Period 1	Sep 2023 to Feb 2024	52.5
Breeding Period 1	Apr to Aug 2023	42.5
Total Baseline Period		131

Vantage Point Selection

7.19 The location of the vantage point and the associated visibility coverage are shown in **Figure 7.1**. The location is outside the Site on adjacent land with access permissions and just outside the 500 m extent turbine buffer area. The location of the vantage point is such that the presence of an observer is highly unlikely to affect bird activity within the target area.

7.20 Visibility is shown for a 2 km extent from the vantage point (observer height of 1.8 m) and at collision risk height (middle of the rotor-swept disc). For the assessment of collision risk, visibility at rotor height is more important than visibility at or near the ground, however as far as practicably possible the vantage point was selected so as to also provide an adequate view at or near ground level.

7.21 Although visibility is shown for a 2 km extent (the recommended maximum distance for optimal detection of the target species) it is important to note that in reality visibility does not stop at 2 km: most of the relevant target species are readily detectable by an experienced observer at distances up to at least 3 km and any birds detected in these more distant areas were not ignored. Additional location details for the vantage point are provided in Technical Appendix 7.3.

Vantage Point Method

7.22 The vantage point watches were completed in line with the NatureScot method statement for this type of survey[5]. The surveys therefore extended to at least a 500 m extent around the Proposed Development however birds detected in other areas visible from the vantage point were not ignored: in particular, the turbine array of Dunbeg Wind Farm is located just to the northeast of the Site and is visible from the vantage point (mostly within a distance of not more than 3 km and partly within 2 km) and it was therefore possible to detect birds in this area as well as within the main target area (see Figure 7.1). The target species were all raptor species with priority given to the Annex-1 species. Other species were recorded as secondary species. At the discretion of the observer, notes were also kept of any significant activity by smaller aerial species.

7.23 For the non-Annex-1 raptor species (buzzard and kestrel) it was sometimes necessary to adopt a pragmatic approach to recording observations. In these instances it was possible to record activity using the 5-minute activity-period summary method thereby allowing the observer greater focus on searching for the Annex-1 target species: this is discussed further in Technical Appendix 7.12.

7.24 Vantage point watches were carried out at different times of day and in a range of weather conditions but not during continuous or heavy precipitation or in conditions of continuous high wind or gale (Beaufort scale). Details of weather conditions during the watches are provided in Technical Appendix 7.2. Most watches were of three hours duration but in order to make best use of time spent on the Site (for example during shorter winter days) some shorter or longer watches were also completed.

7.25 During the non-breeding (winter) period a total of four watches (two in November, one in December and one in January) were completed till after sunset and were targeted at detecting potential roosting activity, particularly by hen harriers. These watches commenced at least 30 minutes before sunset and continued as long as reasonably possible up to a maximum 30 minutes after sunset. Further details of these watches are provided in Technical Appendix 7.2.

[5] Scottish Natural Heritage (2017): Recommended bird survey methods to inform impact assessment of on-shore wind farms (Guidance Note, March 2017)

Wider Area Checks

7.26 Checks for breeding activity by raptor species in the wider area around the Site have been carried out concurrently with the vantage point surveys as summarized in Table 7.4 and further details are provided in Technical Appendix 7.4. The selection of target species depended primarily on extensive professional knowledge of the wider surrounding area: the principal target species were hen harrier, peregrine and merlin however any other species present were also noted. Current NatureScot guidance for the relevant species indicates a wider area survey limit of at least 2 km extent[6]. In the first instance all species were looked for during the vantage point surveys with additional checks of the wider surrounding area as deemed necessary: these checks extended up to a maximum 3 km extent around the Proposed Development.

7.27 The wider area checks followed appropriate methodologies for the relevant species[7]. The surveys were carried out from public roads and other areas with access permissions such as forestry tracks. To avoid disturbance, all observations were made from a safe distance (if possible from a vehicle) and no attempt was made to approach nests. Some potential breeding sites (in particular forest-edges that are favoured breeding sites for merlins) were also checked during the Brown and Shepherd Surveys for breeding birds.

Table 7.4 – Summary of Wider Area Checks

Baseline Period	Survey Dates	Maximum Survey Extent
Breeding Period 2	March to June 2024	3 km
Breeding Period 1	April to August 2023	3 km

Desk Study

8.1 A limited amount of desk study was completed, principally in relation to assessing bird habitats within the wider surrounding area (using publically available on-line mapping and imagery) and also to identify any protected areas such as Nature Reserves or Areas of Special Scientific Interest (ASSI's).

Assessing Significance of Effects

Favourable Conservation Status

7.28 The assessment of the significance of effects on bird communities primarily follows the Favourable Conservation Status approach recommended by NatureScot[8]. An effect should be judged to be of concern where it would adversely affect the favourable conservation status of a species (or prevent a species from recovering to

[6] SNH (2016) Assessing Connectivity with Special Protection Areas (Guidance Note June 2016)

[7] Gilbert, G *et al.* (1998): Bird Monitoring Methods – a manual of techniques for key UK bird species (RSPB)

[8] SNH (2018): Assessing Significance of Impacts from Onshore Wind Farms Outwith Designated Areas (Guidance, February 2018)

favourable conservation status) at the regional or national level. The conservation status of the bird species considered by the ornithology assessment follows the current non-statutory list of Birds of Conservation Concern published for the island of Ireland[9].

7.29 For assessing the significance of bird populations (or any expected losses at the national or regional level) the generally accepted 1% threshold level is used, therefore if a population (or loss) exceeds 1% of the national or regional population of the species then it should be considered to be significant.

7.30 In the assessment of effects, the probability of any given effect occurring (and the probability of any likely effects being significant) are described using the scale suggested by the Institute of Ecology and Environmental Management (IEEM)[10] – the scale is given in Technical Appendix 7.5.

7.31 In line with the IEEM guidance and planning guidance, where relevant the assessment also considers possible local effects on bird communities. The assessment of the significance of local effects follows the same approach as for regional and national effects.

Cumulative Effects

7.32 Where relevant the assessment also considers possible cumulative effects on bird communities due to other existing or consented wind farm developments (including single turbines) in the vicinity of the Proposed Development. The assessment of cumulative effects on birds has been completed with reference to the current published NatureScot guidance[11].

Baseline Conditions

Breeding Birds

7.33 The status of breeding birds within the Site and surrounding buffer area is summarized in Technical Appendix 7.6 and discussed further under the relevant species headings below. The locations of breeding territories for selected bird species are shown in **Figures 7.2 – 7.4**. Those species associated exclusively with areas of commercial tree plantation or anthropomorphic habitat features and also very mobile species (e.g. cuckoo) have not been mapped. A total of 30 bird species were confirmed or probably breeding within the survey area. An additional ten species were observed as non-breeding transients (using the Site temporarily for feeding or on migration but not breeding there).

[9] Gilbert, G *et al.* (2021): Birds of Conservation Concern in Ireland 4: 2020-2026 (Irish Birds 43: 1 - 22)
[10] IEEM (2006): Guidelines for Ecological Impact Assessment in the United Kingdom
[11] SNH (2018): Assessing the cumulative impacts of onshore wind farms on birds (Guidance, August 2018)

Red grouse

7.34 During the baseline period there were no observations (or other signs of presence) of red grouse within the Site or surrounding buffer area: the Site is relatively small in extent and the habitat is unsuitable for this species.

Curlew

7.35 During the baseline period there were no observations of breeding curlews within the Site or surrounding buffer area. There was one observation of a curlew during a vantage point survey however the date and circumstances of the observation (a single bird flying high and direct from west to east in March) indicated a migrating bird rather than a breeding individual: further details of this observation are provided in the results for the vantage point surveys.

Snipe

7.36 The locations of territorial snipe are shown in **Figure 7.2** and details of the observations are provided in Technical Appendix 7.7. The three observations were on different dates and form a cluster that is likely to represent a single snipe breeding pair / territory: the observations were contained within an area of approximately three hectares that includes some permanent wet areas (likely to be suitable for feeding) and also taller vegetation (suitable for nesting). The observations related to territorial birds calling from the ground ('chipping') and were located within the buffer area in the range of 140 – 340 m (average 240 m) from the nearest proposed turbine location (T1). The other three proposed turbine locations are significantly further away (none is closer than 540 m).

7.37 The northern part of the Site (north of the A37 road) appears suitable in places for breeding snipe however closer investigation reveals that much or all of the marshy grassland vegetation in this area is secondary in nature with relatively low floristic diversity, evidence of significant disturbance in the relatively recent past and significant drainage features. The southern part of the Site (south of the A37 road) is in close proximity to woodland and extensive commercial forestry and has been significantly disturbed in places (e.g. by tree harvesting) in the recent past and therefore appears to be largely unsuitable for breeding snipe.

Moorland Passerines

7.38 The locations of selected breeding moorland passerine species are shown in **Figures 7.3 and 7.4** and details of the observations are provided in Technical Appendix 7.8. Almost half of the breeding passerines (12 of total 27 species) were exclusively or predominantly associated with the wooded areas and commercial forestry habitats, two species (moorhen and mallard) were found at small wetland features (ponds) and two species (pied wagtail and jackdaw) were associated with anthropomorphic habitat features. A small colony of sand martins (approximately ten to 12 occupied

burrows in both baseline years) was located at the disused quarry located within the southern part of the Site.

7.39 The most abundant species found during the surveys was meadow pipit: these were widely distributed within the Site and buffer area (total of at least 20 breeding pairs). Skylarks were not found within the Site, however a small number of pairs (six in total) were located within the buffer area: the close proximity of woodland and commercial forestry means that the southern part of the Site in particular is likely to be unattractive to this species, which prefers more open habitats. Other species found included grey wagtail (one pair), dipper (one pair), cuckoo (at least one singing male), grasshopper warbler (four singing males), redpoll (two pairs), stonechat (three pairs), raven (one confirmed nest) and reed bunting (six pairs). The location of the raven's nest is shown in Figure 7.7 (Confidential Appendix).

7.40 Wheatears were observed within the Site in small numbers during the spring migration period, however there were no observations to indicate breeding and it is considered that all birds observed were migrating through the area on-route to more northerly breeding areas. The singing male cuckoos (at least one individual) were very mobile within the survey area, often flying long distances between song-posts. Dippers and grey wagtails were observed in the vicinity of the culverts at the A37 road.

Non-breeding Birds

7.41 Observations of birds during the non-breeding (winter and migration) baseline period are summarized in Technical Appendix 7.9 and detailed further in Technical Appendix 7.10. A total of 35 species were observed within the survey area including three raptor species (buzzard, sparrowhawk and kestrel) and three wetland species (grey heron, moorhen and mallard). About a third of all species found during the non-breeding period were associated predominantly with the woodland and commercial forestry habitats. The two most regularly occurring species (found on all surveys) were raven and hooded crow. No species were found in what could in any way be regarded as significant numbers.

7.42 Wintering snipe were found on most survey visits but in small numbers (maximum count six birds). There were two observations of jack snipe (in November and February): both observations were within the buffer area though this species could possibly also occur within the Site.

7.43 There were no observations of golden plovers within the Site (for various reasons the habitat is unsuitable) however two birds were disturbed from short grass within the southwestern part of the buffer area in March and a flock of 45 plovers were disturbed by a foraging hen harrier (observed during a vantage point watch) from just outside the southwestern boundary of the buffer area in November. The observations indicate that although the Site is not used by golden plovers, small numbers of birds may occasionally occur within or close to the southwestern part of the buffer area.

7.44 There were some observations of winter thrush and finch species however flock sizes were small. One interesting observation was of two waxwings feeding in the hawthorn hedge beside the busy A37 road (close to the proposed entrance to the Site) during the February visit: this species is nomadic and is an irregular winter visitor to Britain and Ireland and would certainly not be expected to be regularly occurring in the area.

Vantage Point Surveys

Annex-1 Species

Overview

7.45 Activity by Annex-1 species observed from the vantage point during the baseline period is summarized in Table 7.5 and discussed further under the relevant species headings below. Details of the observations of Annex-1 species are provided in Technical Appendix 7.11.

Table 7.5: Summary of Observations of Annex-1 Species

Species (BTO Code)	No. of Observations	Details
Whooper swan (WS)	0	-
White-tailed eagle (WE)	1	immature, 19th Jun 2023
Hen harrier (HH)	1	adult male, 9th Nov 2023
Peregrine (PE)	5	Mar, Apr, May, Jul, Sep
Merlin (ML)	1	juvenile / 1st cal. year, 29th Jul 2023

White-tailed eagle

7.46 During the baseline period there was one observation of a white-tailed eagle concerning an older immature (sub-adult) bird during baseline Year 1 on 19th June 2023. The bird was watched for a moderately prolonged period (up to 15 minutes) and was tracked flying widely within the vantage point survey area including for a time within the Dunbeg Wind Farm turbine array before passing directly over the Site and then eventually departing to the northwest. The median height of the bird during the period of observation was estimated at 150 m (range 100 – 200 m). The bird was without wing-tags and its origin is therefore unknown.

7.47 There were no subsequent observations of white-tailed eagles during the remaining part of the baseline period however immature white-tailed eagles are being increasingly observed in Northern Ireland as birds disperse from the various re-introduction schemes for this species in southern Ireland and Britain. Up to four or five different individuals are known to have been present simultaneously in Northern Ireland in recent summers and these birds appear to range (almost at random) over extensive geographical areas[12]. On current status this species might

[12] www.nibirds.blogspot.com and www.irishbirding.com

be expected to continue to occur very infrequently in the vicinity of the Site but is not expected to be regularly occurring.

Hen harrier

7.48 During the baseline period there was just one observation of a hen harrier during the vantage point surveys. The observation was of an adult male harrier foraging near the vantage point (and flushing a small flock of golden plovers) in fine conditions late in the day on 9th November 2023 (baseline Year 1). The location is shown in **Figure 7.7** (Confidential Appendix). Although the bird was observed on the periphery of the 500 m buffer area it cannot be excluded that it was also foraging within the Site prior to being detected by the observer. Subsequent vantage point observations made during the same month (in similar fine conditions and at the same time of day) did not detect any further harrier activity.

7.49 In addition to the vantage point observation there was one observation of a hen harrier during a Brown and Shepherd survey on 15th June (baseline Year 2). The observation was of an adult female harrier in an area just beyond the 500 m extent buffer area and in relatively close proximity of (c. 100 m) the Dunbeg Wind Farm turbine array: the location is shown in **Figure 7.7** (Confidential Appendix) and further details are provided in Technical Appendix 7.11. The bird was foraging (mobbed by small birds) and was watched for approximately five minutes before moving out of view. There was no indication of any breeding behaviour and the habitat at the location (predominantly grassland) is in any case unsuitable for nesting by this species.

7.50 The observations indicate that on current status foraging hen harriers occur very infrequently within the Site and surrounding 500 m extent buffer area and could not be considered to be regularly occurring within this area.

Peregrine

7.51 During the baseline period there were five observations of peregrines within the vantage point survey area. All the observations were of birds confirmed or likely to be engaged in foraging activity and included two observations of birds flying within (or above) the Dunbeg Wind Farm turbine array. The observations indicate that foraging peregrines occur occasionally within the Site and surrounding 500 m extent buffer area.

Merlin

7.52 During the baseline period there was just one observation of a merlin within the vantage point survey area. The observation was of a juvenile (1st calendar-year) bird foraging along the boundary of the southern part of the Site and within the southern part of the buffer area (near the vantage point location) on 29th July 2023 (baseline Year 1). Young merlin's typically fledge during early July and by the end of the month would be expected to be dispersing away from their immediate natal area: therefore, although the bird was a juvenile, the date of the observation and

the behaviour (flying strongly and foraging independently) indicates a bird engaged in post-breeding dispersal and not a dependant juvenile in close proximity to the nest site.

Non Annex-1Raptor Species

Overview

7.53 Activity by Non Annex-1 raptor species observed from the vantage point during the baseline period is summarized in Table 7.6 and discussed further under the relevant species headings below. The flight-lines for these species are shown in **Figure 7.5** (buzzard) and **Figure 7.6** (kestrel). Only a small number of sparrowhawk observations were made during the vantage point surveys. Details of the observations of Non Annex-1 species during the baseline period are provided in Technical Appendix 7.12.

Table 7.6: Summary of Observations of Non Annex-1 Raptor Species

Baseline Period	Survey Dates	Species / No. of Observations		
		buzzard	kestrel	sparrowhawk
Breeding Period 2	Mar to Jun 2024	10	6	0
Non-breeding Period 1	Sep 2023 to Feb 2024	9	7	1
Breeding Period 1	Apr to Aug 2023	8	3	1
Total Baseline Period		27	16	2

Buzzard

7.54 Buzzards were the most frequently observed raptors within the survey area, and they were observed in most calendar months during the baseline period however there were no observations during the mid-winter months of November to January inclusive. Most observations were of single birds however there was one observation of five birds soaring together (during fine weather in late February) and also an exceptional observation of a flock of 13 birds (all juveniles) soaring together in August.

7.55 Nine of the buzzard observations were of birds flying (either entirely or partly) within the Dunbeg Wind Farm turbine array: these birds were mostly engaged in foraging and their behaviour appeared normal, with no obvious sudden or erratic flight manoeuvres that might indicate strong avoidance of the operational turbines in this cluster.

Kestrel

7.56 Kestrels were observed much less frequently than buzzards within the survey area however they were observed in all calendar months except July and December. All the observations were of single kestrels and most birds were obviously engaged in foraging behaviour. Of those individuals seen well enough (ten out of total 16 observations) seven were adult males, two were females and one was a juvenile.

7.57 Seven of the kestrel observations were of birds flying (either entirely or partly) within the Dunbeg Wind Farm turbine array: these birds were mostly engaged in foraging and (as with buzzards) their behaviour appeared normal. Kestrels were also observed hunting from elevated perches (small conifer trees) located within the Dunbeg turbine array.

Other Species

Overview

7.58 Activity by other species observed from the vantage points during the baseline period is summarized in Table 7.7 and discussed further under the relevant species headings below. Further details of the observations are provided in Technical Appendix 7.13.

Table 7.7: Summary of Observations of Other Species

Species (BTO Code)	No. of Observations	Remarks
curlew (CU)	1	a single bird flying over in Mar (not seen to land within the survey area)
golden plover (GP)	2	unseen birds calling overhead in Oct and a flock of c. 50 birds circling in Nov
great black-backed gull (GB)	4	-
lesser black-backed gull (LB)	5	-
raven (RN)	10+	regular observations of up to six birds
swallow (SL)	1	flock 20 birds feeding widely over the Site in Aug
fieldfare (FF)	1	flock c. 50 birds flying to roost in trees in Dec

Curlew

7.59 During the baseline period there was one observation of a curlew from the vantage point, of a single bird on 26th March 2024 (baseline Year 2). The bird was detected approaching high from the west (from the direction of the Lough Foyle catchment area) before it then lost some altitude above the northern part of the Site (to the north of the A37 road) before continuing away to the east / northeast and directly through the middle of the Dunbeg Wind Farm turbine array (it made no attempt to fly around or above the turbines but continued directly through, partly at rotor height). In Northern Ireland curlews typically return to their breeding territories from mid-March however the circumstances of this observation were strongly indicative of a transient individual engaged on spring migration and not indicative of a breeding bird on territory.

Golden plovers

7.60 During the baseline period there were just two observations of golden plovers from the vantage point: on 2nd October an unknown number of migrating birds were heard calling overhead (too high to locate visually) and on 8th November a flock of c. 50 birds were observed circling just within the southwestern part of the buffer area (close to the vantage point location) before moving away further to the southwest. The observations indicate that flocks of golden plovers occasionally over-fly the Site during the migration period but are likely to be very high-up, beyond visual (and above turbine rotor) height. Flocks may also occur occasionally within the southwestern part of the buffer area however the overall frequency of observations in this area has been very low and the maximum flock size observed has been small.

Gulls

7.61 During the baseline period two gull species (great black-backed gull and lesser black-backed gull) were observed flying over the Site however the frequency of observations of both species was low and all observations have related to either single birds or small groups of less than ten gulls.

Wider Area Surveys

7.62 Observed breeding activity by raptor species within the wider surrounding area of the Proposed Development is summarized in Table 7.8 and discussed further under the relevant species headings below. Further details of any breeding locations are provided in Technical Appendix 7.15 (included in the Confidential Appendix) and if relevant are shown in **Figure 7.7** (included in the Confidential Appendix).

Table 7.8 – Summary of Wider Area Observations

Species (Code)	No. Pairs	No. Confirmed Nests
Hen harrier (HH)	1	1
Buzzard (BZ)	5+	0
Peregrine (PE)	1	1
Kestrel (K.)	1	1
Merlin (ML)	0	-
Sparrowhawk (SH)	2+	2+

Hen harrier

7.63 During the baseline period one pair of hen harriers were confirmed breeding within a 3 km extent around the Proposed Development. The birds were found at approximately the same location in both baseline years: in baseline Year 1 a pair was observed engaging in courtship and display flights indicating probable breeding however a nest was not confirmed in that year. In baseline Year 2 a nest was confirmed early in the season in the same general area as the Year 1 observations of probable breeding ('hen harrier location 1'). This nest subsequently failed

however after a new bout of displays and courtship the same harrier pair nested again a short distance away from the first attempt ('hen harrier location 2').

7.64 The two hen harrier nesting locations were located within the same Irish National Grid (ING) 1 km square and were on the periphery of the 3 km survey extent: 'location 1' is 2.9 km from the nearest proposed turbine location (the other proposed turbines are in the range of 3.1 – 3.6 km distant) and 'location 2' is 2.7 km from the nearest proposed turbine location (the other proposed turbine locations are in the range of 2.8 – 3.4 km distant). Further details of the two nest locations are provided in the Confidential Appendix.

Buzzard

7.65 During the baseline period buzzard pairs were observed at a minimum of five locations within a 3 km extent around the Proposed Development. The observations (pairs soaring or displaying over suitable habitat) indicate probable breeding and although no actual nest locations were confirmed observations of fledged juvenile buzzards within the survey area during the late summer period indicated that successful breeding certainly occurred. Further details of the locations of buzzard pairs (ING 1 km grid squares) are provided in the Confidential Appendix.

Peregrine

7.66 During the baseline period one pair of peregrines were confirmed breeding within a 3 km extent around the Proposed Development. The breeding location is approximately 2.8 km from the nearest proposed turbine location. Further details of the breeding location are provided in the Confidential Appendix.

Kestrel

7.67 During the baseline period one pair of kestrels were confirmed breeding within a 3 km extent around the Proposed Development. The breeding location is approximately 2.5 km from the nearest proposed turbine location. Further details of the breeding location are provided in the Confidential Appendix.

Merlin

7.68 Although potential habitat exists (in particular undisturbed edges of commercial forestry) during the baseline period there were no observations of breeding merlins within a 3 km extent around the Proposed Development.

Sparrowhawk

7.69 During the baseline period sparrowhawks were confirmed breeding at two locations within a 3 km extent around the Proposed Development. Although no actual nests were located (this species usually nests in pole-stage forestry) in both cases the general area of nesting was strongly indicated by birds flying with prey into the trees. Further details of the locations (ING 1 km grid squares) are provided in the Confidential Appendix.

Assessment of Effects

Breeding Birds

General Remarks

7.70 The published research has indicated that the main adverse effects of wind farms for breeding birds are likely to be due to disturbance displacement during construction and that wind farm operation is unlikely to have a significant effect on local breeding bird populations[13]. The research also suggested that there are potential beneficial effects of wind farm construction for some passerine species. The potential effects of the Proposed Development on breeding birds are described under the headings below. Potential adverse effects and the significance of any likely effects are summarized in Table 7.9.

Snipe

7.71 The baseline surveys have indicated that one pair of snipe are present within the Site and surrounding buffer area. The potential adverse effects of the Proposed Development on snipe are likely to relate to displacement effects: these effects can extend up to 400 m around the turbine array resulting in a predicted average 48 % reduction in snipe breeding density within a 500 m extent of the turbine array[14].

7.72 Snipe is a Red-listed Species of Conservation Concern in Ireland[15]. The Northern Ireland breeding population has declined c. 78% since the 1980's up to 2013 when there were estimated to be 1,123 breeding pairs however further decline since then is likely. The displacement of one pair of snipe is likely to be significant for the local snipe breeding population but is not significant at the regional or national population level.

7.73 Importantly, the published research also indicates that adverse effects on breeding snipe are likely to be due to disturbance during wind farm construction and any subsequent effects (including collision mortality) during the operational phase are unlikely to be significant for the local snipe population.

Moorland Passerines

Overview

7.74 The baseline surveys have found 27 species of breeding passerines within the Site and surrounding buffer area however almost half of the passerine species were exclusively or predominantly associated with the commercial forestry and other

[13] Pearce-Higgins, J.W. *et al.* (2012): Greater impacts of wind farms on bird populations during construction than subsequent operation: results of a multi-site and multi-species analysis (Journal of Applied Ecology 49)

[14] Pearce-Higgins, J.W. *et al.* (2009): The distribution of breeding birds around upland wind farms (Journal of Applied Ecology 46)

[15] Gilbert, G *et al.* (2021): Birds of Conservation Concern in Ireland 4: 2020-2026 (Irish Birds 43: 1 - 22)

woodland habitats and several other species were associated exclusively with anthropomorphic habitat features. With the exception of meadow pipit, all of the remaining species were found in relatively small numbers. Skylarks were not found within the Site however a small number of pairs were located within the buffer area. The majority of the passerine species found within the Site and surrounding buffer area are not currently of conservation concern in Ireland (green-listed) however two species (meadow pipit and grey wagtail) are red-listed birds of conservation concern and four species (skylark, sand martin, willow warbler and goldcrest) are amber-listed.

7.75 The potential adverse effects of the Proposed Development on breeding passerines relate principally to disturbance displacement during wind farm construction and it is not expected that there would be any significant adverse effects due to wind farm operation. Potential adverse effects have been demonstrated for only a small number of passerine species and effects have been of a relatively small magnitude compared with non-passerine species: for meadow pipit there is a predicted 15% reduction in breeding density within a 500 m extent of turbine arrays. For several passerine species found within the survey area (skylark, meadow pipit and stonechat) the published research has also indicated possible beneficial effects due to wind farm construction: it is suggested that vegetation disturbance during the construction of wind farms may result in changes to the vegetation that favours these species.

Red-listed Passerine Species

7.76 For meadow pipit a 15% reduction in breeding density within a 500 m extent of the Proposed Development is equivalent to the displacement of up to three breeding pairs however this may be mitigated to some degree by the potential beneficial effects of wind farm construction for this species. Meadow pipit is also very widely distributed locally and at a regional level[16] and the displacement of (up to) three pairs is certainly not significant at the regional level. It is also noted that NatureScot take the view that passerine species should not generally be of concern in relation to on-shore wind farm developments[17]. Overall, therefore, there are unlikely to be any significant adverse effects on this species due to the Proposed Development.

7.77 Grey wagtails were associated with anthropomorphic habitat features (road culverts) within the survey area. There are highly unlikely to be any significant adverse effects on this species due to the Proposed Development and indeed (due to association with anthropomorphic habitat features) beneficial effects are likely: the author has reported increases in numbers of grey wagtails (and also pied

[16] Balmer, D *et al.* (2013): Bird Atlas 2007-2011 (BTO Books)

[17] SNH (2006): Assessing the significance of impacts of on-shore wind farms on birds out-with designated areas (Guidance Note, July 2006)

wagtails and several other species associated with anthropomorphic features) during construction at several wind farm sites in Northern Ireland[18].

Amber-listed Passerine Species

7.78 Skylarks (although present within the buffer area) were not found within the Site therefore they are not likely to be in close proximity to any construction works and the probability of disturbance displacement for this species is therefore likely to be reduced accordingly. Skylark is also one of the passerine species identified by the published research as potentially benefiting due to changes to the vegetation during wind farm construction. Overall, therefore, there are unlikely to be any significant adverse effects on this species due to the Proposed Development.

7.79 Nesting sand martins occur at the disused quarry within the Site however the number of birds is very small (certainly not significant at the regional level) and it is not expected that the quarry site used by the birds will be directly impacted by the Proposed Development therefore there are unlikely to be any significant adverse effects on this species.

7.80 Willow warblers and goldcrests are associated with the woodland and commercial forestry habitats within the Site and surrounding buffer area. It is not expected that these habitats will be significantly impacted by the Proposed Development therefore the probability of disturbance displacement for these species is highly likely to be negligible. Both these species are also widely distributed locally and at a regional level[19] and indeed willow warbler is abundant locally in suitable habitat[20]. Overall, therefore, there are unlikely to be any significant adverse effects on these two species due to the Proposed Development.

Other Passerine Species (Green-listed)

7.81 The majority of the passerine species found within the Site and surrounding buffer area are not currently of conservation concern and many of these species are furthermore associated (either entirely or predominantly) with the woodland and commercial forestry habitats and it is not expected that these habitats will be significantly impacted by the Proposed Development. Those species associated with the more open habitats are cuckoo, grasshopper warbler, stonechat and reed bunting. Disturbance displacement effects due to wind farm construction have not been demonstrated for any of these species (however possible beneficial effects have been indicated for stonechat) and the distribution of these species within the Site indicates that they are unlikely to be directly impacted by construction work. All these species are also widely distributed locally and at a regional level[21].

[18] Unpublished wind farm construction bird monitoring reports to the Planning Authority

[19] Balmer, D *et al.* (2013): Bird Atlas 2007-2011 (BTO Books)

[20] Personal observations

[21] Balmer, D *et al.* (2013): Bird Atlas 2007-2011 (BTO Books)

Overall, therefore, there are highly unlikely to be any significant adverse effects on these species due to the Proposed Development.

Table 7.9 – Summary of Potential Effects on Breeding Birds

Species / Species Group	Potential Effects	Significance of Effect
Snipe	Displacement of up to one breeding pair	Likely to be significant for the local snipe population but not significant at the regional or national level
Meadow pipit	Displacement of up to three breeding pairs	Unlikely to be significant
Grey wagtail	Beneficial effect due to association with anthropomorphic habitat features	Likely to be significant at the local population level
Amber-listed passerine species	Disturbance displacement of birds during construction	Unlikely to be significant
Green-listed passerine species	Disturbance displacement of birds during construction	Highly unlikely to be significant

Winter Birds

7.82 The potential effects of the Proposed Development on winter bird species are likely to be similar to those described for breeding birds, therefore principally due to disturbance displacement during wind farm construction and it is not expected that there would be any significant adverse effects due to wind farm operation. All of the species found during the winter and migration seasons are very widespread in distribution locally and regionally[22] and were observed within the Site and surrounding buffer area in relatively small numbers. It is therefore unlikely that the Proposed Development would cause any significant adverse effects on the local populations of wintering birds and highly unlikely that there would be any significant adverse effect on regional or national populations.

Annex-1 Raptor Species

7.83 The potential effects of the Proposed Development on Annex-1 raptor species and the significance of any likely effects are described under the headings below and summarized in Table 7.10.

Hen Harrier

Displacement Effects (Foraging)

7.84 The baseline surveys indicate that on current status foraging hen harriers occur very infrequently within the Site and surrounding 500 m extent buffer area and certainly could not be considered to be regularly occurring within this area. The

[22] Balmer, D *et al.* (2013): Bird Atlas 2007-2011 (BTO Books)

Site is relatively small in extent, is partly farmland and is bisected by a busy trunk-road (the A37) so even allowing for possible future changes in the local status of hen harrier the Site is probably unlikely to ever be an important foraging area for this species. Published guidance indicates a core foraging range for hen harriers of 2 km around the nest however foraging up to at least 5 km has been observed in Northern Ireland[23] and up to a maximum of 10 km has been recorded in Scotland[24].

7.85 During the baseline period harriers were confirmed nesting at a distance of approximately 3.0 km form the Proposed Development (distance averaged for the four proposed turbine locations) therefore potentially within maximum foraging distance but beyond the likely core foraging range for this species. Even a fairly rudimentary appraisal of the habitats in the wider vicinity of the nesting location (using professional experience, field observations and available on-line aerial imagery) indicates that there are plenty of suitable foraging areas available in the vicinity and therefore on current status availability of foraging habitat is unlikely to be a significant constraint for the birds.

7.86 For hen harriers the published research indicates a displacement effect extending up to 250 m from turbines and resulting in a predicted 52% reduction in flight activity within a 500 m extent of turbine arrays. The predicted reduction in harrier activity needs to be considered in the context of the wider availability of foraging habitat and also the significance of the Site as a foraging area for the birds and in this context the predicted reduction in foraging activity is highly unlikely to have any significant adverse effect on the local hen harrier population or on the regional conservation status of this species.

Collision Risk

7.87 Because there were only a very small number of harrier observations use of the Collision Risk Model to estimate collision risk was considered unwarranted for this species however a subjective appraisal of collision risk indicates that it is likely to be very low and is therefore highly unlikely to have a significant adverse effect on the local hen harrier population or on the regional conservation status of this species.

Direct Disturbance (Nest Sites)

7.88 During the baseline period harriers were confirmed nesting at a location approximately 3.0 km form the Proposed Development (distance averaged for the four proposed turbine locations). Ornithology baseline surveys completed for the Dunbeg South Wind Farm (during 2016 and 2017) found that the location in question was not occupied by hen harriers during those two earlier years[25]. For hen harriers

[23] Personal observations

[24] SNH (2016) Assessing Connectivity with Special Protection Areas (Guidance Note June 2016); NIEA guidance given in wind farm consultation responses

[25] Dunbeg South Wind Farm Environmental Statement

changes in breeding locations between years are linked to several factors including breeding success (if a nest is successful then the birds are more likely to nest again at that location in the following year) and also the commercial forestry harvesting and re-planting cycle (re-stocked forestry sites are unsuitable initially then become suitable for a period of years as the vegetation cover develops before the tree canopy closes and the site becomes unsuitable forcing the birds to move).

7.89 Published guidance on the upper disturbance limit for nesting hen harriers indicates a distance in the range of 300 - 750 m[26] therefore at least on current status it is highly unlikely that nesting harriers would be directly disturbed by either the construction or operation of the Proposed Development. Even after factoring for changes due to the forestry cycle it is unlikely that harriers will be found nesting within the upper disturbance distance during the short to medium term (including the construction phase of the wind farm). In the longer term (including the operational phase) then it is more difficult to predict what might happen however as wind farm operation is not generally expected to have a significant adverse effect on breeding birds then direct disturbance of harrier nests due to wind farm operation is considered to be unlikely.

Peregrine

Displacement Effects (Foraging)

7.90 The baseline surveys have indicated that peregrines occasionally forage within the Site and surrounding buffer area however the frequency of observations has been relatively low. Published guidance indicates a core foraging range for peregrines of 2 km however foraging up to a maximum of 18 km from the nest has been recorded in Scotland[27]. It can therefore be assumed that foraging peregrines are likely to travel significantly beyond the indicated core range. Peregrines also forage over a very wide range of habitats including even urban areas and the open sea (anywhere where their principal prey of small and medium sized birds is available).

7.91 Peregrine has a favourable conservation status in the island of Ireland and the U.K. (it is not currently a species of conservation concern) and the most recent published information for the UK indicates a population of 95 territorial pairs in Northern Ireland[28]. The published research on the effects of wind farms on birds does not indicate any specific turbine displacement effect for peregrines. It can probably be assumed that there is likely to be some degree of turbine avoidance however this would need to be considered in the context of the expected foraging range and behaviour of this species: in this context it is highly unlikely that displacement of foraging peregrines around the turbine array (assuming a moderate

[26] NatureScot Guidance – Disturbance Distances in Selected Scottish Bird Species

[27] SNH (2016) Assessing Connectivity with Special Protection Areas (Guidance Note June 2016); NIEA guidance given in wind farm consultation responses

[28] Eaton, M (2023): Rare breeding birds in the UK in 2021 (British Birds 116)

level of turbine avoidance) would have any significant adverse effects on the local peregrine population or on the regional conservation status of this species.

Collision Risk

7.92 From the baseline observations the Collision Risk Model (Technical Appendix 7.14) indicates a collision risk for peregrine equivalent to one bird every 33.1 years. Peregrines have a typical lifespan of seven years and the adult survival rate (the proportion of birds surviving each year) is high at about 80%; clutch size is three or four and juvenile survival is also relatively high at 60%[29]. Considering these various factors then it is highly unlikely that the number of predicted collisions would have a significant adverse effect on the local peregrine population or on the regional conservation status of this species.

Direct Disturbance (Nest Sites)

7.93 During the baseline period peregrines were found breeding at a location 2.8 km from the Proposed Development. However, ornithology baseline surveys completed for the Dunbeg South Wind Farm (during 2016 and 2017) found that the location in question was not occupied by peregrines during those two years[30]. Like several other raptor species, peregrines are known for switching breeding locations between years and the site in question is therefore not certain to be occupied during the construction phase of the Proposed Development however there is a reasonable possibility that it might be. Published guidance on the upper disturbance limit for nesting peregrines indicates a distance in the range of 500 - 750 m[31] therefore it is highly unlikely that nesting peregrines would be directly disturbed by either the construction or operation of the Proposed Development.

Table 7.10 – Summary of Potential Effects on Annex-1 Raptor Species

Species / Species Group	Potential Effects	Significance of Effect
Hen harrier	Displacement (foraging birds)	Highly unlikely to be significant
	Predicted collision mortality: very low	Highly unlikely to have any significant adverse effects on the local harrier population or on the regional conservation status of the species
	Direct disturbance (breeding sites)	Highly unlikely to occur
Peregrine	Displacement (foraging birds)	Highly unlikely to be significant
	Predicted collision mortality: one bird every 33.1 years	Highly unlikely to have any significant adverse effects on

[29] BTO BirdFacts (www.bto.org)

[30] Dunbeg South Wind Farm Environmental Statement

[31] NatureScot Guidance – Disturbance Distances in Selected Scottish Bird Species

Species / Species Group	Potential Effects	Significance of Effect
		the local peregrine population or on the regional conservation status of the species
	Direct disturbance (breeding site)	Highly unlikely to occur

Non Annex-1 Raptor Species

7.94 The potential effects of the Proposed Development on Non Annex-1 raptor species and the significance of any likely effects are described under the headings below and summarized in Table 7.11.

Buzzard

Displacement Effects (Foraging)

7.95 The baseline surveys have indicated that foraging buzzards occur fairly regularly within the Site and surrounding buffer area however there appears to be significantly less activity during the mid-winter period. The potential adverse effects of the Proposed Development on foraging buzzards include displacement due to avoidance of the turbine array and for buzzards the effect can extend up to 500 m resulting in a predicted 41 % reduction in flight activity within a 500 m extent of turbine arrays[32] however the significance of this effect needs to be assessed in the context of other habitat that is likely to be available to the birds and also the favourable conservation status[33] and very widespread distribution of this species in Northern Ireland and in the island of Ireland as a whole[34].

7.96 Buzzards forage over a very wide range of habitats including upland habitats such as open moorland and bogs, upland (less improved) farmland habitats, woodland and commercial forestry habitats, intensive lowland farmland habitats (including highly intensive grassland) and are also associated with anthropomorphic features such as roads (scavenging on road-kill) and road-verges (grassland). During the baseline period buzzards were observed foraging in association with all of the above habitats within the wider area around the Proposed Development and availability of foraging habitat is highly unlikely to be a significant constraint for the birds.

7.97 During the baseline period buzzards were observed foraging on a significant number of occasions (nine out of total 27 observations) within the existing Dunbeg Wind Farm turbine array and the behaviour of these birds appeared normal. These observations indicate that buzzards are highly unlikely to be completely excluded

[32] Pearce-Higgins, J.W. *et al.* (2009): The distribution of breeding birds around upland wind farms (Journal of Applied Ecology 46)

[33] Gilbert, G *et al.* (2021): Birds of Conservation Concern in Ireland 4: 2020-2026 (Irish Birds 43: 1 - 22)

[34] Balmer, D. *et al.* (2013): Bird Atlas 2007-2011 (BTO Books)

form foraging within the Site during the operational phase of the Proposed Development and likely also indicate a significant degree of habituation of local buzzards to the existing wind turbines in the area and displacement of foraging birds is therefore likely to be significantly less than predicted by the published research. Considering all of the above factors and also the relatively small size of the Site then it is highly unlikely that the predicted reduction in flight activity would have any significant adverse effects on the local buzzard population or on the regional conservation status of this species.

Collision Risk

7.98 From the baseline observations the Collision Risk Model (Appendix 7.14) indicates a collision risk for buzzard equivalent to one bird every 13.4 years however the predicted mortality needs to be assessed in the context of likely breeding productivity and also the favourable conservation status and very widespread distribution of this species in Northern Ireland and in the island of Ireland as a whole.

7.99 The all-Ireland buzzard breeding population (including Northern Ireland) has been estimated at 3,312 pairs however the population is still expanding in size and range[35]. The population in the U.K. is estimated at 57,000 - 79,000 pairs of which 1,000 – 2,000 pairs are in Northern Ireland[36]. Breeding productivity in Northern Ireland has been estimated to average 1.95 young fledging per successful pair[37] and a study in the Republic of Ireland recorded an average of 2.61 young fledging per successful pair[38]. Breeding pairs are usually successful as nests are located in trees (typically a dense conifer) and are therefore much less vulnerable to predation compared to those of ground nesting species[39]. Buzzards are relatively long-lived and have a typical lifespan of 12 years and the adult survival rate (the proportion of birds surviving each year) is high at 90%; clutch size is two or three and juvenile survival is also relatively high at 63%[40].

7.100 The baseline surveys have found at least five pairs of buzzard within the wider surrounding area of the Proposed Development (within a 3 km extent) and these pairs are likely to produce in the region of ten to fifteen fledged young each year. The baseline observations have indicated current good productivity within the local buzzard population: for example a flock of 13 fledged juveniles were observed soaring within the survey area during fine weather in mid-August. Considering these various factors then it is highly unlikely that the number of predicted

[35] Nagle, T. *et al*. (2014): Habitat and diet of re-colonising common buzzards *Buteo buteo* in County Cork (Irish Birds 10)
[36] Musgrove *et al*. (2013): Population Estimates of Birds in Great Britain and the United Kingdom (British Birds 106)

[37] Rooney, E and Montgomery, W.I. (2013) Diet diversity of the common buzzard *Buteo buteo* in a vole-less environment (Bird Study 60)

[38] Nagle, T. *et al*. (2014): Habitat and diet of re-colonising common buzzards *Buteo buteo* in County Cork (Irish Birds 10)
[39] Personal observations

[40] BTO BirdFacts (www.bto.org)

collisions would have a significant adverse effect on the local buzzard population or on the regional conservation status of this species.

Kestrel

Displacement Effects (Foraging)

7.101 The baseline surveys have indicated that kestrels occasionally forage within the Site and surrounding buffer area. The potential adverse effects of the Proposed Development on foraging kestrels include displacement due to avoidance of the turbine array however the published research indicates only possible weak avoidance of turbines by this species and no strong avoidance[41] suggesting that kestrels are significantly less sensitive to displacement effects than other raptor species. Kestrels also have an extensive foraging range that is likely to extend up to at least 3 km from the nest and possibly up to 5 km[42].

7.102 During the baseline period kestrels were observed foraging on a significant number of occasions (seven out of total 16 observations) within the existing Dunbeg Wind Farm turbine array and the behaviour of these birds appeared normal. These observations indicate low avoidance of the Dunbeg turbine array and seem to be in keeping with the suggestion of low sensitivity to displacement for this species in the published research. As with buzzards, there is also likely to be a significant degree of habituation of local kestrels to the existing wind turbines in the area. Displacement effects are therefore highly unlikely to be significant for kestrels.

Collision Risk

7.103 From the baseline observations the Collision Risk Model (Appendix 7.14) indicates a collision risk for kestrel equivalent to one bird every 13.6 years. Kestrel is a Red-listed Species of Conservation in Ireland (due to a significant population decline)[43] however it nevertheless remains the most widely distributed raptor species on the island of Ireland and in the U.K.[44] and the breeding range of the nominate subspecies also extends across the whole of Europe. The species is closely associated with farmland throughout most of its European range and the effects of agricultural intensification are considered likely to be an important factor in the observed declines in the U.K. and Ireland and parts of continental Europe (notably France and European Russia). Populations in central Europe are comparatively stable and in northern Europe kestrels have increased their range in boreal Scandinavia in birch forest and alpine habitats[45].

[41] Pearce-Higgins, J.W. *et al.* (2009): The distribution of breeding birds around upland wind farms (Journal of Applied Ecology 46)

[42] Personal observations

[43] Gilbert, G *et al.* (2021): Birds of Conservation Concern in Ireland 4: 2020-2026 (Irish Birds 43: 1 - 22)

[44] Balmer, D. *et al.* (2013): Bird Atlas 2007-2011 (BTO Books)

[45] European Breeding Bird Atlas 2 (European Bird Census Council and Lynx Edicions, Barcelona)

7.104 The significance of any potential collisions needs to be considered in the context of this very widespread distribution, the underlying landscape-scale effects of agricultural intensification and also other relevant factors, in particular the anticipated breeding productivity of the local kestrel population, typical annual survival and typical life-span). Kestrels have a typical lifespan of just four years and the adult survival rate (the proportion of birds surviving each year) is about 70%; clutch size is four or five and juvenile survival is relatively low at about 30%[46]. As with buzzards, breeding pairs are usually successful as nests are located off the ground (in a tree or old building or on a cliff-ledge) and are therefore much less vulnerable to predation compared to those of ground nesting species[47].

7.105 The baseline surveys have found at least one confirmed kestrel nest within the wider surrounding area of the Proposed Development (within a 3 km extent) and this pair are likely to produce in the region of three young birds annually (although nests of this species are usually successful productivity is unlikely to match clutch size). Only about a third of fledged young are expected to survive their first-year and any loses to the local population due to the predicted collision mortality are therefore expected to be small by comparison. For adult kestrels the typical life-span of four years means that any one individual is highly unlikely to be the victim of a collision. Considering these various factors then it is highly unlikely that the number of predicted collisions would have a significant adverse effect on the local kestrel population or on the regional conservation status of this species.

Table 7.11 – Summary of Potential Effects on Non Annex-1 Raptor Species

Species / Species Group	Potential Effects	Significance of Effect
Buzzard	Displacement (foraging birds)	Highly unlikely to be significant
	Predicted collision mortality: one bird every 13.4 years	Highly unlikely to be significant
Kestrel	Displacement (foraging birds)	Highly unlikely to be significant
	Predicted collision mortality: one bird every 13.6 years	Highly unlikely to be significant

Protected Areas

Overview

7.106 Three ASSI's (Ballyrisk More, Gortcorbies and River Roe and tributaries) are located within relatively close proximity of the Proposed Development (within an extent of up to approximately 3 km). All three sites are designated for their natural habitat features and can therefore be expected to possibly support a significant number of bird species however none are designated for general ornithology features or for

[46] BTO BirdFacts (www.bto.org)

[47] Personal observations

bird species type. Details of the ASSIs and any likely significant adverse effects on their bird communities due to the Proposed Development are summarized in Table 7.12.

Ballyrisk More and Gortcorbies ASSIs

7.107 Ballyrisk More and Gortcorbies ASSIs are designated for their purple moor-grass and rush pasture habitats and are therefore likely to support only a relatively limited number of bird species. Both these sites are also located not closer than approximately 1 km from the Proposed Development and it is therefore highly unlikely that the Proposed Development would have any significant adverse effects on the bird communities occurring within these ASSIs.

River Roe and Tributaries ASSI

7.108 The River Roe and tributaries ASSI is designated for river and woodland habitat types and therefore is likely to support a significant number of bird species. A small part of the ASSI is immediately adjacent to the northern boundary of the Site however it is not expected that the Proposed Development would impact directly on the river or woodland habitats within this part of the ASSI and therefore there are highly unlikely to be any significant adverse effects on the bird communities occurring within the ASSI.

Table 7.12 – Summary of Effects on Local Protected Areas

Site Name	Protected Status	Distance from the Proposed Development (km)	Designation Features		Likely Significant Effects on ASSI Bird Communities
			Habitats	Species	
Ballyrisk More	ASSI	3 km	purple moor-grass and rush pastures	none	none
Gortcorbies	ASSI	1 km	purple moor-grass and rush pastures	none	none
River Roe and tributaries	ASSI	0 km	river, oakwood	Atlantic salmon, otters	none

Cumulative Effects

Scope

Other Wind Farms

7.109 Details of other wind farms (existing or consented) within a 40 km extent of the Proposed Development have been provided by the Applicant. Most of these wind farms could not reasonably be considered to be within the same wider local area as the Proposed Development and for the purposes of this assessment therefore only

wind farms within a 10 km extent have been included: it is considered that wind farms located >10 km away are highly unlikely to have a significant adverse effect on local bird populations in the vicinity of the Proposed Development and therefore associated cumulative effects are highly unlikely.

7.110 Within a 10 km extent of the Proposed Development there are a total of seven other wind farms (three existing and four consented) and further details of these are provided in Table 7.13. The existing Rigged Hill Wind Farm is not included in the table as it will be substituted by Rigged Hill Re-Power. Three of the other wind farms are in relative close proximity to each other and (along with the Proposed Development) form the 'Dunbeg cluster' of wind farms. Craiggore Wind Farm is located further away and is part of the distant 'Garvagh cluster' of wind farms. The remaining two wind farms (Cam Burn and Rigged Hill Re-Power) are not considered to be part of a cluster.

7.111 The cumulative assessment has been completed principally in relation to the 'Dunbeg cluster' of four wind farms. The other wind farms are significantly further away and are referenced in the cumulative assessment only if necessary.

Table 7.13 – Summary of Other Wind Farms within 10 km of the Proposed Development

Wind Farm	Status	No. of Turbines	Distance from the Proposed Development[48]	Wind Farm 'Cluster'
Cam Burn	consented	4	8.5 km southeast	not in a cluster
Craiggore	existing	10	8.0 km south	'Garvagh cluster'
Dunbeg	existing	14	0.2 km northeast	'Dunbeg cluster'
Dunmore	existing	7	1.0 km northeast	'Dunbeg cluster'
Dunmore Extension	consented	8	1.0 km northeast	'Dunbeg cluster'
Dunbeg South	consented	9	0.0 km south (adjacent)	'Dunbeg cluster'
Rigged Hill Re-Power	consented	7	4.7 km south	not in a cluster

Single Turbines

7.112 Details of single wind turbines within the wider vicinity of the Proposed Development have been provided by the Applicant. Most of these turbines could not reasonably be considered to be within the same local area as the Proposed Development and for the purposes of this assessment therefore only single turbines within the immediate local area (within a 2 km extent) have been considered and

[48] Distances measured from the *centre* of Dunbeg South Wind Farm to *nearest turbine* in the cumulative wind farms

there are no single turbines (including proposed turbines) within this area: it is considered that single turbines located >2 km away are highly unlikely to have any significant adverse effects on local bird populations in the immediate vicinity of the Proposed Development and therefore associated cumulative effects are highly unlikely.

Target Species

7.113 The target species for the cumulative assessment are all bird species that are regularly occurring within the vicinity of the Proposed Development (within the Site and the relevant surrounding buffer areas) that could also be reasonably considered to be potentially sensitive to wind farm developments due to displacement or collision mortality. Bird species that are not regularly occurring in the vicinity (or are not likely to be adversely affected) are not considered further.

Assessment

7.114 The assessment of cumulative effects is summarized in Table 7.14 and detailed further under the relevant species headings below.

Snipe

7.115 For snipe the cumulative assessment considers whether the predicted displacement of birds due to the Proposed Development is likely to be additional to displacement effects due to the other wind farms in the 'Dunbeg array'. It is predicted that up to one pair of snipe could be displaced from within a 500 m extent buffer area around the Proposed Development (Figure 7.2) however the location of these birds is also in the near vicinity (<100 m) of the consented Dunbeg South turbines (Figure 7.2) and this population of snipe has previously been considered in the assessment of effects for that wind farm[49]. Therefore, the possible displacement of up to one pair of snipe by the Proposed Development is not additional to the birds predicted to be displaced by the Dunbeg South Wind Farm (because they are not additional or 'new' birds) and therefore there is no cumulative effect.

Hen harrier

7.116 Potential cumulative effects on hen harriers relate to additional displacement of foraging birds around the Proposed Development and also additional collision mortality. In terms of displacement effects, the published Environmental Statements (Non-Technical Summaries) for the Dunmore and Dunmore Extension Wind Farms indicate that the greater part of the 'Dunbeg cluster' of wind farms is not a significant foraging area for hen harriers[50]. Harriers have previously been observed foraging within the consented Dunbeg South Wind Farm (also part of the

[49] Dunbeg South Wind Farm Environmental Statement

[50] Dunmore Wind Farm Environmental Impact Assessment Non-Technical Summary (November 2007); Dunmore 2 Environmental Impact Assessment Non-Technical Summary (October 2023)

'Dunbeg cluster') however no likely significant displacement effect was found[51]. The Proposed Development is for a relatively small cluster of four turbines and the baseline surveys have indicated that the Site and surrounding buffer area is not regularly used by foraging harriers therefore it is highly unlikely that there would be any significant additional displacement effects due to the Proposed Development. For collision mortality it is also highly unlikely that there would be any significant additional effects.

Peregrine

Displacement Effects

7.117 In terms of displacement effects, the Proposed Development is for a relatively small cluster of four turbines and when this is considered in the context of the known likely foraging range and diverse habitat tolerance of peregrines then it is highly unlikely that there would be any significant additional displacement effects due to the Proposed Development.

Collision Risk

7.118 Information published in the EIAs (Non-Technical Summaries) for the other wind farms within the 'Dunbeg cluster' have indicated no significant collision mortality effects for peregrines due to these wind farms. One additional collision every 33.1 years is predicted for the 'Dunbeg cluster' due to the Proposed Development. Peregrine has a favourable conservations status in the U.K. and Ireland and it is highly unlikely that this number of predicted additional collisions would have a significant adverse effect on the local peregrine population or on the regional conservation status of this species.

Buzzard

Displacement Effects

7.119 In terms of displacement effects, the Proposed Development is for a relatively small cluster of four turbines and when this is considered in the context of the known likely foraging range and diverse habitat tolerance of buzzards then it is highly unlikely that there would be any significant additional displacement effects due to the Proposed Development.

Collision Risk

7.120 For the Dunbeg South Wind Farm (consented) the predicted collision mortality is one buzzard every 10.8 years[52]. No quantified estimates of collision mortality are

[51] Dunbeg South Wind Farm Environmental Statement

[52] Dunbeg South Wind Farm Environmental Statement

available for the other wind farms within the 'Dunbeg cluster' however information published in the EIAs (Non-Technical Summaries) for these wind farms indicate no significant collision mortality effects for buzzards. One additional collision every 13.4 years is predicted for the 'Dunbeg cluster' due to the Proposed Development. Buzzard has a favourable conservations status in the U.K. and Ireland and it is highly unlikely that this number of predicted additional collisions would have a significant adverse effect on the local buzzard population or on the regional conservation status of this species.

Kestrel

Displacement Effects

7.121 In terms of displacement effects, the published research indicates only possible weak avoidance of wind turbines by kestrels and no strong avoidance suggesting that kestrels are significantly less sensitive to displacement effects than other raptor species. Information published in the EIAs (Non-Technical Summaries) for the other wind farms within the 'Dunbeg cluster' have indicated no significant displacement effects for kestrels due to these wind farms. The Proposed Development is for a relatively small cluster of four turbines and when this is considered in the context of the expected weak turbine avoidance and the other factors discussed above then it is highly unlikely that there would be any significant additional displacement effects due to the Proposed Development.

Collision Risk

7.122 For the Dunbeg South Wind Farm (consented) the predicted collision mortality is one kestrel every 8.0 years[53]. No quantified estimates of collision mortality are available for the other wind farms within the 'Dunbeg cluster' however information published in the EIAs (Non-Technical Summaries) for these wind farms indicate no significant collision mortality effects for kestrels. One additional collision every 13.6 years is predicted for the 'Dunbeg cluster' due to the Proposed Development therefore the total cumulative collision risk is likely to be of the order of two birds every 10.8 years.

7.123 Kestrel has an unfavourable conservations status in the U.K. and Ireland and populations may therefore be more sensitive to the effects of collision mortality however the predicted cumulative mortality still needs to be considered in the context of other relevant factors, in particular the very widespread distribution in Ireland and the U.K., the underlying landscape-scale effects of agricultural intensification on this species and also anticipated breeding productivity, typical annual survival and typical life-span.

[53] Dunbeg South Wind Farm Environmental Statement

7.124 It is estimated that the local kestrel population is likely to produce in the region of at least three young birds annually. Only about a third of fledged young are expected to survive their first-year and any loses to the local population due to the predicted cumulative collision mortality are therefore expected to still be relatively small by comparison. For adult kestrels the typical life-span of four years means that any one individual is still unlikely to be the victim of a collision. It is also noted (as detailed in the ornithology baseline for the Proposed Development) that kestrels continue to occur in the vicinity of the existing Dunbeg Wind Farm even after more than ten years of operation of this project. Considering these various factors then even after allowing for the cumulative effect it is unlikely that the number of predicted collisions would have a significant adverse effect on the local kestrel population or on the regional conservation status of this species.

Table 7.14 – Summary of Possible Cumulative Effects

Species	Potential Cumulative Effect	Significance
Snipe	additional displacement of breeding pairs	highly unlikely to occur
Hen harrier	additional displacement of foraging birds	highly unlikely to be significant
	additional collision mortality	highly unlikely to be significant
Peregrine	additional displacement of foraging birds	highly unlikely to be significant
	additional collision mortality	highly unlikely to be significant
Buzzard	additional displacement of foraging birds	highly unlikely to be significant
	additional collision mortality	highly unlikely to be significant
Kestrel	additional displacement of foraging birds	highly unlikely to be significant
	additional collision mortality	unlikely to be significant

Mitigation

7.125 Proposed mitigation measures are outlined below and summarized in Table 7.15 and it is proposed that these would be implemented in full by the Applicant. Full details of the Ornithology Mitigation Strategy (OMS) and Ornithology Management and Monitoring Plan (OMMP) would be provided in reports prior to the commencement of construction.

Habitat Management

7.126 It is not proposed to implement a programme of habitat management measures specifically for birds in relation to the Proposed Development as no adverse effects

on bird communities have been identified that are additional to those already found for the immediately adjacent Dunbeg South Wind Farm (consented).

Ornithology Mitigation Strategy (OMS)

7.127 It is proposed that no development activity will take place on the Site between 1 March and 31 August in any year until an Ornithology Mitigation Strategy (OMS) has been prepared by a suitably experienced ornithologist and approved by the Planning Authority. The OMS is to include:

- Details of pre-construction bird surveys including the locations of any breeding activity by sensitive species;
- Details of mitigation measures to be implemented prior to construction works commencing including details of disturbance buffers and any associated phasing of works;
- Details of the timing of ground preparation and vegetation clearance to avoid disturbance to breeding birds;
- Details of bird surveys to be conducted during the construction phase;
- Details of appropriate mitigation measures to be implemented during the construction phase (e.g. species-specific buffer zones);
- Provisions for reporting after construction has commenced and at the end of each breeding season during which construction takes place.

Ornithology Management and Monitoring Plan (OMMP)

7.128 It is proposed that no development activity will take place until an Ornithology Management and Monitoring Plan (OMMP) has been prepared by a suitably experienced ornithologist and approved by the Planning Authority. The OMMP is to include:

- Details of a programme of appropriate post-construction bird surveys and monitoring;
- Details of the provision of bird monitoring reports at the end of each year.

Table 7.15 – Proposed Mitigation Measures

Proposed Mitigation	Implementation	Reason
▪ Habitat Management	▪ No specific measures proposed	▪ Not required
▪ Ornithology Mitigation Strategy (OMS)	▪ Prior to and during construction when this takes place during 1 March to 31 August in any year	▪ To protect breeding birds during the construction phase
▪ Ornithology Management and Monitoring Plan (OMMP)	▪ During construction and post-construction	▪ To monitor the long-term effects of the Proposed Development on sensitive bird species

Residual Effects

7.129 Any likely significant effects of the Proposed Development on birds and any residual effects after the implementation of the proposed mitigation measures are summarized in Table 7.16. (Potential effects that have been assessed as unlikely to be significant are not included in the table).

Table 7.16 – Summary of Likely Significant Effects and Residual Effects

Species / Species Group	Effect	Proposed Mitigation	Residual Effects
Snipe	▪ Potential displacement of up to one pair of snipe ▪ Likely to be significant for the local snipe population ▪ Not significant at the regional or national level	▪ Implementation of Ornithology Mitigation Strategy ▪ Implementation of Ornithology Management and Monitoring Plan	▪ No residual effects

Summary and Conclusions

7.130 The Site of the Proposed Development is relatively small in extent, is of relatively low sensitivity for ornithology and there are no protected sites in the vicinity that are designated specifically for ornithological features or that are otherwise likely to be affected by the Proposed Development in terms of their bird communities.

7.131 There is a potential significant adverse effect for breeding snipe (displacement of up to one breeding pair) however the effect would be local in scale and importantly it is not additional to the displacement effect for snipe found for the immediately adjacent Dunbeg South Wind Farm (consented).

7.132 During the baseline surveys hen harriers have been confirmed breeding in the wider surrounding area however they are not particularly close to the Proposed Development: foraging activity by harriers in the immediate vicinity of the Proposed Development has been negligible and significant adverse effects on this species are considered highly unlikely.

7.133 Other raptor species found in the vicinity are peregrine, buzzard and kestrel however no significant displacement or collision mortality effects have been identified for any of these species.

7.134 Potential cumulative effects have been considered in terms of other wind farms located within 10 km of the Proposed Development (in particular the 'Dunbeg

cluster' of wind farms) however no likely significant cumulative effects have been identified.

7.135 Details are provided of mitigation measures in particular an Ornithology Mitigation Strategy to protect breeding birds from disturbance displacement effects during the construction phase. Habitat management measures are not proposed for bird communities.

7.136 Assuming full implementation of the mitigation measures then it is concluded that the Proposed Development is unlikely to have any significant adverse effects on bird populations at the local, regional or national scale.

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- Technical Appendix 7.1 – Details of Brown and Shepherd Survey Visits
- Technical Appendix 7.2 – Details of Vantage Point Watches
- Technical Appendix 7.3 – Details of Vantage Point Location
- Technical Appendix 7.4 – Details of Wider Area Checks
- Technical Appendix 7.5 – IEEM Probability Table
- Technical Appendix 7.6 - Summary of Baseline for Breeding Birds
- Technical Appendix 7.7 – Details of Snipe Observations
- Technical Appendix 7.8 - Details of Brown and Shepherd Survey Observations (Breeding Period)
- Technical Appendix 7.9 - Summary of Baseline for Non-Breeding Birds
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List of Figures

- Figure 7.1 – Ornithology Viewpoint Coverage
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- Figure 7.5 – Buzzard Flight-lines
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- Figure 7.7 – Wider Area Raptor Map (INCLUDED IN CONFIDENTIAL APPENDIX)

8 Fisheries

Introduction

8.1 This chapter describes the fisheries interests of the watercourses draining the Proposed Dunbeg South Extension Wind Farm, hereinafter referred to as 'the Development', and considers the potential effects of the construction, operation and decommissioning of the development on these interests. The assessment consists of a desk based assessment using available published and online information in combination with data and observations collected in the field. The specific objectives of the chapter are to:

- describe the fisheries baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects;
- assess the residual effects remaining following the implementation of mitigation.

8.2 The assessment has been carried out by Paul Johnston Associates Ltd, an independent fisheries consultancy specialising in freshwater fisheries in Ireland.

8.3 David Kelly holds a BSc (1st Class Hons) degree in Zoology, and a PhD in Freshwater Ecology & Fisheries; he is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and a visiting Research Fellow at Queens University Belfast.

8.4 The practice has completed a wide range of assignments in the areas of environmental impact assessment, fisheries development and catchment management. This includes fisheries assessments in connection with a series of onshore wind farm developments in Northern Ireland.

8.5 **Figures 8.1 – 8.6** are referenced in the text where relevant.

Legislation, Policy & Relevant Guidance

Fisheries Administration

8.6 With regard to fisheries administration and legislation, the footprint of the development lies within the Loughs Agency's geographic area of responsibility.

8.7 Under Section 11 (6) of the Foyle Fisheries Act (Northern Ireland) 1952 and the Foyle Fisheries Act 1952 (Republic of Ireland) the Foyle Fisheries Commission was given the responsibility for "the conservation, protection and improvement of the Fisheries of the Foyle Area generally". Under the North/South Co-Operation (Implementation

Bodies) (Northern Ireland) Order 1999 and the British Irish Agreement Act 1999 these functions were extended to include the Carlingford Area, and the Foyle Fisheries Commission transferred its functions to the Loughs Agency.

8.8 The Loughs Agency is an agency of the Foyle, Carlingford and Irish Lights Commission (FCILC), established under the 1998 Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of Ireland.

Legislation

EU Legislation

8.9 EU and local legislation relevant to fisheries and the water environment in the area of the Development includes the following:

- EC Habitats Directive (92/43/EEC);
- EU Water Framework Directive (2000/60/EC) [incorporating standards from the Fish Directive [Consolidated] (2006/44/EC) – this Directive was repealed in 2013];
- European Eel Regulation (EC) 1100/2007.

Domestic Legislation

- Fisheries (Northern Ireland) Act 1966;
- Foyle Fisheries Act (Northern Ireland) 1952;
- North/South Co-Operation (Implementation Bodies) (Northern Ireland) Order 1999;
- Drainage (Northern Ireland) Order 1973;
- Environment (Northern Ireland) Order 2002;
- Nature Conservation and Amenity Lands (Amendment) (Northern Ireland) Order 1989;
- Water (Northern Ireland) Order 1999;
- Water Environment (Water Framework Directive) (Northern Ireland) Regulations 2003;
- Wildlife (Northern Ireland) Order 1985;
- Wildlife and Natural Environment Act (Northern Ireland) 2011.

Policy

8.10 Policy with regard to Atlantic salmon and European eel in this region is set out in the following:

- River Roe and Tributaries ASSI Citation;
- River Roe and Tributaries SAC Conservation Objectives;
- River Roe Local Management Area Plan;
- Atlantic Salmon Management Strategy for Northern Ireland and the Cross-Border Foyle and Carlingford catchments to meet the objectives of NASCO resolutions and agreements, 2008–2012 (DCAL);
- North Western International River Basin District Eel Management Plan (Northern Regional Fisheries Board/Loughs Agency/DCAL).

Guidance

8.11 Specific guidance relevant to the Development includes the following:

- Guidelines for Fisheries Protection during Development Works (Foyle and Carlingford areas); Environmental Guidelines Series – No. 1 (Loughs Agency, 2011);
- Culvert Design and Operation Guide (C689) (Balkham et al, 2010);
- Engineering in the water environment: good practice guide River Crossings (SEPA 2nd Edtn 2010);
- Industry Best Practice as described in the Good Practice Guidance for Pollution Prevention (https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/), including but not limited to the following;
  - GPP1: Understanding your environmental responsibilities – good environmental practices
  - GPP2: Above ground oil storage tanks;
  - GPP5: Works and maintenance in or near waters;
  - PPG6: Working at construction and demolition sites;
  - PPG7: Safe Storage – The safe operation of refuelling facilities
  - GPP8: Safe storage and disposal of used oils;
  - PPG13: Vehicle washing and cleaning;
  - PPG18: Managing fire water and major spillages;
  - GPP21 Pollution incident response planning;
  - GPP22 Dealing with spills;
  - GPP26 Safe storage – drums and intermediate bulk containers

Scope of Assessment

8.12 The fisheries assessment has involved desk study, field work, data processing and analysis and interpretation using professional judgement. The key receptors are the River Roe, the Curly River and a series of tributary streams which drain the area within the Site Boundary, hereinafter referred to as 'the Site'.

8.13 Existing fisheries data and relevant conservation information on the River Roe and Curly River is assimilated and supplemented through a bespoke fisheries survey of the Site covering the principal watercourses draining the area.

8.14 The field study consisted of walkover surveys of the principal watercourses, assessments of physical habitat conditions, measurement of basic chemistry

parameters, collection of benthic invertebrate samples for assessment of biological quality, and a fish stock survey by electrofishing.

8.15 The sensitivity of each watercourse regarding fisheries and aquatic ecology has been assessed according to a methodology for environmental sensitivity outlined in the Design Manual for Roads and Bridges, specifically regarding the effects on the water environment (DMRB, 2019). Potential effects of the construction, operation and decommissioning phases of the Development were then assessed. This assessment was based primarily on the potential effects on aquatic ecology, water quality, and resident fish stocks, either directly or upon their habitats.

Consultation

8.16 The principal consultee during the study was the Loughs Agency as the statutory body with authority for fisheries matters in the local waters.

8.17 Consultations were also conducted with other sub-consultants on the project, notably in relation to hydrology and drainage issues which are contained within **Chapter 9: Geology and Water Environment** of this ES.

Assessment Methodology

Baseline Characterisation

Study Area

8.18 The study area focussed on the streams draining the area within the Site, all of which are small headwaters of the Curly River. Field survey work was carried out on these streams both within the Site Boundary and downstream to the confluence with the Curly River. Field survey work also focussed on a section of the main Curly River from just upstream of the Site boundary to downstream of the Site boundary.

8.19 The desk assessment includes an evaluation of fisheries in downstream reaches of the Curly River and the wider catchment of the River Roe **(Figure 8.1)**.

Desk Study

8.20 A desk study was carried out to assimilate baseline information relating to salmonid fisheries, ecological status (under WFD) and water quality (chemical and biological) for the study area. The following sources were consulted/used:

- Loughs Agency
- Northern Ireland Environment Agency (NIEA) – Water Management Unit (WMU) (Rivers and Lakes Team) river information request viewer https://gis.daera-ni.gov.uk/arcgis/apps/webappviewer/index.html?id=7e234827aa7a405d990359aa92c7c287https://www.daera-ni.gov.uk/articles/water-framework-directive

- DAERA NIEA - Protected Areas https://www.daera-ni.gov.uk/landing-pages/protected-areas

Field Survey

General Approach

8.21 An initial walkover survey was carried out to assess the significance of the streams directly draining the Site. This was followed by more detailed surveys of the section of the Curly River within the Site and the small tributary streams also within or adjoining the Site (Streams A-D; **Figure 8.2**).

8.22 The surveys at each site comprised assessments of stream quality (water chemistry, physical habitat and aquatic ecology), fisheries habitat and juvenile fish stocks.

Stream Quality

8.23 A series of survey sites was selected on the streams draining the Site. Surveys were conducted in October 2023. For each site, baseline water chemistry, physical habitat and aquatic ecology were assessed.

Water Chemistry

8.24 A series of basic water quality parameters were measured at each site using portable meters to provide an outline profile of chemical quality.

8.25 Dissolved oxygen was measured with a Hanna Oxy-Check oxygen meter, conductivity with a Hanna HI86303 conductivity meter, and pH with a Hanna 8424 pH meter; temperature measurements were made with the oxygen meters.

Physical Habitat

8.26 River physical habitat (substratum type, depth, flow velocity) was assessed based on the fully quantitative method developed by DAERA Inland Fisheries Division and the AgriFood and Biosciences Institute (AFBI). In each site, surveys consisted of a 40m stream reach with 25 sampling points across five equidistant cross-sectional transects except on very narrow (<0.3m width) and overgrown streams where it was difficult to observe the riverbed; on these streams, up to 12 transects (1-3 sampling points per transect) were surveyed in each reach.

8.27 At each sampling point, flow velocity was recorded at 60% depth using a Geopacks flow meter, with water depth measured using the meter's impeller stick; substrate was visually assessed using a bathyscope with the dominant substrate type recorded according to a modified Wentworth Scale (Bain et al. 1985; **Table 8.1**).

Table 8.1: Substrate classification and scoring based on the Wentworth system (from Bain *et al*. 1985)

Substrate type	Size Class (mm)	Score
Sand/silt	<2	1
Gravel	2-16	2
Pebble	17-64	3
Cobble	65-256	4
Boulder	>256	5
Irregular Bedrock	-	6

8.28 The following physical characteristics were measured at each site:

- Stream width and depth at each transect (m)
- Substrate composition (visually estimated as per Bain et al., 1985);
- Percentage of deposited fine sediment (<2mm grain) on the river bed as per Clapcott et al. (2011), with the dominant fine sediment type (sand, silt, clays) determined by running the grain through the observer's fingers.

8.29 The classification system of Bain *et al* (1985) was used to summarise the composition of substrate in a reach based on two indices:

- Coarseness index (CI) – calculated as the mean dominant substrate score
- Heterogeneity (SD) – calculated as the standard deviation of the mean CI.

These indices show how coarse or smooth the substrate of a reach is and if it is comprised of a mixture or is dominated by a particular substrate class **(Table 8.2)**.

Table 8.2: Substrate description inferred from sample data (from Bain *et al*. 1985)

Mean substrate score (CI)	Heterogeneity (SD)	Inferred substrate description
3.2	1.96	Heterogeneous, smooth and rough
5.0	0.00	Homogeneous, coarse
1.25	0.44	Nearly homogeneous, smooth
3.25	0.85	Heterogeneous, intermediate coarseness
5.05	0.69	Heterogeneous, coarse

Aquatic Ecology

8.30 Stream benthic communities are sensitive to a wide range of environmental stressors including nutrient enrichment and organic pollution, acidification, fine deposited and suspended sediments, and hydrocarbons/ oils. The relatively long lifespans and varying sensitivities of individual taxa mean that invertebrate communities can integrate stressor effects over longer timescales than may be indicated by physico-

chemical parameters alone. As such, they are important for assessing both short and longer term effects (Matthaei et al. 2006).

8.31 In March 2023, baseline ecology of watercourses adjacent and downstream of the Development was assessed by sampling the benthic macroinvertebrate community in the riffle/ run habitat using a standard three-minute kick sample (hand held 1mm mesh pole net); the method is recommended by the United Kingdom Technical Advisory Group (UK-TAG) for assessing the condition of the quality element "benthic invertebrates" for WFD reporting (WFD-UKTAG, 2014).

8.32 Samples were collected from riffle/run habitats, fixed in 4% formalin for 1 week, followed by preservation in 70% ethanol prior to sorting and identification.

8.33 In the laboratory, macroinvertebrate samples were spread across a 4 x 5, 20-square grid sorting tray to facilitate identification and to estimate relative abundance. Abundant taxa were counted in a subset of five squares and scaled to whole sample estimates as recommended in Murray-Bligh (2002). Less abundant taxa were counted in all grid squares. The ecological quality baseline was summarized as the following observed metrics; total number of taxa (NTAXA), total site WHPT score, and average score per taxon (WHPT-ASPT), using the abundance weighted sensitivity scores developed by Walley and Hawkes as recommended for the WFD (WFD-UKTAG, 2014).

8.34 In order to determine the ecological quality classification for each site, the River Invertebrate Classification Tool, RICT version 3, accessible as a single web application via the Freshwater Biological Association website (https://www.fba.org.uk/rivpacs-and-rict/river-invertebrate-classification-tool), was used.

8.35 For summer sampled macroinvertebrates in Northern Ireland, Model 1 was selected as recommended. The model uses environmental predictors to model expected reference conditions for a site using the RIVPACS IV models. It calculates observed ecological quality ratios for WHPT-ASPT and NTAXA to determine an unofficial ecological status classification. Both metrics are assessed in a "worst of" approach to give an overall invertebrate classification for each site (see WFD-UKTAG, 2014).

8.36 It should be noted that classifications based on single season sampling (as here) are intended only for investigations and are unsuitable for setting environmental objectives or testing compliance against them (https://aquametrics.github.io/rict/articles/user-guide.html).

8.37 Predictions and classifications require input of the following test site data: Altitude, distance from source, discharge category, percent substrate composition, and alkalinity (or a surrogate such as electrical conductivity). Input data were obtained from 1:50,000 ordnance surveys maps and from the physical habitat surveys based on the recommended methods outlined in Murray-Bligh (2002). However, discharge category was estimated from width, depth and flow velocity measurements taken during the baseline physical habitat surveys.

8.38 After running RICT3, an output of the probabilities that a site or waterbody is classed into one of five ecological quality classes (based on observed to expected metric

ratios for each site) is generated. Quality classes correspond with those used for WFD waterbody status reporting;

- High
- Good
- Moderate
- Poor
- Bad

8.39 It should be noted that classifications based on single season sampling (as here) are intended only for investigations and are unsuitable for setting environmental objectives or testing compliance against them (RICT2 user guide, https://www.fba.org.uk/FBA/Public/Discover-and-Learn/Projects/User%20Guides.aspx.)

Fisheries Habitat

8.40 An outline assessment of the streams draining the Site was carried out in September and October 2023 and consisted of walkover surveys recording general characteristics to provide an outline assessment for these watercourses. This was then complimented through a fish stock survey by electrofishing in September 2023.

8.41 The descriptive terminology used in the survey is based on the Life Cycle Unit method (Kennedy, 1984) currently used by DCAL and the Loughs Agency. Habitat type is recorded as:

- Nursery (shallow rock/cobble riffle areas for juvenile fish - fry/parr);
- Holding (deeper pools/runs for adult fish);
- Spawning (shallow gravel areas for fish spawning);
- Unclassified (unsuitable for fish – shallow bedrock areas or heavily modified sections of channel).

Juvenile Fish Stocks

8.42 Monitoring of fish stocks by the Loughs Agency tends not to include sampling sites in the upper reaches of tributaries in most river systems. Therefore, this part of the fisheries assessment considered the principal streams draining the Development site and set out to obtain details on salmonid distribution in tributaries of the Curly River and the main river itself not covered in routine sampling by the Loughs Agency.

8.43 A juvenile fish stock survey of the Curly River and main Site drainage streams was carried out by electrofishing at selected locations in September 2023.

8.44 Electrofishing was carried out according to a semi-quantitative methodology described by Crozier and Kennedy (1994). The procedure involves two operators fishing continuously in an upstream direction for five minutes at each sampling location, using an E-Fish 500W single anode electrofishing backpack (EF-500B-SYS).

The system operates on 24V input and delivers a pulsed DC output of 10 to 500W at a variable frequency of 10 to 100Hz. Output voltage and frequency are adjusted according to the electrical conductivity at the survey site.

8.45 All fish were caught using a dip net and retained for general inspection and length measurement before being returned to the water live. Any additional Age 0 salmonids observed but not captured were also recorded. This method is consistent with DAERA and Loughs Agency monitoring procedures.

8.46 The semi-quantitative electrofishing method has been calibrated separately for trout and salmon based on extensive studies in river reaches of known juvenile salmonid density. This has resulted in the development of an abundance classification system (Abundance Index) for salmon with five categories: Absent, Poor, Fair, Good, Excellent (**Table 8.3a**). The Abundance Index for trout has six classifications: Absent, Poor, Poor/Fair, Moderate, Good, Excellent (**Table 8.3b**).

Table 8.3: Semi-quantitative abundance categories for age 0 salmon (a) and trout (b), as developed by Crozier and Kennedy (1994); Kennedy (*unpublished data*)

(a) Salmon

Fry (0+) nos.	Density (No/100m2)	Abundance/ quality category
0	0	Absent
1 - 4	0.1 - 41.0	Poor
5 - 14	41.1 - 69.0	Fair
15 - 24	69.1 - 114.6	Good
25+	114.6+	Excellent

(a) Trout

Fry (0+) nos.	Density (No/100m2)	Abundance/ quality category
0	0	Absent
0 - 1	0.1 - 7.0	Poor
2 - 3	7.1 - 16.5	Fair
4 - 8	17 - 31	Moderate
9 - 17	32 - 59.9	Good
18+	60+	Excellent

Assessment of Effects

8.47 The assessment of effects was derived from methodologies outlined by:

- The Design Manual for Roads and Bridges specifically with regard to Road Drainage and the Water Environment, Volume 11, Section 3, Part 10 LA113 (DMRB, 2019);

8.48 The significance of the potential effects of the Development has been classified by professional consideration of the sensitivity of the receptor and the magnitude of the potential effect.

Sensitivity Criteria

8.49 Using the information assembled through the baseline assessment, the Fisheries Significance/Sensitivity of each watercourse was graded according to the generic methodology for environmental sensitivity outlined in Table 8.4, which is adapted from DMRB guidance for assessing the importance/ sensitivity of water environment features (Table 3.7; DMRB, 2019) and biodiversity resources (Table 3.9; DMRB, 2019b). details the framework applied in determining the sensitivity and this evaluation was used as the basis for the assessment of effects and the specification of any necessary mitigation requirements regarding fisheries and the aquatic environment.

Table 8.4: Estimating the Sensitivity/Importance of Receptors (adopted from Table 3.70, DMRB, 2019b)

Sensitivity	Criteria	Typical Examples
Very High	Attribute has a high quality and rarity on a regional or national scale	WFD Class 'High'. Site protected/designated under EC or UK habitat legislation (SAC, ASSI, salmonid water)/Species protected by EC legislation. Watercourse containing salmon and supporting a nationally important fishery or river ecosystem.
High	Attribute has a high quality and rarity on a local scale	WFD Class 'Good'. Species protected under EC or UK habitat legislation. Watercourse containing salmon or trout and supporting a locally important fishery or river ecosystem.
Medium	Attribute has medium quality and rarity on a local scale	WFD Class 'Moderate'. Watercourse containing trout and upstream of locally important fishery or river ecosystem.
Low	Attribute has low quality and rarity on a local scale	WFD Class 'Poor'. Watercourse without salmon or trout but upstream of locally important fishery or river ecosystem.
Negligible	Attribute has very low quality and rarity on a local scale	WFD Class 'Poor'/unspecified.

Magnitude of Effect

8.50 The magnitude of effect was assessed according to the criteria set out in **Table 8.5** and includes a consideration of the timescale of the effect (short, medium or long term).

Table 8.5: Estimating the Magnitude of Impact on Receptors indicating type and scale of effect (adopted from Table 3.71, DMRB, 2019b).

Magnitude	Criteria	Type and Scale of Effect
Major	Results in loss of attribute and/or quality and integrity of the attribute	Loss or extensive change to a fishery. Loss or extensive change to a designated Nature Conservation Site. Major alteration to fish population levels in catchment as a whole, through fish mortality, habitat destruction or barrier to migration. Duration: long-term (>5 years).
Moderate	Results in effect on integrity of attribute, or loss of part of attribute	Partial loss in productivity of a fishery. Appreciable alteration to fish population levels in specific sub-catchment or zone. Duration: medium-term (1-5 years).
Minor	Results in some measurable change in attribute's quality or vulnerability	Minor loss in productivity of a fishery. Minor alteration to fish population levels in specific sub-catchment or zone. Duration: short-term (up to 1 year).
Negligible / No impact	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity	Unlikely to affect the integrity of the water environment. No measurable alteration to fish population levels.

Significance Criteria

8.51 The correlation of magnitude against the sensitivity of the receptor determines a qualitative expression for the significance of the effect on the basis of a standard matrix shown in **Table 8.6**. The greater the sensitivity or value of a receptor or resource, and the greater the magnitude of the impact, the more significant the effect.

Table 8.6: Estimating the Significance of Potential Effects (adapted from Table 3.13, DMRB, 2019b and Table 3.8.1, DMRB, 2019c).

Sensitivity	Magnitude of Effect			
	Major	**Moderate**	**Minor**	**Negligible**
Very High	Very Large	Large/Very Large	Moderate/Large	Neutral
High	Large/Very Large	Moderate/Large	Slight/Moderate	Neutral
Medium	Large	Moderate	Slight	Neutral
Low	Slight/Moderate	Slight	Neutral	Neutral

8.52 The five significance categories with typical effects are shown in **Table 8.7**. Effects evaluated as being Moderate, Large or Very Large are considered to be significant for the purpose of the EIA in line with the EIA Regulations and will require mitigation. Those effects assessed as Slight or Neutral are not considered to be significant in terms of the EIA.

Table 8.7: Descriptors of the Significance of Effect Categories (adopted from Table 3.7, DMRB, 2019c).

Significance category	Descriptors of effects
Very large	Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
Large	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
Moderate	These beneficial or adverse effects may be important but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
Slight	These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the project.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

Baseline Conditions

Outline

8.53 This element of the assessment consisted of:

- Desk studies to collate baseline information on fisheries, conservation designations, and ecological status of waterbodies hydrologically connected to the Site; and
- Field surveys focused on the streams draining the Site to assess baseline physical habitat conditions, biological quality, salmonid habitat, and fish distribution. Field survey work was therefore carried out both within the Site Boundary and in the immediate downstream reaches of the connected Curly River.

Catchment Status

Designated Sites

8.54 The Site drains into the Curly River which forms part of the River Roe and Tributaries Area of Special Scientific Interest (ASSI) and Special Area of Conservation (SAC; Figure 8.1).

Legislative Context

8.55 The EC Habitats Directive (92/43/EEC) requires member states to designate Special Areas of Conservation (SACs) in order to protect habitats and species listed in Annex I and Annex II of the directive. The Habitats Directive was transposed into Northern Ireland legislation by the Conservation (Natural Habitats, etc) (Northern Ireland) Regulations 1995.

8.56 Subsequent to the UK leaving the EU, various technical and miscellaneous amendments to transposed EU planning legislation have occurred. These changes have been implemented to ensure planning legislation remains operable and legally certain post the UK exit from the European Union. The regulations are:

- The Planning (Environmental Assessments and Miscellaneous Amendments) (EU Exit) (Northern Ireland) Regulations 2018;
- The Planning (Environmental Assessments and Technical Miscellaneous Amendments) (EU Exit) Regulations (Northern Ireland) 2020

8.57 These Regulations have been made in exercise of the powers in section 8(1) of the European Union (Withdrawal) Act 2018 (c. 16) in order to address failures of retained EU law to operate effectively and other deficiencies arising from the withdrawal of the United Kingdom from the European Union. Apart from regulation 9(3)(b), these Regulations are made under section 8 of that Act and correct deficiencies of the type mentioned in section 8(2)(a) and (g) of that Act – matters which have no practical application to the United Kingdom or are otherwise redundant, and EU references which are no longer appropriate.

8.58 These Regulations are also made under section 2(2) of the European Communities Act 1972. Regulation 9(3)(b) is made under that Act. These Regulations make amendments to subordinate legislation in the field of planning. In particular, with reference to compliance with or having regard to EU or union law have been replaced with references to complying with or having regard to retained EU law such as domestic law which implemented Directives as set out in regulations.

8.59 Environment (Northern Ireland) Order 2002 provides the legislative basis for the protection of important nature conservation sites in Northern Ireland through the declaration of Areas of Special Scientific Interest. ASSIs are the major statutory mechanism for protecting nature conservation sites and generally provide the underpinning protection measure for the designation of European sites.

River Roe and Tributaries ASSI

8.60 The River Roe and Tributaries was declared an Area of Special Scientific Interest (ASSI) in 2007 (ASSI 246), due to the physical features of the river and its associated riverine flora and fauna.

8.61 The ASSI (and SAC, see below) extends over approximately 87 km of watercourse and encompasses the main channel of the River Roe and several significant tributaries including the Curly River, which drains and intersects the Site (**Volume 3 - Figure 8.1 and Figure 8.2**). The ASSI is noted for the physical diversity and naturalness of the banks and channels, especially in the upper reaches. The richness and naturalness of its plant and animal communities are also significant features, in particular the population of Atlantic salmon, which is of international importance.

River Roe and Tributaries SAC

8.62 The River Roe and Tributaries was designated as a Special Area of Conservation (SAC) in 2007 (UK0030360) with Atlantic salmon noted as the Annex II species selected as the primary reason for designation of the site. The Roe SAC was also selected for the following Annex I habitat:

- Water courses of plain to montane levels with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation.

8.63 Otter *Lutra lutra*, also listed in Annexe II, was identified as a qualifying feature but not a primary reason for site selection.

8.64 The conservation objectives for this SAC regarding salmon are:

- Maintain and if possible, expand existing population numbers and distribution (preferably through natural recruitment), and improve age structure of population.
- Maintain and if possible, enhance the extent and quality of suitable Salmon habitat - particularly the chemical and biological quality of the water and the condition of the river channel and substrate.

8.65 Salmon is included in Annex II as a species of European importance, and other SACs in the Foyle catchment with salmon as the primary selection feature are:

- River Foyle and Tributaries
- River Faughan and Tributaries

EU Water Framework Directive

Local River Catchments

8.66 The Development is located in the Curly River sub-catchment of the River Roe. The Curly River flows in a south-westerly direction to join with the Roe at Limavady. The Roe forms one of the major sub-catchments of the Foyle system, which is assigned to the North Western International River Basin District (NWIRBD) under the Water Framework Directive.

8.67 The River Roe drains a catchment area of 385km^2 through a river length of approximately 132km including tributaries. The river flows in a general northerly direction to discharge into Lough Foyle near Limavady.

8.68 The river rises in the Sperrin Mountains and land use in the upper reaches is predominantly rough grazing for sheep with extensive conifer forestry plantation. In the middle reaches the river flows through a deep narrow gorge then emerging onto an alluvial flood plain to form a meandering channel between open grassy embankments.

8.69 The Roe is a top-quality salmon system with excellent quality habitats populated by sustainable stocks of salmon and trout. The river is particularly suited to a flourishing stock of Atlantic salmon and supports a popular recreational fishery. This is borne out in the accumulated data recorded by the Loughs Agency which indicates consistent levels of spawning by salmon and generally favourable densities of juvenile salmon.

Ecological Status

8.70 The Water (Amendment) (Northern Ireland) (EU Exit) Regulations 2019 ensured that the Water Framework Directive (WFD) continues to operate in Northern Ireland after January 1st 2021. To achieve the ecological objectives of the WFD, River Basin Management Plans (RBMPs) have been implemented through a series of Local Management Areas (LMAs) during the 2010 to 2015 planning cycle, now extended into the subsequent 2016 to 2021 second cycle, and with a draft plan now published for the third cycle from 2021 to 2027 (https://www.daera-ni.gov.uk/consultations/consultation-draft-3rd-cycle-river-basin-management-plan-2021-2027).

8.71 The Development lies entirely within the Roe LMA, with all of the application area located in the waterbody defined as Curly River (UKGBNI1NW020204060). Proceeding downstream from the application area there is sequential hydrological connection between the following waterbodies in the Roe LMA (ecological status as assessed in 2021 is noted):

- Curly River (UKGBNI1NW020204060): Good
- River Roe (UKGBNI1NW020202024): Poor

8.72 The latest ecological assessment for these waterbodies was for 2021 as summarised in **Table 8.8,** which indicates the overall classification and status with regard to each of the principal parameters monitored.

Table 8.8: Classification of individual quality elements contributing to overall WFD status of relevant water bodies in Roe LMA, 2021

Parameter	Curly River (Ref 4060)	River Roe (Ref 2024)
Ammonia	High	High
Benthic Invertebrates	Good	Good

Parameter	Curly River (Ref 4060)	River Roe (Ref 2024)
Dissolved oxygen	High	High
Fish	-	Poor
Macrophytes	High	Good
pH	High	High
Phytobenthos	Good	Good
SRP	Good	High
Hydrological regime	High	Poor
Morphology	-	Poor
Overall Status	**Good**	**Poor**

8.73 For the current planning cycle 2021 to 2027, NIEA has published a draft RMBP that includes the Northwestern International RBD. This document sets out the latest assessment of pressures and impacts on the water environment, describe the progress DAERA NIEA made towards achieving objectives for 2015 and mid-cycle 2018, and explains the significant water management issues that still need to be addressed.

8.74 For the Curly River waterbody immediately draining the Site, all indicators were classified either as Good or High, with the overall ecological status indicated as Good. However, for the River Roe waterbody located more distant downstream of the Site drainage, the final classification as Poor arises from Hydromorphology and fish indicators, which were all Poor.

8.75 It should be noted that these classifications are broadly applicable to a waterbody but may fail to reflect the status of individual tributaries that occur distantly upstream of monitoring sites. It is for this reason that additional baseline data is used here to inform on baseline status within the Site (see Aquatic Ecology).

EC Fish Directive

8.76 The EC Freshwater Fish Directive (Consolidated) 2006/44/EC (FWFD) set physical and chemical water quality objectives for salmonid waters and cyprinid waters, specifically with regard to dissolved oxygen, ammonia, pH and total zinc.

8.77 The main stem channel of the River Roe (including the Curly River up to Bolea) was designated as “salmonid” under the Surface Waters (Fish Life Classification) Regulations (Northern Ireland) 1997, which implements the EC Freshwater Fish Directive. In 2003 this designation was extended to include several tributaries and extending the designation to the source of the Curly River.

8.78 The Fish Directive was repealed by the Water Framework Directive at the end of 2013, and the ecological status defined in the WFD sets the same protection to waterbodies designated for fish under the original directive. Areas designated under the Fish Directive have become areas designated for the protection of economically significant aquatic species under WFD and placed on a Register of Protected Areas.

8.79 The following fish species are recorded as being present in the Roe catchment (Loughs Agency, 2010):

- Atlantic salmon (*Salmo salar*);
- Brown trout and Sea trout (*Salmon trutta*);
- Eel (Anguilla anguilla);
- Three-spined stickleback (*Gasterosteus aculeatus*);
- Minnow (Phoxinus phoxinus);
- Smelt (Osmerus eperlanus)
- River/Brook lamprey (*Lampetra* sp);
- Sea lamprey (Petromyzon marinus).

Significant Freshwater Species

8.80 This section outlines the current status of Annexe II freshwater species and other species of conservation interest in the River Roe catchment.

Atlantic salmon

8.81 As an anadromous species, Atlantic salmon use both the freshwater and marine for the completion of the life cycle. The relevant conservation designations for Atlantic salmon give the species national and international significance. Atlantic salmon is listed in Annexes IIa and Va of the EC Habitat and Species Directive (Directive 92/43/EEC), Appendix III of the Bern Convention, and has a IUCN status of threatened in the Irish Red List No 5 (King et al, 2011). The species was added to the UK Biodiversity Action Plan (BAP) list in 2007 as a priority species for conservation action.

8.82 Adult salmon mature at two to four years of age with spawning occurring between November and December usually the upper reaches of suitable tributaries. Juvenile fish remain in freshwater for one or two years to attain sufficient size before becoming smolts, when they migrate to sea during April and May. The marine phase represents a period of rapid growth associated with greater food availability. Many salmon will return to freshwater in the following year as one sea-winter fish (grilse) but a proportion may remain at sea for another year to return as two sea-winter fish.

8.83 The North Atlantic Salmon Conservation Organisation (NASCO) has endorsed a precautionary approach to the conservation, management and exploitation of the salmon resource and the environments in which it lives; Northern Ireland, through the UK and EU, is a Party to NASCO.

8.84 Atlantic salmon stocks in general are in serious decline with some stocks threatened with extinction. Atlantic salmon in the Foyle system (designated as an SAC and ASSI largely because of salmon), are of international importance and represent one of the largest populations in Europe with genetically distinct sub-populations found in

individual sub-catchments. The Loughs Agency is responsible for monitoring and conserving Atlantic salmon stocks in this jurisdiction.

8.85 Within the Foyle system, counts of returning adult fish on the River Finn indicate a failure to meet the conservation limit over the five-year period to 2014 (Niven et. al. 2015). Low returns of adult fish to the Finn and failure to achieve Conservation Limits underpinned the introduction of suspensions to existing commercial netting in the Foyle and its estuary, and mandatory catch and release for rod caught fish in the Finn and Foyle rivers, under The Foyle Area (Control of Fishing) Regulations 2010.

8.86 Condition Assessments for the River Roe & Tributaries SAC, undertaken as part of Habitats Directive reporting requirements, indicate that the Atlantic salmon population was at *Favourable status* in both 2007 and 2011.

Lamprey

8.87 There are three species of lamprey in Northern Ireland:

- Brook lamprey (*Lampetra planeri*)
- River lamprey (Lampetra fluviatilis)
- Sea lamprey (Petromyzon marinus)

8.88 Sea and River lampreys are parasitic and migrate between the freshwater and marine environments, returning to freshwater to breed. In contrast, Brook lamprey are resident freshwater throughout their life cycle and are non-parasitic. Brook lamprey are widely distributed in Northern Ireland but River and Sea lamprey have a more limited distribution (Goodwin *et al*, 2009).

8.89 All three species are designated under Annex II of the EU Habitats Directive (Directive 92/43/EEC) and there are five large river SACs designated in the Foyle area. None of the three species is listed as a site selection feature of the River Foyle and Tributaries SAC but River/Brook lamprey are known to be present.

8.90 The Loughs Agency carried out a baseline survey in 2013 to record the abundance and distribution of juvenile lamprey in the Roe SAC; it was found that River/Brook lamprey populations were at Favourable conservation status while Sea lamprey populations were Unfavourable (Niven & McCauley, 2013). The assessment also demonstrated the presence of River/Brook lamprey in the Curly River.

Eel

8.91 The European eel the stock has been in rapid decline throughout its range since around 1980. This has led to the passing of the European Eel Regulation (EC) 1100/2007 which aims to return the European eel stock to more sustainable levels of adult abundance and juvenile eel recruitment. Member States are required to implement Eel Management Plans in each eel river basin, in this case the North Western International River Basin District.

8.92 The European eel is not listed under Annexe II but has recently been added to the International Union for Conservation of Nature (IUCN) Red List of Threatened Species in the category of Critically Endangered (King *et al*, 2011).

8.93 There is limited data available on the distribution of eel in the River Roe but the catchment status report for 2009 records the occurrence of the species during salmonid electrofishing surveys and indicates a regular distribution throughout the catchment, including the Curly River (Loughs Agency, 2010).

Brown trout

8.94 The Brown trout is a priority species for conservation action in Northern Ireland, as required under the Wildlife and Natural Environment Act (Northern Ireland) 2011. The species is widely distributed in the River Roe catchment and a significant proportion of the stock migrates to sea and returns to freshwater to spawn. The Roe is one of the more significant Sea trout rivers in the Foyle system and the species is a popular target for anglers. However, there is little data available on the status of stocks in the Roe or in any Northern Ireland rivers - a major difficulty in assessing stock status is that juvenile trout do not exhibit any specific features which identify them as potential adult Sea trout.

Salmon & Trout Stock Data

8.95 Annual monitoring of salmon (and trout) stocks in the Foyle system is conducted by the Loughs Agency based on:

- Adult salmon runs;
- Salmon spawning;
- Juvenile fish stocks.

The River Roe and the Curly River support significant stocks of Atlantic salmon and brown trout.

Adult Salmon Runs and Conservation Limits

8.96 A key factor in assessing the status of salmon stocks is determination of Conservation Limits for individual river systems. The Conservation Limit for Atlantic salmon is defined by NASCO as: *the spawning stock level that produces long term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship*. In simpler terms the Conservation Limit for a river is the number of spawning salmon required to ensure that salmon are reproducing in sufficient quantities to produce the next generation of fish.

8.97 The Loughs Agency operates a “real time” management regime for the Foyle system which aims to manage salmon fisheries and spawning populations in a sustainable manner. Management targets and spawning targets are set for each river catchment with egg deposition levels are set according to the area and quality grading of each section of nursery habitat. 25% is deducted from the management target allowing for

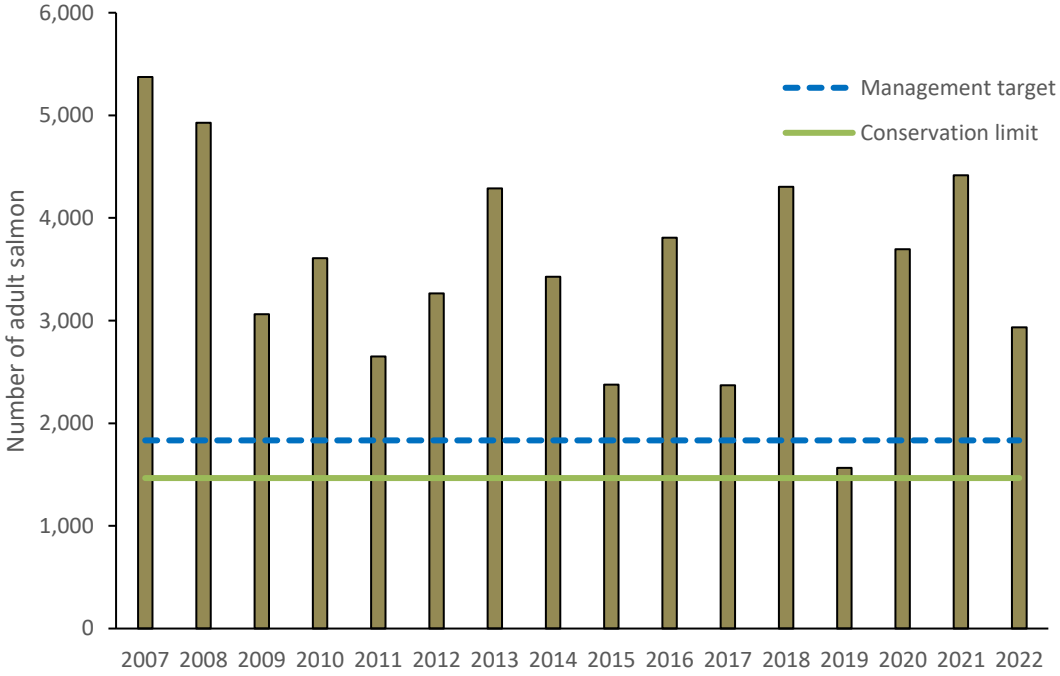
loss of salmon by angling (15%) and poaching and predation (10%). The remaining figure is referred to as the conservation limit/spawning target.

8.98 A management target of 1,833 adult Atlantic salmon has been set for the Roe Catchment, this equates to a conservation limit/spawning target of 1,466 or 2,062,125 eggs.

8.99 Adult salmon runs are now measured by electronic fish counters at six counting stations in the Foyle system; the Roe counter is located downstream of Limavady on a purpose-built crump weir spanning the full width of the river and has been in operation since 2001.

8.100 The numbers of adult fish returning to the river each year between 2007 and 2022 are shown in **Chart 8.1** along with the conservation limit (CL) and management target (MT) for the river. There is some evidence of a decline in the stock but both CL and MT have been exceeded in all but one year (2019) of the last 16 years.

Chart 8.1 Numbers of salmon ascending River Roe fish counter, 2007-22 (Source: Loughs Agency)



Juvenile Fish Stocks

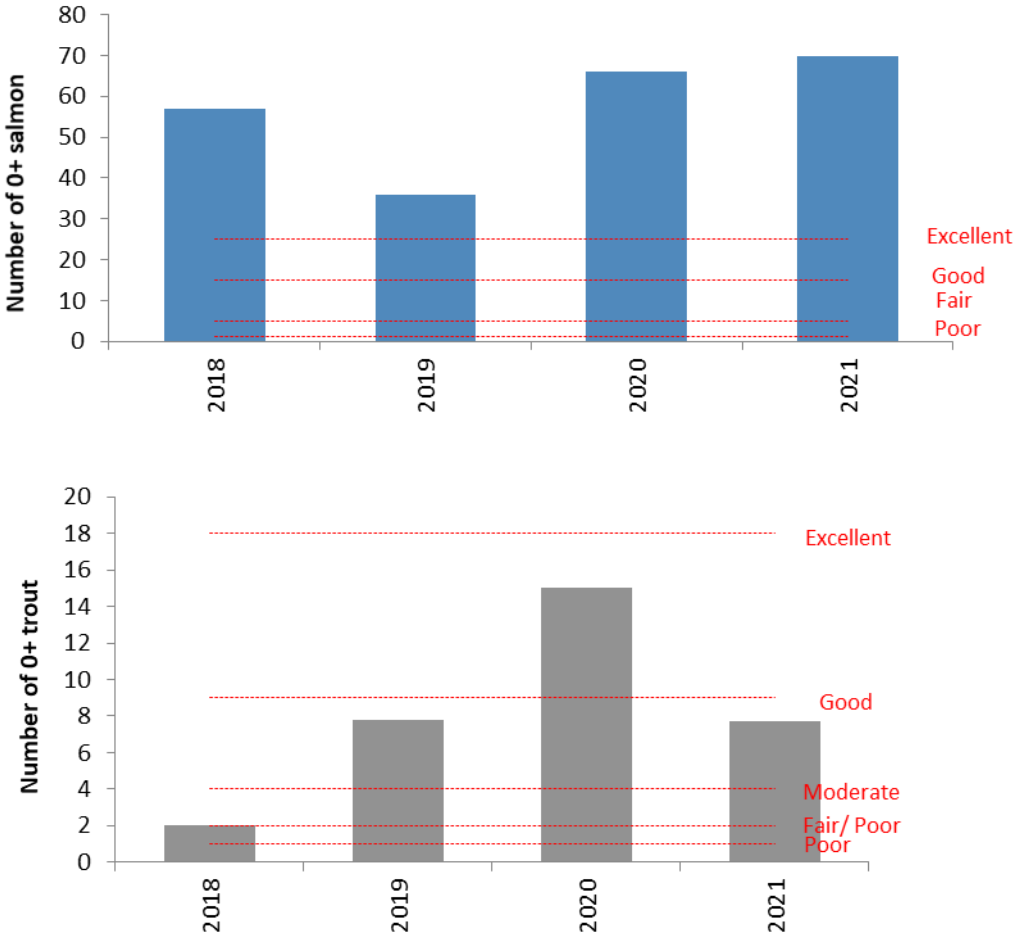
8.101 Fry distribution and abundance are an indication of the distribution and level of spawning by adult fish. Trends in abundance of juvenile salmon and trout are monitored by the Loughs Agency through annual semi-quantitative electrofishing surveys according to a methodology developed by Crozier & Kennedy (1994). Over 450 sites are sampled each year throughout the Foyle area with 60 in the Roe catchment including four on the Curly River.

8.102 The semi-quantitative electrofishing method has been calibrated separately for trout and salmon based on extensive studies in river reaches of known juvenile salmonid density. This has resulted in the development of an abundance classification system (Abundance Index) for salmon with five categories: Absent, Poor, Fair, Good, Excellent (Crozier and Kennedy, 1994). The Abundance Index for trout has six classifications: Absent, Poor, Poor/Fair, Moderate, Good, Excellent (Kennedy, unpublished).

8.103 **Chart 8.2a** shows the average catch of salmon and trout fry at survey sites on the main channel Roe over the most recent four-year period with abundance categories indicated. Salmon fry are significantly more abundant than trout and for each of the years 2018-2021, the average across sites far exceeded the threshold indicative of Excellent abundance.

8.104 For trout, average abundance has fluctuated over the 2018-2021 period, although more recently, values have been close to Good/ Excellent abundance.

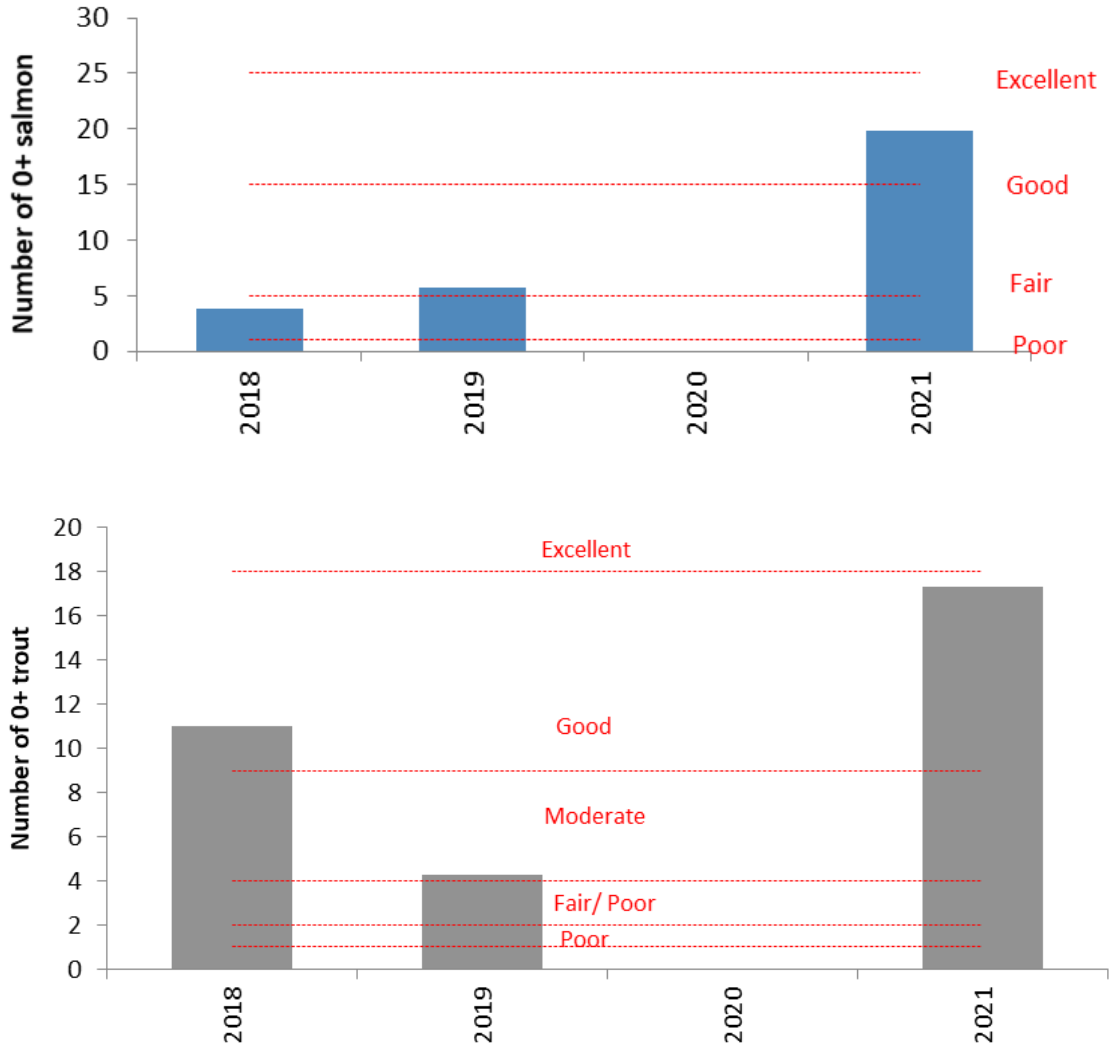
Chart 8.2a Salmon and trout fry Abundance Indices based on mean fry numbers at electrofishing sites on the Roe, 2018-2021 (Source: Loughs Agency). For 2020, data for only a limited number of sites was available.



8.105 **Chart 8.2b** shows the average catch of salmon and trout fry at survey sites on the main channel Curly River (4 sites) over the most recent four-year period of data availability, with abundance categories indicated. Salmon fry abundance was lower than trout fry abundance in 2018 and 2019 but similar in 2021. The average across the four sites exceeded the threshold indicative of good abundance only in 2021 whereas earlier in 2018 and 2019, abundance was Fair or less. It is noteworthy that in 2018 and 2019, salmon fry were absent in two of the four sites immediately downstream of the Site boundary (i.e. Sites 17_068 and 17_070, **Figure 8.2)** but present at all four sites in 2021.

8.106 For trout, average abundance varied from Moderate to Excellent over the three sampling years.

Chart 8.2b Salmon and trout fry Abundance Indices based on mean fry numbers at electrofishing sites on the Curly River, 2018, 2019, and 2021 (Source: Loughs Agency).



8.107 These data demonstrate that salmon spawning in the main river Roe is extensive but more intermittent in the Curly River. More recently (2021), salmon spawning has been

consistent across all the four Loughs Agency monitoring sites in the Curly River, with two of these sites located directly downstream of the Site drainage (within 0.3-1.5km of the boundary), with on average Good fry abundance indicated. Both areas are clearly significant in terms of salmon spawning and recruitment with the main channel Roe exceptional. Trout fry were present at a lower average abundance in the main channel Roe but at higher abundance in the Curly River, occurring at Moderate to Good abundance indicating a good level of spawning activity.

8.108 The Loughs Agency carried out a baseline survey in 2013 to record the abundance and distribution of juvenile lamprey in the Roe SAC; it was found that River/Brook lamprey populations were at Favourable conservation status while Sea lamprey populations were Unfavourable (Niven & McCauley, 2013). The assessment also demonstrated the presence of River/Brook lamprey in the Curly River.

Angling

8.109 The Roe is one of the leading angling waters in the Foyle system providing a popular rod fishery for both the local population and visitors to the area. Fishing rights on the freshwater reaches of the main channel and tributaries are owned by The Honourable Irish Society while the tidal section is owned by the Loughs Agency.

8.110 Angling is controlled and administered by the Roe Angling Ltd which leases the fishing rights on both the freshwater and tidal sections.

8.111 Details of angling activity and catches of salmon and sea trout are shown in **Table 8.9**. As these returns are based on incomplete licence/logbook returns, a raising factor is applied in line with Loughs Agency methodology which is based on an analysis by Small (1991). Adjustment of the catch returns for 2010-2020 would suggest an average annual catch of 293 salmon which would indicate a moderately productive fishery. Voluntary catch and release are now practised widely on the Foyle system reaching 58% in 2012.

Table 8.9: Salmon angling catches for the Roe indicating adjustment according to annual rate of licence/logbook returns, 2014-2020 (Source: Loughs Agency)

Catch statistics	2014	2015	2016	2017	2018	2019	2020	Average
% licence/logbook return	14%		15%	11%	13%	9%	28%	15%
Raising factor	2.84		2.70	3.56	3.03	4.03	1.77	2.99
Reported salmon catch	86		143	121	69	53	156	104
Adjusted salmon catch	244		386	430	209	214	276	293

Fisheries habitat enhancement and protection

8.112 The Curly River downstream of the Site has been the subject of recent riparian enhancement works in several sections (see Figure 8.2). These works include

protection of the banks through fencing and gates, protection of in-channel poaching by provision of pasture pump drinkers, and erection of styles to assist angler access. The work was funded by the National Lottery Fund and the Loughs Agency and administered through The Curly Burn Catchment Care project. It is hoped that such work will contribute to the enhancement and protection of fish and fish habitat in sections of the burn that are within the SAC.

Site Survey: Fisheries Habitat

Overview

8.113 The Development is located entirely within the Curly River sub-catchment of the River Roe catchment. The application area drains via a series of small drainage channels and un-named streams flowing into the Curly River, while a significant section of the Curly River also bisects the Site. In addition, two ponds, most likely historical settlement ponds, occur to the east of the Site and south of the A37 associated with what appears to be an old quarry. Site drainage is described in further detail in Chapter 9 Geology & Hydrogeology.

8.114 The fish habitat survey consisted of a walkover assessment of the main streams draining the Site boundary to the Curly River (Streams A-D), the two ponds (Ponds A and B), and the main channel Curly River within and immediately downstream of the Site (as shown on **Volume 3 - Figures 8.3-8.6**).

General Description / Observations

Stream A

8.115 This watercourse drains the Site boundary along the western boundary and flows in a north-north westerly direction to join the Curly River just below the Site. The apparent source is an area of wet rushes and flushes with no defined channel but soon becoming defined as a narrow and incised drain-like cut (Plates 1 and 2; Figure 8.3). The immediate surrounding land use and habitat is rough sheep grazing and remnant bog with a stream bed of boulder mixed with stretches of vegetation, rushes and silt. There is little flow and overall fisheries significance is low with habitat largely unsuitable for juvenile salmonids.

8.116 Further downstream, the channel remains narrow and incised with little flow or water depth and no useable habitat for trout. In-stream habitat is dominated by grass, rushes and deep silt.

8.117 C. 80m upstream of the A37 road, the channel is narrow (c. 0.2-0.5m wide) with a bed dominated by vegetation, peat and small pebbles; fisheries habitat is a mixture of Unclassified and barely Grade 3 Nursery. However, towards the road bridge, a small section is Grade 3 Nursery with some riffles and runs leading to a small pool above the bridge (Plate 3; Figure 8.3).

8.118 Downstream of the A37, the stream remains narrow and shallow over a moderate gradient; habitat quality is barely consistent with Grade 3 Nursery. Towards the confluence with the main Curly River, the stream passes through a heavily wooded area of mixed hazel, ash and scrub (Plate 4; Figure 8.3). The stream bed is a mixture of boulder and cobble in riffles and runs characterised by small cascades and falls and is largely Grade 3 Nursery (Plate 5; Figure 8.3). It is in this lower section that trout fry occurred at Good abundance (see below) and despite the relatively steep gradient, there was a lack of any barriers to fish passage; it is therefore highly likely that mature trout would have ascended from the main Curly River to spawn.

Stream B

8.119 Stream B is sourced from drainage in an area of rough grazing in the central south of the Site south of the A37 road. The source is an area of wet rushes with no distinct channel that becomes defined some 80-100m south of a radio transmitter (Plate 6; Figure 8.3). Here, the habitat is steep and there is no hard stream bed so that quality is unclassified.

8.120 The stream channel emerges at the bottom of a steep hill and flows north towards the A37 road. However, it first flows for c. 15m via a concrete culvert c. 150m u/s of A37 as it runs beneath the transmitter pad (Plate 7; Figure 8.3).

8.121 Downstream of the culvert, the habitat is barely N3 in a very narrow slow flowing channel with large areas blocked by woody debris from a previously clear-felled conifer plantation (Plate 7).

8.122 Downstream of the A37 road, the stream becomes steep and very narrow and is fed by 2 drains; the true left side channel is a continuation of the stream from above the A37 road and has a hard bed interspersed with soil/ pebbles and tight vegetation (Plate 8; Figure 8.3); habitat quality is Grade 3 Nursery and a few small trout were present (see below). The true right-side channel merges c. 95m upstream of the Curly River confluence, is drain-like, lacks flow and thus has very low fisheries significance (Plate 9; Figure 8.3).

8.123 Towards the confluence with the main Curly River, the stream widens (0.7-1.8m) and has a very clean bed despite its position in an area of open cattle grazing on rough ground. There are some areas of bank poaching, but the habitat is a mixture of riffles and runs in Grade 3 Nursery with gravel pockets consistent with Grade 3 Spawning (Plate 10; Figure 8.3).

Stream C

8.124 This stream is sourced by several small drains in the eastern central area of the Site north of the A37 road. It issues as a vegetated peat-based drain <0.2m wide to the south-east of a small forestry block and above this as a series of flushes and wet rushes in a gentler gradient pad; these coalesce to form a defined channel of very low fisheries significance (Plate 11; Figure 8.4).

8.125 The channel then enters the small forestry block and the bed changes to a hard bottom with increased gradient and a width of c. 1m. The bed is largely boulder and cobble and the habitat Grade 3 Nursery (Plate 12; Figure 8.4).

8.126 Within the small forest block, the channel varies from 1m to 1.8m at the confluence with the Curly River. The bed is mainly boulder and cobble with some gravels and the habitat a mixture of Grade 2 and 3 Nursery although the gradient limits habitat use in places. The bed is clean with riffles and runs and shading due to the conifer canopy. The lower section is more gently sloping towards the Curly River confluence and meets with no barrier to fish movement (Plate 13; Figure 8.4). There is limited cattle poaching due to livestock access from north of the Curly River.

Stream D

8.127 This stream occurs on the eastern boundary of the Site downstream of the A37 road, and above the road, sources within the south-eastern part of the Site. The source appears to be an area of very rough sheep grazing and an area of remnant sphagnum mosses, sedges and rushes that likely acts as a "sponge" capturing drainage water from the hill above (Plate 4; Figure 8.4).

8.128 Two streams then appear with the true right-hand channel merely a wet flush with a soft base that seeps into the main true left channel (Plate 15; Figure 8.4). The true left channel falls steeply through a steep glen dominated by wet willow and scrub for c. 70m. It is narrow (c. 0.2-0.4m wide) with a bed of boulder and cobble but the gradient limits the habitats suitability for juvenile trout.

8.129 The stream passes over a small vertical fall towards the A37 road before entering a c. 25m long c. 1.0m dia. concrete culvert underneath the A37 (Plate 16 Figure 8.4). The culvert is slightly sloped, and the outlet is a 3-stepped drop onto a shallow concrete apron and is thus overall impassable (Plate 17; Figure 8.4).

8.130 Downstream of the culvert, the stream channel is c. 1m wide with a cobble and pebble bed but becomes overgrown and grassy with areas of soft vegetation and surrounding open sheep open grazing; habitat is a mixture of Grade 3 Nursery initially, then becoming unclassified moving downstream (Plate 18; Figure 8.4).

8.131 Further downstream the channel becomes more defined again to 100m u/s of the confluence with the Curly River after issuing from a marshy area where the bed is soft and vegetated. The bed appears drain-like and is openly grazed by sheep and cattle and runs over a moderate gradient with cobble and pebble and is largely Grade 3 Nursery. At this point the stream is steep but potentially passable to fish from main river. The outflow to the Curly River is steep over a series of small chutes and falls with riffles over boulder and cobble; habitat is a mixture of Grade 3 Nursery and unclassified (due to chutes/ falls; Plate 19; Figure 8.4).

Curly River

8.132 The Curly River immediately downstream of the Site boundary is c. 4-6.0m wide and passes over a vertical and cascading waterfall of c. 2m high that would be impassable to migratory salmonid fish species (Plate 20; Figure 8.4). The habitat is cascading flows and high gradient riffles interspersed by short pocket water pools; the bed is a mixture of large moss-covered boulders and cobbles with habitat quality a mixture of Grade 1 and 2 Nursery with some Grade 2 and 3 pools. The immediate riparian area is a wooded strip of hazel and ash with various scrub species including blackthorn and hawthorn that causes significant river channel shading (Plate 21; Figure 8.5). Below the woodland strip, the adjacent land use becomes grazed pasture and the

gradient shallows into a series of riffles and runs consistent with Grade 2 Nursery and Grade 2 and 3 Pools.

8.133 Within the Site boundary, the river gradient flattens out above the waterfall towards a farm track crossing and concrete bridge. Downstream of the bridge, the habitat is a mixture of run and glide and is mainly Grade 3 Nursery and Pools with some deep areas consistent with Grade 2 resting Pools (Plate 22; Figure 8.5). A small passable fall c. 1m high occurs 80m d/s of the farm lane bridge but is passable in high water.

8.134 Upstream of the bridge, a slight increase in gradient is characterised by a series of high gradient riffles with boulder and large cobble dominating (Plate 23; Figure 8.5).

8.135 The section of river from just above the outlet of Stream C to c. 80-90m downstream occurs over a gradient change that is associated with a good quality section of Grade 1 Nursery in a boulder and large cobble dominated reach (Plate 24; Figure 8.5).

8.136 Towards the confluence of Stream D, the main Curly River channel is c. 2.5-4.8m wide and 0.12 to 0.45m deep. The flow habitat is characterised by high gradient riffle and run and the bed is clear and dominated by boulder and cobble with some bedrock in a moderate gradient slope. Habitat quality is mainly Grade 2 and 3 Nursery and Pools (Plate 25; Figure 8.5). The banks are generally openly grazed by cattle and sheep.

8.137 Further upstream above the Site boundary, the channel narrows to c. 2.2-3.75m and is mainly characterised by Grade 1 and 2 Nursery in riffle and high gradient riffle with cascades (Plate 26; Figure 8.5).

Pond A

8.138 This small pond most likely was formed as a settlement pond for the adjacent quarry, which appears di-used. The pond has a perimeter of c. 175m and is fringed by reeds and bullrush (*Typha* spp.) and the open water is choked with both floating and submerged macrophytes, including broad-leaved pondweed (*Potomogeton natans*). The marginal bed is comprised of deep silt and overall, the habitat would be considered unsuitable for salmonid fish species. It should be noted that the landowner landowner informed that his sons had stocked some trout from the River Roe system many years ago but had not observed any since (Plate 27; Figure 8.5).

Pond B

8.139 This much smaller settlement pond has a small overflow pipe that trickles some water to Stream B across the access farm lane; there is no possibility of fish movement into this pipe. The pond itself most likely was an overflow settlement pond for Pond A, which is located up-gradient (Plate 28; Figure 8.5). Overall, the pond is weed choked with significant submerged and floating vegetation including *P. natans*. It is unsuitable as habitat for salmonid fish.

Site Survey: Stream Quality

8.140 Six sites were surveyed in the watercourses draining the development area (Sites 1, 4, 5, 7, 10 and 12; **Volume 3- Figure 8.6**) as follows:

- Site 1 – Curly River downstream of the Site boundary and inflow of Stream A.
- Site 4 – Curly River upstream of inflow of Stream D.
- Site 5- Stream A lower section above Curly River confluence.
- Site 9 – Stream B lower section above Curly River confluence.
- Site 13 - Stream C lower section above Curly River confluence.
- Site 15 - Stream D lower section above Curly River confluence.

Chemical Water Quality: Basic Parameters

8.141 All streams, including the two sites sampled in the main Curly River, had satisfactory dissolved oxygen levels and all had relatively low conductivity (Table 8.10). The low conductivity reflects the upper catchment positions of most sites.

8.142 The pH value was close to neutral (pH 7.0) or mildly acidic across (Streams A, B, and C) all sites and would be expected to support salmonid fish as values generally above 5 are required to sustain egg and fry development.

Table 8.10: Water chemistry parameters measured at six survey sites, October 2023.

Site	River/ stream location	Diss. Oxygen (mg/l; % sat)	Conductivity (µS/cm)	pH
1	Curly River d/s Site	12.8; 100	93	6.7
4	Curly River u/s Site	13.1; 101	105	6.5
5	Stream A	11.6;97	168	6.2
9	Stream B	11.4;92	110	6.35
13	Stream C	11.85;96	140	6.9
15	Stream D	12.5;99	97	6.3

8.143 It should be noted that spot measurements of physico-chemical parameters provide only a snapshot of stream water quality; consensus on overall quality should consider consider additional indicators such as those provided by stream macroinvertebrate communities (see below).

Physical Habitat Quality

8.144 Within the Site, all the drainage streams flowing to the Curly River (Streams A-D) were narrow (<2m wide) and generally very shallow (<0.15m), reflecting their upper catchment locations (Table 8.11). Although the flow velocity was moderate in all streams (i.e., >0.15 m/s), this most likely reflected the sampling timing after several days of rain though the streams were clear.

8.145 All of these drainage streams were characterised by relatively complex substrate mainly comprising cobbles and boulders and this is reflected in the CI values of close to or higher than 4. Fine sediment was minimal in all streams and below the 20% cover threshold above which salmonid and benthic biodiversity can be compromised (Clapcott et al. 2011).

8.146 In the main Curly River upstream (Site 4) and downstream (Site 1) of the Site drainage stream inflows, the bed was largely free of fine sediment despite open access to cattle and sheep along both banks. The lower site was markedly wider than the upper site and slightly deeper. However, both sites had substrate dominated by boulder and large cobble, reflected in their high CI values. Flow velocity was similar at both sampling locations.

Table 8.11: Stream habitat quality from baseline surveys conducted in October 2023.

Site	River/ stream	Sediment cover (%) & type	Mean width (m)	Mean water depth (m)	Mean flow velocity (ms-1)	Coarse-ness (CI)	Substrate hetero-geneity (SD)	Inferred substrate
1	Curly River	0	5.4	0.29	0.32	4.5	0.6	Mixture; coarse
4	Curly River	0	2.4	0.23	0.31	4.28	0.54	Mixture; coarse
5	Stream A	0	1.4	0.05	0.29	4.36	0.5	Mixture; coarse
9	Stream B	3.1	1.23	0.12	0.23	3.87	0.68	Mixture; intermed. coarseness
13	Stream C	0	0.69	0.065	0.22	4.05	0.39	Almost homog.; coarse
15	Stream D	0	0.85	0.06	0.35	4.27	0.82	Mixture; coarse

Aquatic Ecology

8.147 Recorded invertebrate community metrics for the six survey sites are shown in Table 8.12. Based on the benthic invertebrate indicator element, and the “one out, all out” philosophy (NTAXA indicator), the four drainage stream sites (Streams A-D; sites 5,9,13 and 15) were indicated as having at least GOOD or better WFD-based ecological quality. The two main Curly River sites were classed at Moderate ecological quality. However, based on the ASPT indicator element, all sites were classed at High ecological quality; this likely provides a better representation of the water quality as it shows that all of the sites have invertebrate communities dominated by taxa that are largely sensitive to pollution, including organic inputs and nutrient enrichment.

Table 8.12: WFD-based ecological quality classes at each site derived from benthic invertebrate baseline surveys, October 2023.

Site	River/ stream	BMWP WHPT score	Number of taxa	N-TAXA WFD-based invert. class	WHPT ASPT	ASPT WFD-based invert. class
1	Curly River	124	18	Moderate	7.1	High
4	Curly River	130.8	19	Moderate	6.8	High
5	Stream A	122.1	19	Good	6.3	High
9	Stream B	119.5	18	Good	6.6	High
13	Stream C	118.3	18	Good	6.9	High
15	Stream D	132.3	19	Good	6.9	High

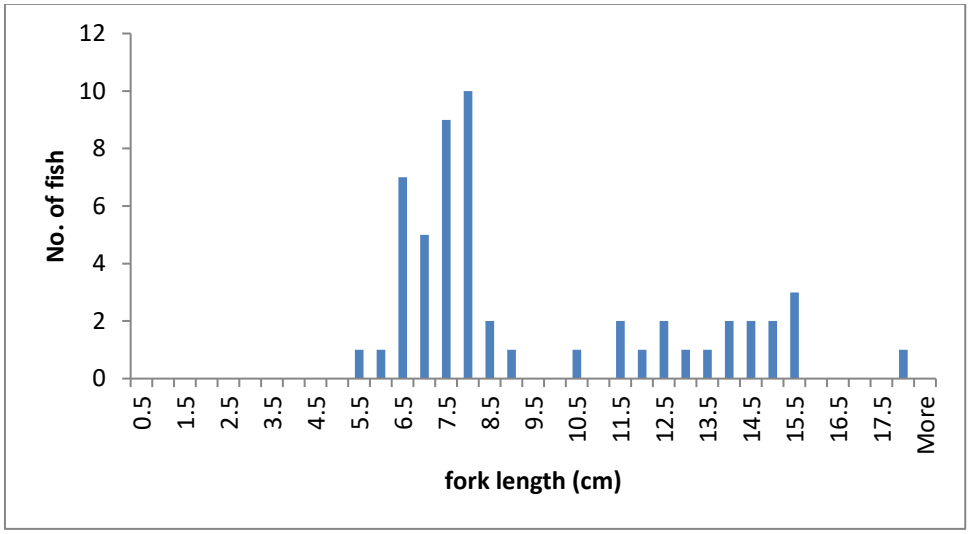
Site Survey: Juvenile Fish Stocks

8.148 Thirteen sites were surveyed in September 2023 in the watercourses draining the development area (Sites 1; 3-11, and 13 and 14; **Volume 3 - Figure 8.6**). Trout were present in each of the four small drainage streams within/ bounding the Site (Streams A-D) and present at all three sites surveyed in the Curly River upstream, within, and downstream of the Site. Salmon were absent at all survey sites, including the Curly River immediately downstream of the large waterfall close to the Site. However, note that salmon were recorded present at Loughs Agency monitoring site close to the Site boundary in 2021 (Site 17_070).

Population Age Structure

8.149 The age structure of the trout stocks in the drainage streams was verified by constructing a length frequency distribution (**Charts 8.3**).

Chart 8.3: Length frequency distribution of trout caught in the streams draining the landholding.



8.150 The trout length frequency shows a clear separation of Age 0 fry (5.5-9cm) from Age 1 fish (10.5-c.13.5cm), with fish Age greater than 1 most likely >13.5cm in length.

Fish Distribution & Abundance

8.151 The results of the semi-quantitative survey are shown in **Table 8.13** with the numbers of trout and salmon at each site separated into age groups based on observed fish length as outlined above.

Table 8.13: Summary results of electrofishing survey indicating numbers of age 0 and older trout and salmon caught; fry abundance indices also indicated.

Site	Stream	Trout (Age)		Salmon (Age)		Fry abundance index	
		(0)	(>1)	(0)	(1)	Trout	Salmon
1	Curly River	15	6	0	0	Good	Absent
3	Curly River	6	12	0	0	Moderate	Absent
4	Curly River	18	15	0	0	Excellent	Absent
5	Stream A	13	0	0	0	Good	Absent
6	Stream A	0	0	0	0	Absent	Absent
7	Stream B	16	1	0	0	Good	Absent
8	Stream B	1	2	0	0	Poor	Absent
9	Stream B	0	0	0	0	Absent	Absent
10	Stream C	3	0	0	0	Fair	Absent
11	Stream C	0	0	0	0	Absent	Absent
13	Stream D	8	0	0	0	Moderate	Absent
14	Stream D	3	1	0	0	Fair	Absent

8.152 Juvenile trout fry occurred at *Moderate* to *Excellent* abundance in the Curly River immediately downstream, within and upstream of the Site (Site 1, 3 and 4; **Table 8.13; Figure 8.6**).

8.153 The lack of salmon in the Curly River within and upstream of the Site (Sites 3 and 4) is most likely due to the presence of the impassable waterfall immediately downstream of the Site boundary.

8.154 In Stream A, trout fry occurred at *Good* abundance immediately upstream of the Curly River confluence (Site 5) but were absent upstream of this within the landholding (Site 6) where the channel becomes narrower, steeper, and the bed offers less suitable trout nursery habitat.

8.155 Stream B had trout fry present both in the lower (*Good* abundance) and middle sections (*Poor* abundance; Sites 7 and 8) within the Site but not in the upper section upstream of the A37 road (Site 9). The upper section was considered less suitable for

trout given the presence of narrowing and steepening reaches with little flow and sub-optimal stream bed substrate.

8.156 Stream C had trout fry present at *Fair* abundance the lower reach immediately upstream of the Curly River confluence but lacked fish further upstream where the channel became incised and overgrown with grasses and the bed was a mixture of fines and peat/ vegetation.

8.157 Stream D had trout fry present at *Moderate* abundance immediately upstream of the Curly River confluence but at *Fair* abundance immediately downstream of the impassable pipe culvert below the A37 road. Above the A37, the channel narrowed, and the gradient increased markedly so that habitat suitability for trout was deemed very low.

8.158 Other species present included eels in the main Curly River, the lower section of Stream B and the section of Stream D immediately downstream of the A37 road.

8.159 Overall, there is evidence of good recruitment of trout fry in most sections of streams draining the Site north of the A37, including n the main Curly River. However, within the landholding south of the A37, no fish were present. Trout were clearly more common downstream where there would be sensitivity to sediment, other pollutants, and passage impacts should these small streams be crossed by track infrastructure. Eels would also be sensitive to any pollutant inputs in addition to passage impacts caused by any stream crossings.

8.160 Very sensitive salmon occurred downstream of the Site based on the most recent Loughs Agency monitoring data (2021) and these would be sensitive to both sediment run-off and the release of other pollutants.

Assessment of Effects

8.161 Potential effects were assessed for construction, operational and decommissioning phases of the Development. Construction impacts cover the discharge of suspended solids, release of other pollutants and temporary interruption of fish passage. Post-construction (operational) impacts include habitat loss at watercourse crossings, obstruction of fish passage and surface water run-off.

8.162 Impact assessments are primarily based on their effect on salmonids either directly or upon their habitats. However, these assessments would be equally relevant to eels and lamprey if present in these waters.

Fisheries Significance / Sensitivity

8.163 Using the information assembled through the baseline assessment, the Fisheries Significance/Sensitivity for the main watercourses draining the area within the Site Boundary and downstream of this area are shown respectively in **Table 8.14**. A watercourse was deemed to have a High/ Very High sensitivity if the WFD class was at least Good and Annex II species were present (e.g. salmon, lamprey). The streams

draining the site were all at least of Good ecological status, supported trout spawning and rearing, and were assessed at *High* sensitivity.

8.164 The Curly River section at the upper and lower Site boundary, was assessed at *Very High* sensitivity as it occurred within the designated SAC/ ASSI and supported Annex II-listed Atlantic salmon and Lamprey spp. (downstream of the Site). Further downstream, the River Roe was also assessed at *Very High* sensitivity as it forms part of the SAC/ ASSI and supports Annex II-listed salmon and lamprey spp.

Table 8.14: Sensitivity of receiving watercourses within Site Boundary and downstream to River Roe main channel.

River/Stream	Key Species/ indicators	WFD invert-based status	Sensitivity
Stream A	Trout fry present at Good abundance in the lower stream along the Site boundary. Fish were absent further upstream.	Good-High	High
Stream B	Trout fry present from Poor to Good abundance within the Site. Eel were present in lower stream within Site. No fish were present in the upper stream.	Good-High	High
Stream C	Trout fry were present at Fair abundance in the lower stream within the Site. No fish occurred in the upper stream.	Good-High	High
Stream D	Trout fry occurred at Fair to Good abundance within the Site to just north of the A37; eel also were present. No fish occurred in the upper stream south of the A37.	Good-High	High
Curly River	ASSI/ SAC. Receiving watercourse located within and downstream of application area; Annexe II species: Atlantic salmon, River/Brook/Sea lamprey. Brown trout & European eel also present.	Moderate-High	Very High
River Roe	ASSI/ SAC. Receiving watercourse located downstream of application area; Annexe II species: Atlantic salmon, River/Brook/Sea lamprey. Brown trout & European eel also present.	n/a	Very High

Construction Phase

8.165 The potential for impacts on fisheries and aquatic habitats during the construction phase is mainly associated with ground disturbance and the entrainment of sediments in surface water drainage. There is also a potential impact from the accidental spillage of other hazardous substances (oil and fuel) used in the construction process.

Sediment Run-off

8.166 The release of fine sediment (grain size <2mm) is potentially a major cause of environmental impacts and is associated with clearly defined negative impacts (Turley et al. 2014). Sensitive fish species such as brown trout and Atlantic salmon

are highly vulnerable to suspended and deposited sediment in spawning and nursery habitats (Kemp et al. 2011). In spawning gravels, incubating salmonid eggs require good water circulation to provide oxygen and remove waste products. As deposited fine sediment content increases, gravels become embedded, resulting in restricted water circulation and reduced egg and alevin survival (Cowx and Welcome, 1998). After emergence, juvenile salmonids (fry) disperse downstream to suitable nursery rearing habitat generally within 100m (Kennedy, 1984), often in faster flowing riffles/ runs, where they establish feeding territories and compete for food.

8.167 Suspended sediment can lower water clarity leading to reduce prey capture efficiency and may affect respiration rates by clogging of gills (Kemp et al. 2011). Deposited sediment can reduce habitat complexity and quality by in-filling of substrate, thus reducing territory size leading to increased aggression and ultimately lower carrying capacity. Deposited fine sediment can also indirectly affect growth and survival of juvenile salmonids by reducing the quality of habitat for preferred invertebrate prey species.

8.168 Although adult salmonids are prone to gill-clogging and visual impairment at high levels of suspended sediment, they are much less reliant on substrate complexity, tending to occupy deeper pools, particularly during the spawning season. Adult salmonids are also more mobile than sessile eggs or juvenile stages, and thus more capable of avoiding adverse local conditions (Kemp et al. 2011).

8.169 Freshwater benthic macroinvertebrates are also an important component of river ecosystems, acting both as sentinels of general water and habitat quality, and as an important food resource for higher trophic levels such as fish and birds. Pulses of fine sediment can cause behavioural drift, whereas excessive fine sediment can reduce the quality of physical habitat by smothering and blocking of interstitial spaces and water flow (Allan, 1999). As fine sediment infiltration increases, invertebrate abundance and community diversity is reduced, resulting in the replacement of sensitive taxa (mayfly, stonefly and caddis) by more tolerant types (worms, midge larvae, molluscs; Matthaei et al. 2006; Kemp et al. 2011).

8.170 Sediment release and entrainment can also increase the risk of nutrient addition and alterations in channel morphology and hydrology (Levesque and Dube, 2007). For example, excavated bank material or soils associated with the construction process could increase inputs of sediment bound phosphorus, which could negatively affect aquatic biota by causing excessive algal and macrophyte growth, and depressed oxygen levels.

8.171 Fine sediment is partly managed by the water quality objectives and standards of the EC Freshwater Fish Directive 2006/44/EC (FWFD), where a mean total suspended solids (TSS) concentration of 25 mg/L is specified for salmonid waters. While Article 6 of the Water Framework Directive has now repealed the FWFD, new standards that provide the same level of protection have been proposed (UKTAG, 2010). However, there is no national environmental standard or guideline for deposited fine sediment in the UK. Fine sediment covers above a threshold of 20% bed cover, based on

recommendations in New Zealand by Clapcott et al. (2011), and published research (e.g. Kemp et al. 2011), provides a general indication of increasing risk for both invertebrates and salmonids.

8.172 The discharge of suspended solids during construction of the Dunbeg South Extension Wind Farm could result from:

- Excavations associated with construction of access tracks and turbine foundations;
- Excavations associated with watercourse crossings;
- Surface peat disturbance and subsequent erosion of the underlying soils;
- Stockpiling of soils and excavated materials;
- Run-off from access roads;
- Landslide resulting from slippage of access roads or excavated materials.

8.173 The proposed site is hydrologically connected to watercourses of significant fisheries interest via on-site and off-site watercourses which are potential routes for suspended solids run-off. The Curly River and the River Roe are of particular significance due to their SAC/ ASSI status and stocks of Annexe II listed Atlantic salmon.

Release of other pollutants

8.174 As the Site drains into the Curly River via Streams A-D, which connects to the River Roe, there is potential for spillage or release of diesel, oil or other polluting substances to reach these key waters with consequences for resident fish together with invertebrate organisms, including Annex II-listed species.

8.175 During construction, with high usage of plant fuel and oil, there is an increased risk of accidental spillage and discharge to the any of the drainage streams and thence to the Curly and Roe Rivers. Similarly, the application of ready-mix concrete in construction processes carries some risk of inadvertent discharge with the potential to impact on resident fish and invertebrate organisms in these watercourses.

Fish passage: temporary obstruction

8.176 Poor management of works adjacent to stream banks or at crossing points may lead to obstruction of the channel during periods of fish migration and spawning.

8.177 Chapter 9 (Geology & Water Environment), identifies 6 crossings of minor watercourses within the planning application boundary;

8.178 Five crossings occur in the southern portion of the landholding south of the A37 road (see Figure 8.6).

8.179 Three of these crossings are located south-west of Turbine 3 with one on the Upper reaches of Stream D and two on minor drains. There were no fish in the Upper reaches of Stream D south of the A37 and so no impact on fish passage will occur.

8.180 Two crossings are located on the upper reaches of Stream A towards the south-west of the landholding (Figure 8.6). No fish occurred in Stream A south of the A37 and the habitat in the area of the proposed crossings was deemed unsuitable for trout (see also Figure 8.3). Therefore, no impact on fish passage will occur at the three proposed crossings.

8.181 The final proposed watercourse crossing is north of the A37 in the upper reaches of Stream B (Figure 8.6). While a few trout fry occurred c. 400m downstream of the proposed crossing, the stream channel further upstream became poorly defined leading to an area of wet ground and rushes. Habitat in the location of the proposed crossing is unsuitable for fish and so no impact on fish passage will occur.

8.182 Overall, trout presence is not expected at any of the seven watercourse crossings within the landholding due to a lack of suitable habitat.

Operational Phase

8.183 The potential for any impacts will be significantly reduced during the operational phase with the construction process complete, site infrastructure in place, and a reduced requirement for any hazardous materials on-site. Potential impacts at Dunbeg South Extension Wind Farm are essentially limited to surface water run-off and the release of other pollutants.

Surface Water Run-off

8.184 Surface water run-off from an increased area of hard surface in the form of access tracks and hardstanding areas (crane hardstanding areas; onsite substation / control building compound) could lead to sediment-laden run-off to the receiving watercourses with potential effects on fish and other forms of aquatic life as outlined above.

8.185 Wash-out of areas of excavated peat and soils during or following periods of heavy rainfall could also result in run-off of sediment to the receiving watercourses with potential increases in sediment load.

Fish Passage obstruction/ inhibition

8.186 The construction of bridges and culverts has the potential to prevent or hinder normal fish movement within the stream or upstream migrations of pre-spawning adults unless consideration is given at the design stage.

8.187 Obstructions can occur if inverts are not sufficiently embedded to below the water level or if the length and gradient over which the culvert is installed causes high flow and an inability to find flow refugia due to a lack of baffles or natural stream substrate.

8.188 However, there is a lack of suitable fish habitat where each of the seven watercourse crossings are proposed across Streams A, B, and D and so no impact on permanent obstruction of fish passage is expected.

Habitat loss at stream crossings

8.189 Depending on the length of culvert used, a watercourse crossing may result in significant loss of habitat, particularly where the original channel bed is lost and cannot be restored. Removal of bed material also can result in long term loss of habitat and channel diversity. Enclosure of the channel over significant lengths restricts light penetration which inhibits growth of primary producers such as benthic algae and aquatic plants, in turn leading to reduced potential for macroinvertebrate and fish secondary production.

8.190 The seven watercourse crossings could result in the loss of a very small area of stream habitat; however, given the very poor physical habitat at these locations and/ or a lack of a well-defined channel, coupled with the short lengths of culvert, only very short sections of poor-quality stream habitat will be lost. Therefore, a negligible effect on primary (algae/ plants) and secondary (macroinvertebrate) stream production is expected given the overall scale in relation to the existing watercourse area.

Decommissioning Phase

8.191 Decommissioning of the Development would have potential effects on fish stocks and aquatic habitats in the drainage streams of the Curly River and the main section of the Curly River within the Site, as well as the River Roe downstream. These impacts will be like those predicted for the construction phase but will ultimately depend on the level of reinstatement required.

8.192 In this case the decommissioning process will involve the removal of all above ground structures, removal of underground structures to one metre below ground level, and reinstatement of disturbed areas; access tracks are likely to remain for farm use. However, it is unlikely that any of the structures at or near to the main watercourses will be removed or modified in any way.

8.193 The effects of decommissioning on fish habitats and fish stocks are therefore like those of construction, although of lower magnitude.

Mitigation

Construction Phase

Sediment Run-off

8.194 Mitigation measures to control sediment run-off are described in detail in Chapter 9 (Geology & Water Environment) and summarised as follows:

Buffer Zones

8.195 During the construction phase it is important that works should be avoided within the area of sensitive watercourses, with the preservation of intact vegetated buffer zones

between development infrastructure and stream channels. To this end, buffer zones of 50m minimum width are specified in Chapter 9 for significant watercourses (catchment area within site >0.25 km^2), and buffer zones of 10m were given to minor watercourses. The location of buffer zones are shown in Figure 9.1.

8.196 Turbine bases, access roads and associated infrastructure will be located out-with buffer zones although there are six crossings of minor watercourses (catchment area within site <0.25 km^2) of very low local fisheries sensitivity.

8.197 The application of buffer zones will minimise the risk of sediment run-off from site construction works to on-site watercourses and more sensitive downstream reaches in the Curly River and River Roe.

Construction Methods & Timing of Works

8.198 The Loughs Agency has produced Guidelines for Fisheries Protection during Development Works (2011) which identifies the likely impact of construction and development work on fisheries habitat and outlines practical measures for the avoidance and mitigation of damage.

8.199 The Development will require watercourse crossings on Streams A, B, and D. All of these crossings are relatively minor, are located on minor watercourses and will be completed using standard culvert structures which may be installed without any seasonal restriction due to a lack of fish or fish suitable habitat.

8.200 All works at stream crossings will adhere to the measures outlined in the Good Practice Guidance (GPP) notes (https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/,) particularly those near to water outline in GPP 5.

8.201 It is also recommended that to minimise the risk of suspended sediment entrainment in surface water run-off, the site drainage system should only be constructed during periods of low rainfall and therefore low run-off rates.

Surface Water Management

8.202 The potential for pollution of watercourses by silt-laden runoff is addressed in detail in Chapter 9: Geology & Water Environment. A surface water management plan will be developed using the principles of Sustainable Drainage, based on the on-site retention of flows and use of buffers and other silt removal techniques. An established Sustainable Drainage System (SuDS) design which will be used to control drainage and silt management.

8.203 The surface water management plan outlined in Chapter 9 will include a series of measures to minimise modification and disruption of the existing hydrology. This approach will include a system for the drainage of the temporary works during the construction phase, with use of swales, check dams and settlement ponds to provide a surface water management system that will prevent any adverse effects on the

ecology of the principal receiving watercourses during the construction phase of the project.

Water Quality Monitoring

8.204 Chapter 9 also proposes the implementation of a water quality monitoring programme to examine the effects of the infrastructure construction works on surface water quality. It is recommended that the monitoring programme be continued through the operation and decommissioning phases of the Development.

Release of other pollutants

Site Management

8.205 All precautions will be taken to avoid spillages of diesel, oil or other polluting substances during the construction phase. This will be achieved through adhere to the measures outlined in the Good Practice Guidance (GPP) notes (https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/,) particularly those near to water, including but not limited to the following;

- GPP1: Understanding your environmental responsibilities – good environmental practices;
- GPP5: Works and maintenance in or near waters;
- PPG6: Working at construction and demolition sites;
- GPP21: Pollution incident response planning;

8.206 A Pollution Prevention Plan will be included as part of the Construction & Decommissioning Method Statement (CDMS) for the Development, to be agreed with the local planning authority at the pre-construction stage. This will incorporate a contingency plan setting out the procedure to be followed in the event of a significant spillage occurring.

Surface Water Management

8.207 The proposed surface water management plan and associated SuDS system will also facilitate the interception of diesel, oil or other polluting substances during the construction phase.

Operational Phase

Surface Water Run-off

8.208 As outlined in Chapter 9, site drainage will use the principles of SuDS, with installations to incorporate a “treatment train” of two to three stages of pollutant removal to all surface water runoff during the operational phase, as with the construction and decommissioning phases. Additional measures to prevent the release of suspended solids will include:

- Preservation of natural run-off patterns;

- Reduction of flow rates from access tracks through use of attenuating check-dams;
- Use of shallow ponds to aid settlement;
- Linear track drainage swales with regular outflow points throughout the SuDS system to limit the potential for large flows at single outflow points;
- Avoidance of peat storage within denoted watercourse buffer zones or in areas of overland water flow.

Decommissioning Phase

8.209 Mitigation measures during decommissioning will be the same as during the construction phase to address the potential for run-off of suspended solids and other polluting substances. However, the level of mitigation will be determined by the level of reinstatement required.

Residual Effects

8.210 The potential effects of the Development on fish stocks and their habitats in the drainage streams of the Curly River, the main Curly River within and downstream of the Site, and the River roe downstream of the Site are measured against proposed mitigation measures, as a means of assessing the residual effects of the project. Of particular importance in this context are the impacts on the Annex II listed Atlantic salmon as the primary feature of the River Roe & Tributaries ASSI/SAC.

8.211 The magnitude of the potential effects and their residual significance were assessed according to the procedure outlined in the Methodology section of this chapter. It is the residual effects associated with the Development that most accurately reflect the overall predicted effects on fisheries and the aquatic environment during the construction, operational and decommissioning phases.

Construction Phase

8.212 Mitigation measures employed through the surface water management plan outlined in Chapter 9 based on SuDS technology to control drainage and silt management on the Development site will remove the potential for direct damage to fish or siltation of spawning and nursery habitats. These measures in association with the Pollution Prevention Plan will also minimise the risk for release of other construction related polluting substances into the river network.

8.213 The magnitude and significance of potential effects during the construction phase before mitigation are summarised for each watercourse in **Table 8.15** along with the predicted residual effects after mitigation.

8.214 Without mitigation the effects during the construction phase are predicted to be at worst of ***Moderate to Major Magnitude*** and of ***Large to Very Large Significance***, depending on specific effects and the sensitivity of individual watercourses e.g. the run-off of sediment or the release of other pollutants to the Curly River and River

Roe, as significant salmon spawning and nursery rivers. However, with mitigation the effects are reduced to ***Neutral***.

Operational Phase

8.215 As the sections of the small streams where watercourse crossings are proposed have unsuitable habitat for salmonids, there will be no loss of salmonid habitat or reduced productivity.

8.216 Although there will be an increase in the area of hard surface due to the Development, the surface water management plan / drainage design features for the control and attenuation of storm water run-off will protect receiving watercourses from excessive inputs of sediment and so the magnitude of effect is expected to be lower than during the construction phase.

8.217 The magnitude and significance of potential effects during the operational phase before mitigation are summarised for each watercourse in **Table 8.16** along with the predicted residual effects after mitigation.

8.218 Without mitigation the effects during the operational phase are predicted to be at worst of ***Minor to Major Magnitude*** and of ***Moderate to Very Large Significance***, depending on specific effects and the sensitivity of individual watercourses. However, with mitigation the effects are reduced to ***Neutral***.

Decommissioning Phase

8.219 The magnitude and significance of potential effects during the decommissioning phase before mitigation are summarised for each watercourse in **Table 8.17** along with the predicted residual effects after mitigation.

8.220 Without mitigation the effects during the decommissioning phase are predicted to be at worst of ***Moderate to Major Magnitude*** and of ***Large to Very Large Significance***, depending on specific effects and the sensitivity of individual watercourses e.g. the run-off of sediment or the release of other pollutants to the Curly River and River Roe, as significant salmon spawning and nursery rivers. However, with mitigation the effects are reduced to ***Neutral***.

Table 8.15: Construction Phase - Magnitude and Significance of Effects without Mitigation, and Residual Effects after Mitigation.

River/ Stream	Designation	Key Species	Sensitivity	Potential Effect	Magnitude of Effect	Significance without Mitigation	Residual Effect after Mitigation
Stream A	None	Trout fry present in lower stream. Fish absent south A37 upstream. WFD invert-based status Good-High	High	Sediment run-off	Moderate	Large adverse	Neutral
				Release of other pollutants	Major	Very Large adverse	Neutral
Stream B	None	Trout fry and eel present in lower stream. No suitable fish habitat in upper stream. WFD invert-based status Good-High	High	Sediment run-off	Moderate	Large adverse	Neutral
				Release of other pollutants	Major	Very Large adverse	Neutral
Stream C	None	Trout fry present in lower stream. Fish absent south A37 upstream. WFD invert-based status Good-High	High	Sediment run-off	Moderate	Large adverse	Neutral
				Release of other pollutants	Major	Very Large adverse	Neutral
Stream D	None	Trout fry and eel present in lower stream to A37. Fish absent south A37 upstream. WFD invert-based status Good-High	High	Sediment run-off	Moderate	Large adverse	Neutral
				Release of other pollutants	Major	Very Large adverse	Neutral
Curly River	ASSI / SAC	Annex II species: Atlantic salmon, River/Brook/Sea lamprey. Brown trout & European eel also present.	Very High	Sediment run-off	Moderate	Large/Very Large adverse	Neutral
				Release of other pollutants	Major	Very Large adverse	Neutral
River Roe	ASSI / SAC	Annex II species: Atlantic salmon, River/Brook/Sea lamprey. Brown trout & European eel also present.	Very High	Sediment run-off	Moderate	Large/Very Large adverse	Neutral
				Release of other pollutants	Major	Very Large adverse	Neutral

Table 8.16: Operational Phase – Magnitude and Significance of Potential Effects without Mitigation, and Residual Effects after Mitigation.

River/ Stream	Designation	Key Species	Sensitivity	Potential Effect	Magnitude of Effect	Significance without Mitigation	Residual Effect after Mitigation
Stream A	None	Trout fry present in lower stream. Fish absent south A37 upstream. WFD invert-based status Good-High	High	Sediment run-off	Minor	Moderate adverse	Neutral
				Release of other pollutants	Major	Large adverse	Neutral
Stream B	None	Trout fry and eel present in lower stream. No suitable fish habitat in upper stream. WFD invert-based status Good-High	High	Sediment run-off	Minor	Moderate adverse	Neutral
				Release of other pollutants	Major	Large adverse	Neutral
Stream C	None	Trout fry present in lower stream. Fish absent south A37 upstream. WFD invert-based status Good-High	High	Sediment run-off	Minor	Moderate adverse	Neutral
				Release of other pollutants	Major	Large adverse	Neutral
Stream D	None	Trout fry and eel present in lower stream to A37. Fish absent south A37 upstream. WFD invert-based status Good-High	High	Sediment run-off	Minor	Moderate adverse	Neutral
				Release of other pollutants	Major	Large adverse	Neutral
Curly River	ASSI / SAC	Annex II species: Atlantic salmon, River/Brook/Sea lamprey. Brown trout & European eel also present.	Very High	Sediment run-off	Minor	Large adverse	Neutral
				Release of other pollutants	Major	Very Large adverse	Neutral
River Roe	ASSI / SAC	Annex II species: Atlantic salmon, River/Brook/Sea lamprey. Brown trout & European eel also present.	Very High	Sediment run-off	Minor	Large adverse	Neutral
				Release of other pollutants	Major	Very Large adverse	Neutral

Table 8.17: Decommissioning - Magnitude and Significance of Effects without Mitigation, and Residual Effects after Mitigation.

River/ Stream	Designation	Key Species	Sensitivity	Potential Effect	Magnitude of Effect	Significance without Mitigation	Residual Effect after Mitigation
Stream A	None	Trout fry present in lower stream. Fish absent south A37 upstream. WFD invert-based status Good-High	High	Sediment run-off	Moderate	Large adverse	Neutral
				Release of other pollutants	Major	Very Large adverse	Neutral
Stream B	None	Trout fry and eel present in lower stream. No suitable fish habitat in upper stream. WFD invert-based status Good-High	High	Sediment run-off	Moderate	Large adverse	Neutral
				Release of other pollutants	Major	Very Large adverse	Neutral
Stream C	None	Trout fry present in lower stream. Fish absent south A37 upstream. WFD invert-based status Good-High	High	Sediment run-off	Moderate	Large adverse	Neutral
				Release of other pollutants	Major	Very Large adverse	Neutral
Stream D	None	Trout fry and eel present in lower stream to A37. Fish absent south A37 upstream. WFD invert-based status Good-High	High	Sediment run-off	Moderate	Large adverse	Neutral
				Release of other pollutants	Major	Very Large adverse	Neutral
Curly River	ASSI / SAC	Annex II species: Atlantic salmon, River/Brook/Sea lamprey. Brown trout & European eel also present.	Very High	Sediment run-off	Moderate	Large/Very Large adverse	Neutral
				Release of other pollutants	Major	Very Large adverse	Neutral
River Roe	ASSI / SAC	Annex II species: Atlantic salmon, River/Brook/Sea lamprey. Brown trout & European eel also present.	Very High	Sediment run-off	Moderate	Large/Very Large adverse	Neutral
				Release of other pollutants	Major	Very Large adverse	Neutral

Cumulative Effects

Additional Wind Farm Developments

8.221 This section considers other wind farm developments within a 20 km radius which have either been constructed or are at different stages of the planning process in Northern Ireland. Along with the proposed development, these developments/proposals could give rise to the potential for cumulative effects on local rivers.

8.222 Regarding fisheries and the aquatic environment, the potential for cumulative effects is only relevant when proposed or existing developments are either hydrologically connected or which drain to the same receiving environment. It is therefore more important to consider additional developments in the context of river catchments, both locally and on a wider river basin scale.

8.223 Within a 20 km radius of the Development a total of 13 additional wind farm developments have been identified which are wholly or partly located within River Roe catchment and might therefore be considered to have the potential for cumulative impacts on the river **(Table 8.18)**. Moreover, three of these developments, Dunbeg, Dunmore, and Dunmore Extension are also located within the immediate Curly River catchment and have the potential for more localised cumulative impacts in this sub-catchment.

Table 8.18: Additional wind farm developments/proposals within a 20 km radius of the Development indicating their location within the River Roe catchment and the Curly River sub-catchment.

Wind Farm	Planning Reference	WFD waterbody	No. of Turbines	Status
Rigged Hill Repowering	LA01/2019/0890/F	Castle River	7	Consented
Smulgedon	B/2009/0070/F		7	Consented
Craiggore	B/2012/0268/F		10	Operational
Altahullion I	B/2000/0118/F	Bovevagh River	20	Operational
Altahullion II	B/2004/0795/F		9	Operational
Altahullion Ill	B/2007/0006/F		12	Operational
Glenconway	B/2011/0272/F		8	Operational
Dunbeg	B/2007/0560/F	Curly River	14	Operational
Dunmore	B/2007/0563/F		7	Operational
Dunmore Extension	B/2013/0241/F		8	Consented
Dunbeg South	LA01/2018/0200/F		9	Consented
Evishagaran	LA01/2018/1151/F		14	Operational
Ballyhanedin	A/2014/0630/F	Owenbeg River	8	Consented

8.224 Whilst there has been one noted problem relating to sediment run-off at Bin Mountain Wind Farm in the Fairy Water catchment, and another at Meenbog Wind Farm in the Derg catchment, there does not appear to have been any problems relating to other sites in Northern Ireland or specifically to the seven sites currently operational in the Roe catchment.

8.225 The greatest risk to fisheries and the aquatic environment is during the construction phase of these projects when the civil engineering works are carried out. It follows that it is vital for the highest standards to be maintained regarding site preparation, temporary works and site drainage issues, and that full mitigation measures must be applied to remove any potential for this type of incident. However, both Dunmore and Dunbeg Wind Farms within the Curly River sub-catchment are operational with all civil engineering works including land excavation and in-river works complete. As such the risk of potential run-off of sediments to local watercourses with resultant damage to aquatic fauna and habitats is now negligible.

Assessment

8.226 There is no evidence that existing wind farm developments in the area have had any adverse impact on either the Curly River or the wider River Roe catchment which in turn could have affected the integrity of the River Roe & Tributaries ASSI/SAC.

8.227 However, there are a range of activities that currently have an influence on conservation and management of the SAC, primarily in relation to water quality e.g. point-source pollution from urban and industrial sources; point-source pollution from development including proposed wind farm developments; and diffuse pollution from commercial forestry in the upper catchment and farming in the lower catchment. There is potential for these impacts to act in combination to produce cumulative impacts on water dependant qualifying features, affecting their conservation status, and the overall integrity of the SAC.

8.228 The likelihood of significant cumulative impacts on the aquatic environment is increased if two or more wind farms are to be constructed or decommissioned at the same time. Only Dunmore Extension Wind Farm is within the Curly River and would therefore have the potential for simultaneous construction with Dunbeg South Extension Wind Farm, although the permission granted was in 2018 and it is likely that construction of this wind farm would be complete long before Dunbeg South Extension (subject to planning approval). In addition, as part of the Planning Approval for Dunmore Extension Wind Farm, a number of planning conditions outline requirements for water quality monitoring, earthworks management and associated measures to mitigate surface water run-off, inclusion of water buffer zones, an environmental emergency plan, on-site requirement for Ecological Clerk of Works, site drainage management plan including full SuDs, a required pollution prevention plan and associated CEMP.

8.229 Implementation of the mitigation measures as described for Dunmore Extension, together with those proposed for the current assessment, will ensure that the proposed Dunbeg South development will not contribute to any cumulative impact on the SAC, or on Atlantic salmon as the primary feature of the site.

Summary

8.230 This chapter outlines the potential effects of the Development on the fish stocks and fish habitats of the receiving watercourses in the River Roe catchment. It provides relevant baseline information on fisheries enabling the potential effects to be identified and evaluated.

8.231 It has been determined that potential impacts are primarily related to the sediment run-off to the receiving watercourses with related effects on fish stocks and their habitats. Without mitigation it is considered that these impacts have the potential to be of Major Magnitude and of Very Large Significance depending on the sensitivity of individual watercourses

8.232 A series of specific mitigation measures have been designed to avoid adverse effects on fisheries regarding both construction and operational phases of the project.

8.233 Hydrology and site drainage issues have been considered in detail in Chapter 9 which outlines a surface water management system and drainage (SuDS) designed to control drainage and silt management on the Site.

8.234 It is concluded that, provided the mitigation measures are implemented as specified, construction and operation of the proposed development will have a neutral impact on the fish stocks and aquatic biology of the Curly River and the wider River Roe catchment. It follows that the development will have no effect on the Atlantic salmon as the primary feature of the River Roe and Tributaries ASSI/SAC.

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Geology and Water Environment

Introduction

Terms of Reference

9.1 This chapter considers the likely significant effects on the receiving hydrological, geological, and hydrogeological environments associated with the construction, operation and decommissioning of the proposed Dunbeg South Wind Farm Extension near Limavady, Co. Derry/Londonderry, hereinafter referred to as the 'Proposed Development'.

9.2 The impacts caused by the construction, operation and decommissioning phases of the Proposed Development are assessed, and mitigation measures are provided where required.

9.3 The assessment also identifies where hydrological features may constrain the layout of the Proposed Development.

Supplementary Assessments

9.4 This Chapter is supported by:

- Technical Appendix 9.1: Surface Water Management Plan
- Technical Appendix 9.2: Drainage Assessment
- Technical Appendix 9.3: Peat Slide Risk Assessment Report
- Technical Appendix 9.4: Consultation Records
- Figure 9.1 to Figure 9.3

9.5 Reference should be made to **Chapter 1: Introduction & the Proposed Development** for information regarding detailed construction proposals.

9.6 Changes to the hydrological / hydrogeological regime may create resultant effects on ecology within hydrological dependent ecosystems. Therefore, this chapter is further supported by:

- Chapter 6: Ecology; and
- Chapter 8: Fisheries.

Statement of Authority

9.7 The assessment has been carried out by McCloy Consulting Ltd.; an independent environmental consultancy specialising in the water environment, with specialist knowledge of hydrological and hydrogeological assessments.

9.8 The key staff members involved in this project are as follows:

- Caitriona Downey BSc - Senior Project Consultant with consultancy and regulatory experience specialising in the water environment, with particular expertise in the regulatory framework and inland fisheries requirements for

work affecting watercourse. Experienced in development planning and EIA for onshore wind and solar energy projects in Northern Ireland and Ireland.

- Iain Muir MSc CEnv MIEnvSc – Senior Consultant and Chartered Environmentalist experienced in Environmental Impact Assessment (EIA) specialising in the water environment, undertaking hydrology, water quality and flood risk assessments for major infrastructure projects in highland environments, and renewable energy projects in the UK and Ireland; and
- Kyle Somerville BEng (Hons) CEng MIEI – Director and Chartered Engineer with over 19 years' experience specialising in the fields of hydrology, surface water management, groundwater screening assessments and geology assessments for wind farm developments in the UK and Ireland, and has overseen outline and detailed design of surface water management for in excess of thirty onshore wind farm developments in the UK and Ireland.

Scope of Assessment

9.9 This report will assess the effects of the Proposed Development on hydrology and surface water quality, hydrogeology and groundwater quality, and geological features. The assessment covers the construction, operational, maintenance and decommissioning phases of the Proposed Development.

9.10 This assessment identifies the hydrological constraints within lands under applicant control, herein referred to as 'the Site', and assesses the potential effects of the following:

- Existing natural and artificial drainage patterns;
- Water quality of surface water and groundwater;
- Surface and groundwater dependent ecosystems;
- Usage of surface water and groundwater including abstractions;
- Groundwater - surface water interactions;
- Aquifer systems and their vulnerability;
- Superficial and bedrock geology at the site; and
- Structural geology of the area and its environs.

9.11 In order to quantifiably assess the preceding, this report:

- Outlines relevant policy relating to the water environment;
- Summarises consultations provided in response to scoping requests;
- Provides baseline information and identifies sensitive receptors;
- Identifies potential likely effects, including potential likely cumulative effects;
- Assesses the significance of any adverse effects and resulting impacts based on the magnitude of the impact and the sensitivity of the receptors;
- Discusses management of design evolution and details mitigation measures;
- Provides a residual impact assessment; and
- Discusses the cumulative effects of the development in conjunction with other proposed and existing developments in the vicinity.

Legislation and Planning Policy

9.12 Relevant Environmental planning legislation and policy and industry best-practice guidance relevant to an assessment of hydrogeology and the water environment are summarised in **Table 9.1** and the following sections.

Relevant Legislation and National Planning Policy

Table 9.1: Relevant Legislation and National Planning Policy

Legislation	
NI	Control of Pollution (Oil Storage) (Amendment) Regulations (Northern Ireland) 2011
	Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017
	Water Resources (Environmental Impact Assessment) Regulations (Northern Ireland) 2017
	The Environmental Liability (Prevention and Remediation) (Amendment) Regulations (NI) 2009
	The Groundwater (Amendment) Regulations (Northern Ireland) 2016
	Nature Conservation and Amenity Lands (NI) Order 1985
	The Private Water Supplies Regulations (Northern Ireland) 2017
	The Surface Waters (Dangerous Substances) (Classifications) Regulations (NI) 1998
	Drainage (Northern Ireland) Order 1973 / Drainage (Amendment) (Northern Ireland) Order 2005
	The Environment (Northern Ireland) Order 2002
	Fisheries (Northern Ireland) Act 1966
	Water (Northern Ireland) Order 1999
	The Water Supply (Water Quality) Regulations (Northern Ireland) 2017
	Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017
	Water Framework Directive (Classification, Priority Substances and Shellfish Waters) Regulations (NI) 2015
	The Water (Amendment) (Northern Ireland) (EU Exit) Regulations 2019
	Groundwater (Amendment) Regulations (Northern Ireland) 2016
	The Surface Waters (Dangerous Substances) (Classifications) Regulations (NI) 1998
UK	UK Environmental Standards and Conditions Phase 1 and Phase 2 (UK TAG 2008)

Regional and Local Planning Policy

9.13 The Proposed Development has been reviewed in relation to local planning policy specific to geology and the water environment. A detailed planning policy and legislation review is included within **Chapter 2: Planning Policy.**

Regional Development Strategy 2035

9.14 The RDS promotes a sustainable approach to the provision of water and sewerage services and flood risk management including grey water recycling, rainwater harvesting and sustainable surface water management e.g., Sustainable Drainage Systems (SuDS).

Planning Policy Statements

Strategic Planning Policy Statement (SPPS)

9.15 In working towards sustainable development, the Department will aim to conserve both the archaeological and built heritage and natural resources (including wildlife, landscape, water, soil and air quality), taking particular care to safeguard designations of national and international importance.

PPS15 – Revised Planning and Flood Risk

9.16 Revised PPS15 sets out planning policies to "minimise flood risk to people, property and the environment", emphasising sustainable development and the conservation of biodiversity. The policy refers to the use of Sustainable Drainage Systems (SuDS) to minimise effects on the receiving water environment.

9.17 The policy that development proposals facilitating sustainable drainage would be considered favourably by the planning authority as such a sustainable drainage approach should be adopted by the Development.

9.18 Flood risk and drainage planning policy is similarly established by the Strategic Planning Policy Statement (SPPS). Transitional arrangements stated in the SPPS at paragraph 1.10 to 1.12 confirm that until a Plan Strategy is adopted, existing policies will apply together with the SPPS. Where the SPPS is silent or less prescriptive on a matter then this should not be judged to lessen the weight afforded to the retained policy.

9.19 In relation to flood risk planning policy, RPPS15 is more prescriptive on all aspects of matters for consideration, and the policy direction contained in RPPS15 is consistent with that stated in the SPPS.

PPS18 - Renewable Energy

9.20 The PPS18 sets out the planning policy for development that generates energy from renewable resources and aims to facilitate the siting of renewable energy generating facilities in appropriate locations within the built and natural environments.

9.21 Policy RE 1 of PPS18 states that, 'Development that generates energy from renewable resources will be permitted provided the proposal, and any associated buildings and infrastructure, will not result in an unacceptable adverse impact on…local natural resources, such as air quality or water quality.'

Local Plans

9.22 The Proposed Development is located within the jurisdiction of Causeway Coast and Glens Borough Council.

Northern Area Plan 2016

9.23 Causeway Coast and Glens Borough Council (CCGBC) are currently preparing a new Local Development Plan (LDP) for the Borough up to 2035. According to the Council's Revised LDP Timetable, CCGBC plan to adopt the plan strategy in Winter 2024 and adopt the Local Policies plan in Summer 2028. In the interim, the current area plan for CCGBC is the Northern Area Plan 2016.

9.24 Policy ENV 4: Development Adjacent to a Main River, states a biodiversity strip of at least 10 m from the edge of the river is provided, there is no significant adverse impact on nature conservation and the proposal will not compromise or impact on the natural flooding regime of the main river and complies with the requirements of PPS 15 (Revised): Planning and Flood Risk.

9.25 There are no particular drainage policies identified within the Plan, with the exemption of key site requirements noted for specific housing zones, stating that the development of same will require substantial improvements to stormwater drainage.

Causeway Coast & Glen Borough Council, Revised Local Development Plan 2035 (Draft)

9.26 The Council's Development Plan Team are currently preparing a new Local Development Plan for the Borough. Although the LDP is not yet drafted themed topic papers, which will inform the LDP, have been presented to the Council's Planning Committee and agreed for use as background evidence for the Plan. Discussion Paper 2 focuses on the Environment.

9.27 Section 4.51 to 4.53, titled Rivers, acknowledges rivers are a key feature of the Borough and valuable habitats for wildlife and refers to Policy ENV 4 in the DNAP 2016, in relation to maintaining a buffer strip along river corridors in the consideration of development proposals.

9.28 In relation to floodplains and storage, the Draft LDP 2035 notes it is essential floodplains are not lost or compromised and refers to PPS 15 Planning and Flood Risk, having a presumption against development within floodplains in Policy FLD 1.

9.29 As the draft Local Development Plan is only at consultation stage, it holds no material weight in decision making.

Guidance on Conservation of Geological Features - Earth Science Conservation Review

9.30 The Earth Science Conservation Review (ESCR) is the means whereby areas of geological interest in Northern Ireland are assessed to determine their importance to science and hence to earth science conservation.

9.31 The objective of the ESCR is to define systematically all earth science localities (geological and/or geomorphologic) in Northern Ireland. The overall aim of the process is to encourage conservation of such areas to protect them from potential threats such as landfill, changes to natural systems and coastal defence work.

Industry Guidelines

9.32 The Pollution Prevention Guidelines (PPGs), published by the Northern Ireland Environment Agency (NIEA) in conjunction with the Environment Agency for England and Wales, and the Scottish Environment Protection Agency (SEPA) are currently being replaced by updated Guidance for Pollution Prevention (GPPs). Guidance notes relevant to the Development include:

- NIEA Guidance for Pollution Prevention (GPPs):
    - GPP 1: Understanding Your Environmental Responsibilities – Good Environmental Practice;
    - GPP 2: Above ground oil storage tanks;
    - GPP 3: Use and Design of Oil Separators in Surface Water Drainage Systems
    - GPP 4: Treatment and disposal of Wastewater where there is no connection to the public foul sewer;
    - GPP 5: Works and Maintenance in or near Water;
    - GPP 6: Working at Construction and Demolition Sites;
    - GPP 8: Safe Storage and Disposal of Used Oils;
    - GPP 20: Dewatering Underground Ducts and Chambers;
    - GPP 21: Pollution Incident Response Planning;
    - GPP 22: Dealing with Spills; and
    - GPP 26 Safe Storage – Drums and Intermediate Bulk Containers.
- In the absence of revised specific guidance, works shall similarly consider the lapsed NIEA Pollution Prevention Guidance Notes (PPGs):
    - PPG 7: The Safe Operation of Refuelling Facilities; and
    - PPG 18: Managing Fire Water and Major Spillages.

9.33 Other relevant industry guidance includes:

- BS6031: 2009 Code of Practice for Earthworks;
- BS 5930 2015: Code of Practice for Ground Investigations (+A1:2020);
- CIRIA C523 - Sustainable Urban Drainage Systems; Best Practice Manual (2001);

- CIRIA C532 - Control of Water Pollution from Construction Sites (2001);
- CIRIA C741 - Environmental Good Practice On-Site (2015);
- CIRIA C609 - Sustainable Drainage Systems: hydraulic/structural/water quality (2004);
- CIRIA C753- The SuDS Manual (2015);
- CIRIA C786- Culverts, Screen and Outfall manual (2019);
- DEFRA Construction Code of Practice for Sustainable Use of Soils on Construction Sites (2009);
- DAERA - A Guide to EIA and Planning Considerations: Environmental Advice for Planning Practice Guide - Water Features Survey (2018);
- DAERA - A Guide to EIA and Planning Considerations: Wind Farms and Groundwater Impacts (2019);
- DAERA Standing Advice on Pollution Prevention Guidance;
- DAERA Standing Advice on Commercial or Industrial Developments;
- DAERA Standing Advice on Culverting;
- DAERA Standing Advice on Abstraction and Impoundments;
- DAERA Standing Advice on Sustainable Drainage Systems; and
- DAERA Standing Advice on Discharges to the Water Environment.

Consultation

9.34 Pre-application consultation and data gathering to form opinion and requirements with regards to the hydrological and geological environments was sought from local and regional stakeholder organisations, including organisations who would be anticipated to be consulted by the planning authority in relation to the planning application. The consultation is intended to pre-empt any pre-application or in-application consultation that would be undertaken on notification or submission of the planning application and EIA. The informal consultation excludes NIEA:NED whose concerns are addressed separately in **Chapter 6: Ecology**.

9.35 A summary of the specific data provided by, and information / concerns raised by the various stakeholders is included in the following table. Site specific input provided is included in the following baseline assessment. Stakeholder responses are included in **Technical Appendix 9.4**.

Table 9.2: Consultee Summary

Consultees		Summary of Response	Addressed in Assessment
Causeway Coast and Glens	Environmental Health	The Council do not hold any records pertaining to private ground water supplies within a 2 km radius of the proposed windfarm site. The response noted that private water supplies to single private dwellings are not	9.90

Consultees		Summary of Response	Addressed in Assessment
		required to be registered with DWI and the Council's Environmental Health Service does not maintain an up-to-date record of such supplies.	
DAERA	NIEA Private Water Supply / Drinking Water Inspectorate	DWI does not hold information on private water supplies which supply single dwellings.	
DAERA	Inland Fisheries	Advised that the Proposed Development is located entirely within the Curly River catchment and that Loughs Agency is the lead body for provision of advice.	9.123
DAERA	Environmental Crime Department	No response to an information request regarding unlicenced landfills.	9.70
DAERA	NIEA Water Management Unit	Noted there are no industrial consents within 2km of the site. Provided water quality data for the requested search area. WMU noted abstraction data locations can be found at DAERA abstraction licensing open data. WMU also noted that all the information requested (except for groundwater quality), is available on the new Water Information Request Viewer.	9.123
Loughs Agency		Provided water quality information for watercourses in the vicinity of the development. Provided locations of river enhancement works in the Curly Burn.	9.123
Department for Infrastructure	Rivers	Confirmed there an no watercourses designated under the terms of the Drainage (Northern Ireland) Order 1973 within or bounding the site. There may be undesignated watercourses, advised to consulted OS mapping and under site inspections. Acknowledged that a portion of the site is affected by the predicted 1 in 100-year fluvial floodplain and predicted 1 in 200-year pluvial (surface water) flooding.	9.132

Consultees		Summary of Response	Addressed in Assessment
Department for Economy	Geological Survey of Northern Ireland (GSNI)	Confirmed there are two basalt quarries to the east.	9.72
		Confirmed no mineral development restrictions associated with the development.	9.74

Assessment Methodology

Baseline Characterisation

9.36 This qualitative assessment has been undertaken based on experienced professional judgement and assessment of compliance with statutory and industry guidance, including site visits for verification.

Study Area

9.37 Potential effects were considered within 'the Site' (refer to para 9.10) within which the 'Planning Application Boundary' lies, and the wider geological and hydrogeological setting of the area.

9.38 The hydrological study area includes surface water catchments draining the area within the Site and the downstream river reaches affected by this area as defined by the relevant River Basin Management Plans, Local Management Areas (LMAs) and Catchment Stakeholder Groups.

9.39 The hydrogeological and geological study area extends to the underlying aquifer catchments and extents of the geological units.

Additional Areas Considered

9.40 A potential grid connection route is described within Technical Appendix 1.3: Assessment of Potential Grid Connection. Although the grid route is not part of the Proposed Development, consideration has been given to potential likely significant effects.

Desk Study

9.41 The desktop study involved collation and assessment of the relevant information from the following sources:

- Close scale Ordnance Survey mapping in addition to aerial photography to assess land use and environs and to identify water features and watercourse catchments;
- Local authority and regulatory body consultation responses;
- NIEA river quality data and natural heritage data;

- DfI Rivers Flood Maps NI;
- NIEA Drinking Water Inspectorate and Water Management Unit data;
- Review of CEH Flood Estimation Handbook (web portal) for details of river catchment data;
- Review of Inland Fisheries information;
- Review of detailed site topographic survey;
- GSNI GeoIndex (1:10,000 bedrock and superficial geology maps);
- GSNI GeoIndex (aquifers and aquifer vulnerability);
- GSNI GeoRecords database;
- General Soil Type Map of Northern Ireland at 1:250 000 scale;
- NIEA Groundwater quality data and abstractions / discharges database; and
- NIEA Drinking Water Inspectorate and Water Management Unit data.

Determination of Sensitivity, Magnitude, Likelihood and Significance

9.42 This assessment determines the nature, scale and significance of the effects of the Development on the baseline (current) scenario in accordance with a methodology stated within The Institute of Environmental Management and Assessment guidance[1].

9.43 The potential impact significance is defined by the combination of the sensitivity of the receptor and the magnitude of the effect. Following this, an overall impact significance is determined by considering the potential impact significance and the likelihood of the effect occurring.

Sensitivity Criteria

9.44 The scale and sensitivity of the receiving environment (receptor) has been categorised on a scale of "Very High" to "Low". The sensitivity criteria used for this assessment are presented in Table 9.3 and are based on:

- Vulnerability of a receptor to a particular pressure (degree of environmental response to any particular effect); and
- The importance or 'value' of the receptor e.g. an area of international importance should be considered more sensitive to effect than a local area of little or no conservation value.

Table 9.3: Evaluation of Receptor Sensitivity Criteria

Scale / Sensitivity of the Environment (Receptor)		
International and / or Very High	Attribute has a very high quality / rarity at an international scale.	Important on a European or global level, e.g. Ramsar Sites, SAC, SPA and Habitats Directive Sites with dependence on the water environment.

[1] Institute of Environmental Management and Assessment (2004) Guidelines for Environmental Impact Assessment.

Scale / Sensitivity of the Environment (Receptor)		
National and / or High	Attribute has a high quality and rarity at a national scale.	Important in Northern Ireland, e.g. ASSI or National Nature Reserve (NNR) with respect to the hydrological environment and / or geological environment. WFD classification of 'High' with the watercourse providing a nationally important resource or supporting river ecosystem. Public water supplies and highly productive aquifers or local water supplies, including private water supplies where there is no alternative to private supplies. Principal aquifer providing a nationally important resource. Source Protection Zone 2 (Outer Source Protection Zone).
Regional and / or Medium	Attribute has a medium quality and rarity at a regional scale.	Important in the context of the region, e.g. catchment scale issues, main river within the catchment, local Nature Reserves or Sites of Local Importance for Nature Conservation (SLNCI). Site of regional geological importance. Sites of Nature Conservation Importance in relation to earth science interest. WFD classification of 'Good' with the watercourse providing an important resource or supporting river ecosystem or upstream of a designated fishery. Active floodplain area. Designated fishery, catchment regionally important for fisheries. Domestic private water supplies located within vicinity of mains water supply or private water supplies used only for agricultural purposes and not drinking water. Groundwater dependent terrestrial ecosystems in hydraulic continuity with the Site. Principal aquifer providing a regionally important resource e.g. industrial use with limited connection to surface water. Source Protection Zone 3 (catchment of groundwater source).

Scale / Sensitivity of the Environment (Receptor)		
Local and / or Low	Attribute has a low quality and rarity at a local scale.	WFD classification of 'Moderate' or less with the watercourse providing a locally important resource or supporting river ecosystem. Geological features not currently identified as ASSI, ESCR that may require protection in the future. Areas with properties (geology / soils) abundant on a local or regional scale or with little or no agricultural value. Domestic private water supplies located within vicinity of mains water supply or private water supplies used only for agricultural purposes and not drinking water. Groundwater dependent terrestrial ecosystems in hydraulic continuity with the Site. Aquifer providing a locally important resource e.g. For agricultural or small-domestic supplies.

Magnitude of Effect

9.45 The magnitude of change / effect is influenced by the timing, scale, size and duration of the hazardous effect; magnitude has been categorised on a scale of "High" to "Low"; defined in **Table 9.4.**

Table 9.4: Evaluation of Magnitude of Effect Criteria

Magnitude of Effect / Description		Definition of Criteria	
High	Fundamental change resulting in loss of an attribute and /or the quality and integrity of conditions.	Water Quality	Potential high risk of pollution to surface water changing water quality status.
		Water Supply	Loss of local water supply or change in quality with respect to drinking water standards (DWS).
		Flood Risk / Erosion Potential	Significant increase in risk due to a significant change in the proportion of hard standing and altered surface water flows.
		Groundwater	Significant change in groundwater levels, flow regime, groundwater quality or extensive change to an aquifer.
		Surface Water Dependent Ecosystem	Loss of, or extensive change to, a surface water dependent ecosystem or fishery.

Magnitude of Effect / Description		Definition of Criteria	
		Geology and Soils	Partial (greater than 50%) or total loss of a geological site or mineral deposit. Major or total loss of topsoil, soils or peatland.
Medium	Detectable change to conditions resulting in non-fundamental temporary or permanent consequential changes.	Water Quality	Potential medium risk of pollution to surface water, changing water quality status.
		Water Supply	Temporary loss of local water supply or minor change in quality of supply with respect to drinking water standards.
		Flood Risk / Erosion Potential	Detectable increase in flood risk and erosion potential due to a medium change in the proportion of hardstanding and altered surface water flows.
		Groundwater	Measurable change in groundwater levels, groundwater flow regime, groundwater quality or identifiable change to an aquifer.
		Surface Water Dependent Ecosystem	Partial loss or change to a surface water dependent ecosystem or fishery.
		Geology and Soils	Partial (between 15% - 50%) loss of topsoil, soils or peatland, or where the value of the area would be affected, but not to a major degree. The site's integrity would not be adversely affected, but the scheme may lead to a loss of or damage to key characteristics, features or attributes.

Magnitude of Effect / Description		Definition of Criteria	
Low	Results in minor effect on attribute of insufficient magnitude to affect the use or integrity.	Water Quality	Minor deterioration in water quality unlikely to affect the most sensitive receptor or insignificant change in water quality conditions not exceeding those expected due to naturally occurring fluctuations.
		Water Supply	No change in pressure or flow to local water supply or minor change in quality of supply with respect to drinking water standards.
		Flood Risk / Erosion Potential	Minor changes in the proportion of hardstanding and altered surface water flows result in no detectable increase in flood risk and erosion potential.
		Groundwater	Minor alteration to one or more characteristics, features or elements or no observable effect. Any measurable change in groundwater levels does not affect groundwater flow regime, groundwater quality with regards to DWS or result in any change to an aquifer.
		Surface Water Dependent Ecosystem	Minor loss or change to a surface or groundwater dependent ecosystem or fishery.
		Geology and Soils	Small effect on a geological/ geodiversity site or mineral deposit (up to 15%). Partial loss of topsoil, soils or peatland, or where soils will be disturbed but the value of the area would not be affected. No significant loss of or damage to key characteristics, features or attributes.
Negligible	Results in negligible effect on attribute	Water Quality	No perceptible change in water quality.
		Water Supply	No change in pressure or flow to local water supply and negligible change in quality of supply with respect to drinking water standards.

Magnitude of Effect / Description		Definition of Criteria	
		Flood Risk / Erosion Potential	No measurable change in the proportion of hardstanding and altered surface water flows result in no detectable increase in flood risk and erosion potential.
		Groundwater	No alteration to groundwater characteristics, features or elements. No measurable change in groundwater levels, groundwater flow regime, groundwater quality with regards to DWS. No change to an aquifer.
		Surface Water Dependent Ecosystem	No measurable change to a surface or groundwater water dependent ecosystem or fishery.
		Geology and Soils	Negligible change from geological, mineral and soil baseline conditions. No significant loss of or damage to key characteristics, features or attributes.

Impact Significance Criteria

9.46 The magnitude of effect and receptor sensitivity are combined to evaluate and qualify if an impact is of high, moderate, low, or negligible significance as outlined in **Table 9.5**.

Table 9.5: Evaluation of Potential Effect Significance

Scale / Sensitivity of the Environment (Receptor)	Magnitude of Effect			
	Negligible	Low	Medium	High
International / Very High	Moderate	Moderate	High	High
National / High	Low	Moderate	Moderate	High
Regional / Medium	Negligible	Low	Moderate	Moderate
Local / Low	Negligible	Negligible	Low	Low

Likelihood of Occurrence Criteria

9.47 The likelihood of the potential effects occurring is assessed based on historical data, quantitative analysis and professional judgement based on relevant experience as shown in **Table 9.6**.

Table 9.6: Evaluation of Likelihood of Occurrence

Likelihood of occurrence	Criteria
Certain	Likely consequential effect in medium term and inevitable in long term (within the life of the development).
Likely	Possible consequential effect in the medium term and likely but not inevitable in the long term.
Unlikely	Unlikely that any consequential effect would arise within the lifetime of the development.
Rare	It is unlikely that any consequence would ever arise.

Determination of Overall Impact Significance

9.48 Potential Impact Significance (Table 9.5) and Likelihood of Occurrence (**Table 9.6**) are combined to determine an Overall Impact Significance as shown in the matrix in **Table 9.7**.

Table 9.7: Evaluation of Overall Significance

Potential Significance	Likelihood of Occurrence			
	Rare	Unlikely	Likely	Certain
High	Minor	Moderate	Major	Major
Moderate	Minor	Minor	Moderate	Major
Low	Not Significant	Minor	Minor	Moderate
Negligible	Not Significant	Not Significant	Minor	Moderate

Site Characteristics & Baseline Conditions

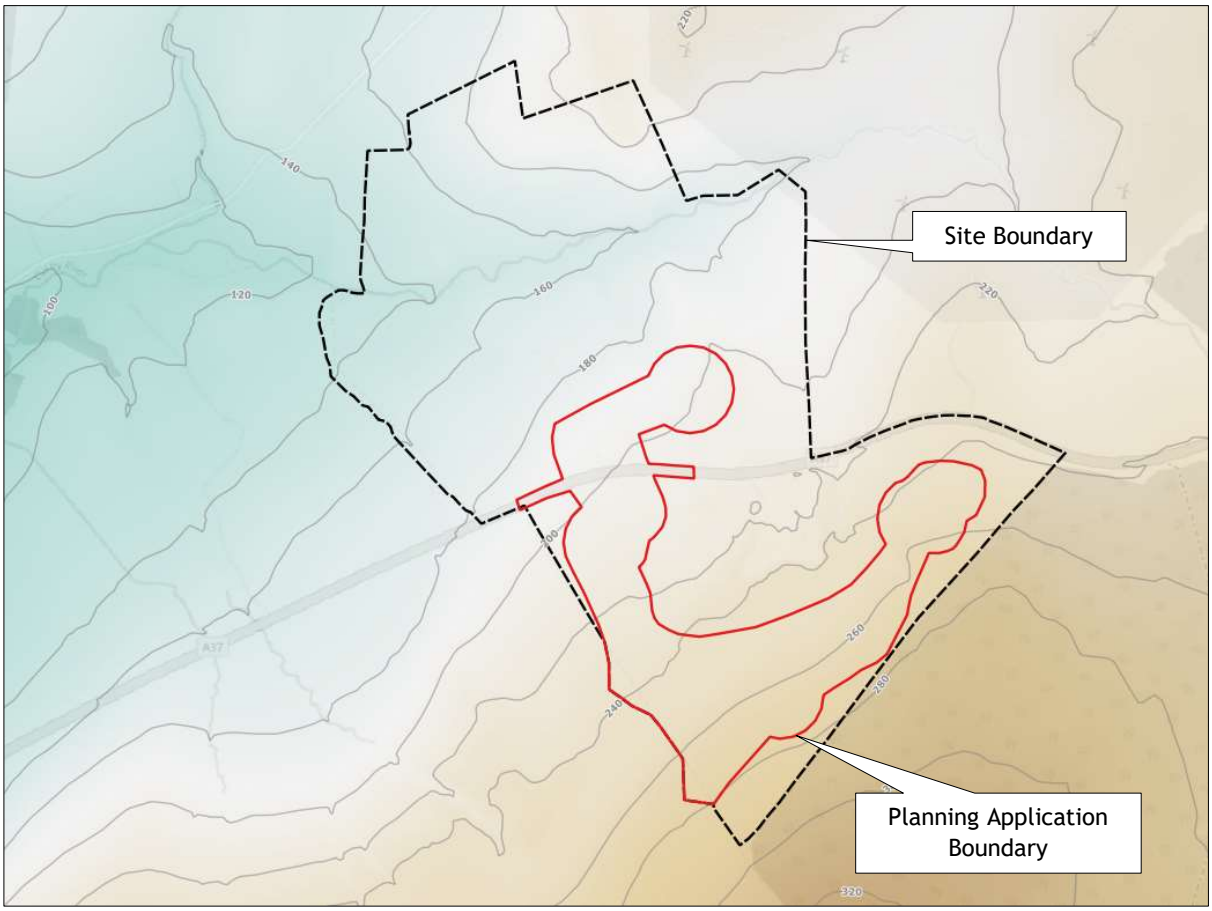
Site Description

9.49 The Proposed Development is located approximately 6.5 km north-east of Limavady, Co. Derry/Londonderry, Northern Ireland. The assessment area (the Site) considered within this assessment occupies an area of approximately 1.54 km^2.

Topography

9.50 Topography within the Site generally slopes south-east to north. Maximum ground levels are approximately 280 m OD at the eastern extent of the Site. Minimum ground levels of approximately 187 m OD are found at the northern extent of the Site.

Plate 9-1: Topography



Land Cover

9.51 The Site is covered mainly be marshy grassland. South of the A37 road discrete pockets of acid grassland, introduced scrub, and wet modified bog are present. gently sloping terrain of grassland and moorland used for grazing. North of the road, pockets areas of dry modified bog, improved and semi- improved grassland, scrub, and coniferous woodland are present. Further information on land cover and species present is provided in detail within **Chapter 6: Ecology**.

Meteorological Data Summary

9.52 The Standard Percentage Runoff (SPR) is a parameter used in runoff and flood estimation, which represents the percentage of total rainfall likely to contribute to direct runoff and storm flow. Review of the site in relation to FEH catchment descriptors indicates a SPR of approximately 24.05%. For context, SPR values in the UK range from 2% (sand or chalk with slow response / low runoff) to a maximum of 60% (peat bog with rapid response / high runoff).

9.53 Rainfall data from the Ballykelly Climate Station[2] (approx. 12.5 km west from the Proposed Development) records an annual average rainfall total of 861.15 mm during the 1991 – 2020 climatic period. Based on the Meteorological Office banding of annual average rainfall (1991 – 2020), rainfall in the vicinity of the Site is within the sixth highest of nine bands (800 - 1000 mm) and is typical for elevated regions in Northern Ireland.

Geology

Agricultural Land Classification

9.54 DAERA published a classification index for Agricultural Land Classification (ALC) in 1997 based on a document "Agricultural Land Classification of England and Wales" published by the Ministry of Agriculture and Fisheries and Food (now Department for Environment, Food and Rural Affairs)[3] in 1988. The index classifies agricultural land into five grades based on climate, topography, soil, slope and altitude characteristics; with Grade 1 excellent quality and Grade 5 very poor quality.

9.55 Using the guidance from the ALC of England and Wales, along with available site information, including site walkover observations and gradients of the land, the most suitable land classifications for the site range from Grade 3b – 'moderate quality agricultural land' to Grade 4 – 'poor quality agricultural land'.

9.56 The loss or partial loss of agricultural function on the site is therefore not significant and does not inform constraints to development.

Soil Conditions

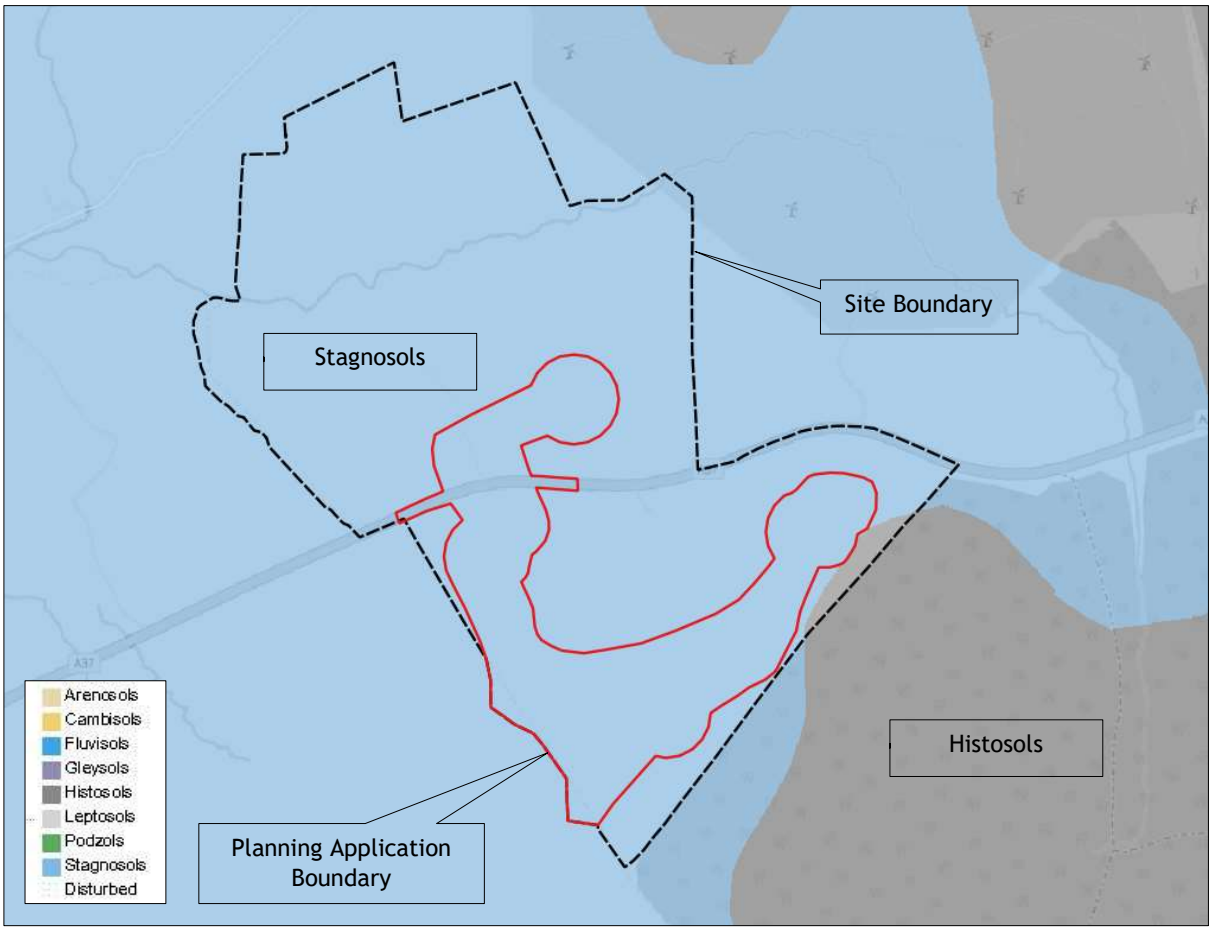
9.57 A review of the UK Soil Observatory interactive map viewer indicates a homogeneous soil type coverage on the site.

9.58 The Site is characterised by 'Stagnosols', which are usually developed on unconsolidated materials, such as, glacial till and alluvial deposits due to stagnating water and poor drainage. For use of agricultural purposes, this soil type requires drainage channels, however, in areas with low permeability subsoil engineered drainage channels are often insufficient. In summary, they comprise very poorly draining clay soils.

[2] Met Office, Ballykelly Climate. Available at https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcg10wbfm Accessed 25/06/2024.

3 Ministry of Agriculture, Fisheries and Food: Agricultural Land Classification of England and Wales (1988) http://publications.naturalengland.org.uk/file/5526580165083136

Plate 9-2: Soils

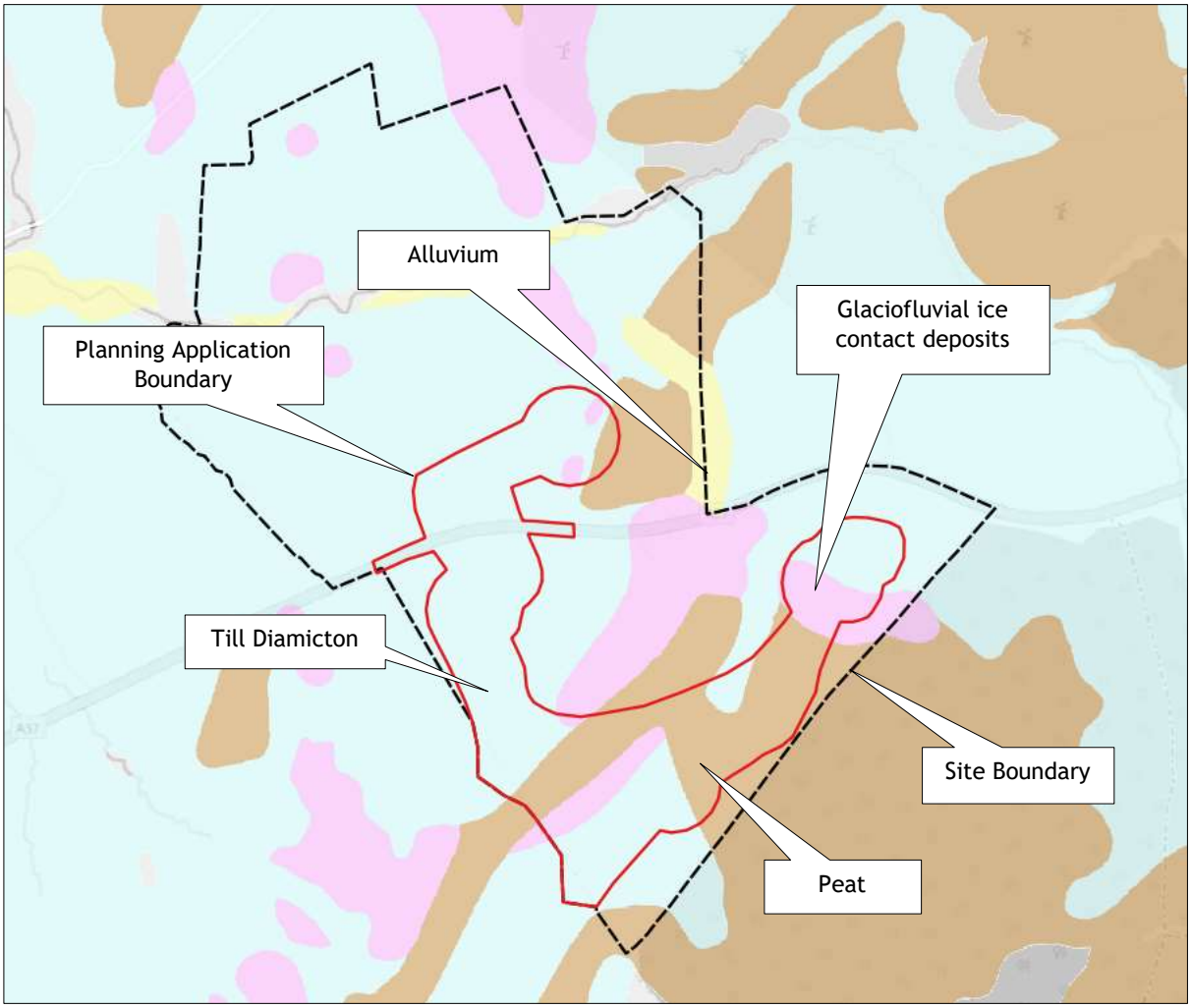


Superficial Deposits

9.59 The Site has been reviewed in relation to the 1:10,000 mapping available from the GSNI GeoIndex WMS layers.

9.60 The western and southern central portion of the Site is underlain by Till Diamicton. The eastern and northern central part of the site is primarily underlain by peat deposits, with areas of Glaciofluvial ice contact deposits (unlithified deposits – silt, sand, gravel and boulders).

Plate 9-3: Superficial Deposits

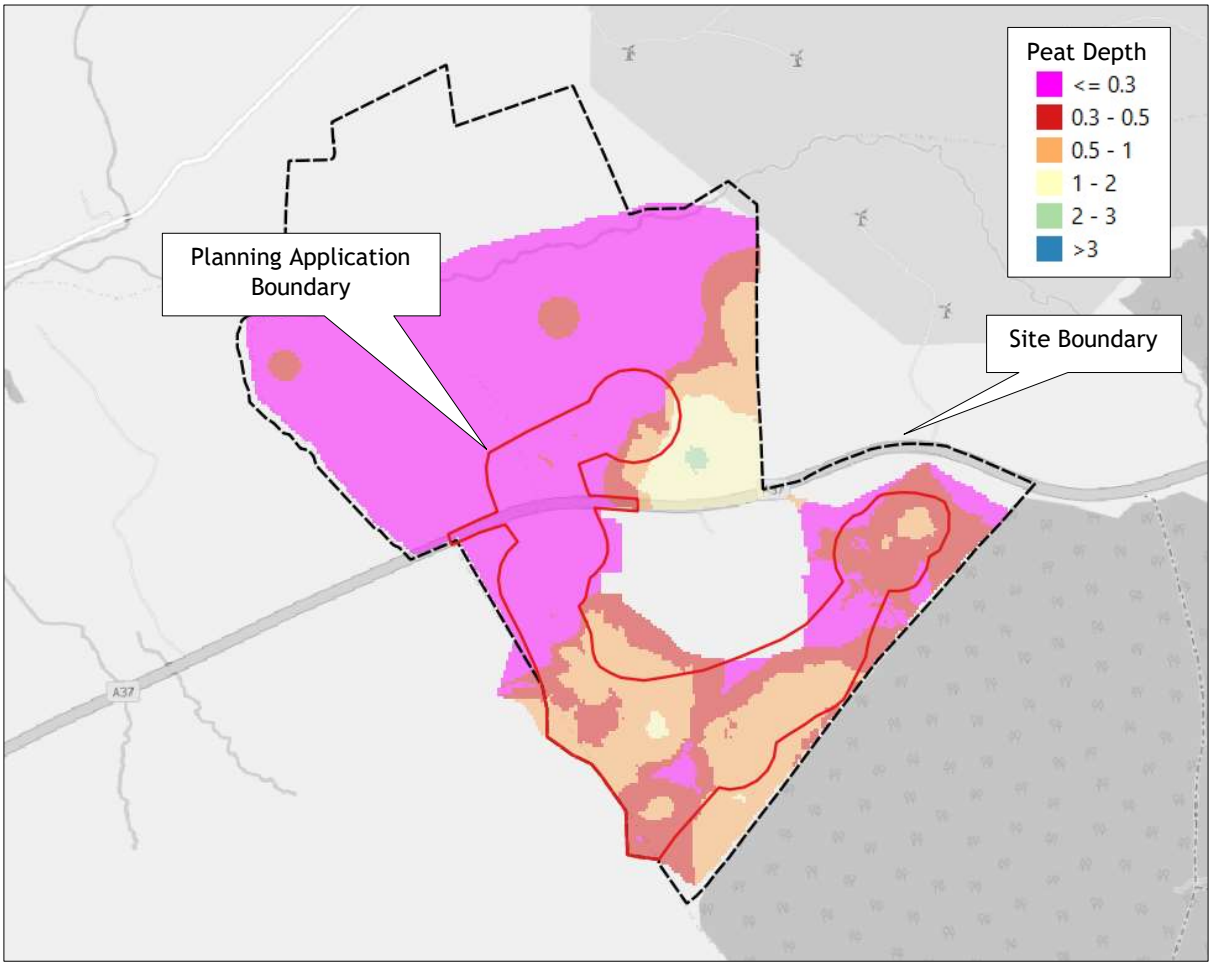


Peat

9.61 The presence of peat coverage is initially identified by GSNI 1:10,000 mapping (shown on **Plate 9-3**) and the NIEA Natural Environment Map Viewer, both of which indicate peat coverage within the Site. A Peat Slide Risk Assessment (PSRA) has been produced by a 3rd party for the applicant and is included in **Appendix 9.3** and the findings of that intrusive investigation take precedent over desktop sources in relation to peat coverage at the Site.

9.62 The PSRA confirmed peat is present across much of the Site. Where peat is present, an interpolated peat depth map of the 110 soil probes collected during the peat survey is shown on **Plate 9-4** below. Peat is found with varying thickness across the site, but generally below 0.5 m. Several isolated pockets of deeper peat are found to be up to 2.8 m.

Plate 9-4: Interpolated Peat Depth



Bedrock Geology

9.63 The bedrock geology of the site has been reviewed in relation to the 1:10,000 mapping available from the GSNI GeoIndex WMS layers. The entirety of the site is underlain by the Upper Basalt Formation.

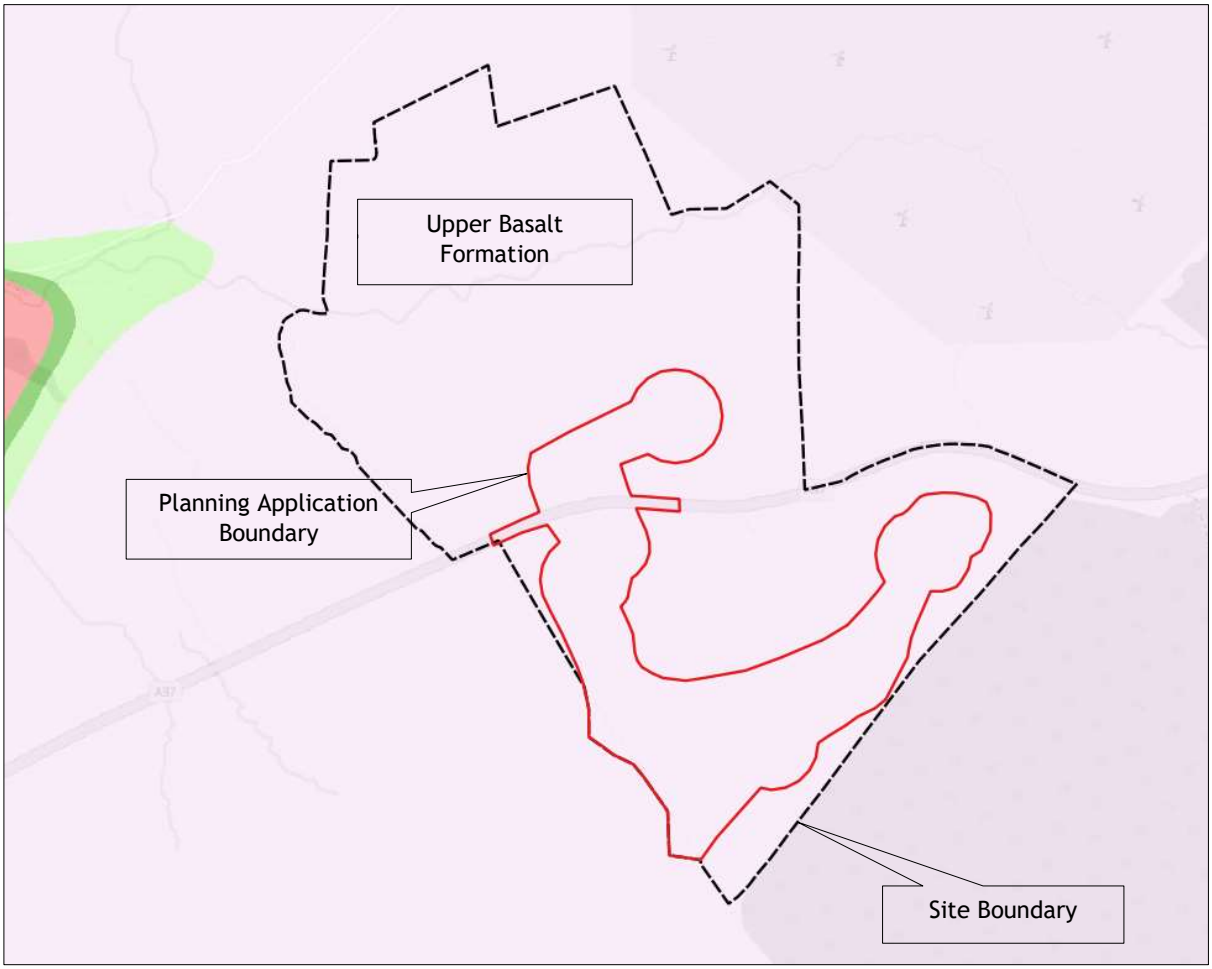
Exposed Bedrock

9.64 Exposed bedrock was not observed during the site walkover.

Faults

9.65 Review of GSNI 'linear features' mapping does not indication any faults within the Site boundary. The PSRA (**Appendix 9.3**) notes no faults are recorded within or near to the site, and therefore are not a further consideration in this report.

Plate 9-5: Solid Geology



Mass Movement

9.66 A review of the 1:10,000 mapping on the GSNI GeoIndex did not identify areas of mass movement within the Site.

Radon

9.67 The UK interactive radon map[4], based on the Indicative Atlas of Radon in Northern Ireland[5], indicates that the parts of the Site area are situated in the lowest band of radon potential i.e., less than 1 % of homes above the Action Level.

[4]Public Health England (2015) UK Maps of Radon. Available at http://www.ukradon.org/information/ukmaps. Accessed 28/06/2024.

[5] Public Health England (2015) Radon in Northern Ireland: Indicative Atlas. Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/453711/PHE-CRCE-017__maps_with_place_names_.pdf. Accessed 28/06/2024.

Waste and Minerals

Waste Site Licence Exemptions and Sites

9.68 NIEA datasets did not identify any waste sites situated within 1 km of the Site.

Landfills

9.69 A review of the opensource NIEA authorised landfill sites dataset does not identify any within 1 km of the Site.

9.70 No information has been established to indicate any unauthorised landfill sites within 2 km of the Site.

Industrial Consents

9.71 Review of DAERA mapping identified 2 no. domestic and industrial consents within 2 km of the Site boundary. They are described as 'private sewage – domestic'. Both are located down gradient from the Site and, therefore, are not considered a constraint to the Proposed Development.

Historic Quarries / Mines

9.72 A review of GSNI Historic Mine Workings (Group) dataset did not identify any mapped shafts and /or adits within the Site boundary.

Active Quarries

9.73 The GSNI GeoIndex identifies 2 no. active quarries in proximity to the site. Cam (c. 2.5 km south-east) and Croghan (c. 4km east/south-east), are basalt quarries. The Proposed Development cannot affect or be affected by those quarries.

Mineral Occurrences

9.74 Information available on the GSNI GeoIndex shows there are no mineral occurrences within a 2 km radius of the Site.

Mineral Prospecting Licences March

9.75 There are no current licences affected by the proposed development and no other anticipated impacts on future licensing at this time. Mineral Licence activity offers no constraint on the development.

Summary of Geohazards

Table 9.8: Summary of Identified Geohazards

Geohazard Type	Applicable to the Development?	Rationale / Potential Constraint	Consider Further?
Extractions	Yes	2 no. active quarries were identified within 2 km from the Site. GSNI confirmed there is no known economic mineralisation in the area to constraint development at this time.	No
Adit / Shafts (Mine Entries)	No	None located within the Site boundary.	No
Land Slip	Yes	The PSRA (Appendix 9.3) notes conditions applicable to peat slide are observed to be very rare due to shallow peat depths on steeper slopes, and deep peat only being found in small localities with relatively shallow gradients; but the variable nature of the topography on the relatively small scale, could lead to potentially high-risk areas being masked by the coarse nature of the survey grid.	No
Peat	Yes	Peat is present within the Site boundary. The occurrence of peat is a potential constraint to development. Peat depth across the development is relatively shallow, but depths of up to 2.80m were found in discrete pockets. The PSRA (Appendix 9.3) concludes there are no significant environmental constraints but that consultation with NIEA will be required. The PSRA states it is envisaged that adverse impacts will be mitigated through the implementation of set-back buffers from watercourses and waterbodies combined with good practice mitigation during construction.	No
Running Sands	No	No mapped sands on site.	No
Compressible Ground	Yes	Peat is present within the Site. Highly compressible deposits acidic groundwater may pose a risk to buried steel and concrete. The PSRA states where deep peat coincides with proposed infrastructure areas, resulting in potentially unstable, compressible peat deposits, will require excavation and suitable re-use and stabilisation strategies.	No
Landfill	No	There is no evidence (current or historic) of landfill(s) present at the Site.	No
Karst Features	No	No recorded features within the vicinity of the Site.	No
Radon	No	The site is situated in the lowest band of radon potential i.e., less than 1 % of homes above the Action Level.	No

Hydrogeology

Groundwater Body

9.76 The groundwater body underlying the Site is the Magilligan Groundwater Body (UKGBNI4NW001) which has an overall area of 115 km^2. The characteristics of the groundwater body are summarised in the following sections.

Groundwater Quality

9.77 The European Water Framework Directive (2000/60/EC) (WFD) requires the status of groundwater management units (groundwater bodies) within each river basin to be determined as 'Good' or 'Poor'. The latest published results (2021) in relation to groundwater quality are available from the NIEA River Basin Management site[6]. Both the quantitative and chemical status of the Magilligan bedrock groundwater body is 'Good'; therefore, the overall status of the body is classified as 'Good.'

9.78 The Magilligan groundwater monitoring site (GBNIGWNW01-C) is less than 1 km from the Site.

Bedrock Aquifer Classifications

9.79 A review of the online data available on GSNI GeoIndex indicates the bedrock aquifer underlying the Site is classified as Bm(f) where high to moderate yields are possible in places, however, dependence on fracture flow makes poorer yields possible. There is potential element of regional flow, but local flow is significant.

9.80 The GSNI Groundwater Vulnerability Map indicates that groundwater within the Site is classified as 2 (in the western, central and north-eastern portion of the Site) and 4e (within the majority of the eastern portion of the Site), on a vulnerability scale of 1 (very low) to 5 (very high). Note: Class 4 can be further subdivided according to the nature of the pathway; 4e where superficial aquifers are present.

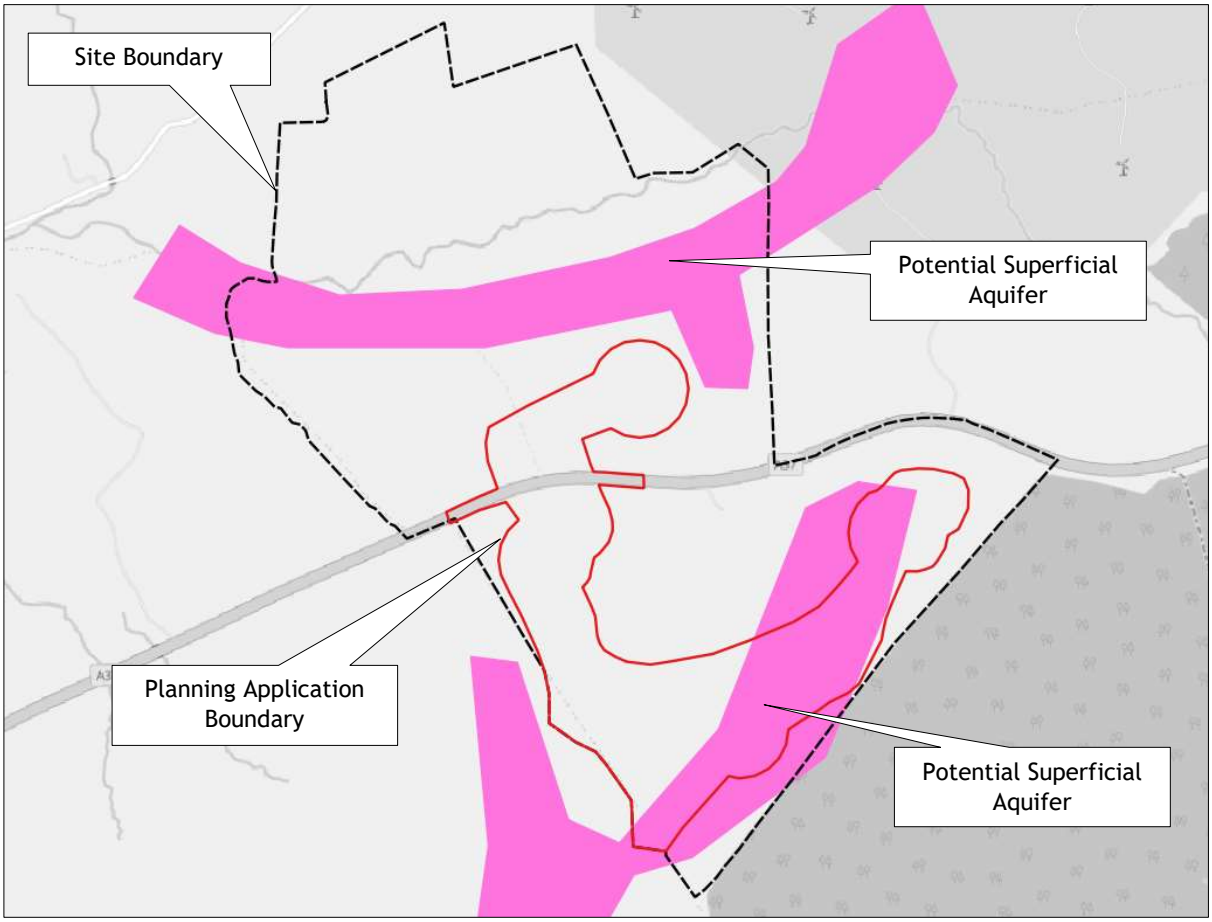
Superficial Aquifer

9.81 GSNI 1:250k mapping indicates there are two discrete areas noted as potential superficial aquifers within the Site boundary (coinciding with areas shown on GSNI Groundwater Vulnerability as Class 4e).

9.82 Areas of potential superficial aquifers are defined based upon superficial deposits considered to have potentially significant permeability and storage properties.

[6] https://gis.daera-ni.gov.uk/arcgis/apps/webappviewer/index.html?id=16fddc459bd04d64b9e8f084f3a8e14a

Plate 9-6: Potential Superficial Aquifer



Groundwater Recharge

9.83 NIEA data[7] indicates that most recharge of the Magilligan groundwater body will be direct where bedrock is at / close to surface. A portion of recharge through overlying till deposits may also occur especially where these are thin.

9.84 Recharge is expected to be restricted where thicker tills overlie bedrock. Recharge to the superficial aquifer will be mostly direct. Long term recharge rates for the body are approximately ~ 337mm/a.

Groundwater Flow

9.85 NIEA data[8] indicates that within the groundwater body, fracture flow is dominant within the bedrock. Flow paths are generally considered to be short (tens to hundreds of metres) with flow mainly following topography. Some limited regional

[7] Characterisation of groundwater bodies within Northern Ireland (2012). Available at: https://www.daera-ni.gov.uk/sites/default/files/publications/doe/water-report-characterisation-of-groundwater-bodies-within-Northern-Ireland-June-2012.pdf (Accessed 05/07/2024)

[8] Characterisation of groundwater bodies within Northern Ireland (2012). Available at: https://www.daera-ni.gov.uk/sites/default/files/publications/doe/water-report-characterisation-of-groundwater-bodies-within-Northern-Ireland-June-2012.pdf (Accessed 05/07/2024)

flow may also occur eastwards in the basalt/chalk to the adjacent groundwater body (UKGBNI4NB001). Within the mudstones flow will be negligible. In the sandy superficial deposits, flow will be intergranular with potentially shorter flow paths to surface water discharge areas and also possibly to the coast.

9.86 The PSRA (Appendix 9.3) notes groundwater conditions on the site are unknown as shall be investigated as part of the intrusive ground investigations. It would be anticipated that groundwater will be encountered within the superficial deposits and are likely to vary across the site given the variable topography and soil and rock mass units.

9.87 Discharge from basalt/chalk is likely to be mainly along the boundary with underlying mudstones. There may be some eastwards flow in these units into the adjacent Neagh-Bann RBD.

Springs / Wells

9.88 A review of the OSNI historical maps available from PRONI[9] and the Historical Map Viewer[10] indicated there are no historical springs within the Site boundary and immediate vicinity. GSNI do not hold records of any springs within 1 km of the Site boundary.

Boreholes

9.89 GSNI confirmed they do not hold records of any boreholes within 1 km of the Site boundary.

Groundwater Abstractions

9.90 In order to identify potential groundwater users, data was sought from a number of sources. Findings from this is summarised as follows:

- Review of NIEA Drinking Water Inspectorate (DWI) data confirmed there are no private drinking water supplies registered with the Inspectorate under the Private Water Supplies Regulations (Northern Ireland) 2017 within a conservative 2 km screening distance of the Site.
- Causeway Coast and Glens Borough Council was contacted with respect to information on private water supplies which supply single dwellings. They noted that private water supplies to single private dwellings are not required to be registered with DWI and the Council's Environmental Health Service does not maintain an up-to-date record of such supplies. The Council response is included in **Appendix 9.4**.
- The DAERA Abstraction and Impoundment Licencing (AIL) information available on the Water Information Request Viewer was reviewed for

[9] PRONI Historical Maps. Available from https://apps.spatialni.gov.uk/EduSocial/PRONIApplication/index.html

[10] Department for Communities Historical Environment Map Viewer. Available from https://dfcgis.maps.arcgis.com/apps/webappviewer/index.html?id=6887ca0873b446e39d2f82c80c8a9337

licenced groundwater-fed abstractions within a conservative 2 km screening distance of the Site. None were identified.

9.91 In addition to identification of potential abstractions from records, the various consultees indicated that they do not hold a definitive database of individual properties served by a private water supply. In order to ensure a robust assessment, screening has been undertaken to identify properties potentially served by local, unrecorded water abstractions within the vicinity of the Proposed Development based on property and occupancy information determined by the applicant.

9.92 To a ensure a precautionary approach to the assessment, a 500 m screening radius (i.e., 2 x NIEA Guidance) has been applied to the Site boundary. Screened properties are shown on **Plate 9-7** and scheduled in **Table 9.9**.

Plate 9-7: Property Screening

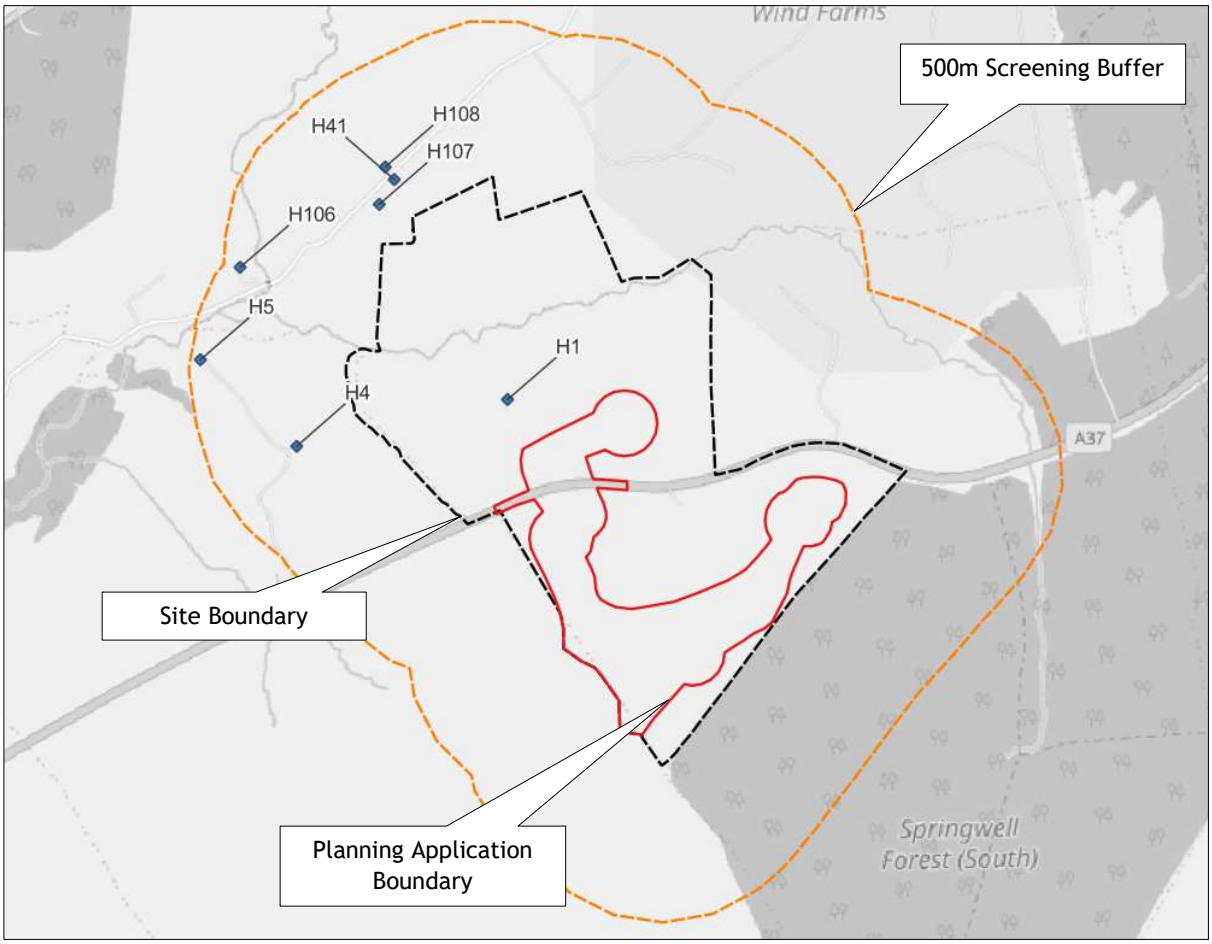


Table 9.9: Summary of Dwellings

Feature ID	Description	Significance and Rationale for Scoping Out
H1	Uninhabited property	Uninhabited building, no drinking water requirements.
H4	Uninhabited property	Uninhabited building, no drinking water requirements.
H5	Uninhabited property	Uninhabited building, no drinking water requirements.
H41	Occupied property	No works proposed in the vicinity of the property. Property located c. 1.1 km from any proposed infrastructure / construction works (i.e., greater than 4 times the 250 m buffer recommended by NIEA).
H106	Occupied property	NI Water main present, unlikely to rely on a private supply.
H107	Occupied property	No works proposed in the vicinity of the property. Property located c. 900 m from any proposed infrastructure / construction works (i.e., greater than 3 times the 250 m buffer recommended by NIEA).
H108	Occupied property	No works proposed in the vicinity of the property. Property located c. 1.1 km from any proposed

Feature ID	Description	Significance and Rationale for Scoping Out
		infrastructure / construction works (i.e., greater than 4 times the 250 m buffer recommended by NIEA).

9.93 The screening exercise confirms no additional properties downgradient from the Site boundary within the screening buffer that are likely to rely on private water supply abstractions; therefore, no private water supplies are likely to be affected by the Proposed Development.

Catchment Hydrology

Surface Water Bodies

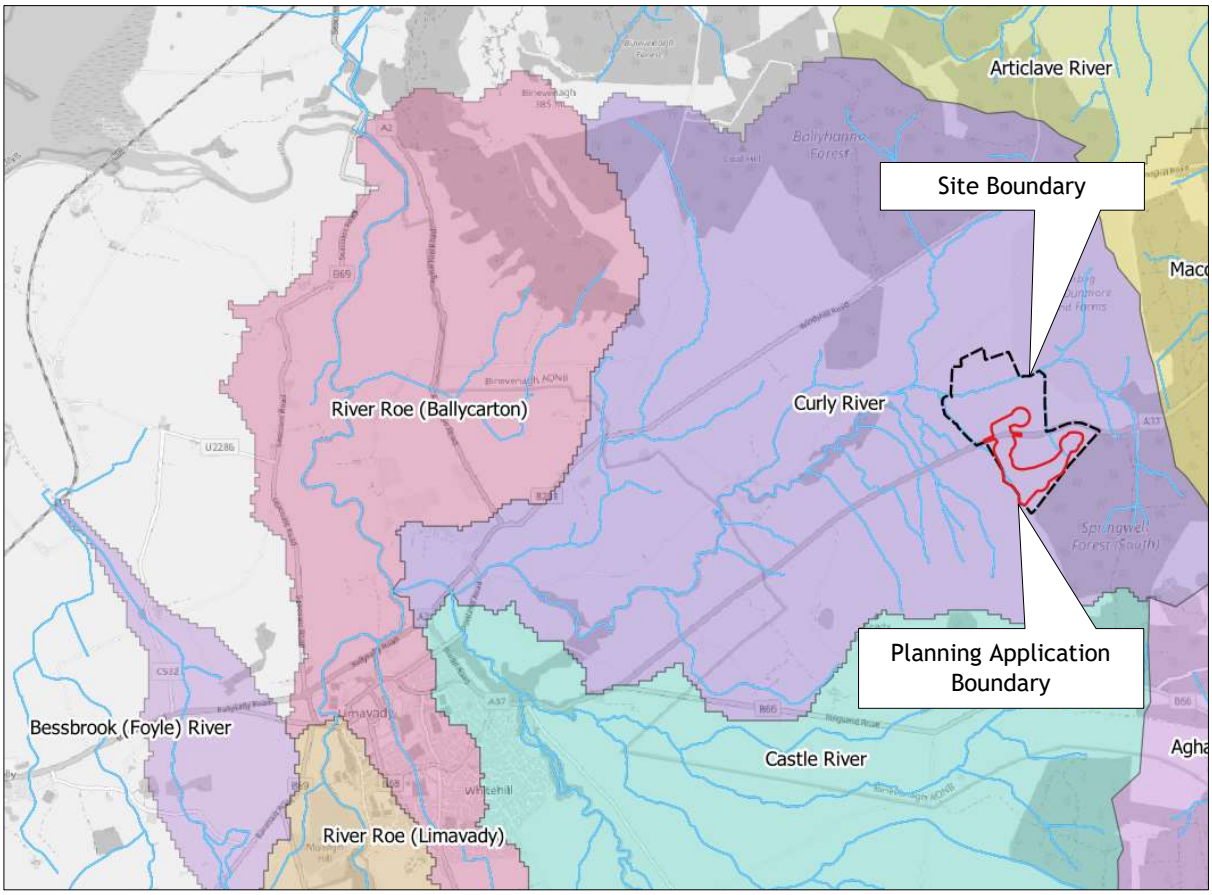
9.94 All other watercourses within the Site boundary are subject to riparian ownership and maintenance only.

9.95 Site reconnaissance observations indicate that the current hydrology of the Site consists of several natural source watercourses and streams and artificially modified drainage ditches and peat drains.

9.96 The hydrological regime of the Site and discharge locations of onsite watercourses as determined by desktop studies and site walkovers are shown on **Figure 9.1: Site Hydrology.**

9.97 NIEA River Water Body dataset boundaries show the Site drains to one delineated and named waterbody – the Curly River (UKGBNI1NW020204060) which has an overall area of 41.33 km^2. The Curly River flows in a westerly/south-westerly direction away from the Site, before joining the River Roe (in the River Roe (Ballycarton) waterbody) c. 7 km west of the Site. Waterbody context is shown at **Plate 9-8**.

Plate 9-8: Watersheds and NIEA Waterbodies



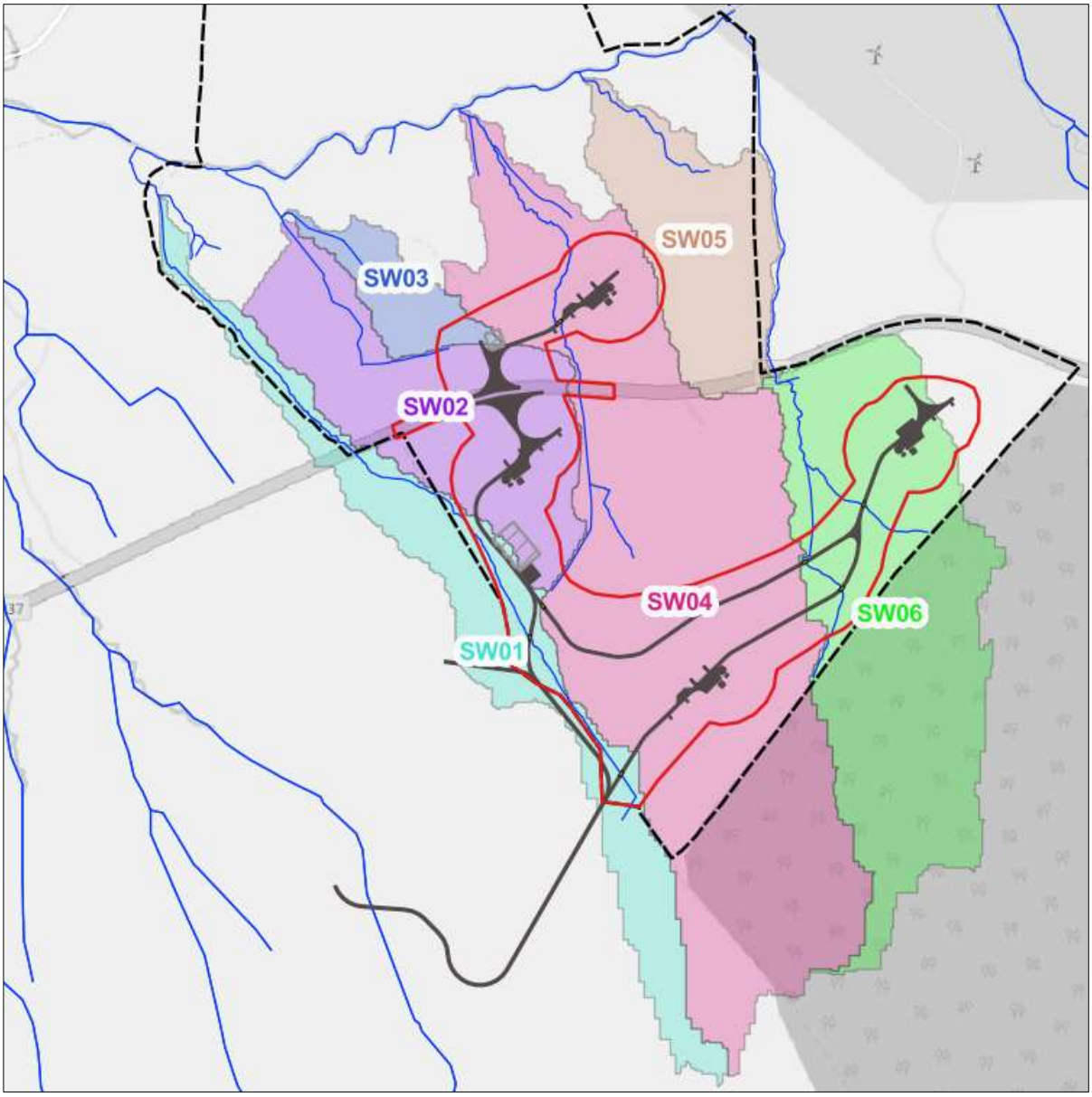
9.98 Internal site drainage comprises minor watercourses and field / land drains in the upper elevations of the site, which tend to flow north and are culverted under the A37 road. More significant watercourses are located on lower elevations of the Site north of the A37. Detailed site hydrology identified following several walkovers, tracing surveys, and desktop analysis of flow routes and catchments based on height data is shown on **Figure 9.1: Site Hydrology**.

Sub-catchments / Watersheds

9.99 For purposes of differentiation of effects the hydrology of the Site can be split into 6 no. sub-catchments all of which discharge to the Curly River. Those sub-catchments / main internal watercourses are shown on .

9.100 Where applicable, the following sections include both the surface water (SW) catchment reference numbers used in this assessment and the naming convention used in Chapter 8: Fisheries (provided in brackets).

Plate 9-9: Internal Sub-Catchments



SW01 (Stream A)

9.101 The watercourse drains the Site boundary along its western boundary and flows in a north-north westerly direction to join the Curly River just north of the Site. The source is an area of wet rushes and flushes with no defined channel. It soon becomes defined as a narrow and incised cut drain. The immediate surrounding land use and habitat is rough sheep grazing and remnant bog with a stream bed of boulder mixed with stretches of vegetation, rushes and silt.

9.102 Approximately 80 m upstream of the A37 road, the channel is narrow (c. 0.2 –0.5 m wide) with a bed dominated by vegetation, peat and small pebbles. Downstream of the A37, the stream remains narrow and shallow over a moderate gradient.

9.103 Towards the confluence with the main Curly River, the stream passes through a heavily wooded area of mixed hazel, ash and scrub (Plate 4; Figure 8.3). The stream bed is a mixture of boulder and cobble in riffles and runs characterised by small cascades and falls.

9.104 The **Fisheries Assessment (Chapter 8)** suggests that it is in the lower reaches that trout fry occurred at 'good' abundance and, despite the relatively steep gradient, there was a lack of any barriers to fish passage and it is highly likely that mature trout would have ascended from the main Curly River to spawn.

SW02 & SW03

9.105 These catchments drain the central-western part of the Site. SW02 begins as standing water and a minor field drain upstream the A37 road. The watercourse is culverted and becomes more defined downstream (north) of the road, with rushes along the length of the channel. Towards the southern extent of the Site, the channel widens and becomes more heavily vegetated.

9.106 SW03 begins as a poorly defined field drain. The source is north of the A37 road. The channel becomes more established downstream and is vegetated with rushes. It joins SW02 approximately 475 m north of the A37 road.

9.107 These watercourses are not assessed as part of the **Fisheries Assessment (Chapter 8)**; therefore, they are considered to have limited fisheries potential.

SW04 (Stream B)

9.108 The watercourse is sourced from drainage in an area of rough grazing in the central-southern section of the Site, south of the A37 road. The source is an area of wet rushes with no distinct channel that becomes defined approximately 80 – 100 m south of a radio transmitter.

9.109 The stream channel emerges at the bottom of a steep hill and flows north towards the A37 road. However, it first flows for approximately 15 m via a concrete culvert 150 m upstream of A37 as it flows beneath the transmitter pad. Downstream of the culvert, the channel is very narrow and slow flowing with large areas blocked by woody debris from a previously clear-felled conifer plantation.

9.110 Downstream of the A37 road, the stream becomes steep and very narrow and has a hard bed interspersed with soil / pebbles and dense vegetation. A second channel merges with the watercourse approximately 95 m upstream from the confluence with the Curly River. Towards the confluence with the main Curly River, the stream widens (0.7 - 1.8 m) and has a very clean bed despite its position in an area of open cattle grazing on rough ground. There are some areas of bank poaching but exhibits a mixture of riffles and runs.

9.111 The **Fisheries Assessment (Chapter 8)** noted trout fry present in the lower and middle reaches of the watercourse.

SW05 (Stream C)

9.112 The stream is sourced by several small drains in the eastern-central area of the Site north of the A37 road. It issues as a vegetated peat-based drain <0.2 m wide to the south-east of a small forestry block and above this as a series of flushes and wet rushes in a gentler gradient pad. These merge to form a defined channel.

9.113 The channel then enters the small forestry block where the bed changes to a hard bottom with increased gradient and a width of c. 1 m. The bed at this reach is largely boulder and cobble. Within the small forest block, the channel varies from 1 m to 1.8m at the confluence with the Curly River. The bed is mainly boulder and cobble with some gravels exhibiting riffles and runs. The lower section is more gently sloping towards the Curly River confluence.

9.114 The **Fisheries Assessment (Chapter 8)** noted trout fry present in the lower reach immediately upstream of the Curly River confluence, but the channel lacked fish further upstream where it became incised and overgrown with grasses and the bed was a mixture of fines and vegetation.

SW06 (Stream D)

9.115 This stream is located in the eastern boundary of the Sit. Its sources are located within the south-eastern part of the Site in an area of very rough sheep grazing and an area of remnant sphagnum mosses, sedges and rushes capturing drainage water from the hill above.

9.116 The upper reaches are comprised of two channels. The eastern channel is a wet flush with a soft base that seeps into the main (western channel). The main channel falls steeply through a glen dominated by wet willow and scrub for approximately 70 m. It is narrow (approximately 0.2 - 0.4 m wide) with a bed of boulder and cobble.

9.117 The stream then passes over a small vertical fall towards the A37 road before entering an 1800 mm diameter concrete culvert (approximately 25 m in length) underneath the A37. The culvert outlet has a 3-stepped drop onto a shallow concrete apron. Downstream of the culvert, the stream channel is approximately 1 m wide with a cobble and pebble bed but becomes overgrown and grassy with areas of soft vegetation and surrounding open sheep open grazing.

9.118 Approximately 100 m upstream from its confluence with Curly River, the channel becomes more defined again after issuing from a marshy area where the bed is soft and vegetated. The bed appears drain-like and is openly grazed by sheep and cattle and runs over a moderate gradient with cobble and pebble before steepening towards its discharge point to the Curly River.

9.119 The **Fisheries Assessment (Chapter 8)** noted had trout fry present immediately upstream of the Curly River.

Standing Water (Pond A & Pond B)

9.120 Two areas of standing water (ponds) are located within the catchment of SW04 / Stream B upstream of the A37 road. The southern pond (Pond A) was likely formed as a result of works associated with the adjacent quarry, which currently appears disused. OSNI historic mapping (1905–1957) indicates the pond to be located on the route of an historic watercourse that discharged into SW04 / Stream B upstream of the road, suggesting water from the surrounding areas drain towards the pond.

9.121 The northern pond (Pond B), located immediately adjacent to the A37 road, is hydrologically connected to Pond A by a small drainage channel. Pond B has a small overflow pipe that drains water to SW04 / Stream B under the access farm lane from the A37 to the north.

9.122 The **Fisheries Assessment (Chapter 8)** noted the ponds are unsuitable for salmonid fish.

Surface Water Quality

9.123 The following section is intended to provide a qualitative appraisal of existing surface water quality in those catchments the Proposed Development lies within.

9.124 Following the publication of the Water Framework Directive (Classification, Priority Substances and Shellfish Waters) Regulations (Northern Ireland) 2015 waterbodies are given a classification based on annual average / percentile results from several individual monitoring stations.[11] The WFD classification is a combination of chemical, biological and hydromorphological elements; whereby, the overall status is the lowest of the combined constituents.

9.125 All of the Site is located within the Curly River (UKGBNI1NW020204060) catchment. This watercourse ultimately discharges in the River Roe (Ballycarton) catchment. The River Roe discharges into Lough Foyle north of Limavady. The status of the receiving river waterbodies are summarised in the table below.

Table 9.10: River Water Body Status

River Waterbody	2021 Status	2027 Target
Curly River (UKGBNI1NW020204060)	Good	Good

[11] The European Water Framework Directive (2000/60/EC) has been transposed into Northern Ireland regulations through The Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017. The Water (Amendment) (Northern Ireland) (EU Exit) Regulations 2019 ensures that the Water Framework Directive (as transposed) and the various supporting pieces of water legislation continue to operate here after 1 January 2021 (https://www.daera-ni.gov.uk/articles/water-framework-directive)

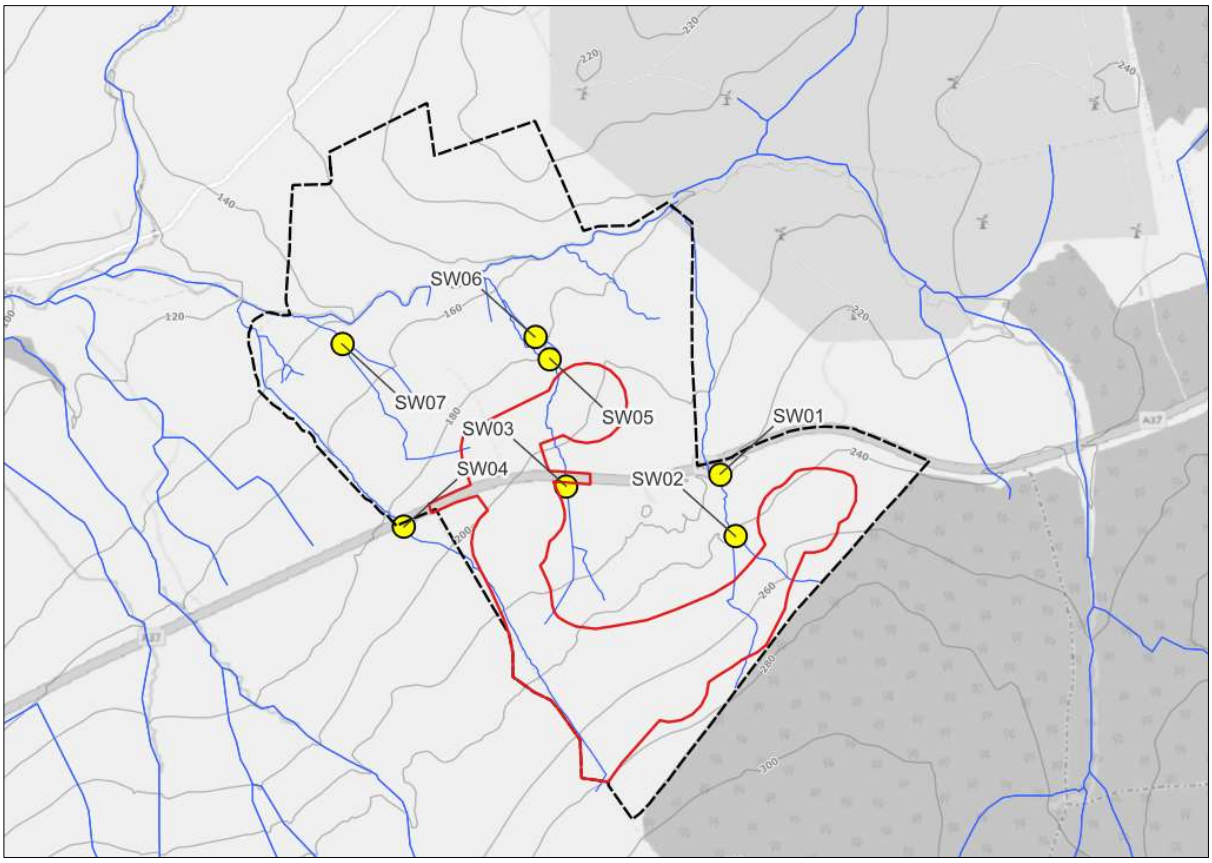
River Waterbody	2021 Status	2027 Target
River Roe (Ballycarton) (UKGBNI1NW020202024)	Poor	Good

Project Specific Water Quality Assessment

9.126 In addition to a review of water quality data held by statutory bodies, independent water quality monitoring has been undertaken as part of this assessment to provide baseline water quality standards of water features within the Site boundary prior to any development. Sampling was carried out on 9th July 2024. Weather conditions were overcast with some rain.

9.127 The baseline assessment collected and assessed seven representative water samples from watercourses draining the site for a range of physio-chemical parameters. Monitoring locations are shown on Plate 9.10 below and **ES Figure 9.2: Site Water Quality Assessment**.

Plate 9-10: Watersheds and NIEA Waterbodies



9.128 Site water quality is summarising as follows;

- pH levels recorded in watercourses draining the site were all WFD "High" classification
- Orthophosphate levels were below Limit of Detection (LoD) at all sample locations.
- BOD concentrations found to be below LoD.
- Ammoniacal Nitrogen levels were classified as 'High' under the WFD.
- Total Suspended Solids (TSS) were very elevated at four sample locations (SW02, SW03, SW06 and SW07; with values ranging from 73 to 500 mg/l. At the three other sample locations values were below the LoD.
- Turbidity was elevated at the same four locations were elevated TSS were recorded.
- Alkalinity (Ph buffering capacity) at the site was reported at "Moderate" at two locations (SW01 and SW02) and "High" at the remaining locations.

9.129 Water quality for watercourses draining the Site is generally consistent with the WFD status of 'Good' status / target for the downstream waterbodies outlined previously. Therefore, preservation of the baseline water quality results within

the upper reaches would be important at a local level to preserve the downstream NIEA classifications.

Surface Water Abstractions

9.130 In order to allow assessment of potential for the Proposed Development to affect surface water abstractions in the catchment at and up to 2 km downstream of the Site, an initial screening review of the NIEA WMU Water Information Request Viewer was carried out. No surface water abstractions were identified.

Northern Ireland Water Infrastructure

9.131 A review of Northern Ireland Water asset information did not identify any assets within proximity to the Site boundary (i.e., 2 km) that could feasibly be affected by the Proposed Development.

Flood Risk

9.132 The Proposed Development was assessed in relation to Flood Maps (NI) and similar DfI Rivers datasets, which provide an indication of predicted flood extents for a 1% Annual Exceedance Probability (AEP) fluvial flood and 0.5% AEP Surface Water Flood, and for reservoir inundation. DfI Rivers have also been consulted regarding flooding; the response (IN1-23-11516) is included in **Appendix 9.4**.

Historical Flood Extents

9.133 Flood Maps (NI) indicates no recorded incidents of historic flooding in the vicinity of the Site.

Fluvial Flooding

9.134 The Proposed Development is unaffected by the indicative predicted 1 % AEP fluvial (river) flood extents as identified on the Flood Maps (NI), including for the effect of climate change.

9.135 Fluvial flooding is predicted with FMNI flood extents indicating an active floodplain area along the reach of Curly River within the Site boundary. However, no development is proposed in the vicinity of this reach.

Pluvial Flooding

9.136 Surface water flooding is predicted by the indicative 0.5 % AEP surface water flood extent mapping at a limited number of discrete locations within the survey boundary, and generally coincides with watercourses culverted at the A37 road. Surface water flooding coinciding with watercourses is more appropriately assessed as fluvial further assessment is provided in **Appendix 9.2 – Drainage Assessment** and mapped on **Figure 9.1: Site Hydrology**.

9.137 Surface water flooding would not constrain development but would inform design of the infrastructure with a view to ensuring that surface water flow paths are

maintained, and a suitable standard of protection if afforded to any development adjacent to areas predicted to be affected by flooding.

Reservoir Flooding

9.138 The risk of reservoir flooding was assessed using Reservoir Flood Mapping for Emergency Planning[12], which shows the indicative area that may flood from an uncontrolled release of water from all possible dam failure scenarios. The Proposed Development is unaffected.

Summary

9.139 Flood extents are shown on **Figure 9.1: Site Hydrology**. Mitigation of flood risk is described in subsequent sections and is addressed in detailed in **Appendix 9.2 - Drainage Assessment** in the format normally requested by DfI Rivers in consultation.

Eco-Hydrology & Water Dependent Habitats / Species

9.140 Consideration has been given to local surface water and groundwater dependent ecosystems and habitats dependent on, or prone to change due to variation in surface water and groundwater patterns on the Site within **Chapter 6: Ecology**. No further consideration is given to those aspects within this chapter.

Fisheries

9.141 Detailed consideration has been given to fisheries on and downstream of the Site within **Chapter 8: Fisheries**.

9.142 The criteria by which Chapter 8 assigns sensitivity / importance of receptors is not as per those outlined in Table 9.3 of this chapter. Further details, including figures of watercourses downstream of the Site, are included in Chapter 8: Fisheries and associated appendices.

Aquaculture

9.143 There are no aquaculture (fisheries / hatcheries) sites located in the vicinity or downstream of the Site.

Shellfish Water Protected Area

9.144 The Northern Ireland Marine Map Viewer shows a WFD Shellfish Water Protected Area (SWPA) at Balls Point, where the River Roe discharges to Lough Foyle. Under the WFD, all SWPAs must be managed to ensure that they meet their ecological and chemical objectives.

[12] DfI Rivers (2017) Reservoir Flood Mapping for Emergency Planning. Available at http://riversagency.maps.arcgis.com/apps/webappviewer/index.html?id=006872dcdd7b43b89d352e0b93190e67. Accessed 30/06/2024

Water Framework Directive – Fisheries Classification

9.145 The Curly River Upper and Lower and the River Roe Lower were given status under the now revoked Directive 2006/44/EC 'on the quality of fresh waters needing protection or improvement in order to support fish life'; more commonly known as the Freshwater Fish Directive.

9.146 NIEA Water Management Unit data, on the NIEA Catchment Data Map Viewer[13] designates these rivers as protected areas containing economically significant species. The River Roe discharges to Lough Foyle at Balls Point (Protected Area Code UKGBNIPA2_40001) classed as a marine protected area containing economically significant species (shellfish).

Designated Sites

9.147 Designated sites such as Special Areas of Conservation (SAC), Special Protected Areas (SPA), Areas of Special Scientific Interest (ASSI), Ramsar sites, and similarly designated environmental receptors, have been identified as part of this assessment. Sites were identified utilising the datasets available on the NIEA Natural Environment Map Viewer and Join Nature Conservation Committee[14] website and were screened to identify:

- Hydrological sites with sensitivities to the water environment that are connected to the Site, i.e. sites which lie in the upstream catchment of or are on downstream streamlines of the watercourses draining the Site;
- Terrestrial sites of geological importance on or immediately adjacent to the Site.

9.148 Only sites meeting these criteria are discussed further in this assessment. Terrestrial sites with ground or surface water-dependent habitats are considered in **Chapter 6: Ecology**.

Table 9.11: Initial Screening of Designated Sites

Name	Designation	Reason for designation and qualifying features relevant to this assessment	Distance from Preliminary Site Boundary at Nearest Point (km)	Considered further and rationale.
River Roe and Tributaries	SAC (UK0030360)	Supports a significant presence of otters (*Lutra lutra*).	0.25 km – north	Yes: The designated site is hydrologically connected to the

[13] https://www.daera-ni.gov.uk/articles/daera-map-viewers (Accessed 10/07/2024)

[14] Joint Nature Conversation Committee (2016) Protected Sites. Available at: https://jncc.gov.uk/our-work/uk-protected-areas/ (Accessed 30/06/2024)

Name	Designation	Reason for designation and qualifying features relevant to this assessment	Distance from Preliminary Site Boundary at Nearest Point (km)	Considered further and rationale.
	ASSI (ASSI246)	Considered one of the best areas in the UK for Atlantic salmon (*Salmo salar*). Rivers which support species of floating vegetation. Supporting old oak woods.		proposed development.
Gortcorbies	ASSI (ASSI371)	Species-rich wet grassland, in particular Purple Moor-grass	0.75 km – west	No: no works associated with the proposed development will affect the geological features for which the site is designated.
Lough Foyle	Ramsar Site (UK12014)	The site qualifies under Criterion 1a of the Ramsar Convention by being a particularly good representative example of a wetland complex including intertidal sand and mudflats with extensive seagrass beds, saltmarsh, estuaries and associated brackish ditches.	9 km – north-west (c. 17 km downstream)	Yes: The designated site is hydrologically connected to the proposed development.
	SPA (UK9020031)	This area qualifies as a special protection area by regularly supporting three species of wintering birds and migratory waterfowl.	9 km – north-west (c. 17 km downstream)	Yes: The designated site is hydrologically connected to the proposed development.

Name	Designation	Reason for designation and qualifying features relevant to this assessment	Distance from Preliminary Site Boundary at Nearest Point (km)	Considered further and rationale.
	ASSI (ASSI051)	The area is of special scientific interest because of its coastal flora, fauna and physiographical features. A range of notable fish species have been recorded in Lough Foyle estuary and the lower reaches of some of its tributary rivers. Important populations of Atlantic salmon (*Salmo salar*) migrate through the system to and from their spawning grounds.	9 km – north-west (c. 17 km downstream)	Yes: The designated site is hydrologically connected to the proposed development.

Baseline Summary and Receptor Sensitivities

9.149 The baseline assessment identified the receptors which have the potential to demonstrate a sensitivity to the Proposed Development; the receptors and their scale / sensitivity value are summarised in Table 9.12. Sensitivity is based on the baseline assessment and determined in accordance with the rationale previously described in Table 9.3.

Table 9.12: Receptor Sensitivity

Type	Receptor	Scale / Sensitivity	Rational
Geological	Soils / Drift Deposits	Local / Low	Site with little geological value or of widespread local abundance. Loss of the land on the Site would not be considered significant in the context of the region.
Hydrological	On-site significant watercourses (Tributaries of Curly River)	National / High	Within the Site boundary, several tributaries of Curly River are considered significant (major) in terms of the contributing catchment areas. The current physico-chemical conditions of these water features in proximity to the Proposed Development results in limited / negligible fisheries potential; however, the lower reaches in the vicinity of the Curly River have 'good' fisheries potential (trout fry present).

Type	Receptor	Scale / Sensitivity	Rational
	On-site Minor Drainage	Local / Low	All other on-site watercourses are generally characterised by vegetated overgrown field drains / cut peat drainage / trackside drainage and have low fisheries and other ecological potential and have no other use of significant value.
	Off-site watercourse / designated site (River Roe and Tributaries SAC/ASSI including Curly River)	International / Very High	Designated site with internal importance hydrologically connected to the Site.
	Off-site designated sites (Lough Foyle Ramsar/ASSI)	International / Very High	Designated site with internal importance hydrologically connected to the Site.
Hydro-Geological	Bedrock Groundwater / Aquifers	Local / Low	Aquifer with limited productivity and no significant abstractions. Potential for discrete local supply sources.
	Shallow Groundwater / potential superficial Aquifers	Local / Low	Potential superficial aquifers identified within the Site boundary; however, no potential abstractions / private water supplies are known to operate in the area.
Terrestrial	The Development	Local / Low	Proposed infrastructure prone to damage including potential for water damage of electrical infrastructure in a flood event; potential for structural damage of access infrastructure in the event of hydraulic incapacity.

Predicted Environmental Effects

Preamble

9.150 This section outlines and describes the potential likely effects of the Proposed Development on hydrological patterns and water quality on the Site, and in the downstream environment, that have the potential to arise in the absence of mitigation. The following phases of the Proposed Development are considered;

- Windfarm construction;
- Windfarm operation and maintenance; and
- Wind farm decommissioning.

9.151 During each phase some of the activities undertaken have the potential to modify hydrological regimes and affect water quality on the site and the downstream environment. Due to the nature of the Site and work undertaken, the hazards and associated effects will be similar for each phase, with an increased likelihood during the construction phase.

Components Contributing to Predicted Environmental Effects

Activities Associated with Construction, Operation and Decommissioning

9.152 During construction, the Proposed Development comprises construction of infrastructure which would be likely to cause change to local hydrology and water quality, comprising earthworks, plant movements with associated use of lubricants and fuel oils, spoil handling and placement of aggregates and cementitious materials, and dewatering associated with construction of temporary compounds, turbine foundations, building foundations, access tracks, and cable trenches.

9.153 The operational phase of the Proposed Development (the designed operating life estimated to be 35 years) would cause runoff from access tracks, turbine bases and hard standings via drainage features, would require onsite welfare facilities with associated waste, and potentially necessitate storage and use of oils, fuels and lubricants on-site, each with the potential to cause adverse effects on the environment without adequate avoidance, design, or mitigation measures.

9.154 Activities associated with the decommissioning phase at the end of the operating design life are generally as per those for the construction phase i.e., earthworks, plant movements with associated use of lubricants and fuel oils, spoil handling and placement of aggregates and cementitious materials, and dewatering associated with removal of turbines, buildings, hard standing areas, and buried structures followed by reinstatement and restoration of ground cover.

Likely Significant Effects

9.155 The likely effects of the Proposed Development on the surface and groundwater environment prior to any avoidance, careful design, or additional mitigation are summarised in the following sections.

Changes in Runoff and Flow Patterns

9.156 New temporary and permanent impermeable surfaces, as well as temporary compaction of soils due to construction phase plant and site traffic movements, may cause increased rate and volume of surface water runoff due to the reduced permeable area on the Site through which rainfall can infiltrate. Impermeable surfaces will cause an increased "flashy" response to rainfall events, with increased water velocities in new and existing drainage features. As a consequence, the effect would be likely to cause temporary or permanent increases in surface water runoff rates and volumes, leading to increased flood risk and increased effects of erosion and scour in downstream watercourses. Similarly, loss of permeable areas is likely to cause reduced potential for groundwater recharge affecting aquifers.

9.157 Significant excavations, in particular linear works such as access tracks, drainage ditches and cable trenches, are likely to act as barriers to runoff resulting in

ponding, or development of preferential flow routes, diverting surface water away from its current route. Consequently, temporarily or permanently redirected surface water flows may starve areas where water currently flows, or cause flooding of areas where water currently does not flow.

9.158 Works to existing surface watercourses (such as installation of culverts or bridges) have the potential to cause an obstruction to flows and may alter conveyance capacities, potentially causing temporary or permanent restrictions in watercourse channels, affecting upstream water levels and increasing flood risk.

Changes to Water Quality

Sediment / Suspended Pollution

9.159 Temporary activities required to construct windfarm infrastructure would require excavations, ground disturbance (due to excavations and plant and vehicle movements), stripping and excavation of peat and soils, and temporary spoil deposition. Exposed soils have potential to release fine sediments in surface water runoff or where excavations come in contact with surface watercourses.

9.160 Construction of hardstanding areas and access tracks would require importing, handling and placement of aggregate; which would have the potential to release fine sediments into surface water runoff. The proximity of such works to surface watercourse will increase the risk of pollution to the wider water environment.

9.161 Temporary surface water or shallow groundwater gathering in significant excavations has the potential to be significantly polluted due to contact with excavated surfaces and aggregates. Discharge of intercepted contaminated groundwater during passive or active dewatering has the potential to pollute the wider water environment if not disposed of correctly.

9.162 Silt and suspended sediments and debris entering watercourses would have the potential to adversely modify stream morphologies, smother habitats and harm aquatic flora and fauna.

Chemical Pollution of Surface Water and Groundwater

9.163 Temporary storage and use onsite use of chemicals, fuels and oils associated with construction activities, and use of wet concrete and other cementitious material, may result in potentially harmful substances entering the water environment. Possible pathways to hydrological receptors may include; accidental spillages, improper transport and refuelling, or inappropriate storage and disposal procedures, by gradual leakage or single failure of storage tanks or refuelling mechanisms. Temporary presence of alum-based flocculants (used to remove suspended solids from surface water) has the potential to enter surface waters if unregulated.

9.164 During the operational phase of the Proposed Development, the permanent presence of oils and lubricants associated with turbine maintenance has a similar potential to enter and pollution the water environment.

9.165 Wastewater effluent from temporary construction phase welfare facilities and permanent substation building welfare facilities has the potential to enter surface water or shallow groundwater.

9.166 As a consequence, chemical pollutants from construction activities, storage of materials, or from coliforms from wastewater entering watercourses have the potential to adversely affect water quality, with associated effects to potable supplies, fish and aquatic ecology.

Design Evolution: Constraints and Avoidance Measures

9.167 The magnitude and significance of those effects determined as being likely to be a consequence of the Proposed Development can be substantially reduced or eliminated through a proactive design approach to avoid identified baseline receptors, with particular emphasis in relation to fishery habitats.

9.168 This section identifies the avoidance measures imposed and outlines the resulting magnitude and significance of residual effects. Additional mitigation is then specified to further reduce or eliminate remaining residual effects.

9.169 Detail of the design evolution highlighting considerations made with regards to hydrology and water quality management is presented in **Chapter 3: Design Evolution & Alternatives.**

9.170 The Proposed Development layout has evolved so that the design avoids conflict with the water and geology environment, as demonstrated in the following sections.

Water Features

9.171 As a precautionary measure and in accordance with the guidance previously advocated by NIEA Natural Environment Division, buffer (exclusion) zones to valuable water features are adopted as constraints to built development, and for incorporation as a construction buffer in relation to permissible land uses in proximity to watercourses.

9.172 Impact avoidance and design of mitigation have been developed in accordance with legislation and best practice guidance outlined in **Table 9.1** and paragraphs 9.32 and 9.33, respectively. Mitigation for all water features aims to preserve existing water quality ratings as a minimum.

9.173 Establishment of intact vegetated buffer zones between infrastructure and water features allows:

- Protection of water quality by filtering runoff within riparian vegetation before it enters the watercourse;
- Space for natural fluvial processes such as channel shape and planform adjustment which help restore and maintain the natural dynamic balance of river systems and associated habitats;
- Establishment of vegetation to stabilise banks and reduce soil erosion;
- Access for the maintenance and inspection of watercourses and for dealing with any residual risk of pollution incidents; and
- Habitat for plants and animals to form part of a habitat network.

9.174 The sensitivity of the water feature and the associated degree of protection it is therefore afforded, is primarily dependent on;

- Environmental designations on the water feature or downstream environment;
- Fisheries or ecological potential in the water feature or in the downstream environment;
- Water feature morphology (natural substrate or artificial channel, soil/ground type);
- Water feature size, capacity to convey water and hydrological potential (flows) – proportionate to the size of the catchment drained by the water feature;
- Nature and topography of the surrounding land, i.e. wet, poorly drained soils and steep slopes (>10˚) would require greater protection; and
- Sensitivity of the water feature to particular types of pollution, i.e. silts / nutrient enrichment / chemical pollution.

9.175 The rationale adopted in relation to water feature buffers is informed by NIEA Natural Environment Division guidance, which has typically, in response to similar development, advised no infill, disturbance, construction activity or storage of materials within 50 m of natural watercourses. NIEA has indicated that justification for buffer zones applied is the responsibility on the Applicant, while any rationale for reducing the scale of the buffer zone must be demonstrated requiring the submission of detailed information using a number of additional factors e.g. soil typology, topography, size of watercourse and climatic conditions.

9.176 NIEA, in Practice Guide to EIA and Planning Considerations, outlines buffer zones for water features as per the below table:

Table 9.13: NIEA Buffer Zones for Water Features

Width of Watercourse	Width of Buffer Strip
Surface Watercourse	10 m (minimum detailed in GGP 5)
Water Feature (surface watercourse, spring, well, borehole used for Drinking Water – public or private)	250 m
Water Feature (surface watercourse, spring, well, borehole not used for water supply – but could provide preferential flow pathway)	50 m
Designated Wetland	250 m

9.177 Additional industry guidance relevant and similar in nature to the construction and operational activities for the Development has been reviewed and taken into account:

- Guidance for Pollution Prevention (GPPs): GGP5-Works and Maintenance in or near water;
- Pollution Prevention Guidance (PPGs);
- Best practice in relation to forestry works (in particular on upland and peat sites) recommends riparian buffer reflecting stream size, with buffers from 5 –20 m; and
- Best practice in management of sediments and runoff from exposed ground in relation to agriculture recommends buffers of up to 10 m in order to protect surface waters from pollution by suspended solids, and nutrient enrichment by organic/inorganic fertilisers.

9.178 Water features considered significant for the purposes of the Proposed Development are shown on **Figure 9.1** and drainage drawings within **Appendix 9.1: Surface Water Management Plan**.

9.179 Significance has been determined following desktop studies and verified by site walkovers, with all streamlines subject to catchment and flow analysis by GIS - flow-raster accumulation analysis.

Significant watercourses

9.180 Significant watercourses identified and requiring application of a buffer to the proposed turbines and infrastructure are largely as per OS close scale vector mapping and were subject to ground truthing on Site.

9.181 A 50 m buffer has been applied to the significant watercourses identified in the baseline assessment. Watercourse significance has been determined based on professional judgement to suit observed riparian and in channel characteristics, stream morphology, and typically coincide with channels where the contributing catchment is >0.3 km^2.

9.182 Examples of the significant watercourses on the site are shown on the following **Plate 9-10**.

Plate 9-11: Significant Watercourse Examples

Location	SW06 – Draining the northern section of the Site into Curly River
Grid Ref.	274770, 426917
Photo Ref.	IMG_6422
	

Minor Watercourses

9.183 Minor watercourses were given buffers of 10 m based on SEPA and NatureScot (previously SNH) guidance and represent tributary channels on the Site where the catchment area was less than 0.25 km^2. Many are the sources / upper reaches of the more identifiable downstream channels and appear as grass / heather-covered depressions in the land. They are distinct and easily identifiable on aerial imagery but often harder to differentiate from the surrounding land at ground level during dry conditions. Others are more defined channels cut into peat.

9.184 Minor watercourses will either be protected on their present alignment, or where works or diversions are required then this shall be as enabling work adhering to strict procedures for working in or near water (described later in this assessment) with the proposed alignment then protected from the development.

9.185 Examples of minor watercourses on the site are shown on the following **Plate 9-11.**

Plate 9-12: Minor Watercourse Examples

Location	SW04 - Minor watercourse draining the central section of the Site
Grid Ref.	274439, 426384
Photo Ref.	IMG_6567
	

Other Drainage Features

9.186 All other minor drainage features (mapped or otherwise) comprising; dry or partially dry agricultural ditches, ephemeral drains, dry track drainage, grips, peat cuttings or other drainage features, are considered insignificant in the context of site hydrology and habitat potential.

9.187 Such features would be managed during and following construction by means of diversion and/or temporary blocking (with prior settlement features upstream of and outwith the drainage channel), using filtration check dams or similar, in order to prevent residual indirect potential pollution downstream caused by connectivity to downstream waterways.

Adopted Watercourse Buffers

9.188 The significance of watercourses is shown on Figure 9.1: Site Hydrology. Conservative minimum hydrological buffer zones are adopted and implemented as shown in **Table 9.14**. The buffer widths adopted exceed those recommended in industry guidance; the allowance provided gives due consideration to the nature of peat soil conditions on the Site, antecedent weather, moisture and base flow and a significantly increased factor of safety in all instances given the significance of fishery interests within downstream catchments.

Table 9.14: Minimum Adopted Hydrological Buffer Zones

Water Features	Minimum Width of Buffer Strip
Significant Watercourses (catchment >0.25 km^2)	50 m
Minor Watercourses (catchment <0.25 km^2)	10 m
Other Drainage Features	Managed on-site by diversion / temporary blocking in accordance with GGPs and PPGs.

9.189 The buffer widths adopted meet the criteria as recommended in industry guidance. Discretion has been adopted where applying buffers to 'other drainage features' based on observed site conditions and using professional judgement. Given the number and insignificance of ephemeral features, peat drains, and artificial drainage features (in the context of site hydrology and habitat potential), it is not practical to apply buffers to all 'surface water drains' (as per GPP5). Protection of other drainage features would be implemented via observational design at the time of implementing the development to suit site conditions and would include appropriate buffer strips or other appropriate temporary measures. Such an approach is routine and well understood and managed by the onshore wind development sector.

9.190 Buffers are indicated on Surface Water Management drawings included at **Appendix 9.1**.

9.191 New infrastructure is designed to lie outwith the hydrological buffer zones. This includes those elements of the works associated with large-scale earthworks and greatest potential for spillage or leakage of chemical pollutants from associated mechanical plant during the construction and operational phases; i.e.:

- All turbine bases, crane pads and associated working areas;
- Temporary and permanent spoil storage areas;
- Enabling works compound, substation and construction compound, fuel and chemical storage areas and any other platforms;
- Spoil movements and earthworks

9.192 New permanent access tracks are to lie outside of buffer zones; with the exception of unavoidable crossings of water features. Careful consideration has been given to the routing of access tracks in order to avoid / limit crossing of watercourses. Where crossings are proposed, appropriate design measures shall be incorporated to control or reduce the potential effect of the Proposed Development on the receiving environment (refer to paras. 9.205 to 9.210).

9.193 Temporary track infrastructure (such as temporary widening and turning heads) that may encroach into buffers shall be managed through the use of additional surface water management measures, discussed in paragraphs 9.218 through 9.228.

Abstractions

9.194 The proposed infrastructure layout within the Site is such that no development (tracks, turbines or other significant infrastructure) is sited within 250 m of any known or potential potable water abstraction identified in the previous screening assessment. No further constraint is required.

Floodplains

9.195 All development is located beyond the extents of the 1 % AEP indicative fluvial floodplain.

9.196 Pluvial flood extents noted along watercourses on-site (shown on **Figure 9.1: Site Hydrology**) generally coincide with the headwaters of watercourses. Surface water flooding coinciding with watercourses is more appropriately assessed as fluvial and would not pose an additional constraint.

9.197 Infrastructure is designed to ensure that conveyance of watercourse and surface water flooding is not impeded by means of providing drainage culverts / under track crossings where necessary.

9.198 Electrical infrastructure that would be susceptible to damage by floodwater is designed such that it does not have potential to be affected by fluvial (watercourse) or surface water flooding.

9.199 Areas of isolated surface water flooding generally coincide with source areas of on-site water features or isolated low points. Site drainage and culverts shall allow passage of local surface flooding as considered within **Appendix 9.1: Surface Water Management Plan, Appendix 9.2 Drainage Assessment** and accompanying drainage management drawings.

Designed Measures

9.200 Normal design measures associated with development of the type proposed are not considered “mitigation” in EIA terms, but are important in their effect of

controlling or reducing the potential effect of the Proposed Development on the receiving environment. Such measures are outlined in the following sections.

Site Drainage Management and SuDS Design

9.201 The Proposed Development will adopt a surface water management plan / site drainage design using the principles of Sustainable Drainage, promoting the principles of onsite retention of flows and use of buffers and other silt removal techniques. All drainage related mitigation measures proposed will be encompassed by a robust and proven Sustainable Drainage System (SuDS) design which will be used to control drainage and silt management on the site.

9.202 Onsite drainage design will minimise modification and disruption of the existing natural hydrology by:

- Maintaining existing overland flow routes and channels. Existing natural flow paths lateral to access roads will be maintained through the use of piped crossings under road alignments at natural depressions and at regular intermediate intervals. The spacing of cross drains will be specified at detailed design stage;
- Avoiding transporting rainfall runoff in long linear drainage swales by providing regular channel "breakouts", whereby water is encouraged to flow overland, thus maintaining existing natural hydrological patterns;
- Reducing surface water flow rates and volumes by attenuating runoff from tracks and hard standings "at source" by providing check-dams in swales, whereby the flow velocity and rate of discharge is artificially reduced to mimic natural properties;
- Providing settlement ponds at turbine hard standing areas and other main surface water discharge locations, where runoff from significant new impermeable areas is treated and attenuated before being released overland; and
- All swales, crossings and other hydraulic features will be engineered to ensure that dimensions are suitable to convey predicted flows and so prevent build-up of surface water and / or flooding.

9.203 Drainage design will reduce chemical, silt and other suspended pollutant transport by providing a "treatment train" of two to three stages of pollutant removal to all surface water runoff, nominally by:

- Ensuring that drainage swales are designed to convey flows at a low velocity by using a wide, flat-bottomed drain;
- Providing settlement and filtration features in all linear drainage swales (check dams, filtration dams) to reduce flow velocity and encourage settlement;
- Encouraging appropriate vegetation growth in the base of all linear drainage to provide additional filtration to flows;

- Providing settlement ponds at turbine hard standing areas and other key discharge locations in order to provide treatment to contaminated runoff prior to discharge; and
- Discharging surface water runoff over undisturbed vegetated ground, hence allowing any remaining silts and other pollutants to drop out of flows before entering the watercourse (having the effect of polishing the runoff);
- Preventing the discharge of surface water runoff flows directly to existing watercourses or drainage. All discharges shall seek to be via SuDS and buffer zones which will act as a filter strip, allowing deposition of suspended solids and other pollutants.

9.204 Consideration specific to the proposed infrastructure elements are documented in the detailed site-specific drainage management / SuDS design – see **Appendix 9.1: Surface Water Management Plan** and accompanying drainage drawings.

Watercourse Crossings

9.205 As noted previously, the number of watercourse and drainage crossings has been minimised through the principle of avoidance at the layout design stage. Proposals submitted in conjunction with this assessment indicate 6 no. crossings of minor watercourses.

9.206 Culverts will be designed to accommodate track crossings and minimise length of affected channel in order to comply with Revised PPS15 policy FLD4.

9.207 Hydraulic design of crossings will be undertaken as per the guidance and requirements provided in CIRIA C786 "Culverts, Screen and Outfall Manual" (or other standard as may be required by DfI Rivers in post-consent consultation), with primary parameters likely to include:

- Width of the culvert will be greater than the width of the active drainage channel;
- Alignment of the culvert will suit the alignment of the drainage channel, i.e. preserve the existing direction of flow;
- The slope of the culvert will not exceed the slope of the bed of the existing drainage channel.
- Detailed design of crossings will assume a hydraulic capacity requirement of 1% Annual Equivalent Probability flow including factor for climate change as required by DfI Rivers Technical Flood Risk Guidance in relation to Allowances for Climate Change in Northern Ireland as a conservative measure. Detailed hydraulic design of culverts and similar structures post permission is normal and accepted practice for wind farms in Northern Ireland.
- Fisheries shall be protected by adopting the guidance stated in Guidelines for Fisheries Protection during Development Works as published by Loughs Agency.

9.208 Typical design drawings for a closed culvert has been provided as part of the planning application and are included as part of the Drainage Management Drawings within **Appendix 9.1: Surface Water Management Plan.**

9.209 Consultation and approval will be sought from all relevant parties as required by the DAERA Surface Waters Alteration Handbook (November 2017), including and DfI Rivers in particular, at the pre-construction detailed design stage for all works in and affecting watercourses and drains, as per the requirements of Schedule 6 of the Drainage (Northern Ireland) Order 1973 and subsequent amendments.

9.210 No watercourse crossings are proposed within the floodplain.

Radon

9.211 The Site is within an area of lowest elevated radon potential, where less than 1% buildings are above the action level. Radon protection measures are advised to be implemented for the permanent control building or as may be directed by the local Building Control office suitable to the nature of the proposed enclosed space.

Effect of the Proposed Development

9.212 Magnitude and likelihood of the potential environmental effects have been determined based on criteria outlined within paragraphs 9.42 to 9.48 taking into account the effect of avoidance measures and normal designed-in measures proposed and described in preceding sections.

9.213 The associated impact significance of these effects on the receptors affected (following the implementation of avoidance and design measures proposed) has been determined in accordance with the rationale described previously and the results are presented in summary **Table 9.15.**

Table 9.15: Potential Magnitude and Significance of Impacts to Receptors – Including Effect of Avoidance & Design

Receptor and Sensitivity	Effect and Magnitude		Potential Effect Significance	Likelihood	Overall Effect Significance	Rationale
Soils / Drift Deposits (Local / Low)	Ground Movement / Instability	Low	Negligible	Unlikely	Not Significant	The Peat Slide Risk Assessment Report concluded proposed wind farm infrastructure layout should be designed to avoid the areas of deepest peat identified.
On-site Significant Watercourses (Local / Low)	Changes in runoff and flow patterns	Negligible	Low	Rare	Not Significant	Increased runoff from impermeable infrastructure is to be attenuated to a greenfield equivalent rate and will adopt "soft" rural SuDS features to ensure response to rainfall is not exacerbated. No crossings or structures are proposed on watercourses classed as 'significant' within the Site boundary that would affect their morphology or capacity.
	Silt / suspended solid pollution of surface waters	Medium	Low	Likely	Minor	Temporary short-term construction activities within watercourses would be likely to cause a significant but temporary fundamental change in water quality in watercourses on the Site.
	Chemical pollution of surface waters	Medium	Low	Likely	Minor	Spillage of oils, chemicals, or cementitious material associated with temporary construction and arising due to improper site management would be likely to cause a fundamental but temporary change in water quality in watercourses on the Site.

Receptor and Sensitivity	Effect and Magnitude		Potential Effect Significance	Likelihood	Overall Effect Significance	Rationale
On-site Minor Watercourses (Local / Low)	Changes in runoff and flow patterns	Low	Negligible	Unlikely	Not Significant	Increased runoff from impermeable infrastructure is to be attenuated to a greenfield equivalent rate and will adopt "soft" rural SuDS features to ensure response to rainfall is not exacerbated. Design of crossings of minor watercourses within channels on-site when adopting best practice design standards as stated result in no significant localised effect in terms of restricted capacity that would cause any change to flood risk.
	Silt / suspended solid pollution of surface waters	Medium	Low	Likely	Minor	Temporary short-term construction activities within watercourses would be likely to cause a significant but temporary fundamental change in water quality in watercourses on the Site.

Receptor and Sensitivity	Effect and Magnitude		Potential Effect Significance	Likelihood	Overall Effect Significance	Rationale
	Chemical pollution of surface waters	Medium	Low	Likely	Minor	Spillage of oils, chemicals, or cementitious material associated with temporary construction and arising due to improper site management would be likely to cause a fundamental but temporary change in water quality in watercourses on the Site.
Off-site Watercourses / Designated Sites (River Roe and Tributaries SAC/ASSI including Curly River) (International / Very High)	Changes in runoff and flow patterns	Negligible	Low	Rare	Not Significant	Increased runoff from impermeable infrastructure is to be attenuated to a greenfield equivalent rate and will adopt "soft" rural SuDS features to ensure response to rainfall is not exacerbated. The drainage strategy adopted ensures that natural catchments are mirrored and ensures that water is not lost from the catchment that would result in a loss of available water for the designated site.

Receptor and Sensitivity	Effect and Magnitude		Potential Effect Significance	Likelihood	Overall Effect Significance	Rationale
	Silt / suspended solid pollution of surface waters	Medium	High	Likely	Major	Riparian buffer zones, avoidance, and control of reduced quality runoff from the temporary and permanent works would cause runoff from the Site to have no effect exceeding normal seasonal or pre-existing fluctuations. Temporary short-term construction activities within upstream watercourses would be likely to cause a detectable but temporary change in water quality in the immediate downstream environment that would have an effect on water quality.
	Chemical pollution of the watercourse	Medium	High	Likely	Major	Spillage of oils, chemicals, or cementitious material associated with temporary construction, particularly at works adjacent to or within watercourses, and arising due to improper site management would be likely to cause a fundamental but temporary change in water quality in the downstream environment that would have an effect on water quality.

Receptor and Sensitivity	Effect and Magnitude		Potential Effect Significance	Likelihood	Overall Effect Significance	Rationale
Off-site Designated Sites (Lough Foyle Ramsar/ASSI)	Changes in runoff and flow patterns	Negligible	Low	Rare	Not Significant	Increased runoff from impermeable infrastructure is to be attenuated to a greenfield equivalent rate and will adopt "soft" rural SuDS features to ensure response to rainfall is not exacerbated. The planning application boundary as a proportion of the waterbody catchment hydrologically shared with / contributing to the designated site is not significant (i.e., c. 0.14%). Given this, and the distance between the Site and the ASSI (c. 17 km downstream), it is a rare likelihood that the designated site could feasibly be affected by works associated with the Proposed Development.
	Silt / suspended solid pollution of surface waters	Low	Moderate	Unlikely	Minor	Riparian buffer zones, avoidance, and control of reduced quality runoff from the temporary and permanent works would cause runoff from the Site to have no effect exceeding normal seasonal or pre-existing fluctuations. The planning application boundary as a proportion of the waterbody catchment hydrologically shared with the designated site is not significant (i.e., c. 0.14%). Given this, and the distance between the Site and the ASSI (c. 17 km downstream), it is unlikely the designated site could feasibly be affected by works associated with the Proposed Development.

Receptor and Sensitivity	Effect and Magnitude		Potential Effect Significance	Likelihood	Overall Effect Significance	Rationale
	Chemical pollution of the watercourse	Low	Moderate	Unlikely	Minor	Spillage of oils, chemicals, or cementitious material associated with temporary construction, particularly at works adjacent to or within watercourses, and arising due to improper site management would be likely to cause a fundamental but temporary change in water quality in the downstream environment that would have an effect on water quality. The planning application boundary as a proportion of the waterbody catchment hydrologically shared with the designated site is not significant (i.e., c. 0.14%). Given this, and the distance between the Site and the ASSI (c. 17 km downstream), it is unlikely the designated site could feasibly be affected by works associated with the Proposed Development.
Bedrock Groundwater / Aquifers (Local / Low)	Alteration of Groundwater	Low	Negligible	Unlikely	Not Significant	No significant excavations within the bedrock are expected. Significant dewatering with the potential for affecting groundwater levels is not anticipated.
	Chemical pollution of groundwater	Low	Negligible	Likely	Minor	Bedrock is expected to be shallow in several areas, with limited thickness of superficial deposits; however, depth to groundwater is anticipated to be significant and dominated by fracture flow, offering a limited pollution pathway.

Receptor and Sensitivity	Effect and Magnitude		Potential Effect Significance	Likelihood	Overall Effect Significance	Rationale
Potential Superficial Aquifer (Local / Low)	Alteration of Groundwater	Low	Negligible	Unlikely	Not Significant	Significant dewatering with the potential for affecting groundwater levels is not anticipated.
	Chemical pollution of groundwater	Low	Negligible	Likely	Minor	The potential superficial aquifer where infrastructure is proposed to situated in isolation from surface water features and there are no drinking water supplies or abstractions associated with the aquifer.
Private Water Supplies (Local / Low)	Disruption to quantity or quality of supply	Negligible	Negligible	Unlikely	Not Significant	No infrastructure is proposed within 250m of any known or potential abstraction location and as such no supply would be affected.
Tracks, turbines and associated buildings. (Local / Low)	Risk to occupants and infrastructure due to identified potential risk of flooding.	Low	Negligible	Unlikely	Not Significant	The Proposed Development has been designed to avoid fluvial flooding and is resilient to pluvial/ surface water flooding.

Additional Mitigation Measures – Construction Phase

9.214 Additional mitigating measures, over and above the avoidance and buffer zones previously detailed, are intended to reduce or prevent the residual significant hazards which may not be fully mitigated by the design evolution and avoidance.

Water Quality Monitoring

9.215 A water quality monitoring program will be implemented to monitor effects on the surface water quality regime during the infrastructure construction, operational and decommissioning phases of the Proposed Development, in order to;

- Demonstrate that the mitigation measures and surface water management is performing as designed;
- Provide validation that the in-place mitigation measures are not having an adverse effect upon the environment;
- Indicate the need for additional mitigation measures to prevent, reduce or remove any effects on the water environment, such as additional temporary settlement or filtration structures or short-term flocculant dosing to suit observed site conditions.

9.216 The monitoring would be informed by existing water quality baseline data and baseline monitoring rounds undertaken prior to the commencement of the construction phase.

9.217 It is intended that the water monitoring extent, duration and frequency will be agreed with the Department of Infrastructure or the relevant regulating body (nominally NIEA WMU) post consent and will nominally consist of physicochemical and biological monitoring. The extent, duration and frequency of the monitoring will be proportionate to the level of activity during each phase of the Proposed Development and the associated perceived risks.

Pollution Prevention

Pollution Prevention Plan

9.218 A detailed Pollution Prevention Plan (PPP) will be implemented and monitored by the site manager as part of a full Construction & Decommissioning Method Statement (CDMS) for the project, to be submitted post-consent following detailed site investigations and agreed with the local planning authority. Although this will be of particular importance during construction, it will apply to potentially polluting activities during all phases of the Proposed Development.

9.219 The detailed PPP will be produced following consultation and agreement with NIEA, and all appropriate personnel working on the Proposed Development will be trained in its use. As a minimum, the PPP will comply with Guidance for Pollution Prevention (GPP) and Pollution Prevention Guidelines (in particular GPP 21: Pollution Incident Response Planning) and best practice as advocated by CIRIA. The

PPP will identify site-specific measures and incorporate a Pollution Incident Plan, which will include emergency contact details, details of spill kits on the Proposed Development and instructions on actions in case of spillage / emergency.

9.220 Measures to be incorporated within the PPP are identified in the following sections.

Pollution Prevention Measures

9.221 During all phases the site manager will ensure that mitigation measures as identified within this assessment are fully implemented and that activities are carried out in such a manner as to prevent or reduce effects. The following construction and decommissioning phase-specific measures will be implemented. The following sections should be read in conjunction with the construction management information provided within **Chapter 1: Introduction & Proposed Development.**

9.222 To ensure best practice on site and to help avoid pollution release to watercourses and groundwater, the following NIEA Guidance for Pollution Prevention (GPP) and Pollution Prevention Guidance (PPGs) will be adhered to:

- GPP 1 Understanding Your Environmental Responsibilities - Good Environmental Practices;
- GPP 2 Above Ground Oil Storage Tanks;
- GPP 3 Use and Design of Oil Separators in Surface Water Drainage Systems;
- GPP 4 Treatment and disposal of Wastewater where there is no connection to the public foul sewer;
- GPP 5 Works and Maintenance in or near Water;
- GPP 6 Working at Construction and Demolition Sites;
- GPP 8 Safe Storage and Disposal of Used Oils;
- GPP 20 Dewatering Underground Ducts and Chambers;
- GPP 21 Pollution Incident Response Planning;
- GPP 22 Dealing with Spills;
- GPP 26 Safe Storage of Drums and Intermediate Bulk Containers;
- PPG 7 Safe Storage – The Safe Operation of Refuelling Facilities; and
- PPG 18: Managing Fire Water and Major Spillages.

9.223 Key requirements for control of chemical pollution risk are identified in the above guidance and will include the following:

Storage

9.224 All equipment, materials and chemicals on the Proposed Development will be stored away from any watercourse (i.e. outwith previously stated buffer zones). Chemical, fuel and oil stores will be sited on impervious bases in accordance with GPP2 and within a secured bund of 110% of the storage capacity, within the temporary storage compound.

Vehicles and Refuelling

9.225 Standing machinery will have drip trays placed underneath to prevent oil and fuel leaks causing pollution. Refuelling of vehicles and machinery will be carried out on an impermeable surface in designated areas, well away from any watercourse or drainage ditches (i.e. outwith previously stated buffer zones) and will adhere to best practice as detailed in PPG 7.

Maintenance

9.226 Onsite maintenance to construction plant will be avoided in all practicable instances, unless vehicles have broken down necessitating maintenance at the point of breakdown. Suitable measures in accordance with a Pollution Prevention Plan (PPP) will be put in place prior to commencement of maintenance in this instance.

Cement and concrete batching

9.227 Preference shall be given to construction techniques that do not require use of cementitious materials where suitable practicable alternatives exist. When concrete / cement is used, concrete batching will not be permitted on site. Wet concrete operations will not be carried out within watercourses or adjacent to watercourses. Measures to prevent discharge of alkaline wastewaters or contaminated storm water to watercourses will be outlined in a detailed PPP for the Proposed Development to be approved by NIEA before commencement of works. Wastewater spillage will be minimised by using settling tanks and recycling water.

Mess and welfare facilities

9.228 Mess and welfare facilities will be required during construction and decommissioning and will be located at the construction compound. Foul effluent disposal shall be via chemical facilities with periodic tankered removal by a licensed waste haulier for licensed offsite disposal (i.e. there shall be no emission on site).

Construction Best Practice

Construction in the vicinity of Watercourses

9.229 The following procedures apply to the general construction activities either within the watercourses or in defined watercourse buffer zones:

- Due consideration will be given to the prevailing ground and weather conditions when programming the execution of the works in order to ensure that in-channel works are undertaken during periods of predicted low flow and low rainfall in order to minimise contact with water; and
- Ensure that roadside drains do not discharge directly into watercourses, but rather through a riparian buffer area of intact vegetation as denoted on design drawings.

Construction of Watercourse Crossings

9.230 Construction of watercourse crossings will be programmed to coincide with periods of predicted low flow in the affected channel (determined by rainfall and would generally coincide with summer months) and adhere to working period restrictions imposed. Construction will be strictly as per the design for each identified watercourse crossing and will fully implement all SuDS and additional mitigating measures proposed at the detailed design stage. For purposes of outline design, the proposed mitigation will include:

- Installation of silt fences parallel to the watercourse channel in the vicinity of the proposed crossing;
- Installation of small cut-off drains to prevent natural surface runoff entering area of construction activity;
- Installation of filtration or other silt entraining features within the watercourse channel immediately downstream of the works location; and
- Use of over pumping where deemed appropriate.

Temporary SuDS

9.231 Temporary drainage and silt management features (SuDS) will be constructed prior to earthworks (including preliminary or enabling works) proceeding to construct any linear works (tracks / hardstanding areas / cable routes), turbine bases, and other infrastructure. Drainage will be provided to temporary works and reinstated to suit the final footprint of the completed development.

9.232 Temporary drainage measures in particular will be employed in enabling works to facilitate widening of existing tracks and diversion of minor watercourses where specifically proposed.

9.233 Temporary measures may include:

- Temporary silt fences erected in areas where risk of pollution to watercourses has been identified e.g. watercourse crossing locations and areas where tracks or other infrastructure lie within watercourse buffer zones;
- Placing temporary filtration silt fences within drainage channels where siltation is observed;
- Installing temporary constructed settlement features such as sumps or settlement ponds / lagoons where required;

- Upslope cut-off drainage channels approximately parallel to the proposed track alignment installed in advance of any excavated cuttings for the track or turbine hardstanding areas;
- Watercourses, drains, natural flow paths and cut-off drain outlet locations should be identified and charted, in order to ensure that piped crossings can be installed in advance of or adjacent to the track construction;
- Settlement ponds should be constructed in advance of commencing excavations for foundations and at any other locations identified as required at detailed design stage; and
- Trackside drainage swales should be installed in parallel with track construction. Note that this may require that drainage swales are reformed on an ongoing basis as temporary track alignments are modified to their eventual finished design level.

9.234 Suitable prevention measures should be in place at all times to prevent the conveyance of silts to receiving watercourses.

Electrical Cable Laying

9.235 Due consideration will be given to the prevailing ground conditions and season when programming the execution of cable trench excavations in order to ensure works are undertaken during periods with low rainfall and elevated shallow groundwater levels in order to reduce the likelihood of runoff entering the excavations.

9.236 Excavation of cable trenches will be carried out over short distances, with frequent backfilling of trenches to minimise opportunity for the ingress of water into open trenches, temporary silt traps will be provided in longer trench runs and on steeper slopes and spoil will be stored in line with a spoil management plan, which will be produced as part of the CDMS at the pre-construction stage.

Excavations and Spoil Management

9.237 Soil and subsoil excavation and movement will be undertaken in accordance with best practice guidelines such as Good Practice Guide for Handling Soils (MAFF, 2000) in order to minimise potential for silt laden runoff from spoil and excavations. Areas of stockpiled spoil including stored peat:

- will not be permitted within previously identified watercourse buffer zones; and
- will not be permitted to obstruct the flow of overland surface water with specific drainage to spoil mounds to be provided.

9.238 Material produced from excavations on the Site will be reused where reasonably practicable in the reinstatement of the site. Excavated materials will be separated into rock material, subsoil, reusable peat and vegetated sod material and will be stored in the designated temporary stockpile zones, under the supervision of a geotechnical expert. These materials will be reused where possible to re-grade

slopes, and to re-vegetate and stabilise the sides of access tracks and hard standing areas.

9.239 Spoil drainage will be designed on a bespoke basis for spoil storage areas to allow controlled dewatering and prevent washout of suspended solids to the receiving water environment. As part of the detailed CDMS a spoil management strategy will be developed by the appointed competent contractor for the development. Outline designs for drainage arrangements for temporary spoil areas are shown on the Drainage Management Drawings within **Appendix 9.1: Surface Water Management Plan**.

Dewatering of Excavations

- The majority of the turbine base foundations will be on bedrock or other hard strata above bedrock (to be confirmed by detailed site investigation prior to detailed design); therefore, deep excavations within bedrock and the associated bedrock aquifer are not anticipated and dewatering below the bedrock aquifer groundwater table is therefore not anticipated.
- Shallow groundwater (e.g. in areas of glacial sand and gravel) or rainfall runoff collected in excavations will be discharged via settlement ponds or filter strips prior to entry to the receiving water environment.
- Any settlement lagoons or filter strips associated with dewatering will be regularly inspected, particularly after periods of heavy rainfall and prior to periods of forecast heavy rainfall. Maintenance (to clear blockages or remove silt) will be carried out in periods of dry weather where practicable. Maintenance requirements are further considered in **Appendix 9.1: Surface Water Management Plan**.

Dust Management

9.240 Loose track material generated during the use of access tracks and the construction compound will be prevented from reaching watercourses by maintenance to surface water drainage systems installed at aggregate based hard standing areas. In dry weather dust suppression methods such as by dust suppression bowser will be employed.

Borrow Pits

9.241 For the avoidance of doubt, no borrow pits are proposed at the Proposed Development, therefore associated pollution risks associated with rock extraction activities are not a consideration.

Maintenance of Pollution Prevention Measures

9.242 All SuDS and additional pollution prevention measures installed will be subject to a regular maintenance regime for the life of the construction phase in order to maintain functionality of all features. This will comprise:

- Unblocking of drains;
- Maintenance of access road and other hard standing surfaces;
- Replacement of filtration features; and
- Removal of silt build-up from settlement and filtration features.

Mitigating Measures - Operational Phase

9.243 Mitigation of the effects of the Proposed Development will comprise the following:

- Ensure best practice is adhered to on the Site and avoid pollution release to watercourses by incorporating NIEA Pollution Prevention Guidance notes into management policy;
- In the event that permanent welfare facilities are installed as part of control building / substation facilities, foul effluent will be disposed of through the use of sealed cesspools or chemical facilities with periodic tankered removal by a licensed waste haulier for licensed offsite disposal (i.e. there shall be no emission on the site); and
- Cyclical maintenance of permanent SuDS drainage features installed during the construction phase, including unblocking of drains, maintenance of access road and other hard standing surfaces, and removal of silt build-up from settlement features. An outline maintenance programme is included in **Appendix 9.1: Surface Water Management Plan.**

Mitigating Measures and Residual Effects

9.244 The following table details the assessed impact magnitude, likelihood and associated significance as a function of the matrix stated previously of all receptors identified as previously having an unmitigated impact significance greater than ‘not significant’.

Table 9.16: Mitigated Effects

Receptor and Sensitivity	Effect and Magnitude		Potential Effect Significance	Likelihood	Overall Effect Significance	Rationale
On-site Significant Watercourses (Local / Low)	Changes in runoff and flow patterns	Negligible	Low	Rare	Not Significant	Increased runoff from impermeable infrastructure is to be attenuated to a greenfield equivalent rate and will adopt "soft" rural SuDS features to ensure response to rainfall is not exacerbated.
	Silt / suspended solid pollution of surface waters	Negligible	Low	Rare	Not Significant	Surface water management and pollution control and in particular to work in and adjacent to watercourses, is likely to result in no permanent change and no significant temporary change in conditions exceeding natural or pre-existing conditions.
	Chemical pollution of surface waters	Negligible	Low	Rare	Not Significant	Pollution prevention measures proposed to control chemical pollution at all phases is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions. Robust water quality monitoring will permit a rapid response to any residual risk.
On-site Minor Drainage (Local / Low)	Changes in runoff and flow patterns	Negligible	Low	Rare	Not Significant	Increased runoff from impermeable infrastructure is to be attenuated to a greenfield equivalent rate and will adopt "soft" rural SuDS features to ensure response to rainfall is not exacerbated. Design of crossings of minor watercourses on-site when adopting best practice design standards as stated result in no significant localised effect in terms of restricted capacity that would cause any change to flood risk.
	Silt / suspended solid pollution of surface waters	Negligible	Low	Rare	Not Significant	Surface water management and pollution control and in particular to work in and adjacent to watercourses, is likely to result in no permanent change and no significant temporary change in conditions exceeding natural or pre-existing conditions.

Receptor and Sensitivity	Effect and Magnitude		Potential Effect Significance	Likelihood	Overall Effect Significance	Rationale
	Chemical pollution of surface waters	Negligible	Low	Rare	Not Significant	Pollution prevention measures proposed to control chemical pollution at all phases is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions. Robust water quality monitoring will permit a rapid response to any residual risk.
Off-site Watercourses / Designated Sites (River Roe and Tributaries SAC/ASSI including Curly River) (International / Very High)	Changes in runoff and flow patterns	Negligible	Low	Rare	Not Significant	Increased runoff from impermeable infrastructure is to be attenuated to a greenfield equivalent rate and will adopt "soft" rural SuDS features to ensure response to rainfall is not exacerbated. The drainage strategy adopted ensures that natural catchments are mirrored and ensures that water is not lost from the catchment that would result in a loss of available water for the designated site.
	Silt / suspended solid pollution of surface waters	Negligible	Low	Rare	Not Significant	Riparian buffer zones, avoidance, and control of reduced quality runoff from the temporary and permanent works would cause runoff from the site to have no effect exceeding normal seasonal or pre-existing fluctuations. Surface water management and pollution control in particular to work in and adjacent to watercourses, is likely to result in no permanent change and no significant temporary change in conditions exceeding natural or pre-existing conditions.
	Chemical pollution of the watercourse	Negligible	Low	Rare	Not Significant	Pollution prevention measures proposed to control chemical pollution at all phases is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions. Robust water quality monitoring will permit a rapid response to any residual risk.

Receptor and Sensitivity	Effect and Magnitude		Potential Effect Significance	Likelihood	Overall Effect Significance	Rationale
Off-site Designated Sites (Lough Foyle Ramsar/ASSI)	Changes in runoff and flow patterns	Negligible	Low	Rare	Not Significant	Increased runoff from impermeable infrastructure is to be attenuated to a greenfield equivalent rate and will adopt "soft" rural SuDS features to ensure response to rainfall is not exacerbated. The Site as a proportion of the waterbody catchments is not significant.
	Silt / suspended solid pollution of surface waters	Negligible	Low	Rare	Not Significant	Riparian buffer zones, avoidance, and control of reduced quality runoff from the temporary and permanent works would cause runoff from the site to have no effect exceeding normal seasonal or pre-existing fluctuations. Surface water management and pollution control in particular to work in and adjacent to watercourses, is likely to result in no permanent change and no significant temporary change in conditions exceeding natural or pre-existing conditions.
	Chemical pollution of the watercourse	Negligible	Low	Rare	Not Significant	Pollution prevention measures proposed to control chemical pollution at all phases is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions. Robust water quality monitoring will permit a rapid response to any residual risk.
Potential Superficial Aquifer (Local / Low)	Alteration of Groundwater	Low	Negligible	Unlikely	Not Significant	Significant dewatering with the potential for affecting groundwater levels is not anticipated.
	Chemical pollution of groundwater	Low	Negligible	Unlikely	Not Significant	Pollution prevention measures proposed to control chemical pollution at all phases is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions.
Bedrock Groundwater / Aquifers	Alteration of Groundwater	Low	Negligible	Unlikely	Not Significant	No significant excavations within the bedrock are expected. Significant dewatering with the potential for affecting groundwater levels is not anticipated.

Receptor and Sensitivity	Effect and Magnitude		Potential Effect Significance	Likelihood	Overall Effect Significance	Rationale
(Local / Low)	Chemical pollution of groundwater	Low	Negligible	Unlikely	Not Significant	Bedrock is expected to be shallow in several areas, with limited thickness of superficial deposits; however, depth to groundwater is anticipated to be significant and dominated by fracture flow, offering a limited pollution pathway. Pollution prevention measures proposed to control chemical pollution at all phases is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions.

Cumulative Effects

9.245 An assessment has been undertaken of the cumulative effect on geology and the water environment of the Proposed Development in conjunction with other known wind farms and other significant developments in planning, construction or operation at the time of the application.

9.246 The assessment aims to determine potential for cumulative impact within the hydrological, hydrogeological and geological setting of the Proposed Development caused by an accumulation of similar developments.

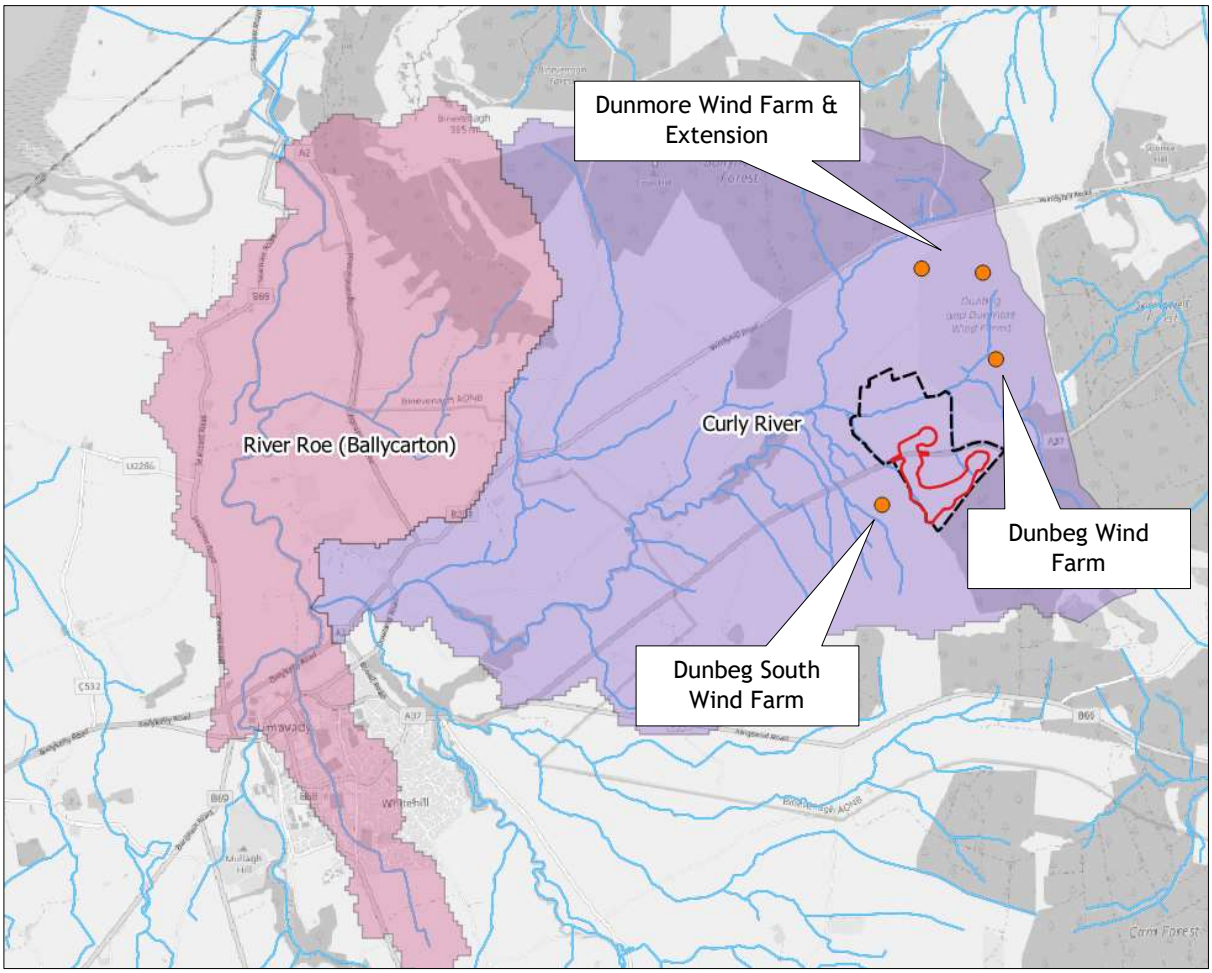
9.247 The hydrological and hydrogeological setting of the site for the purposes of the assessment is the downstream Curly River and River Roe (Ballycarton) catchments as identified on the NIEA Catchment Data Map Viewer and shown on **Plate 9-13**.

9.248 Windfarms identified within the setting are detailed within the table below:

Table 9.17: Cumulative Assessment

Wind Farm	Number of turbines	Status
Dunbeg Wind Farm	**14**	**Operational**
Dunbeg South Wind Farm	**9**	**Consented**
Dunmore Wind Farm	**7**	**Operational**
Dunmore Wind Farm Extension	**8**	**Consented**

Plate 9-13: Cumulative Assessment Area & Hydrological Setting



9.249 As no likely significant residual water environment or geological effects are predicted arising from the current Proposed Development, there is no potential significant cumulative effect to water or the geological environment in conjunction with any other pre-existing or other proposed / consented development.

Summary and Conclusions

9.250 This assessment identifies the potential geological, hydrological, and hydrogeological impacts, including surface and groundwater quality of the Proposed Development. It summarises the relevant legislation and guidance and provides appropriate baseline information, enabling the potential effects to be identified.

9.251 Aspects of the design, construction and operation of the Proposed Development that may potentially impact on the receiving geological and water environment have been identified and the pathways for impacts assessed. It has been determined that without mitigation, the Proposed Development would be likely to cause adverse impacts of major significance primarily driven by the sensitivity of

fisheries interests / designated site shortly downstream of the Site. As such, informed by the baseline assessment and pathways identified, mitigation integrated as part of outline design and proposed during construction phase includes:

- Avoidance of water features based on baseline constraints mapping;
- Design of site elements to minimise impact on the geological and water environment;
- Implementation of a comprehensive surface water management plan comprising the use of SuDS (drainage) and silt management in order to prevent pathways for pollution;
- Construction phase pollution prevention procedures in accordance with NIEA requirements and guidance.

9.252 Monitoring of the effect of the Proposed Development on the water environment and fisheries habitat will be provided by the Applicant through physicochemical and biological water quality monitoring. Implementation of the mitigation proposed eliminates or reduces the potential significance to all receptors to "not significant".

9.253 There is no likelihood of significant cumulative impacts over and above any pre-existing effect caused by existing or consented wind development.

10 Acoustic

Introduction

10.1 This chapter considers the likely significant noise effects associated with the construction, operation and decommissioning of the proposed Dunbeg South Extension Wind Farm (herein referred to as the 'Proposed Development'). The specific objectives of the chapter are to:

- describe and define the current baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address the likely significant effects (if any); and,
- assess the residual effects remaining following the implementation of mitigation measures.

10.2 Furthermore, the neighbouring consented Dunbeg South Wind Farm, located to the southwest of the Proposed Development and which is also being developed by RES, has planning condition noise limits applied which relate to a very different cumulative scenario than currently exists, due to a lapsed planning permission and a different scheme now being proposed as an alternative in the area. As a result, it is considered that there is more 'headroom', 'margin or 'remaining noise budget' in which the Dunbeg South site may operate and this assessment also seeks to demonstrate a means of varying the current Dunbeg South Wind Farm planning condition noise limits such that the combined generating capacity of the Proposed Development and the consented Dunbeg South scheme is maximised whilst retaining compliance with overall cumulative noise limiting requirements.

10.3 This assessment has been undertaken by RES, with three in-house Members of the Institute of Acoustics (MIOA) involved in its production. RES has undertaken acoustic impact assessments in every single one of its UK wind farm development applications since 2000 and has also reported to several local planning authorities on operational wind energy projects, and various other renewable energy developments, including taking measurements on newly constructed wind farms to ensure compliance with planning conditions, investigating sources of complaint and determining relevant remedial action where necessary.

10.4 Additionally, RES has been project co-ordinator for several Joule projects (DGXII European Commission funded projects in the field of Research and Technological Development in non-nuclear energy); led European research into wind turbine noise; was involved in producing the guideline 'The Assessment and Rating of Noise from Wind Farms' ETSU for the DTI in 1996; acted as peer reviewer for the 'Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise' (IOA GPG), and contributed to works conducted via RenewableUK work on Amplitude Modulation (AM).

10.5 A list of relevant publications is provided in **Technical Appendix 10.1: Renewable Energy Systems (RES) Publications**.

10.6 This chapter is supported by the following:

- **Technical Appendix 10.1** – Renewable Energy Systems (RES) Publications;
- **Technical Appendix 10.2** – Issues Scoped Out;
- **Technical Appendix 10.3** – Assessment Charts; and,
- **Technical Appendix 10.4** – Curtailment Strategies.

10.7 These Technical Appendices are referenced in the text where relevant.

Legislation, Policy & Guidance

Operation

Planning Policy Statement 18: Renewable Energy

10.8 Within Northern Ireland, noise from wind farms is defined within the planning context by Planning Policy Statement 18: Renewable Energy[1] (PPS 18).

Best Practice Guidance to Planning Policy Statement 18: Renewable Energy

10.9 The Best Practice Guidance to Planning Policy Statement 18: Renewable Energy[2] refers to the use of the Department of Trade and Industry's 'The Assessment and Rating of Noise from Wind Farms' (ETSU-R-97), stating that *"The report, 'The Assessment and Rating of Noise from Wind Farms' (ETSU-R-97), describes a framework for the measurement of wind farm noise and gives indicative noise levels calculated to offer a reasonable degree of protection to wind farm neighbours, without placing unreasonable restrictions on wind farm development."*

10.10 The guide also states that *"There are two quite distinct types of noise source within a wind turbine. The mechanical noise produced by the gearbox, generator and other parts of the drive train; and the aerodynamic noise produced by the passage of the blades through the air. Since the early 1990s there has been a significant reduction in the mechanical noise generated by wind turbines and it is now usually less than, or of a similar level to, the aerodynamic noise. Aerodynamic noise from wind turbines is generally unobtrusive – it is broad-band in nature and in this respect is similar to, for example, the noise of wind in trees."*

ETSU-R-97 The Assessment & Rating of Noise from Wind Farms

10.11 The operational noise assessment methodology described in ETSU-R-97[3] was developed by a working group comprised of a cross section of interested persons including Environmental Health Officers (EHOs), wind farm operators and independent acoustic experts amongst others.

10.12 ETSU-R-97 makes it clear from the outset that any noise restrictions placed on a wind farm must balance the local environmental impact against the national and global benefits that arise through the development of renewable energy resources. The principle

[1] 'Planning Policy Statement 18: Renewable Energy', PPS18, August 2009

[2] 'Best Practice Guidance to Planning Policy Statement 18: Renewable Energy', PPS18, August 2009

[3] 'The Assessment and Rating of Noise from Wind Farms', The Working Group on Noise from Wind Turbines, ETSU Report for the DTI, ETSU-R-97

of balancing development needs against protection of amenity may be considered common to any type of noise control guidance.

10.13 The basic aim of ETSU-R-97, in arriving at the recommendations contained within the report, is the intention to provide *"Indicative noise levels thought to offer a reasonable degree of protection to wind farm neighbours, without placing unreasonable restrictions on wind farm development or adding unduly to the costs and administrative burdens on wind farm developers or local authorities"*.

10.14 ETSU-R-97 has been applied at the vast majority of wind farms currently operating in the UK and provides a robust basis for assessing the noise impact of a wind farm when used in accordance with relevant supplementary guidance. It is the only guidance referenced in Northern Irish planning policy for rating and assessing operational noise from wind turbines. Based on planning policy and guidance, as outlined above, a wind farm which can operate within noise limits derived according to ETSU-R-97 shall be considered acceptable in respect of operational noise.

10.15 It is therefore considered that the use of ETSU-R-97, as criteria for assessment of wind farm noise, fulfils the requirements of PPS18.

A Good Practice Guide to ETSU-R-97 The Assessment and Rating of Noise from Wind Turbines

10.16 A Good Practice Guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise[4] (IOA GPG), issued by the Institute of Acoustics in May 2013 and subsequently endorsed by the Northern Ireland Executive, along with the governments in England, Scotland and Wales, provides guidance on all aspects of the use of ETSU-R-97, reaffirming the recommendations of a previous Acoustics Bulletin[5] article with regard to propagation modelling and wind shear. The assessment presented herein adopts the recommendations of the IOA GPG.

10.17 Supplementary guidance notes were published by the Institute of Acoustics in July and September 2014, and these provide further details on specific areas of the IOA GPG. The assessment presented herein adopts the recommendations made within these supplementary guidance notes.

Construction & Decommissioning

The Control of Noise (Codes of Practice for Construction and Open Sites) Order (Northern Ireland) 2002

10.18 In Northern Ireland, advice on construction noise assessment is referred to in 'The Control of Noise (Codes of Practice for Construction and Open Sites) Order (Northern Ireland) 2002'[6]. This legislation points to BS 5228: Part 1:1997 for guidance on appropriate methods for minimising noise from construction and open sites in Northern Ireland.

[4] 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise - Supplementary Guidance Notes', Institute of Acoustics, July & September 2014.

[5] 'Prediction and Assessment of Wind Turbine Noise', Bowdler et al, Acoustics Bulletin Vol 34 No 2 March/April 2009

[6] 'The Control of Noise (Codes of Practice for Construction and Open Sites) Order (Northern Ireland) 2002', The Department of the Environment, November 2002

BS 5228-1 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Part 1: Noise

10.19 BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 1: Noise[7], which supersedes the 1997 version of the standard, has been identified as being the appropriate source of guidance on appropriate methods for minimising noise from construction activities and is adopted herein. The document provides guidance on construction noise limits, noise modelling techniques and best practicable measures for the reduction of noise generated during construction activities including overpressure from blasting at borrow pits.

BS 5228-2 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Part 2: Vibration

10.20 BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration[8], provides a method for predicting levels of vibration. The document provides guidance on construction vibration limits, vibration modelling techniques and best practicable measures for the reduction of vibration generated during construction activities.

The Pollution Control and Local Government (NI) Order 1978

10.21 The Pollution Control and Local Government (NI) Order 1978[9] provides information on the need for ensuring that best practicable means are employed to minimise noise.

Consultation

10.22 No specific consultation has been undertaken. The average best-fit background noise levels used to inform the assessment provided have been taken from information supporting the various other existing, consented and potential development applications in the area. These have previously been accepted by representatives of the Local Planning Authority (LPA) in their consideration of the other schemes and are also considered appropriate for use here as a result.

Methodology

Scope of Assessment

Operation

10.23 The noise which may be generated by the operation of the Proposed Development in isolation, and cumulatively with other potential developments in the area, has been assessed in full according to documentation referenced within relevant planning policy on noise.

[7] 'Code of Practice for Noise and vibration control on construction and open sites - Part 1: Noise', British Standards Institution, BS 5228-1:2009+A1:2014

[8] 'Code of Practice for Noise and vibration control on construction and open sites - Part 2: Vibration', British Standards Institution, BS 5228-2:2009+A1:2014

[9] 'Pollution Control and Local Government (NI) Order 1978', published by Her Majesty's Stationary Office, 1978

10.24 The assessment incorporates the assessment of operational noise for a range of frequencies most relevant to turbine operation, including that generated at relatively low frequencies. A specific and targeted assessment of low frequency noise (in the frequency range of approximately 20 to 200 Hz) and infrasound (less than 20 Hz) has not been undertaken as this is not required by current planning policy and is considered unjustified based on various research and relevant documentation on these topics.

10.25 The assessment also accounts for the inherent character of noise generated by turbine blades as they pass through the air known as 'blade swish' or amplitude modulation (AM); factors in the effects of wind shear (i.e. the rate of change in wind speed with height above ground level) according to best practice in this regard; accounts for relevant noise propagation effects in terms of topographical valley and shielding considerations and is based on information provided by the manufacturer for a candidate turbine considered for the purposes of this assessment.

10.26 A discussion of relevant research and documentation relating to low frequency noise; infrasound; sleep disturbance; vibration; amplitude modulation; 'wind turbine syndrome'; and health effects associated with the operation of wind turbines in general is provided in **Technical Appendix 10.2**. These topics have not been assessed in any further detail herein other than that required under current planning guidance in this regard.

Construction & Decommissioning

10.27 The construction of turbines, ancillary electrical equipment, compounds and the corresponding access tracks typically occurs at large distances from neighbouring residences. The resultant noise and vibration, which would be temporary in nature, is only very rarely cause for concern in terms of the potential for disturbing the inhabitants of neighbouring residences. Whilst the noise associated with the construction of these aspects may well be audible to people residing in the area, the levels would be below established noise limits and planning requirements in this respect. Nevertheless, typical mitigation measures, including the use of 'best practicable means' would be incorporated into the construction practices for the Proposed Development with a view to reducing noise and vibration levels where possible and practical. As a result, this aspect is discussed in generalised terms with reference to standard noise limiting requirements; typical working practices; hours of work, and standard mitigation measures in this respect. A detailed assessment has not been undertaken and a similar rationale can be applied for noise and vibration impacts associated with decommissioning of the Proposed Development.

10.28 Construction relating to the provision of access to the site, including the upgrade of local roads and their use thereof, may well occur at locations near to residences. As a result, and in instances where this is likely to occur, consideration of enhanced mitigation measures which would be reasonably possible to implement, have been discussed. In any event, typical noise limiting requirements would apply and the contractor undertaking the works would be responsible for potential issues and taking appropriate and reasonable steps to address these should they occur. As a result, this aspect is also discussed in generalised terms and a detailed assessment has not been undertaken as this would require a detailed construction plan to provide confidence in the results, which is not

available at this time. However, certain details as to construction practices would be provided within a Construction Environmental Management Plan (CEMP), with reference to potential noise and vibration impacts, where necessary. An outline CEMP is provided in **Technical Appendix 1.5**.

10.29 Noise and vibration associated with the movement of additional vehicles, including heavy goods vehicles (HGVs) along local roads and access routes may well be noticeable to residents adjacent to these. However, this would essentially only result in a minor increase in the average noise levels from existing roads, with the most noticeable noise and perceptible vibration effects resulting from the sporadic and increased number of HGV pass-bys at residences along the access routes, with resulting levels for individual events being similar to that created by existing HGV movements.

Establishing Baseline Conditions

Operation

10.30 The ETSU-R-97 and IOA GPG operational assessment methodology requires the comparison of predicted noise levels due to turbine emissions (which vary with hub height wind speed) with noise limits based upon the noise levels already existing under those same conditions (i.e. the baseline). This is similar, in principle, to the assessment of other noise generating facilities which are required to be assessed according to BS 4142 Methods for rating and assessing industrial and commercial sound[10] for which ETSU-R-97 identifies the 1990[11] and, at the time, soon to be released 1997[12] version as forming the basis of its recommendations.

10.31 Since background noise levels in rural environments often vary with induced noise generated by the wind passing through trees and foliage surrounding dwellings and that wind turbine noise emissions also vary with wind speed, it is important that this context is considered when conducting reference measurements.

10.32 Thus, the assessment of background noise levels at potentially sensitive residential properties requires the measurement of not only noise levels, but concurrent wind conditions, covering a representative range of wind speeds. These wind measurements are made at the site rather than at the residential properties since it is this wind speed that would subsequently govern the Proposed Development's sound generation. Occasionally, the residential properties themselves will be sheltered from the wind and may consequently have relatively low background sound levels, even at high wind speeds.

10.33 To establish the baseline conditions, sound level meters and associated apparatus are set-up to record the required acoustic information at a selection of the nearest residential properties geographically spread around the site which are likely to be representative of other residential properties in the locale.

10.34 In order to establish the background/baseline noise levels considered representative of properties neighbouring the Proposed Development, the measurement data is separated in to two sets, as specified by ETSU-R-97 and shown in **Table 10.1**.

[10] 'Methods for rating and assessing industrial and commercial sound', BSI, BS 4142:2014 + A1:2019, June 2019

[11] 'Method for Rating Industrial Noise affecting Mixed Residential and Industrial Areas', BSI, 1990

[12] 'Method for Rating Industrial Noise affecting Mixed Residential and Industrial Areas', BSI, 1997

Table 10.1 - Definition of Quiet Daytime & Night-time Periods

Time of Day	Definition
Quiet Daytime	18:00 - 23:00 Every Day 13:00 - 18:00 Saturday 07:00 - 18:00 Sunday
Night-time	23:00 - 07:00 Every Day

10.35 Any data affected by the pattering of rainfall at the measurement location and on the measurement equipment itself, which can result in increased measured noise levels, is systematically removed from the acoustic data set. To facilitate this, a tipping bucket rain gauge is deployed at the site to record 10-minute rainfall data and identify potentially affected noise data. Both the 10-minute period containing the bucket tip and the preceding 10-minute period are removed from the dataset as recommended in the IOA GPG. This is to account for the time it takes for the tipping bucket to fill.

10.36 Periods of measured background noise data thought to be affected by extraneous (i.e. non-typical, noise sources) are identified and removed from the data set. Whilst some 'extraneous' data may actually be real, this tends to bias trend lines upwards, so is removed as a conservative measure.

10.37 In practice, the above means close inspection of the measured background noise levels, comparison with concurrent data measured at nearby locations and consideration of both directional and temporal variation in the measured noise levels. This may include filtering of data to remove any data affected by dawn chorus, the presence of boiler flues, increased traffic movements during certain times and obvious effects correlated to the wind direction experienced during the survey with due regard to the location of the property relative to the Proposed Development site.

Construction & Decommissioning

10.38 Baseline background and ambient levels of noise and vibration area are consistent with that of a rural environment, as discussed elsewhere within this Chapter. No formal quantification of current levels has been supplied as this is not considered relevant to the overall construction and decommissioning noise and vibration discussion.

Assessment Criteria

Operation

10.39 ETSU-R-97 seeks to protect the internal and external amenity of wind farm neighbours by defining acceptable limits for operational noise from wind turbines. The test applied to operational noise is whether or not the noise levels produced by the combined operation of the wind turbines lie below noise limits derived in accordance with ETSU-R-97 at nearby residential properties.

10.40 Whilst ETSU-R-97 presents a comprehensive and detailed assessment methodology for wind farm noise, it also provides a simplified methodology, stating that "if the noise is limited to an $L_{A90,10min}$ of 35 dB(A) up to wind speeds of 10 m.s^{-1} at 10 m height, then these conditions alone would offer sufficient protection of amenity, and background noise surveys would be unnecessary".

10.41 As part of the detailed methodology, ETSU-R-97 states that different limits should be applied during daytime and night-time periods. The daytime limits, derived from the background noise levels measured during 'quiet daytime' periods, are intended to preserve outdoor amenity, while the night-time limits are intended to prevent sleep disturbance. The general principle is that the noise limits should be based on existing background noise levels, except for low background noise levels, in which case a fixed limit may be applied. The suggested limits are given in **Table 10.2**, where L_B is the average background $L_{A90,10min}$ as a function of wind speed. During daytime periods and at low background noise levels, a lower fixed limit of 35-40 dB L_{A90} is applicable. The exact value is dependent upon factors including the number of nearby dwellings, the effect of the noise limits on energy produced and the duration and level of exposure.

Table 10.2 - Permissible Noise Criteria

Time of Day	Permissible Noise Level
Daytime	35-40 dB(A) for L_B less than 30-35 dB(A) L_B + 5 dB, for L_B greater than 30-35 dB(A)
Night-time	43 dB(A) for L_B less than 38 dB(A) L_B + 5 dB, for L_B greater than 38 dB(A)

10.42 It should be noted that a higher noise level is permissible during the night than during the day as it is assumed that residents would be indoors during the night-time. The night-time criterion is derived from sleep disturbance criterion referred to in ETSU-R-97, with an allowance of 10 dB for attenuation through an open window.

10.43 Further to the above, the absolute lower noise limits may be increased up to 45 dB(A) for both daytime and night-time periods if the occupant of a property has a financial involvement in the Proposed Development.

10.44 The wind speeds considered for the impact assessment are less than or equal to a standardised 10 m height wind speed of 12 $m.s^{-1}$ as these are expected to be the wind speeds that are critical to the assessment. Above these wind speeds, as stated in ETSU-R-97, reliable measurements of background and turbine noise are difficult to make. However, if a wind farm meets the noise criteria at the wind speeds presented, it is most unlikely that it would cause any greater loss of amenity at higher wind speeds due to increasing background noise levels masking the potential noise generated by the wind farm.

10.45 It is important to note that, since reactions to noise are subjective, it is not possible to guarantee that a given development would not result in any adverse comment regarding noise as the response to any given noise will vary from person to person. Consequently, standards and guidance that relate to environmental noise are typically presented in terms of criteria that would be expected to be considered acceptable by the majority of the population.

10.46 As a result of the above, where turbine noise levels are predicted to meet the noise limits specified as part of ETSU-R-97, these are considered not significant.

Construction & Decommissioning

10.47 Construction and decommissioning noise are discussed with reference to Annex E of BS 5228-1:2009+A1:2014, which provides guidance on setting environmental noise targets. Several methods of assessing the significance of noise levels are presented in Annex E with the ABC method being the most applicable to the construction of the Proposed Development.

10.48 The ABC method sets threshold noise levels for construction noise for specific periods based on the pre-existing ambient noise levels, subject to average lower Category A limiting values of 65, 55 and 45 dB L_{Aeq} for daytime (07:00 - 19:00 weekdays and Saturdays 07:00 – 13:00), evenings and weekends (19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays) and night-time (23:00 – 07:00) periods respectively, for instances where existing ambient noise levels are relatively low, which is the case here.

10.49 BS 6472-2:2008 details the maximum satisfactory magnitudes for vibration measured on a firm surface outside buildings with respect to human response. The generally accepted maximum satisfactory magnitude at residential premises during daytime periods (08:00 – 18:00 Monday to Friday and 08:00 – 13:00 on Saturdays), is a peak particle velocity (ppv) of 6.0 to 10.0 $mm.s^{-1}$. In practice, the lower satisfactory magnitude should be used with the higher magnitude being justified on a case-by-case basis.

10.50 Where it is considered that the levels of construction noise and vibration can meet the relevant limits for each aspect or that appropriate controls or mitigation can be put in place, the resultant impact is considered not significant.

Noise Propagation Modelling

Operation

10.51 Whilst there are several sound propagation models available, the ISO 9613 Part 2[13] model has been used, this being identified as most appropriate for use in such rural sites[14]. The specific interpretation of the ISO 9613 Part 2 propagation methodology recommended in the IOA GPG has been employed.

10.52 To conduct noise predictions, it is assumed that:

- the turbines at the Proposed Development are identical;
- the turbines radiate noise at the sound power levels specified in this report;
- the turbines are modelled as a point source at the hub-height of each; and,
- each residential property is assigned a reference height to simulate the presence of an observer.

10.53 The sound propagation model takes account of attenuation due to geometric spreading and atmospheric absorption corresponding to 10 °C and 70 % respectively, as provided within ISO 9613-1[15]. Ground effects are also taken into account with a ground factor of 0.5 and a receiver height of 4 m used as recommended in the IOA GPG.

[13] 'Acoustics - Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation', International Organisation for Standardisation, ISO 9613-2:1996

[14] 'A Critical Appraisal of Wind Farm Noise Propagation', ETSU Report W/13/00385/REP, January 2000

[15] 'Acoustics - Attenuation of sound during propagation outdoors - Part 1: Calculation of the absorption of sound by the atmosphere', International Organisation for Standardisation, June 1993

10.54 The barrier attenuations predicted by ISO 9613-2 have been shown to be significantly greater than those measured in practice under downwind conditions[14]. Therefore, barrier attenuation according to the ISO 9613-2 method has been discounted. In lieu of this, where there is no direct line of sight between the residential property in question and any part of the wind turbine, 2 dB attenuation has been assumed, as also recommended in the IOA GPG.

10.55 Verification studies have also shown that ISO 9613-2 tends to slightly underestimate noise levels at nearby dwellings in certain exceptional cases, notably in a valley type environment where the ground drops off between source and receiver[16]. Where this is the case, 3 dB has been added to the overall A weighted noise level, as recommended by the IOA GPG. To generate the ground cross sections between each turbine and each dwelling necessary for reliable propagation modelling, ground contours at 5 m intervals for the area of interest have been generated from 50 m grid resolution digital terrain data.

10.56 Additionally, rather than making a conservative assumption that properties are always downwind of the wind farm, a more detailed assessment, which incorporates the effects of wind direction has been undertaken. This accounts for the fact that noise levels at a property will be less when the property is crosswind or upwind of the development. The directional attenuation factors applied, as shown in **Table 10.3**, are consistent with the recommendations of the IOA GPG, with reductions in noise of around 2 dB when a receiver is crosswind, and up to 10 dB when a receiver is upwind of a particular turbine. The IOA GPG also states that upwind reductions in noise level will only come into play gradually at distances of between 5 and 10 tip heights. As a result, these attenuation factors applied have been adjusted by the distance between the source and receiver accordingly.

Table 10.3 – Directional Attenuation

Direction Offset from Downwind, °	0	30	60	90	120	150	180	210	240	270	300	330
Directional Attenuation Factor, dB	0	0	0	2	6.7	9.3	10	9.3	6.7	2	0	0

10.57 The predicted noise levels are calculated as L_{Aeq} noise levels and changed to the L_{A90} descriptor (to allow comparisons to be made) by subtraction of 2 dB, as specified as part of ETSU-R-97 and reaffirmed within the IOA GPG.

10.58 It has been shown by measurement-based verification studies[16] that the ISO 9613-2 model can provide a high degree of accuracy when calculating far field noise levels from elevated sources when the exceptional cases identified above are corrected for. Examples of conservative assumptions modelled which increase the likelihood of the calculated noise levels being an overestimate are that:

- although, in reality, the ground is predominantly porous (acoustically absorptive) it has been modelled as 'mixed', i.e. a combination of hard and porous, corresponding to a ground absorption coefficient of 0.5 as recommended by the IOA GPG;
- receiver heights are modelled at 4 m above local ground level;

[16] 'Development of a Wind Farm Noise Propagation Prediction Model', J H Bass, A J Bullmore, E Sloth, JOR3-CT95-0051, May 1998

- trees and other non-terrain shielding effects have not been considered; and
- an allowance for measurement uncertainty has been included in the sound power levels for the presented turbine models.

10.59 The assumed locations of the turbines which comprise the Proposed Development, the consented Dunbeg South scheme and the existing Dunmore and Dunbeg wind farms neighbouring the site are provided in **Table 10.4**.

Table 10.4 - Turbine Locations

Turbine	Co-Ordinates		Turbine	Co-Ordinates	
	Easting	Northing		Easting	Northing
Dunbeg South Extension			DM4	275028	428631
T1	274345	426041	DM5	275357	428460
T2	274758	425676	DM6	275736	428394
T3	275096	426098	DM7	275661	428763
T4	274543	426407	**Dunbeg**		
Dunbeg South			DB1	275751	427948
T1	273139	425212	DB2	275814	427553
T2	273584	425290	DB3	275853	427209
T3	273367	424945	DB4	275966	426873
T4	273611	424677	DB5	275516	427600
T5	273939	425275	DB6	275482	427244
T6	274080	424814	DB7	274909	427508
T7	274395	425079	DB8	275025	426850
T8	274530	425405	DB9	274556	427226
T9	274276	425694	DB10	274572	427599
Dunmore			DB11	275248	426663
DM1	274530	428445	DB12	275202	427765
DM2	274589	427874	DB13	275556	426885
DM3	274837	428242	DB14	274909	427190

10.60 The locations of the nearest residential properties to the turbines have been determined by inspection of relevant maps, address databases and via site visits. More residential properties may have been identified but have not been considered critical to this assessment and/or may be adequately represented by another residential property. The locations considered are listed in **Table 10.5**.

Table 10.5 - House Locations

House	Co-Ordinates		House	Co-Ordinates	
	Easting	Northing		Easting	Northing
H6	273008	426728	H26	272854	423282
H7	272472	426376	H27	272909	423356
H8	272444	426346	H28	273010	423273
H9	272232	426087	H29	273975	423247

House	Co-Ordinates		House	Co-Ordinates	
	Easting	Northing		Easting	Northing
H10	272050	425810	H30	273989	423241
H11	271738	425476	H31	273981	423277
H12	271705	425389	H32	274145	423178
H13	271625	425273	H33	274414	423279
H14	271608	425251	H34	274449	423291
H15	271755	424863	H35	274862	423484
H16	271796	424809	H36	274901	423478
H17	271778	424682	H37	274972	423478
H18	271807	424666	H38	274987	423479
H19	271855	424613	H39	275513	423379
H21	271750	424052	H40	273923	422996
H22	271921	423842	H41	273812	427187
H23	271951	423759	H42	273315	426910
H24	272280	423403	H43	273777	427131
H25	272406	423257	H44	273785	427222

10.61 The candidate turbine model for the Proposed Development is the Vestas V117 4.3 MW turbine with a hub-height of 91.5 m and serrated trailing edge (STE) blade modifications. This model of turbine can operate in a variety of modes which may be implemented for numerous parameters not limited to wind speed, direction and time. Whilst the actual turbine to be procured and installed at the site is not yet finalised, this model is considered representative of a range of turbines, with similar dimensions and rated powers that could be installed. Acoustic emission data from the manufacturers' general specification for this machine is used in the analysis[17] which is also applicable to the 4.0/4.2 MW turbine variants.

10.62 The assumed turbine model at the consented Dunbeg South Wind Farm site is also the Vestas V117 4.3 MW STE. As such, the same acoustic emission data is used for the analysis.

10.63 The turbine models installed at the existing Dunmore and Dunbeg wind farm sites are the Vestas V90 3 MW and Enercon E82 3 MW turbines with hub heights of 80 and 84 m, respectively. Acoustic emission data for each machine is used in the analysis, as taken from the information supporting the various planning applications for each development[18,19].

10.64 The manufacturers of the various turbines have identified the sound power levels values as warranted. Nevertheless, 2 dB has been added to the specified levels for all turbine models as a conservative measure and as recommended by the IOA GPG.

[17] "Performance Specification V117-4.0/4.2 MW 50/60 Hz Strong Wind", Doc. No.: 0067-7063 V05, Vestas, September 2018

[18] "Dunmore 2 Wind Farm – Noise Impact Assessment", Hayes McKenzie, Report HM: 2776/R1, October 2013

[19] "Dunbeg Wind Farm Extension Environmental Statement, Chapter 11 – Noise Impact Assessment", Gaelectric Developments Ltd, December 2015

10.65 **Table 10.6** shows the overall sound power levels, including for a variety of operational modes which could be implemented at the Proposed Development, over a range of standardised 10 m height wind speeds for the turbine models considered as part of the assessments (inc. cumulative) provided herein.

Table 10.6 – Sound Power Levels, dB L_{WA}

Model	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
Vestas V117 4.3 MW STE - 91.5 m Hub Height										
PO2	94.7	98.0	102.2	106.0	107.9	108.0	108.0	108.0	108.0	108.0
SO1	95.1	98.0	102.2	105.5	106.9	107.0	107.0	107.0	107.0	107.0
SO2	95.1	98.0	102.1	104.0	104.3	104.5	104.9	105.0	105.0	105.0
SO3	95.1	98.0	101.9	102.9	103.0	103.0	103.0	103.0	103.0	103.0
Vestas V90 3 MW – 80 m Hub Height										
V90	101.2	101.2	104.3	107.3	109.6	110.5	110.5	110.5	110.5	110.5
Enercon E82 E4 3MW – 84 m Hub Height										
E82	100.0	100.0	100.0	104.0	107.0	108.0	108.0	108.0	108.0	108.0

10.66 **Table 10.7** shows the octave band noise levels corresponding to the maximum noise output for each respective turbine model, as also based on manufacturers specifications[20], as provided separately for the V117 turbine, and from the various noise information supporting planning applications for the various other developments, including for the relevant uncertainty.

Table 10.7 – Octave Band Sound Power Levels, dB L_{WA}

Model	Overall, dB L_{WA}	Centre of Octave Band (A-Weighted), Hz							
		63	125	250	500	1k	2k	4k	8k
V117	108.0	88.4	95.5	100.2	102.5	102.4	99.8	94.9	87.5
V90	110.5	95.3	97.5	100.8	103.1	105.3	104.0	100.2	90.2
E82	108.0	88.5	95.8	102.0	103.4	100.5	98.2	93.9	87.1

10.67 The turbine models are assumed not to have any tonal noise output that would attract a penalty at neighbouring residences as per the requirements of ETSU-R-97. Nevertheless, a warranty or guarantee would be obtained from the manufacturer which limits the level of tonal noise associated with the operation of the individual turbines (or the site as a whole), should the site be granted planning consent, and a finalised turbine model is procured. This would also help to provide appropriate recourse with the turbine manufacturer should tonal noise be present.

Construction & Decommissioning

10.68 BS 5228 provides various means of predicting construction and decommissioning noise and vibration levels from various plant and supplies a wide range of generic plant source noise levels for this purpose. However, as discussed earlier, the construction of the Proposed Development is not expected to have any significant impacts given the distance of the

[20] "V117-4.3 MW Third octave noise emission (Strong wind & Typhoon)", Doc. No. 0081-4480 V00 Vestas, Dec 2018

turbines from neighbouring properties and the generic nature of the works. As a result, specific construction noise predictions have not been undertaken and only a discursive assessment is provided.

Baseline Conditions

Operation

10.69 The Proposed Development is located approximately 7 km north-east of Limavady. The surrounding area is predominantly rural in nature with an A-class road (the A37) running between the proposed turbines. The general noise character is typical of a rural environment with the addition of traffic noise from the A37.

10.70 The Environmental Statement (ES) for the neighbouring consented Dunbeg South Wind Farm (Planning Reference LA01/2018/0200/F) contains the results of background noise monitoring undertaken in support of the planning application for the development. A survey was undertaken at three locations neighbouring the site and the collected data was reviewed and analysed in accordance with ETSU-R-97 and the IOA GPG. The derived background noise levels are further supplemented by survey information supporting the planning application for the operational Dunbeg Wind Farm (Appeal Reference 2009/A0363). The results are shown in **Table 10.8** and the corresponding overall ETSU-R-97 limits are shown in **Table 10.9** for reference.

10.71 The various levels have been accepted by representatives of Causeway Coast & Glens Borough Council in their consideration of two or more neighbouring consented and operational developments and are also considered appropriate for use here as a result.

Table 10.8 – Average (Best-Fit) Background Noise Levels, dB L_{A90}

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
Quiet Daytime										
H9	34.6	35.2	36.0	37.1	38.5	40.3	42.4	45.0	45.0	45.0
H25	32.8	33.7	34.8	36.1	37.7	39.5	41.6	44.1	44.1	44.1
H40	34.7	35.7	37.0	38.6	40.5	42.6	44.8	47.2	47.2	47.2
H41	37.9	38.8	39.8	40.8	42.1	43.5	45.1	46.9	48.9	51.2
Night-time										
H9	28.9	29.4	30.3	31.5	33.4	35.9	39.4	39.4	39.4	39.4
H25	29.0	29.3	29.6	30.3	31.5	33.6	36.7	36.7	36.7	36.7
H40	29.2	29.7	30.5	31.9	34.1	37.2	41.6	41.6	41.6	41.6
H41	35.0	35.5	36.4	37.6	39.1	40.8	42.8	45.1	47.5	50.1

Table 10.9 – Operational Noise Limits, dB L_{A90}

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
Daytime										
H9	40.0	40.2	41.0	42.1	43.5	45.3	47.4	50.0	50.0	50.0

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H25	40.0	40.0	40.0	41.1	42.7	44.5	46.6	49.1	49.1	49.1
H40	40.0	40.7	42.0	43.6	45.5	47.6	49.8	52.2	52.2	52.2
H41	42.9	43.8	44.8	45.8	47.1	48.5	50.1	51.9	53.9	56.2
Night-time										
H9	43.0	43.0	43.0	43.0	43.0	43.0	44.4	44.4	44.4	44.4
H25	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
H40	43.0	43.0	43.0	43.0	43.0	43.0	46.6	46.6	46.6	46.6
H41	43.0	43.0	43.0	43.0	44.1	45.8	47.8	50.1	52.5	55.1

10.72 The derived noise limits are assigned to each of the assessment locations identified in **Table 10.10** based on the relative proximity of the monitoring location to the assessment locations. Where there is ambiguity in this respect, the noise limits are applied on a basis that is considered conservative.

Table 10.10 – Application of Noise Limits

House	Co-Ordinates		Applied Noise Limit
	Easting	Northing	
H6	273008	426728	H9
H7	272472	426376	H9
H8	272444	426346	H9
H9	272232	426087	H9
H10	272050	425810	H9
H11	271738	425476	H9
H12	271705	425389	H9
H13	271625	425273	H9
H14	271608	425251	H9
H15	271755	424863	H9
H16	271796	424809	H9
H17	271778	424682	H9
H18	271807	424666	H9
H19	271855	424613	H25
H21	271750	424052	H25
H22	271921	423842	H25
H23	271951	423759	H25
H24	272280	423403	H25
H25	272406	423257	H25
H26	272854	423282	H25
H27	272909	423356	H25
H28	273010	423273	H25

House	Co-Ordinates		Applied Noise Limit
	Easting	Northing	
H29	273975	423247	H40
H30	273989	423241	H40
H31	273981	423277	H40
H32	274145	423178	H40
H33	274414	423279	H40
H34	274449	423291	H40
H35	274862	423484	H40
H36	274901	423478	H40
H37	274972	423478	H40
H38	274987	423479	H40
H39	275513	423379	H40
H40	273923	422996	H40
H41	273812	427187	H41
H42	273315	426910	H9
H43	273777	427131	H41
H44	273785	427222	H41

10.73 **Table 10.11** shows the corresponding daytime and night-time noise limits at the residential assessment locations considered here. These limits are intended to apply to the cumulative impact of operational noise from the Proposed Development and the other existing, planned or permitted development near the site to determine whether the combined operation of the sites would be acceptable under current planning guidance.

Table 10.11 – Overall Noise Limits, dB L_{A90}

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
Daytime										
H6	40.0	40.2	41.0	42.1	43.5	45.3	47.4	50.0	50.0	50.0
H7	40.0	40.2	41.0	42.1	43.5	45.3	47.4	50.0	50.0	50.0
H8	40.0	40.2	41.0	42.1	43.5	45.3	47.4	50.0	50.0	50.0
H9	40.0	40.2	41.0	42.1	43.5	45.3	47.4	50.0	50.0	50.0
H10	40.0	40.2	41.0	42.1	43.5	45.3	47.4	50.0	50.0	50.0
H11	40.0	40.2	41.0	42.1	43.5	45.3	47.4	50.0	50.0	50.0
H12	40.0	40.2	41.0	42.1	43.5	45.3	47.4	50.0	50.0	50.0
H13	40.0	40.2	41.0	42.1	43.5	45.3	47.4	50.0	50.0	50.0
H14	40.0	40.2	41.0	42.1	43.5	45.3	47.4	50.0	50.0	50.0
H15	40.0	40.2	41.0	42.1	43.5	45.3	47.4	50.0	50.0	50.0
H16	40.0	40.2	41.0	42.1	43.5	45.3	47.4	50.0	50.0	50.0
H17	40.0	40.2	41.0	42.1	43.5	45.3	47.4	50.0	50.0	50.0

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H18	40.0	40.2	41.0	42.1	43.5	45.3	47.4	50.0	50.0	50.0
H19	40.0	40.0	40.0	41.1	42.7	44.5	46.6	49.1	49.1	49.1
H21	40.0	40.0	40.0	41.1	42.7	44.5	46.6	49.1	49.1	49.1
H22	40.0	40.0	40.0	41.1	42.7	44.5	46.6	49.1	49.1	49.1
H23	40.0	40.0	40.0	41.1	42.7	44.5	46.6	49.1	49.1	49.1
H24	40.0	40.0	40.0	41.1	42.7	44.5	46.6	49.1	49.1	49.1
H25	40.0	40.0	40.0	41.1	42.7	44.5	46.6	49.1	49.1	49.1
H26	40.0	40.0	40.0	41.1	42.7	44.5	46.6	49.1	49.1	49.1
H27	40.0	40.0	40.0	41.1	42.7	44.5	46.6	49.1	49.1	49.1
H28	40.0	40.0	40.0	41.1	42.7	44.5	46.6	49.1	49.1	49.1
H29	40.0	40.7	42.0	43.6	45.5	47.6	49.8	52.2	52.2	52.2
H30	40.0	40.7	42.0	43.6	45.5	47.6	49.8	52.2	52.2	52.2
H31	40.0	40.7	42.0	43.6	45.5	47.6	49.8	52.2	52.2	52.2
H32	40.0	40.7	42.0	43.6	45.5	47.6	49.8	52.2	52.2	52.2
H33	40.0	40.7	42.0	43.6	45.5	47.6	49.8	52.2	52.2	52.2
H34	40.0	40.7	42.0	43.6	45.5	47.6	49.8	52.2	52.2	52.2
H35	40.0	40.7	42.0	43.6	45.5	47.6	49.8	52.2	52.2	52.2
H36	40.0	40.7	42.0	43.6	45.5	47.6	49.8	52.2	52.2	52.2
H37	40.0	40.7	42.0	43.6	45.5	47.6	49.8	52.2	52.2	52.2
H38	40.0	40.7	42.0	43.6	45.5	47.6	49.8	52.2	52.2	52.2
H39	40.0	40.7	42.0	43.6	45.5	47.6	49.8	52.2	52.2	52.2
H40	40.0	40.7	42.0	43.6	45.5	47.6	49.8	52.2	52.2	52.2
H41	42.9	43.8	44.8	45.8	47.1	48.5	50.1	51.9	53.9	56.2
H42	40.0	40.2	41.0	42.1	43.5	45.3	47.4	50.0	50.0	50.0
H43	42.9	43.8	44.8	45.8	47.1	48.5	50.1	51.9	53.9	56.2
H44	42.9	43.8	44.8	45.8	47.1	48.5	50.1	51.9	53.9	56.2
Night-time										
H6	43.0	43.0	43.0	43.0	43.0	43.0	44.4	44.4	44.4	44.4
H7	43.0	43.0	43.0	43.0	43.0	43.0	44.4	44.4	44.4	44.4
H8	43.0	43.0	43.0	43.0	43.0	43.0	44.4	44.4	44.4	44.4
H9	43.0	43.0	43.0	43.0	43.0	43.0	44.4	44.4	44.4	44.4
H10	43.0	43.0	43.0	43.0	43.0	43.0	44.4	44.4	44.4	44.4
H11	43.0	43.0	43.0	43.0	43.0	43.0	44.4	44.4	44.4	44.4
H12	43.0	43.0	43.0	43.0	43.0	43.0	44.4	44.4	44.4	44.4
H13	43.0	43.0	43.0	43.0	43.0	43.0	44.4	44.4	44.4	44.4
H14	43.0	43.0	43.0	43.0	43.0	43.0	44.4	44.4	44.4	44.4

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H15	43.0	43.0	43.0	43.0	43.0	43.0	44.4	44.4	44.4	44.4
H16	43.0	43.0	43.0	43.0	43.0	43.0	44.4	44.4	44.4	44.4
H17	43.0	43.0	43.0	43.0	43.0	43.0	44.4	44.4	44.4	44.4
H18	43.0	43.0	43.0	43.0	43.0	43.0	44.4	44.4	44.4	44.4
H19	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
H21	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
H22	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
H23	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
H24	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
H25	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
H26	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
H27	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
H28	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
H29	43.0	43.0	43.0	43.0	43.0	43.0	46.6	46.6	46.6	46.6
H30	43.0	43.0	43.0	43.0	43.0	43.0	46.6	46.6	46.6	46.6
H31	43.0	43.0	43.0	43.0	43.0	43.0	46.6	46.6	46.6	46.6
H32	43.0	43.0	43.0	43.0	43.0	43.0	46.6	46.6	46.6	46.6
H33	43.0	43.0	43.0	43.0	43.0	43.0	46.6	46.6	46.6	46.6
H34	43.0	43.0	43.0	43.0	43.0	43.0	46.6	46.6	46.6	46.6
H35	43.0	43.0	43.0	43.0	43.0	43.0	46.6	46.6	46.6	46.6
H36	43.0	43.0	43.0	43.0	43.0	43.0	46.6	46.6	46.6	46.6
H37	43.0	43.0	43.0	43.0	43.0	43.0	46.6	46.6	46.6	46.6
H38	43.0	43.0	43.0	43.0	43.0	43.0	46.6	46.6	46.6	46.6
H39	43.0	43.0	43.0	43.0	43.0	43.0	46.6	46.6	46.6	46.6
H40	43.0	43.0	43.0	43.0	43.0	43.0	46.6	46.6	46.6	46.6
H41	43.0	43.0	43.0	43.0	44.1	45.8	47.8	50.1	52.5	55.1
H42	43.0	43.0	43.0	43.0	43.0	43.0	44.4	44.4	44.4	44.4
H43	43.0	43.0	43.0	43.0	44.1	45.8	47.8	50.1	52.5	55.1
H44	43.0	43.0	43.0	43.0	44.1	45.8	47.8	50.1	52.5	55.1

Construction & Decommissioning

10.74 Background/baseline noise levels detailed above are relatively low, as would be expected for a rural area such as that considered here, and existing ambient noise levels are also considered low. As a result, lower limiting values, as discussed previously with reference to the 'ABC method' provided within BS 5228-1, are used to inform discussion as to the potential impacts during construction.

10.75 Existing sources of vibration in the area are expected to be related to HGV movements along local roads, localised construction/maintenance activities and the occasional earthquake and/or tremor, which may well be perceptible to people in the locale but with a certain level of habituation for some residents depending on the source. In general, existing sources of vibration are expected to be intermittent and would not be expected to be significant in terms of normal guidance in this respect.

Potential Impacts

Operation

10.76 **Table 10.12** shows the maximum predicted operational noise levels for any given wind direction (i.e. downwind in this instance) resulting from the introduction of the Proposed Development operating in isolation at the nearest residential properties using the methodology detailed above and over a range of wind speeds.

Table 10.12 – Dunbeg South Extension Predicted Operational Noise Levels, dB L_{A90}

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H6	19.5	22.8	27.0	30.8	32.7	32.8	32.8	32.8	32.8	32.8
H7	18.0	21.3	25.5	29.3	31.2	31.3	31.3	31.3	31.3	31.3
H8	17.9	21.2	25.4	29.2	31.1	31.2	31.2	31.2	31.2	31.2
H9	15.5	18.8	23.0	26.8	28.7	28.8	28.8	28.8	28.8	28.8
H10	14.5	17.8	22.0	25.8	27.7	27.8	27.8	27.8	27.8	27.8
H11	12.9	16.2	20.4	24.2	26.1	26.2	26.2	26.2	26.2	26.2
H12	12.7	16.0	20.2	24.0	25.9	26.0	26.0	26.0	26.0	26.0
H13	12.2	15.5	19.7	23.5	25.4	25.5	25.5	25.5	25.5	25.5
H14	12.2	15.5	19.7	23.5	25.4	25.5	25.5	25.5	25.5	25.5
H15	12.2	15.5	19.7	23.5	25.4	25.5	25.5	25.5	25.5	25.5
H16	11.5	14.8	19.0	22.8	24.7	24.8	24.8	24.8	24.8	24.8
H17	11.2	14.5	18.7	22.5	24.4	24.5	24.5	24.5	24.5	24.5
H18	11.3	14.6	18.8	22.6	24.5	24.6	24.6	24.6	24.6	24.6
H19	10.2	13.5	17.7	21.5	23.4	23.5	23.5	23.5	23.5	23.5
H21	8.8	12.1	16.3	20.1	22.0	22.1	22.1	22.1	22.1	22.1
H22	8.8	12.1	16.3	20.1	22.0	22.1	22.1	22.1	22.1	22.1
H23	8.7	12.0	16.2	20.0	21.9	22.0	22.0	22.0	22.0	22.0
H24	8.7	12.0	16.2	20.0	21.9	22.0	22.0	22.0	22.0	22.0
H25	8.6	11.9	16.1	19.9	21.8	21.9	21.9	21.9	21.9	21.9
H26	9.6	12.9	17.1	20.9	22.8	22.9	22.9	22.9	22.9	22.9
H27	10.0	13.3	17.5	21.3	23.2	23.3	23.3	23.3	23.3	23.3
H28	9.9	13.2	17.4	21.2	23.1	23.2	23.2	23.2	23.2	23.2
H29	11.3	14.6	18.8	22.6	24.5	24.6	24.6	24.6	24.6	24.6

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H30	11.3	14.6	18.8	22.6	24.5	24.6	24.6	24.6	24.6	24.6
H31	11.5	14.8	19.0	22.8	24.7	24.8	24.8	24.8	24.8	24.8
H32	11.2	14.5	18.7	22.5	24.4	24.5	24.5	24.5	24.5	24.5
H33	11.8	15.1	19.3	23.1	25.0	25.1	25.1	25.1	25.1	25.1
H34	11.9	15.2	19.4	23.2	25.1	25.2	25.2	25.2	25.2	25.2
H35	12.9	16.2	20.4	24.2	26.1	26.2	26.2	26.2	26.2	26.2
H36	12.8	16.1	20.3	24.1	26.0	26.1	26.1	26.1	26.1	26.1
H37	12.8	16.1	20.3	24.1	26.0	26.1	26.1	26.1	26.1	26.1
H38	12.8	16.1	20.3	24.1	26.0	26.1	26.1	26.1	26.1	26.1
H39	11.8	15.1	19.3	23.1	25.0	25.1	25.1	25.1	25.1	25.1
H40	10.3	13.6	17.8	21.6	23.5	23.6	23.6	23.6	23.6	23.6
H41	23.5	26.8	31.0	34.8	36.7	36.8	36.8	36.8	36.8	36.8
H42	20.9	24.2	28.4	32.2	34.1	34.2	34.2	34.2	34.2	34.2
H43	23.7	27.0	31.2	35.0	36.9	37.0	37.0	37.0	37.0	37.0
H44	22.6	25.9	30.1	33.9	35.8	35.9	35.9	35.9	35.9	35.9

10.77 **Table 10.13** shows the margin by which the predicted operational noise levels resulting from the introduction of the Proposed Development meets the noise limits set out in **Table 10.11**. A positive number indicates that levels are below the relevant limits.

Table 10.13 – Dunbeg South Extension Margin of Compliance, dB

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
Daytime										
H6	20.5	17.4	14.0	11.3	10.8	12.5	14.6	17.2	17.2	17.2
H7	22.0	18.9	15.5	12.8	12.3	14.0	16.1	18.7	18.7	18.7
H8	22.1	19.0	15.6	12.9	12.4	14.1	16.2	18.8	18.8	18.8
H9	24.5	21.4	18.0	15.3	14.8	16.5	18.6	21.2	21.2	21.2
H10	25.5	22.4	19.0	16.3	15.8	17.5	19.6	22.2	22.2	22.2
H11	27.1	24.0	20.6	17.9	17.4	19.1	21.2	23.8	23.8	23.8
H12	27.3	24.2	20.8	18.1	17.6	19.3	21.4	24.0	24.0	24.0
H13	27.8	24.7	21.3	18.6	18.1	19.8	21.9	24.5	24.5	24.5
H14	27.8	24.7	21.3	18.6	18.1	19.8	21.9	24.5	24.5	24.5
H15	27.8	24.7	21.3	18.6	18.1	19.8	21.9	24.5	24.5	24.5
H16	28.5	25.4	22.0	19.3	18.8	20.5	22.6	25.2	25.2	25.2
H17	28.8	25.7	22.3	19.6	19.1	20.8	22.9	25.5	25.5	25.5
H18	28.7	25.6	22.2	19.5	19.0	20.7	22.8	25.4	25.4	25.4
H19	29.8	26.5	22.3	19.6	19.3	21.0	23.1	25.6	25.6	25.6

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H21	31.2	27.9	23.7	21.0	20.7	22.4	24.5	27.0	27.0	27.0
H22	31.2	27.9	23.7	21.0	20.7	22.4	24.5	27.0	27.0	27.0
H23	31.3	28.0	23.8	21.1	20.8	22.5	24.6	27.1	27.1	27.1
H24	31.3	28.0	23.8	21.1	20.8	22.5	24.6	27.1	27.1	27.1
H25	31.4	28.1	23.9	21.2	20.9	22.6	24.7	27.2	27.2	27.2
H26	30.4	27.1	22.9	20.2	19.9	21.6	23.7	26.2	26.2	26.2
H27	30.0	26.7	22.5	19.8	19.5	21.2	23.3	25.8	25.8	25.8
H28	30.1	26.8	22.6	19.9	19.6	21.3	23.4	25.9	25.9	25.9
H29	28.7	26.1	23.2	21.0	21.0	23.0	25.2	27.6	27.6	27.6
H30	28.7	26.1	23.2	21.0	21.0	23.0	25.2	27.6	27.6	27.6
H31	28.5	25.9	23.0	20.8	20.8	22.8	25.0	27.4	27.4	27.4
H32	28.8	26.2	23.3	21.1	21.1	23.1	25.3	27.7	27.7	27.7
H33	28.2	25.6	22.7	20.5	20.5	22.5	24.7	27.1	27.1	27.1
H34	28.1	25.5	22.6	20.4	20.4	22.4	24.6	27.0	27.0	27.0
H35	27.1	24.5	21.6	19.4	19.4	21.4	23.6	26.0	26.0	26.0
H36	27.2	24.6	21.7	19.5	19.5	21.5	23.7	26.1	26.1	26.1
H37	27.2	24.6	21.7	19.5	19.5	21.5	23.7	26.1	26.1	26.1
H38	27.2	24.6	21.7	19.5	19.5	21.5	23.7	26.1	26.1	26.1
H39	28.2	25.6	22.7	20.5	20.5	22.5	24.7	27.1	27.1	27.1
H40	29.7	27.1	24.2	22.0	22.0	24.0	26.2	28.6	28.6	28.6
H41	19.4	17.0	13.8	11.0	10.4	11.7	13.3	15.1	17.1	19.4
H42	19.1	16.0	12.6	9.9	9.4	11.1	13.2	15.8	15.8	15.8
H43	19.2	16.8	13.6	10.8	10.2	11.5	13.1	14.9	16.9	19.2
H44	20.3	17.9	14.7	11.9	11.3	12.6	14.2	16.0	18.0	20.3
Night-time										
H6	23.5	20.2	16.0	12.2	10.3	10.2	11.6	11.6	11.6	11.6
H7	25.0	21.7	17.5	13.7	11.8	11.7	13.1	13.1	13.1	13.1
H8	25.1	21.8	17.6	13.8	11.9	11.8	13.2	13.2	13.2	13.2
H9	27.5	24.2	20.0	16.2	14.3	14.2	15.6	15.6	15.6	15.6
H10	28.5	25.2	21.0	17.2	15.3	15.2	16.6	16.6	16.6	16.6
H11	30.1	26.8	22.6	18.8	16.9	16.8	18.2	18.2	18.2	18.2
H12	30.3	27.0	22.8	19.0	17.1	17.0	18.4	18.4	18.4	18.4
H13	30.8	27.5	23.3	19.5	17.6	17.5	18.9	18.9	18.9	18.9
H14	30.8	27.5	23.3	19.5	17.6	17.5	18.9	18.9	18.9	18.9
H15	30.8	27.5	23.3	19.5	17.6	17.5	18.9	18.9	18.9	18.9
H16	31.5	28.2	24.0	20.2	18.3	18.2	19.6	19.6	19.6	19.6

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H17	31.8	28.5	24.3	20.5	18.6	18.5	19.9	19.9	19.9	19.9
H18	31.7	28.4	24.2	20.4	18.5	18.4	19.8	19.8	19.8	19.8
H19	32.8	29.5	25.3	21.5	19.6	19.5	19.5	19.5	19.5	19.5
H21	34.2	30.9	26.7	22.9	21.0	20.9	20.9	20.9	20.9	20.9
H22	34.2	30.9	26.7	22.9	21.0	20.9	20.9	20.9	20.9	20.9
H23	34.3	31.0	26.8	23.0	21.1	21.0	21.0	21.0	21.0	21.0
H24	34.3	31.0	26.8	23.0	21.1	21.0	21.0	21.0	21.0	21.0
H25	34.4	31.1	26.9	23.1	21.2	21.1	21.1	21.1	21.1	21.1
H26	33.4	30.1	25.9	22.1	20.2	20.1	20.1	20.1	20.1	20.1
H27	33.0	29.7	25.5	21.7	19.8	19.7	19.7	19.7	19.7	19.7
H28	33.1	29.8	25.6	21.8	19.9	19.8	19.8	19.8	19.8	19.8
H29	31.7	28.4	24.2	20.4	18.5	18.4	22.0	22.0	22.0	22.0
H30	31.7	28.4	24.2	20.4	18.5	18.4	22.0	22.0	22.0	22.0
H31	31.5	28.2	24.0	20.2	18.3	18.2	21.8	21.8	21.8	21.8
H32	31.8	28.5	24.3	20.5	18.6	18.5	22.1	22.1	22.1	22.1
H33	31.2	27.9	23.7	19.9	18.0	17.9	21.5	21.5	21.5	21.5
H34	31.1	27.8	23.6	19.8	17.9	17.8	21.4	21.4	21.4	21.4
H35	30.1	26.8	22.6	18.8	16.9	16.8	20.4	20.4	20.4	20.4
H36	30.2	26.9	22.7	18.9	17.0	16.9	20.5	20.5	20.5	20.5
H37	30.2	26.9	22.7	18.9	17.0	16.9	20.5	20.5	20.5	20.5
H38	30.2	26.9	22.7	18.9	17.0	16.9	20.5	20.5	20.5	20.5
H39	31.2	27.9	23.7	19.9	18.0	17.9	21.5	21.5	21.5	21.5
H40	32.7	29.4	25.2	21.4	19.5	19.4	23.0	23.0	23.0	23.0
H41	19.5	16.2	12.0	8.2	7.4	9.0	11.0	13.3	15.7	18.3
H42	22.1	18.8	14.6	10.8	8.9	8.8	10.2	10.2	10.2	10.2
H43	19.3	16.0	11.8	8.0	7.2	8.8	10.8	13.1	15.5	18.1
H44	20.4	17.1	12.9	9.1	8.3	9.9	11.9	14.2	16.6	19.2

10.78 The results show that predicted noise levels from the Proposed Development are well below the overall operational noise limits in all instances and that no curtailment of the turbines would be required when considering the site in isolative terms.

10.79 Charts showing the overall ETSU-R-97 noise limits and predicted turbine noise levels in relation to each other are provided in **Technical Appendix 10.3**. The charts also show the relative and combined overall levels from other wind farm development in the area, along with relevant planning control limits and the resultant levels from their implementation/application, as discussed in the **Cumulative Effects** section.

Construction & Decommissioning

10.80 Primary activities creating noise during the construction period include the construction of the turbine bases; the erection of the turbines; the excavation of trenches for cables; and the construction of associated hard standings, access tracks and construction compound(s). Noise from vehicles on local roads and access tracks would also arise due to the delivery of turbine components and construction materials, notably aggregates, concrete and steel reinforcement.

10.81 The exact methodology and timing of construction activities have not yet been defined and a reliable assessment of expected construction noise levels is not possible as a result. However, as discussed previously, works expected to be undertaken at or around the proposed turbine locations would occur at distances that are unlikely to result in noise levels that would breach typical criteria at neighbouring residences in this regard.

10.82 The access route for the Proposed Development is expected to pass reasonably close to some dwellings and some upgrade works to existing access tracks and local roads could also occur in close proximity. In these instances, the level of noise generated by construction works could be close to the limits defined as part of the 'ABC method' discussed earlier. As a result, typical construction noise mitigation measures are provided in the **Mitigation** section which aim to minimise noise as far as reasonably practicable and/or reasonable.

10.83 The movement of additional vehicles, including heavy goods vehicles (HGVs), along local roads and access routes may well be noticeable to residents adjacent to these in terms of the noise and vibration generated by them. The resultant impacts on local roads, which are already well used by local traffic and existing HGV movements, would be relatively minor in terms of the increase in average noise levels resulting from the additional vehicles on the roads. However, individual events would be similar to that created by existing HGV movements. The resultant noise levels on parts of the route that are less well used by existing traffic would be noticeable to residents located along the route but the resultant noise and vibration levels from vehicles passing the dwellings would be unlikely to breach the adopted construction noise limits and accepted vibration thresholds.

Mitigation

Operation

10.84 The initial assessment presented above identifies that predicted operational noise levels, when considering the Proposed Development operating in isolation, meet the limiting requirements of ETSU-R-97 for all wind speeds and directions considered. However, the **Cumulative Effects** section below indicates that predicted levels are marginally above the overall night-time limits when considering the site in a cumulative context. As a result, a mitigation/curtailment strategy has been determined, which accounts for the wind regime at the Proposed Development and neighbouring Dunbeg South Wind Farm (which is also being developed by RES); the proposed planning condition and planning variation noise limits detailed in the **Cumulative Effects** section; and the various power curves and overall noise levels associated with the operational modes shown in

Table 10.6, with a view to minimising the potential losses in generating capacity resulting from the potential implementation of the strategy.

10.85 The proprietary in-house RES methodology for determining the curtailment scenario incorporates machine learning techniques to provide an expected best outcome in terms of potential overall generating capacity whilst maintaining compliance with the limiting requirements for operational noise.

10.86 The curtailment strategy, as presented in **Technical Appendix 10.4**, results in cumulative predicted operational noise levels that will meet the requirements of ETSU-R-97 for night-time periods. Furthermore, it is proposed that these levels are further controlled through the imposition of appropriate planning condition limits for the Proposed Development and the neighbouring Dunbeg South Wind Farm, which are intended to be secured via a planning variation for the latter, as detailed in the **Cumulative Effects** section.

Construction & Decommissioning

10.87 For all activities, measures will be taken to reduce noise levels with due regard to practicality and cost as per the concept of 'best practicable means' as defined in Pollution Control and Local Government (NI) Order 1978.

10.88 BS 5228-1:2009+A1:2014 states that the 'attitude of the contractor' is important in minimising the likelihood of complaints and therefore consultation with the local authority and Community Liaison Group is advised to inform residents of intended activity. Non-acoustic factors, which influence the overall level of complaints such as mud on roads and dust generation, would also be controlled through construction practices adopted on the site.

10.89 Furthermore, the following noise mitigation options could be implemented where appropriate:

- Consideration would be given to noise emissions when selecting plant and equipment to be used on site;
- All equipment should be maintained in good working order and fitted with the appropriate silencers, mufflers or acoustic covers where applicable;
- Stationary noise sources would be sited as far away as reasonably possible from residential properties; and
- The movement of vehicles to and from the site would be controlled and employees instructed to ensure compliance with the noise control measures adopted.

10.90 Site operations would be limited to 07:00 - 19:00 weekdays and 07:00 - 13:00 on Saturdays except during turbine erection and commissioning or during periods of emergency work.

Residual Effects

Operation

10.91 The assessment demonstrates that predicted noise levels at all residential properties do not exceed the derived noise limits across all wind speeds when considering the site in isolation. However, a precautionary noise management strategy is applied, and relevant planning controls suggested, when considering the site in a cumulative context, to ensure

that the overall requirements of ETSU-R-97 are met, as discussed in the **Cumulative Effects** section. No significant impacts are therefore expected. This should not be interpreted to mean that wind farm operational noise would be inaudible (or masked by background noise) under all conditions, but that the levels of noise are acceptable under ETSU-R-97 and associated guidance.

Construction & Decommissioning

10.92 Noise and vibration during the construction and decommissioning of the Proposed Development, may well be audible and/or perceptible to people residing in the area, but the levels would be below established noise limits and planning requirements in this respect due to the large distances between the site and the surrounding dwellings. Where construction noise relating to the provision of access to the site, including the upgrade of local roads and their use thereof, is expected to occur in close proximity to residences, enhanced mitigation measures would be adopted to reduce noise and vibration where necessary.

Cumulative Effects

Operation

10.93 A further operational assessment has been undertaken which incorporates the predicted operational noise levels from the Proposed Development operating at the same time (i.e. cumulatively) as the existing Dunbeg and Dunmore wind farm sites and the consented Dunbeg South Wind Farm. The assessment has been undertaken to demonstrate that it is possible to operate all of the sites considered here whilst maintaining compliance with the overall requirements of ETSU-R-97 and to determine relevant planning control limits for the Proposed Development and the consented Dunbeg South Wind Farm, for which a planning variation will be requested for the latter in due course.

10.94 The wind farm layouts and assumptions used for the cumulative assessment are shown in the **Methodology** section.

10.95 **Table 10.14** shows the maximum predicted operational noise levels for any given wind direction resulting from the combined unrestricted operation of the developments at the nearest residential properties, using the methodology detailed above and over a range of standardised 10 m height wind speeds.

Table 10.14 – Overall Predicted Cumulative Operational Noise Levels, dB L_{A90}

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H6	30.6	32.0	34.9	38.7	40.9	41.3	41.3	41.3	41.3	41.3
H7	29.8	31.5	34.8	38.5	40.6	41.0	41.0	41.0	41.0	41.0
H8	29.6	31.3	34.5	38.2	40.4	40.7	40.7	40.7	40.7	40.7
H9	28.2	30.0	33.3	37.1	39.2	39.5	39.5	39.5	39.5	39.5
H10	27.1	28.8	31.9	35.7	37.8	38.2	38.2	38.2	38.2	38.2
H11	25.5	27.2	30.5	34.2	36.3	36.7	36.7	36.7	36.7	36.7
H12	25.7	27.3	30.5	34.3	36.4	36.7	36.7	36.7	36.7	36.7

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H13	25.3	26.9	30.1	33.8	36.0	36.3	36.3	36.3	36.3	36.3
H14	25.2	26.8	30.0	33.8	35.9	36.2	36.2	36.2	36.2	36.2
H15	24.8	26.7	30.2	34.0	36.0	36.3	36.3	36.3	36.3	36.3
H16	24.5	26.6	30.1	33.9	35.9	36.2	36.2	36.2	36.2	36.2
H17	24.3	26.4	29.9	33.7	35.7	36.0	36.0	36.0	36.0	36.0
H18	24.0	26.1	29.6	33.3	35.4	35.7	35.7	35.7	35.7	35.7
H19	23.9	26.0	29.6	33.4	35.4	35.7	35.7	35.7	35.7	35.7
H21	21.5	23.6	27.1	30.8	32.9	33.2	33.2	33.2	33.2	33.2
H22	22.5	24.1	27.3	31.1	33.2	33.6	33.6	33.6	33.6	33.6
H23	22.5	24.1	27.2	31.0	33.1	33.5	33.5	33.5	33.5	33.5
H24	22.3	24.0	27.1	30.9	33.0	33.4	33.4	33.4	33.4	33.4
H25	22.2	23.8	26.9	30.7	32.8	33.2	33.2	33.2	33.2	33.2
H26	22.9	24.7	28.1	31.8	33.9	34.2	34.2	34.2	34.2	34.2
H27	23.3	25.2	28.6	32.3	34.4	34.7	34.7	34.7	34.7	34.7
H28	23.1	25.0	28.4	32.1	34.2	34.5	34.5	34.5	34.5	34.5
H29	23.5	25.5	29.0	32.8	34.8	35.1	35.1	35.1	35.1	35.1
H30	23.5	25.5	29.0	32.7	34.8	35.1	35.1	35.1	35.1	35.1
H31	23.7	25.7	29.2	33.0	35.0	35.3	35.3	35.3	35.3	35.3
H32	23.1	25.1	28.6	32.3	34.4	34.7	34.7	34.7	34.7	34.7
H33	23.4	25.4	28.8	32.6	34.7	35.0	35.0	35.0	35.0	35.0
H34	23.4	25.4	28.8	32.6	34.6	34.9	34.9	34.9	34.9	34.9
H35	23.7	25.7	29.1	32.8	34.9	35.2	35.2	35.2	35.2	35.2
H36	23.7	25.6	28.9	32.7	34.8	35.1	35.1	35.1	35.1	35.1
H37	23.6	25.5	28.8	32.6	34.6	35.0	35.0	35.0	35.0	35.0
H38	23.6	25.4	28.8	32.5	34.6	34.9	34.9	34.9	34.9	34.9
H39	22.6	24.2	27.3	31.1	33.2	33.6	33.6	33.6	33.6	33.6
H40	22.4	24.3	27.7	31.4	33.5	33.8	33.8	33.8	33.8	33.8
H41	36.0	36.6	38.5	42.2	44.6	45.3	45.3	45.3	45.3	45.3
H42	32.4	33.5	36.1	39.8	42.1	42.6	42.6	42.6	42.6	42.6
H43	35.6	36.3	38.3	42.0	44.4	45.1	45.1	45.1	45.1	45.1
H44	35.8	36.3	38.2	41.9	44.4	45.1	45.1	45.1	45.1	45.1

10.96 **Table 10.15** shows the margin by which the predicted cumulative operational noise levels the daytime and night-time noise limits set out in **Table 10.11**. A positive number indicates that levels are below the relevant limits.

Table 10.15 – Cumulative Margin of Compliance, dB

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
Daytime										
H6	9.4	8.2	6.1	3.4	2.6	4.0	6.1	8.7	8.7	8.7
H7	10.2	8.7	6.2	3.6	2.9	4.3	6.4	9.0	9.0	9.0
H8	10.4	8.9	6.5	3.9	3.1	4.6	6.7	9.3	9.3	9.3
H9	11.8	10.2	7.7	5.0	4.3	5.8	7.9	10.5	10.5	10.5
H10	12.9	11.4	9.1	6.4	5.7	7.1	9.2	11.8	11.8	11.8
H11	14.5	13.0	10.5	7.9	7.2	8.6	10.7	13.3	13.3	13.3
H12	14.3	12.9	10.5	7.8	7.1	8.6	10.7	13.3	13.3	13.3
H13	14.7	13.3	10.9	8.3	7.5	9.0	11.1	13.7	13.7	13.7
H14	14.8	13.4	11.0	8.3	7.6	9.1	11.2	13.8	13.8	13.8
H15	15.2	13.5	10.8	8.1	7.5	9.0	11.1	13.7	13.7	13.7
H16	15.5	13.6	10.9	8.2	7.6	9.1	11.2	13.8	13.8	13.8
H17	15.7	13.8	11.1	8.4	7.8	9.3	11.4	14.0	14.0	14.0
H18	16.0	14.1	11.4	8.8	8.1	9.6	11.7	14.3	14.3	14.3
H19	16.1	14.0	10.4	7.7	7.3	8.8	10.9	13.4	13.4	13.4
H21	18.5	16.4	12.9	10.3	9.8	11.3	13.4	15.9	15.9	15.9
H22	17.5	15.9	12.7	10.0	9.5	10.9	13.0	15.5	15.5	15.5
H23	17.5	15.9	12.8	10.1	9.6	11.0	13.1	15.6	15.6	15.6
H24	17.7	16.0	12.9	10.2	9.7	11.1	13.2	15.7	15.7	15.7
H25	17.8	16.2	13.1	10.4	9.9	11.3	13.4	15.9	15.9	15.9
H26	17.1	15.3	11.9	9.3	8.8	10.3	12.4	14.9	14.9	14.9
H27	16.7	14.8	11.4	8.8	8.3	9.8	11.9	14.4	14.4	14.4
H28	16.9	15.0	11.6	9.0	8.5	10.0	12.1	14.6	14.6	14.6
H29	16.5	15.2	13.0	10.8	10.7	12.5	14.7	17.1	17.1	17.1
H30	16.5	15.2	13.0	10.9	10.7	12.5	14.7	17.1	17.1	17.1
H31	16.3	15.0	12.8	10.6	10.5	12.3	14.5	16.9	16.9	16.9
H32	16.9	15.6	13.4	11.3	11.1	12.9	15.1	17.5	17.5	17.5
H33	16.6	15.3	13.2	11.0	10.8	12.6	14.8	17.2	17.2	17.2
H34	16.6	15.3	13.2	11.0	10.9	12.7	14.9	17.3	17.3	17.3
H35	16.3	15.0	12.9	10.8	10.6	12.4	14.6	17.0	17.0	17.0
H36	16.3	15.1	13.1	10.9	10.7	12.5	14.7	17.1	17.1	17.1
H37	16.4	15.2	13.2	11.0	10.9	12.6	14.8	17.2	17.2	17.2
H38	16.4	15.3	13.2	11.1	10.9	12.7	14.9	17.3	17.3	17.3
H39	17.4	16.5	14.7	12.5	12.3	14.0	16.2	18.6	18.6	18.6
H40	17.6	16.4	14.3	12.2	12.0	13.8	16.0	18.4	18.4	18.4

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H41	6.9	7.2	6.3	3.6	2.5	3.2	4.8	6.6	8.6	10.9
H42	7.6	6.7	4.9	2.3	1.4	2.7	4.8	7.4	7.4	7.4
H43	7.3	7.5	6.5	3.8	2.7	3.4	5.0	6.8	8.8	11.1
H44	7.1	7.5	6.6	3.9	2.7	3.4	5.0	6.8	8.8	11.1
Night-time										
H6	12.4	11.0	8.1	4.3	2.1	1.7	3.1	3.1	3.1	3.1
H7	13.2	11.5	8.2	4.5	2.4	2.0	3.4	3.4	3.4	3.4
H8	13.4	11.7	8.5	4.8	2.6	2.3	3.7	3.7	3.7	3.7
H9	14.8	13.0	9.7	5.9	3.8	3.5	4.9	4.9	4.9	4.9
H10	15.9	14.2	11.1	7.3	5.2	4.8	6.2	6.2	6.2	6.2
H11	17.5	15.8	12.5	8.8	6.7	6.3	7.7	7.7	7.7	7.7
H12	17.3	15.7	12.5	8.7	6.6	6.3	7.7	7.7	7.7	7.7
H13	17.7	16.1	12.9	9.2	7.0	6.7	8.1	8.1	8.1	8.1
H14	17.8	16.2	13.0	9.2	7.1	6.8	8.2	8.2	8.2	8.2
H15	18.2	16.3	12.8	9.0	7.0	6.7	8.1	8.1	8.1	8.1
H16	18.5	16.4	12.9	9.1	7.1	6.8	8.2	8.2	8.2	8.2
H17	18.7	16.6	13.1	9.3	7.3	7.0	8.4	8.4	8.4	8.4
H18	19.0	16.9	13.4	9.7	7.6	7.3	8.7	8.7	8.7	8.7
H19	19.1	17.0	13.4	9.6	7.6	7.3	7.3	7.3	7.3	7.3
H21	21.5	19.4	15.9	12.2	10.1	9.8	9.8	9.8	9.8	9.8
H22	20.5	18.9	15.7	11.9	9.8	9.4	9.4	9.4	9.4	9.4
H23	20.5	18.9	15.8	12.0	9.9	9.5	9.5	9.5	9.5	9.5
H24	20.7	19.0	15.9	12.1	10.0	9.6	9.6	9.6	9.6	9.6
H25	20.8	19.2	16.1	12.3	10.2	9.8	9.8	9.8	9.8	9.8
H26	20.1	18.3	14.9	11.2	9.1	8.8	8.8	8.8	8.8	8.8
H27	19.7	17.8	14.4	10.7	8.6	8.3	8.3	8.3	8.3	8.3
H28	19.9	18.0	14.6	10.9	8.8	8.5	8.5	8.5	8.5	8.5
H29	19.5	17.5	14.0	10.2	8.2	7.9	11.5	11.5	11.5	11.5
H30	19.5	17.5	14.0	10.3	8.2	7.9	11.5	11.5	11.5	11.5
H31	19.3	17.3	13.8	10.0	8.0	7.7	11.3	11.3	11.3	11.3
H32	19.9	17.9	14.4	10.7	8.6	8.3	11.9	11.9	11.9	11.9
H33	19.6	17.6	14.2	10.4	8.3	8.0	11.6	11.6	11.6	11.6
H34	19.6	17.6	14.2	10.4	8.4	8.1	11.7	11.7	11.7	11.7
H35	19.3	17.3	13.9	10.2	8.1	7.8	11.4	11.4	11.4	11.4
H36	19.3	17.4	14.1	10.3	8.2	7.9	11.5	11.5	11.5	11.5
H37	19.4	17.5	14.2	10.4	8.4	8.0	11.6	11.6	11.6	11.6

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H38	19.4	17.6	14.2	10.5	8.4	8.1	11.7	11.7	11.7	11.7
H39	20.4	18.8	15.7	11.9	9.8	9.4	13.0	13.0	13.0	13.0
H40	20.6	18.7	15.3	11.6	9.5	9.2	12.8	12.8	12.8	12.8
H41	7.0	6.4	4.5	0.8	-0.5	0.5	2.5	4.8	7.2	9.8
H42	10.6	9.5	6.9	3.2	0.9	0.4	1.8	1.8	1.8	1.8
H43	7.4	6.7	4.7	1.0	-0.3	0.7	2.7	5.0	7.4	10.0
H44	7.2	6.7	4.8	1.1	-0.3	0.7	2.7	5.0	7.4	10.0

10.97 The results show that predicted noise levels meet the requirements of ETSU-R-97 at the majority of properties surrounding the site. The only exceptions are at H41, H43 & H44, where predicted turbine noise levels are marginally above the night-time limits by 0.5 dB or less at a standardised 10 m height wind speed of 7 $m.s^{-1}$. Furthermore, this only occurs for the approximate wind directions of 75 to 135 degrees. As a result, given the conservatism in the predicted noise levels and the relatively rare occurrence of these specific wind directions due to the prevailing wind direction being south-westerly, this is not expected to occur in practice, and it is considered the Proposed Development (and the neighbouring Dunbeg South Wind Farm) could operate unrestricted on this basis.

10.98 Nevertheless, and to provide further reassurance that the overall requirements of ETSU-R-97 can be met, precautionary curtailment strategies and specific planning controls, in the form of relevant applicable noise limits, have been developed. To this end, a night-time noise curtailment strategy for the Proposed Development and the neighbouring consented Dunbeg South Wind Farm, which is also being developed by RES, has been determined which maximises the potential generating capacity of both sites whilst maintaining compliance with the relevant overall planning limits (see the **Mitigation** section). The determined curtailment strategies have been used to inform the development of specific proposed planning condition limits for each site separately.

10.99 Furthermore, the consented Dunbeg South Wind Farm will be subject to a forthcoming application for a variation to the limits currently attached to the planning approval. The current planning condition limits account for a very different cumulative situation than presently exists at the development site, as some wind farm applications and consents that were considered at the time the site was consented have now lapsed and/or are now replaced by new applications leaving more 'margin', 'headroom' or 'remaining noise budget' for the Dunbeg South Wind Farm, including the extension considered here, to occupy. However, should the current limits remain at the site, a similar curtailment strategy to that shown here can be applied to the Proposed Development to equally ensure full compliance with the requirements of ETSU-R-97.

10.100 Night-time curtailment strategies for the Proposed Development and consented Dunbeg South Wind Farm, which result in predicted turbine noise levels that meet the requirements of ETSU-R-97, are provided within **Appendix 10.4**. The corresponding turbine noise levels for night-time operation are shown in **Table 10.16**.

Table 10.16 – Cumulative Night-time Noise Levels with Curtailment Applied, dB L_{A90}

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H6	30.6	32.0	34.9	38.7	39.6	41.3	41.3	41.3	41.3	41.3
H7	29.8	31.5	34.8	38.5	40.1	41.0	41.0	41.0	41.0	41.0
H8	29.6	31.3	34.5	38.2	39.7	40.7	40.7	40.7	40.7	40.7
H9	28.2	30.0	33.3	37.1	39.1	39.5	39.5	39.5	39.5	39.5
H10	27.1	28.8	31.9	35.7	37.7	38.2	38.2	38.2	38.2	38.2
H11	25.5	27.2	30.5	34.2	36.3	36.7	36.7	36.7	36.7	36.7
H12	25.7	27.3	30.5	34.3	36.4	36.7	36.7	36.7	36.7	36.7
H13	25.3	26.9	30.1	33.8	36.0	36.3	36.3	36.3	36.3	36.3
H14	25.2	26.8	30.0	33.8	35.9	36.2	36.2	36.2	36.2	36.2
H15	24.8	26.7	30.2	34.0	36.0	36.3	36.3	36.3	36.3	36.3
H16	24.5	26.6	30.1	33.9	35.9	36.2	36.2	36.2	36.2	36.2
H17	24.3	26.4	29.9	33.7	35.7	36.0	36.0	36.0	36.0	36.0
H18	24.0	26.1	29.6	33.3	35.4	35.7	35.7	35.7	35.7	35.7
H19	23.9	26.0	29.6	33.4	35.4	35.7	35.7	35.7	35.7	35.7
H21	21.5	23.6	27.1	30.8	32.9	33.2	33.2	33.2	33.2	33.2
H22	22.5	24.1	27.3	31.1	33.2	33.6	33.6	33.6	33.6	33.6
H23	22.5	24.1	27.2	31.0	33.1	33.5	33.5	33.5	33.5	33.5
H24	22.3	24.0	27.1	30.9	33.0	33.4	33.4	33.4	33.4	33.4
H25	22.2	23.8	26.9	30.7	32.8	33.2	33.2	33.2	33.2	33.2
H26	22.9	24.7	28.1	31.8	33.9	34.2	34.2	34.2	34.2	34.2
H27	23.3	25.2	28.6	32.3	34.4	34.7	34.7	34.7	34.7	34.7
H28	23.1	25.0	28.4	32.1	34.2	34.5	34.5	34.5	34.5	34.5
H29	23.5	25.5	29.0	32.8	34.8	35.1	35.1	35.1	35.1	35.1
H30	23.5	25.5	29.0	32.7	34.8	35.1	35.1	35.1	35.1	35.1
H31	23.7	25.7	29.2	33.0	35.0	35.3	35.3	35.3	35.3	35.3
H32	23.1	25.1	28.6	32.3	34.4	34.7	34.7	34.7	34.7	34.7
H33	23.4	25.4	28.8	32.6	34.7	35.0	35.0	35.0	35.0	35.0
H34	23.4	25.4	28.8	32.6	34.6	34.9	34.9	34.9	34.9	34.9
H35	23.7	25.7	29.1	32.8	34.9	35.2	35.2	35.2	35.2	35.2
H36	23.7	25.6	28.9	32.7	34.8	35.1	35.1	35.1	35.1	35.1
H37	23.6	25.5	28.8	32.6	34.6	35.0	35.0	35.0	35.0	35.0
H38	23.6	25.4	28.8	32.5	34.6	34.9	34.9	34.9	34.9	34.9
H39	22.6	24.2	27.3	31.1	33.2	33.6	33.6	33.6	33.6	33.6
H40	22.4	24.3	27.7	31.4	33.5	33.8	33.8	33.8	33.8	33.8
H41	36.0	36.6	38.5	42.2	43.8	45.3	45.3	45.3	45.3	45.3

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H42	32.4	33.5	36.1	39.8	41.0	42.6	42.6	42.6	42.6	42.6
H43	35.6	36.3	38.3	42.0	43.5	45.1	45.1	45.1	45.1	45.1
H44	35.8	36.3	38.2	41.9	43.6	45.1	45.1	45.1	45.1	45.1

10.101 **Table 10.17** shows the margin by which the predicted cumulative operational noise levels, with the aforementioned curtailment applied, meet the night-time noise limits set out in **Table 10.11**. A positive number indicates that levels are below the relevant limits.

Table 10.17 – Cumulative Margin of Night-time Compliance with Curtialment, dB

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H6	12.4	11.0	8.1	4.3	3.4	1.7	3.1	3.1	3.1	3.1
H7	13.2	11.5	8.2	4.5	2.9	2.0	3.4	3.4	3.4	3.4
H8	13.4	11.7	8.5	4.8	3.3	2.3	3.7	3.7	3.7	3.7
H9	14.8	13.0	9.7	5.9	3.9	3.5	4.9	4.9	4.9	4.9
H10	15.9	14.2	11.1	7.3	5.3	4.8	6.2	6.2	6.2	6.2
H11	17.5	15.8	12.5	8.8	6.7	6.3	7.7	7.7	7.7	7.7
H12	17.3	15.7	12.5	8.7	6.6	6.3	7.7	7.7	7.7	7.7
H13	17.7	16.1	12.9	9.2	7.0	6.7	8.1	8.1	8.1	8.1
H14	17.8	16.2	13.0	9.2	7.1	6.8	8.2	8.2	8.2	8.2
H15	18.2	16.3	12.8	9.0	7.0	6.7	8.1	8.1	8.1	8.1
H16	18.5	16.4	12.9	9.1	7.1	6.8	8.2	8.2	8.2	8.2
H17	18.7	16.6	13.1	9.3	7.3	7.0	8.4	8.4	8.4	8.4
H18	19.0	16.9	13.4	9.7	7.6	7.3	8.7	8.7	8.7	8.7
H19	19.1	17.0	13.4	9.6	7.6	7.3	7.3	7.3	7.3	7.3
H21	21.5	19.4	15.9	12.2	10.1	9.8	9.8	9.8	9.8	9.8
H22	20.5	18.9	15.7	11.9	9.8	9.4	9.4	9.4	9.4	9.4
H23	20.5	18.9	15.8	12.0	9.9	9.5	9.5	9.5	9.5	9.5
H24	20.7	19.0	15.9	12.1	10.0	9.6	9.6	9.6	9.6	9.6
H25	20.8	19.2	16.1	12.3	10.2	9.8	9.8	9.8	9.8	9.8
H26	20.1	18.3	14.9	11.2	9.1	8.8	8.8	8.8	8.8	8.8
H27	19.7	17.8	14.4	10.7	8.6	8.3	8.3	8.3	8.3	8.3
H28	19.9	18.0	14.6	10.9	8.8	8.5	8.5	8.5	8.5	8.5
H29	19.5	17.5	14.0	10.2	8.2	7.9	11.5	11.5	11.5	11.5
H30	19.5	17.5	14.0	10.3	8.2	7.9	11.5	11.5	11.5	11.5
H31	19.3	17.3	13.8	10.0	8.0	7.7	11.3	11.3	11.3	11.3
H32	19.9	17.9	14.4	10.7	8.6	8.3	11.9	11.9	11.9	11.9
H33	19.6	17.6	14.2	10.4	8.3	8.0	11.6	11.6	11.6	11.6

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H34	19.6	17.6	14.2	10.4	8.4	8.1	11.7	11.7	11.7	11.7
H35	19.3	17.3	13.9	10.2	8.1	7.8	11.4	11.4	11.4	11.4
H36	19.3	17.4	14.1	10.3	8.2	7.9	11.5	11.5	11.5	11.5
H37	19.4	17.5	14.2	10.4	8.4	8.0	11.6	11.6	11.6	11.6
H38	19.4	17.6	14.2	10.5	8.4	8.1	11.7	11.7	11.7	11.7
H39	20.4	18.8	15.7	11.9	9.8	9.4	13.0	13.0	13.0	13.0
H40	20.6	18.7	15.3	11.6	9.5	9.2	12.8	12.8	12.8	12.8
H41	7.0	6.4	4.5	0.8	0.3	0.5	2.5	4.8	7.2	9.8
H42	10.6	9.5	6.9	3.2	2.0	0.4	1.8	1.8	1.8	1.8
H43	7.4	6.7	4.7	1.0	0.6	0.7	2.7	5.0	7.4	10.0
H44	7.2	6.7	4.8	1.1	0.5	0.7	2.7	5.0	7.4	10.0

10.102 The results show that predicted noise levels from the combined operation of the Proposed Development and neighbouring sites are below the overall night-time noise limits in all instances with the curtailment strategies applied.

10.103 **Tables 10.18 & 10.19** show some potential planning condition noise limits for the Proposed Development and the consented Dunbeg South Wind Farm, respectively. These are based on the maximum predicted noise levels for each but, with an additional margin added where sufficient 'headroom' or 'remaining noise budget' exists to allow for this and to enable a range of potential turbines to be installed at the sites. Where less 'headroom' is available, specifically for night-time periods, the values more closely align with the predicted noise levels (including for the curtailment shown in **Appendix 10.4**) associated with each site.

10.104 Furthermore, the condition limits for the Proposed Development only references the relevant dwellings located closest to this site as the other residences considered within this Chapter will have much greater levels of turbine noise associated with other developments, whereas the Dunbeg South Wind Farm has limits which reference all properties considered due to its relative scale and therefore wider impacts.

Table 10.18 – Dunbeg South Extension Proposed Noise Limits, dB L_{A90}

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
Daytime										
H6	23.5	26.8	31.0	32.8	34.7	34.8	34.8	34.8	34.8	34.8
H7	22.0	25.3	29.5	31.3	33.2	33.3	33.3	33.3	33.3	33.3
H8	21.9	25.2	29.4	31.2	33.1	33.2	33.2	33.2	33.2	33.2
H9	19.5	22.8	27.0	28.8	30.7	30.8	30.8	30.8	30.8	30.8
H41	27.5	30.8	35.0	36.8	38.7	38.8	38.8	38.8	38.8	38.8
H42	24.9	28.2	32.4	34.2	36.1	36.2	36.2	36.2	36.2	36.2
H43	27.7	31.0	35.2	37.0	38.9	39.0	39.0	39.0	39.0	39.0

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H44	26.6	29.9	34.1	35.9	37.8	37.9	37.9	37.9	37.9	37.9
Night-time										
H6	23.5	26.8	31.0	32.8	34.7	34.8	34.8	34.8	34.8	34.8
H7	22.0	25.3	29.5	31.3	33.2	33.3	33.3	33.3	33.3	33.3
H8	21.9	25.2	29.4	31.2	33.1	33.2	33.2	33.2	33.2	33.2
H9	19.5	22.8	27.0	28.8	30.7	30.8	30.8	30.8	30.8	30.8
H41	27.5	30.8	35.0	35.6	35.4	37.3	38.8	38.8	38.8	38.8
H42	24.9	28.2	32.4	34.2	35.1	34.6	36.2	36.2	36.2	36.2
H43	27.7	31.0	35.2	36.0	35.9	37.7	39.0	39.0	39.0	39.0
H44	26.6	29.9	34.1	35.0	34.6	36.6	37.9	37.9	37.9	37.9

Table 10.19 – Dunbeg South Proposed Noise Limits, dB L_{A90}

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
Daytime										
H6	28.7	32.0	36.2	38.0	39.9	40.0	40.0	40.0	40.0	40.0
H7	29.4	32.7	36.9	38.7	40.6	40.7	40.7	40.7	40.7	40.7
H8	29.0	32.3	36.5	38.3	40.2	40.3	40.3	40.3	40.3	40.3
H9	28.2	31.5	35.7	37.5	39.4	39.5	39.5	39.5	39.5	39.5
H10	26.5	29.8	34.0	35.8	37.7	37.8	37.8	37.8	37.8	37.8
H11	25.2	28.5	32.7	34.5	36.4	36.5	36.5	36.5	36.5	36.5
H12	25.1	28.4	32.6	34.4	36.3	36.4	36.4	36.4	36.4	36.4
H13	24.7	28.0	32.2	34.0	35.9	36.0	36.0	36.0	36.0	36.0
H14	24.6	27.9	32.1	33.9	35.8	35.9	35.9	35.9	35.9	35.9
H15	25.3	28.6	32.8	34.6	36.5	36.6	36.6	36.6	36.6	36.6
H16	25.4	28.7	32.9	34.7	36.6	36.7	36.7	36.7	36.7	36.7
H17	25.1	28.4	32.6	34.4	36.3	36.4	36.4	36.4	36.4	36.4
H18	24.8	28.1	32.3	34.1	36.0	36.1	36.1	36.1	36.1	36.1
H19	25.0	28.3	32.5	34.3	36.2	36.3	36.3	36.3	36.3	36.3
H21	22.3	25.6	29.8	31.6	33.5	33.6	33.6	33.6	33.6	33.6
H22	22.0	25.3	29.5	31.3	33.2	33.3	33.3	33.3	33.3	33.3
H23	21.9	25.2	29.4	31.2	33.1	33.2	33.2	33.2	33.2	33.2
H24	21.8	25.1	29.3	31.1	33.0	33.1	33.1	33.1	33.1	33.1
H25	21.6	24.9	29.1	30.9	32.8	32.9	32.9	32.9	32.9	32.9
H26	23.0	26.3	30.5	32.3	34.2	34.3	34.3	34.3	34.3	34.3
H27	23.6	26.9	31.1	32.9	34.8	34.9	34.9	34.9	34.9	34.9

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H28	23.4	26.7	30.9	32.7	34.6	34.7	34.7	34.7	34.7	34.7
H29	24.1	27.4	31.6	33.4	35.3	35.4	35.4	35.4	35.4	35.4
H30	24.1	27.4	31.6	33.4	35.3	35.4	35.4	35.4	35.4	35.4
H31	24.3	27.6	31.8	33.6	35.5	35.6	35.6	35.6	35.6	35.6
H32	23.5	26.8	31.0	32.8	34.7	34.8	34.8	34.8	34.8	34.8
H33	23.8	27.1	31.3	33.1	35.0	35.1	35.1	35.1	35.1	35.1
H34	23.8	27.1	31.3	33.1	35.0	35.1	35.1	35.1	35.1	35.1
H35	23.9	27.2	31.4	33.2	35.1	35.2	35.2	35.2	35.2	35.2
H36	23.7	27.0	31.2	33.0	34.9	35.0	35.0	35.0	35.0	35.0
H37	23.5	26.8	31.0	32.8	34.7	34.8	34.8	34.8	34.8	34.8
H38	23.5	26.8	31.0	32.8	34.7	34.8	34.8	34.8	34.8	34.8
H39	21.5	24.8	29.0	30.8	32.7	32.8	32.8	32.8	32.8	32.8
H40	22.6	25.9	30.1	31.9	33.8	33.9	33.9	33.9	33.9	33.9
H41	28.3	31.6	35.8	37.6	39.5	39.6	39.6	39.6	39.6	39.6
H42	28.9	32.2	36.4	38.2	40.1	40.2	40.2	40.2	40.2	40.2
H43	28.6	31.9	36.1	37.9	39.8	39.9	39.9	39.9	39.9	39.9
H44	28.0	31.3	35.5	37.3	39.2	39.3	39.3	39.3	39.3	39.3
Night-time										
H6	28.7	32.0	36.2	38.0	39.9	40.0	40.0	40.0	40.0	40.0
H7	29.4	32.7	36.9	38.7	40.6	40.7	40.7	40.7	40.7	40.7
H8	29.0	32.3	36.5	38.3	40.2	40.3	40.3	40.3	40.3	40.3
H9	28.2	31.5	35.7	37.5	39.4	39.5	39.5	39.5	39.5	39.5
H10	26.5	29.8	34.0	35.8	37.7	37.8	37.8	37.8	37.8	37.8
H11	25.2	28.5	32.7	34.5	36.4	36.5	36.5	36.5	36.5	36.5
H12	25.1	28.4	32.6	34.4	36.3	36.4	36.4	36.4	36.4	36.4
H13	24.7	28.0	32.2	34.0	35.9	36.0	36.0	36.0	36.0	36.0
H14	24.6	27.9	32.1	33.9	35.8	35.9	35.9	35.9	35.9	35.9
H15	25.3	28.6	32.8	34.6	36.5	36.6	36.6	36.6	36.6	36.6
H16	25.4	28.7	32.9	34.7	36.6	36.7	36.7	36.7	36.7	36.7
H17	25.1	28.4	32.6	34.4	36.3	36.4	36.4	36.4	36.4	36.4
H18	24.8	28.1	32.3	34.1	36.0	36.1	36.1	36.1	36.1	36.1
H19	25.0	28.3	32.5	34.3	36.2	36.3	36.3	36.3	36.3	36.3
H21	22.3	25.6	29.8	31.6	33.5	33.6	33.6	33.6	33.6	33.6
H22	22.0	25.3	29.5	31.3	33.2	33.3	33.3	33.3	33.3	33.3
H23	21.9	25.2	29.4	31.2	33.1	33.2	33.2	33.2	33.2	33.2
H24	21.8	25.1	29.3	31.1	33.0	33.1	33.1	33.1	33.1	33.1

House	Standardised 10 m Height Wind Speed, m.s^{-1}									
	3	4	5	6	7	8	9	10	11	12
H25	21.6	24.9	29.1	30.9	32.8	32.9	32.9	32.9	32.9	32.9
H26	23.0	26.3	30.5	32.3	34.2	34.3	34.3	34.3	34.3	34.3
H27	23.6	26.9	31.1	32.9	34.8	34.9	34.9	34.9	34.9	34.9
H28	23.4	26.7	30.9	32.7	34.6	34.7	34.7	34.7	34.7	34.7
H29	24.1	27.4	31.6	33.4	35.3	35.4	35.4	35.4	35.4	35.4
H30	24.1	27.4	31.6	33.4	35.3	35.4	35.4	35.4	35.4	35.4
H31	24.3	27.6	31.8	33.6	35.5	35.6	35.6	35.6	35.6	35.6
H32	23.5	26.8	31.0	32.8	34.7	34.8	34.8	34.8	34.8	34.8
H33	23.8	27.1	31.3	33.1	35.0	35.1	35.1	35.1	35.1	35.1
H34	23.8	27.1	31.3	33.1	35.0	35.1	35.1	35.1	35.1	35.1
H35	23.9	27.2	31.4	33.2	35.1	35.2	35.2	35.2	35.2	35.2
H36	23.7	27.0	31.2	33.0	34.9	35.0	35.0	35.0	35.0	35.0
H37	23.5	26.8	31.0	32.8	34.7	34.8	34.8	34.8	34.8	34.8
H38	23.5	26.8	31.0	32.8	34.7	34.8	34.8	34.8	34.8	34.8
H39	21.5	24.8	29.0	30.8	32.7	32.8	32.8	32.8	32.8	32.8
H40	22.6	25.9	30.1	31.9	33.8	33.9	33.9	33.9	33.9	33.9
H41	28.3	31.6	35.8	36.4	35.5	38.0	39.6	39.6	39.6	39.6
H42	28.9	32.2	36.4	38.2	39.3	38.6	40.2	40.2	40.2	40.2
H43	28.6	31.9	36.1	36.9	36.0	38.6	39.9	39.9	39.9	39.9
H44	28.0	31.3	35.5	36.4	35.5	38.1	39.3	39.3	39.3	39.3

10.105 **Table 10.20** shows the maximum potential operational noise levels over a range of standardised 10 m height wind speeds resulting from the combined operation of the turbines when accounting for wind direction and the implementation of the planning controls outlined above.

Table 10.20 – Maximum Cumulative Levels with Planning Controls, dB L_{A90}

House	Standardised 10 m Height Wind Speed, m.s^{-1}									
	3	4	5	6	7	8	9	10	11	12
Daytime										
H6	32.4	34.5	38.0	40.2	42.3	42.6	42.6	42.6	42.6	42.6
H7	32.0	34.4	38.1	40.2	42.2	42.5	42.5	42.5	42.5	42.5
H8	31.7	34.1	37.8	39.9	41.9	42.2	42.2	42.2	42.2	42.2
H9	30.5	32.9	36.7	38.7	40.7	41.0	41.0	41.0	41.0	41.0
H10	29.2	31.5	35.2	37.3	39.3	39.6	39.6	39.6	39.6	39.6
H11	27.7	30.1	33.8	35.9	37.9	38.2	38.2	38.2	38.2	38.2
H12	27.7	30.1	33.8	35.8	37.9	38.2	38.2	38.2	38.2	38.2
H13	27.3	29.7	33.4	35.4	37.5	37.8	37.8	37.8	37.8	37.8

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H14	27.2	29.6	33.3	35.3	37.4	37.7	37.7	37.7	37.7	37.7
H15	27.2	29.8	33.7	35.7	37.7	37.9	37.9	37.9	37.9	37.9
H16	27.1	29.8	33.7	35.6	37.6	37.8	37.8	37.8	37.8	37.8
H17	26.9	29.5	33.4	35.4	37.4	37.6	37.6	37.6	37.6	37.6
H18	26.6	29.2	33.1	35.1	37.1	37.3	37.3	37.3	37.3	37.3
H19	26.6	29.3	33.2	35.1	37.1	37.3	37.3	37.3	37.3	37.3
H21	24.1	26.7	30.6	32.6	34.6	34.8	34.8	34.8	34.8	34.8
H22	24.6	26.9	30.6	32.7	34.7	35.0	35.0	35.0	35.0	35.0
H23	24.5	26.8	30.5	32.5	34.6	34.9	34.9	34.9	34.9	34.9
H24	24.4	26.7	30.4	32.4	34.5	34.8	34.8	34.8	34.8	34.8
H25	24.2	26.5	30.2	32.3	34.3	34.6	34.6	34.6	34.6	34.6
H26	25.2	27.7	31.5	33.5	35.5	35.8	35.8	35.8	35.8	35.8
H27	25.6	28.2	32.0	34.0	36.0	36.3	36.3	36.3	36.3	36.3
H28	25.4	28.0	31.8	33.8	35.8	36.0	36.0	36.0	36.0	36.0
H29	26.0	28.7	32.5	34.5	36.5	36.7	36.7	36.7	36.7	36.7
H30	26.0	28.6	32.5	34.5	36.5	36.7	36.7	36.7	36.7	36.7
H31	26.2	28.8	32.7	34.7	36.7	36.9	36.9	36.9	36.9	36.9
H32	25.6	28.2	32.0	34.0	36.0	36.3	36.3	36.3	36.3	36.3
H33	25.9	28.5	32.3	34.3	36.3	36.5	36.5	36.5	36.5	36.5
H34	25.8	28.5	32.3	34.3	36.3	36.5	36.5	36.5	36.5	36.5
H35	26.2	28.7	32.6	34.5	36.6	36.8	36.8	36.8	36.8	36.8
H36	26.1	28.6	32.4	34.4	36.4	36.7	36.7	36.7	36.7	36.7
H37	25.9	28.5	32.3	34.2	36.3	36.5	36.5	36.5	36.5	36.5
H38	25.9	28.4	32.2	34.2	36.2	36.5	36.5	36.5	36.5	36.5
H39	24.7	27.0	30.6	32.7	34.7	35.0	35.0	35.0	35.0	35.0
H40	24.7	27.3	31.1	33.1	35.1	35.4	35.4	35.4	35.4	35.4
H41	36.7	37.9	40.5	43.1	45.5	46.0	46.0	46.0	46.0	46.0
H42	33.8	35.6	38.9	41.1	43.3	43.7	43.7	43.7	43.7	43.7
H43	36.5	37.7	40.5	43.0	45.3	45.9	45.9	45.9	45.9	45.9
H44	36.5	37.6	40.1	42.8	45.1	45.8	45.8	45.8	45.8	45.8
Night-time										
H6	32.4	34.5	38.0	40.2	42.3	42.6	42.6	42.6	42.6	42.6
H7	32.0	34.4	38.1	40.2	42.2	42.5	42.5	42.5	42.5	42.5
H8	31.7	34.1	37.8	39.9	41.9	42.2	42.2	42.2	42.2	42.2
H9	30.5	32.9	36.7	38.7	40.7	41.0	41.0	41.0	41.0	41.0
H10	29.2	31.5	35.2	37.3	39.3	39.6	39.6	39.6	39.6	39.6

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H11	27.7	30.1	33.8	35.9	37.9	38.2	38.2	38.2	38.2	38.2
H12	27.7	30.1	33.8	35.8	37.9	38.2	38.2	38.2	38.2	38.2
H13	27.3	29.7	33.4	35.4	37.5	37.8	37.8	37.8	37.8	37.8
H14	27.2	29.6	33.3	35.3	37.4	37.7	37.7	37.7	37.7	37.7
H15	27.2	29.8	33.7	35.7	37.7	37.9	37.9	37.9	37.9	37.9
H16	27.1	29.8	33.7	35.6	37.6	37.8	37.8	37.8	37.8	37.8
H17	26.9	29.5	33.4	35.4	37.4	37.6	37.6	37.6	37.6	37.6
H18	26.6	29.2	33.1	35.1	37.1	37.3	37.3	37.3	37.3	37.3
H19	26.6	29.3	33.2	35.1	37.1	37.3	37.3	37.3	37.3	37.3
H21	24.1	26.7	30.6	32.6	34.6	34.8	34.8	34.8	34.8	34.8
H22	24.6	26.9	30.6	32.7	34.7	35.0	35.0	35.0	35.0	35.0
H23	24.5	26.8	30.5	32.5	34.6	34.9	34.9	34.9	34.9	34.9
H24	24.4	26.7	30.4	32.4	34.5	34.8	34.8	34.8	34.8	34.8
H25	24.2	26.5	30.2	32.3	34.3	34.6	34.6	34.6	34.6	34.6
H26	25.2	27.7	31.5	33.5	35.5	35.8	35.8	35.8	35.8	35.8
H27	25.6	28.2	32.0	34.0	36.0	36.3	36.3	36.3	36.3	36.3
H28	25.4	28.0	31.8	33.8	35.8	36.0	36.0	36.0	36.0	36.0
H29	26.0	28.7	32.5	34.5	36.5	36.7	36.7	36.7	36.7	36.7
H30	26.0	28.6	32.5	34.5	36.5	36.7	36.7	36.7	36.7	36.7
H31	26.2	28.8	32.7	34.7	36.7	36.9	36.9	36.9	36.9	36.9
H32	25.6	28.2	32.0	34.0	36.0	36.3	36.3	36.3	36.3	36.3
H33	25.9	28.5	32.3	34.3	36.3	36.5	36.5	36.5	36.5	36.5
H34	25.8	28.5	32.3	34.3	36.3	36.5	36.5	36.5	36.5	36.5
H35	26.2	28.7	32.6	34.5	36.6	36.8	36.8	36.8	36.8	36.8
H36	26.1	28.6	32.4	34.4	36.4	36.7	36.7	36.7	36.7	36.7
H37	25.9	28.5	32.3	34.2	36.3	36.5	36.5	36.5	36.5	36.5
H38	25.9	28.4	32.2	34.2	36.2	36.5	36.5	36.5	36.5	36.5
H39	24.7	27.0	30.6	32.7	34.7	35.0	35.0	35.0	35.0	35.0
H40	24.7	27.3	31.1	33.1	35.1	35.4	35.4	35.4	35.4	35.4
H41	36.7	37.9	40.5	42.6	44.1	45.5	46.0	46.0	46.0	46.0
H42	33.8	35.6	38.9	41.1	42.8	42.8	43.7	43.7	43.7	43.7
H43	36.5	37.7	40.5	42.5	44.0	45.4	45.9	45.9	45.9	45.9
H44	36.5	37.6	40.1	42.4	44.0	45.3	45.8	45.8	45.8	45.8

10.106 **Table 10.21** shows the resulting margin of compliance to the ETSU-R-97 noise limits for the scenario described above, demonstrating that, provided the relevant precautionary controls are attached to the Proposed Development and the neighbouring Dunbeg South

Wind Farm, predicted overall operational noise levels are below the overall requirements of ETSU-R-97.

Table 10.21 – Margin of Cumulative Levels with Planning Controls to Limits, dB L_{A90}

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
Daytime										
H6	9.4	8.2	6.1	3.4	2.6	4.0	6.1	8.7	8.7	8.7
H7	10.2	8.7	6.2	3.6	2.9	4.3	6.4	9.0	9.0	9.0
H8	10.4	8.9	6.5	3.9	3.1	4.6	6.7	9.3	9.3	9.3
H9	11.8	10.2	7.7	5.0	4.3	5.8	7.9	10.5	10.5	10.5
H10	12.9	11.4	9.1	6.4	5.7	7.1	9.2	11.8	11.8	11.8
H11	14.5	13.0	10.5	7.9	7.2	8.6	10.7	13.3	13.3	13.3
H12	14.3	12.9	10.5	7.8	7.1	8.6	10.7	13.3	13.3	13.3
H13	14.7	13.3	10.9	8.3	7.5	9.0	11.1	13.7	13.7	13.7
H14	14.8	13.4	11.0	8.3	7.6	9.1	11.2	13.8	13.8	13.8
H15	15.2	13.5	10.8	8.1	7.5	9.0	11.1	13.7	13.7	13.7
H16	15.5	13.6	10.9	8.2	7.6	9.1	11.2	13.8	13.8	13.8
H17	15.7	13.8	11.1	8.4	7.8	9.3	11.4	14.0	14.0	14.0
H18	16.0	14.1	11.4	8.8	8.1	9.6	11.7	14.3	14.3	14.3
H19	16.1	14.0	10.4	7.7	7.3	8.8	10.9	13.4	13.4	13.4
H21	18.5	16.4	12.9	10.3	9.8	11.3	13.4	15.9	15.9	15.9
H22	17.5	15.9	12.7	10.0	9.5	10.9	13.0	15.5	15.5	15.5
H23	17.5	15.9	12.8	10.1	9.6	11.0	13.1	15.6	15.6	15.6
H24	17.7	16.0	12.9	10.2	9.7	11.1	13.2	15.7	15.7	15.7
H25	17.8	16.2	13.1	10.4	9.9	11.3	13.4	15.9	15.9	15.9
H26	17.1	15.3	11.9	9.3	8.8	10.3	12.4	14.9	14.9	14.9
H27	16.7	14.8	11.4	8.8	8.3	9.8	11.9	14.4	14.4	14.4
H28	16.9	15.0	11.6	9.0	8.5	10.0	12.1	14.6	14.6	14.6
H29	16.5	15.2	13.0	10.8	10.7	12.5	14.7	17.1	17.1	17.1
H30	16.5	15.2	13.0	10.9	10.7	12.5	14.7	17.1	17.1	17.1
H31	16.3	15.0	12.8	10.6	10.5	12.3	14.5	16.9	16.9	16.9
H32	16.9	15.6	13.4	11.3	11.1	12.9	15.1	17.5	17.5	17.5
H33	16.6	15.3	13.2	11.0	10.8	12.6	14.8	17.2	17.2	17.2
H34	16.6	15.3	13.2	11.0	10.9	12.7	14.9	17.3	17.3	17.3
H35	16.3	15.0	12.9	10.8	10.6	12.4	14.6	17.0	17.0	17.0
H36	16.3	15.1	13.1	10.9	10.7	12.5	14.7	17.1	17.1	17.1
H37	16.4	15.2	13.2	11.0	10.9	12.6	14.8	17.2	17.2	17.2
H38	16.4	15.3	13.2	11.1	10.9	12.7	14.9	17.3	17.3	17.3

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H39	17.4	16.5	14.7	12.5	12.3	14.0	16.2	18.6	18.6	18.6
H40	17.6	16.4	14.3	12.2	12.0	13.8	16.0	18.4	18.4	18.4
H41	6.9	7.2	6.3	3.6	2.5	3.2	4.8	6.6	8.6	10.9
H42	7.6	6.7	4.9	2.3	1.4	2.7	4.8	7.4	7.4	7.4
H43	7.3	7.5	6.5	3.8	2.7	3.4	5.0	6.8	8.8	11.1
H44	7.1	7.5	6.6	3.9	2.7	3.4	5.0	6.8	8.8	11.1
Night-time										
H6	10.6	8.5	5.0	2.8	0.7	0.4	1.8	1.8	1.8	1.8
H7	11.0	8.6	4.9	2.8	0.8	0.5	1.9	1.9	1.9	1.9
H8	11.3	8.9	5.2	3.1	1.1	0.8	2.2	2.2	2.2	2.2
H9	12.5	10.1	6.3	4.3	2.3	2.0	3.4	3.4	3.4	3.4
H10	13.8	11.5	7.8	5.7	3.7	3.4	4.8	4.8	4.8	4.8
H11	15.3	12.9	9.2	7.1	5.1	4.8	6.2	6.2	6.2	6.2
H12	15.3	12.9	9.2	7.2	5.1	4.8	6.2	6.2	6.2	6.2
H13	15.7	13.3	9.6	7.6	5.5	5.2	6.6	6.6	6.6	6.6
H14	15.8	13.4	9.7	7.7	5.6	5.3	6.7	6.7	6.7	6.7
H15	15.8	13.2	9.3	7.3	5.3	5.1	6.5	6.5	6.5	6.5
H16	15.9	13.2	9.3	7.4	5.4	5.2	6.6	6.6	6.6	6.6
H17	16.1	13.5	9.6	7.6	5.6	5.4	6.8	6.8	6.8	6.8
H18	16.4	13.8	9.9	7.9	5.9	5.7	7.1	7.1	7.1	7.1
H19	16.4	13.7	9.8	7.9	5.9	5.7	5.7	5.7	5.7	5.7
H21	18.9	16.3	12.4	10.4	8.4	8.2	8.2	8.2	8.2	8.2
H22	18.4	16.1	12.4	10.3	8.3	8.0	8.0	8.0	8.0	8.0
H23	18.5	16.2	12.5	10.5	8.4	8.1	8.1	8.1	8.1	8.1
H24	18.6	16.3	12.6	10.6	8.5	8.2	8.2	8.2	8.2	8.2
H25	18.8	16.5	12.8	10.7	8.7	8.4	8.4	8.4	8.4	8.4
H26	17.8	15.3	11.5	9.5	7.5	7.2	7.2	7.2	7.2	7.2
H27	17.4	14.8	11.0	9.0	7.0	6.7	6.7	6.7	6.7	6.7
H28	17.6	15.0	11.2	9.2	7.2	7.0	7.0	7.0	7.0	7.0
H29	17.0	14.3	10.5	8.5	6.5	6.3	9.9	9.9	9.9	9.9
H30	17.0	14.4	10.5	8.5	6.5	6.3	9.9	9.9	9.9	9.9
H31	16.8	14.2	10.3	8.3	6.3	6.1	9.7	9.7	9.7	9.7
H32	17.4	14.8	11.0	9.0	7.0	6.7	10.3	10.3	10.3	10.3
H33	17.1	14.5	10.7	8.7	6.7	6.5	10.1	10.1	10.1	10.1
H34	17.2	14.5	10.7	8.7	6.7	6.5	10.1	10.1	10.1	10.1
H35	16.8	14.3	10.4	8.5	6.4	6.2	9.8	9.8	9.8	9.8

House	Standardised 10 m Height Wind Speed, $m.s^{-1}$									
	3	4	5	6	7	8	9	10	11	12
H36	16.9	14.4	10.6	8.6	6.6	6.3	9.9	9.9	9.9	9.9
H37	17.1	14.5	10.7	8.8	6.7	6.5	10.1	10.1	10.1	10.1
H38	17.1	14.6	10.8	8.8	6.8	6.5	10.1	10.1	10.1	10.1
H39	18.3	16.0	12.4	10.3	8.3	8.0	11.6	11.6	11.6	11.6
H40	18.3	15.7	11.9	9.9	7.9	7.6	11.2	11.2	11.2	11.2
H41	6.3	5.1	2.5	0.4	0.0	0.3	1.8	4.1	6.5	9.1
H42	9.2	7.4	4.1	1.9	0.2	0.2	0.7	0.7	0.7	0.7
H43	6.5	5.3	2.5	0.5	0.1	0.4	1.9	4.2	6.6	9.2
H44	6.5	5.4	2.9	0.6	0.1	0.5	2.0	4.3	6.7	9.3

10.107 Charts showing the overall ETSU-R-97 noise limits; the proposed planning controls; predicted noise levels from each site separately; and the combined total, with and without the proposed planning condition limits applied, are provided in **Technical Appendix 10.3**. These show that, with the precautionary proposed planning controls in place, the overall requirements of ETSU-R-97 can be satisfied.

Construction & Decommissioning

10.108 Noise due to the construction and decommissioning of the other wind farms considered in the cumulative operational noise assessment is unlikely to be present at the same time as the construction of the Proposed Development. However, if construction and decommissioning activities are undertaken concurrently this would generally amount to an increase in the frequency of traffic (including HGVs) entering the various sites and passing local residences as a result; and, a slight increase in the overall construction noise levels when building out the infrastructure at each site. As a result, a detailed assessment has not been undertaken and the effect is considered not significant provided that all usual controls and best practice is followed in terms of construction techniques.

Summary

10.109 The acoustic impact of the operation of the Proposed Development on nearby residential properties has been assessed in accordance with 'The Assessment and Rating of Noise from Wind Farms', otherwise known as ETSU-R-97, and Institute of Acoustics Good Practice Guide (IOA GPG), as recommended for use in planning policy for Northern Ireland.

10.110 The results of background noise surveys conducted in support of other wind farm development in the area have been used to determine appropriate overall noise limits for the Proposed Development and the neighbouring planning, consented and operational wind farm sites, as required by ETSU-R-97 and the IOA GPG.

10.111 Operational noise levels were predicted using an appropriate propagation model, incorporating the proposed turbine locations, terrain data and applicable turbine emission information. The resultant predicted noise levels are below noise limits derived in accordance with ETSU-R-97 at all properties at all considered wind speeds when the Proposed Development is considered on its own.

10.112 A cumulative operational noise assessment was completed to determine the potential impact of the Proposed Development at the same time as two existing schemes and one consented development located nearby. The cumulative predicted operational noise levels are marginally above the overall ETSU-R-97 noise limits when assuming that all the considered turbines are operating unrestricted. However, with appropriate precautionary mitigation measures and planning controls applied to the Proposed Development and neighbouring Dunbeg South Wind Farm, for which a planning variation will be sought, predicted operational noise levels are below the limits at all properties for all considered wind speeds and directions.

10.113 Noise associated with construction and decommissioning has been discussed with reference to BS 5228 and it has been determined that onsite construction noise levels are highly unlikely to exceed typical limiting noise criteria at nearby properties although appropriate mitigation measures will be adopted as a matter of due course. The access route for the proposed wind farm is expected to pass reasonably close to some dwellings and with some upgrade works to existing access tracks and local roads potentially occurring in close proximity to some dwellings. In these instances, the level of noise generated by construction works could be close to typical limits for relatively brief periods. As a result, typical and enhanced construction noise mitigation measures are provided in the **Mitigation** section which aim to minimise noise as far as reasonably practicable and/or reasonable.

10.114 The potential impact of the Proposed Development, along with the mitigation proposed and any residual effect, is summarised in **Table 10.22**.

Table 10.22 - Summary of Potential Impacts, Mitigation and Residual Effects

Potential Impact	Mitigation Proposed	Means of Implementation	Outcome/Residual Effect
Operation			
Potential impact on residential amenity due to operational noise	Impact is deemed to be acceptable as wind farm meets noise limits specified by relevant guidance with a noise management strategy in place. No additional mitigation measures are required due to absence of identified significant effect.	The limits specified for the Proposed Development and the planning variation limits proposed for the Dunbeg South scheme.	Not significant.
Construction			
Potential for noise to be created during general construction activities and by construction traffic	Due regard for 'best practicable means' (defined by Section 72 of the Control of Pollution Act 1974). A range of noise mitigation measures are proposed for the construction phase in accordance with measures outlined in BS 5228-1:2009+A1:2014. Site operations to be limited to 07:00-19:00 weekdays and 07:00 -13:00 on Saturdays (except during turbine erection and commissioning/periods of emergency work).	Noise mitigation measures would be implemented as part of the Construction and Environmental Management Plan (CEMP) which would be required to be agreed as a condition of consent.	Not significant.

11. Traffic & Transport

Introduction

11.1. This assessment considers the potential impacts on traffic and transport associated with the construction, operation and decommissioning phases of the proposed Dunbeg South Extension Wind Farm, hereinafter referred to as 'the Proposed Development'.

11.2. The site located on lands to the north of A37 and to the west of the existing Dunbeg Wind Farm and lands to the south of A37 adjacent to a disused quarry, in the townlands of Dunbeg and Dunmore, 6.2km north east of Limavady, County Derry / Londonderry.

11.3. The Planning Application site is shown in **Figure 1.1: Site Location** and **Figure 1.2: Planning Application Boundary**. The proposed site entrance to the northern portion of the site (turbine T4) is along the A37 Broad Road, and the site entrance to the southern portion of the site (turbines T1-T3) is either via the A37 Broad Road or via the permitted Dunbeg South Wind Farm entrance.

11.4. The following have been considered in this chapter:

- Legislation and policy;
- Access routes for abnormal indivisible loads (AIL), normal construction traffic and associated road improvements;
- The type and volume of traffic generated by the Proposed Development;
- Identification of sensitive/ critical locations along the delivery route;
- Assessment of construction, operation and decommissioning traffic impacts;
- Outline of suitable mitigation measures and the evaluation of residual impacts; and
- Cumulative impacts of surrounding operational, consented and proposed developments.

11.5. This assessment has been undertaken in-house by Renewable Energy Systems Ltd (RES) with at least one in-house Member of the Institution of Engineers Ireland and the Institution of Civil Engineers involved in its production.

11.6. This assessment is supported by the following:

- **Technical Appendix 11.1: Delivery Analysis**
- Figure 11.1: Turbine Delivery Route
- Figure 11.2: HGV Routes

Legislation, Policy and Guidance

DOE- Planning Policy Statement 3- Access, Movement and Parking (2005)

11.7. Policy AMP2 of PPS3 issued by the Department of Environment (DOE) in 2005 states that:

- *"planning permission will only be granted for a development proposal involving direct access, of the intensification of the use of an existing access, onto a public road where:*
  - *a) Such access will not prejudice road safety or significantly inconvenience the flow of traffic; and*
  - *b) The proposal does not conflict with Policy AMP3 Access to Protected Routes"*

11.8. Policy AMP3 of PPS3 (Clarification) published by the DOE in October 2006 states that:

"The Department will restrict the number of new access and control the level of use of existing accesses onto Protected routes as follows:

- *Motorways and High Standard Dual Carriageways;*
- *Other Dual Carriageways, Ring Roads, Through- Passes and By-Passes- all Locations;*
- *Other Protected Routes – Outside Settlement Limits; and*
- *Other Protected Routes – Within Settlement Limits"*

Strategic Planning Policy Statement (SPPS)

11.9. The SPPS highlights that transportation issues to be addressed in the LDP should include Protected Routes. Whilst regional policy is to restrict the number of new access and control the level of use of existing accesses onto protected routes, there are exceptions where the principle of development accords with policy elsewhere in the SPPS.

Northern Area Plan 2016 (2015)

11.9 Protected Routes Network seeks to maintain the efficiency and safety of main road system between the Regions towns. The Broad Road (A37) Gortcorbies is under consideration as part of Proposal TRA 1: Rural Route Protection, with a view to improving the overtaking opportunity towards Coleraine.

DOE – Planning Policy Statement 18: Renewable Energy (2009)

11.10. Policy RE1 of PPS18 issued by DOE in 2009 requires applications for a wind energy development to demonstrate that no part of a development will have an unacceptable impact on roads, rails or aviation safety:

- *"Where any project is likely to result in unavoidable damage during its installation, operation or decommissioning, the application will need to indicate how this will be minimised and mitigated, including details of any proposed compensatory measures… This matter will need to be agreed before planning permission is granted."*

DOE – Best Practice to Planning Policy Statement 18 'Renewable Energy' (2009)

11.11. Section 1 of the Guidance relates to wind energy and names the "Adequacy of local access road network to facilitate construction of the project and transportation of large machinery and turbine parts to site" as one of the main concerns that needs to be considered by the developer when applying for a wind farm development.

IEMA – Guidelines for the Environmental Assessment of Road Traffic (1993)

11.12. The Institute of Environmental Management and Assessment (IEMA) guidelines (hereinafter referred to as IEMA Guidelines (1993)) are the most widely used guidance document for assessing traffic impacts as part of Environmental Statements and are referred to throughout this Chapter.

11.13. The IEMA Guidelines (1993) suggest two general rules for identifying the extent of the assessment area:

- **Rule 1** – include highway links where traffic flows will increase by more than 30% (or the number of heavy good vehicles (HGVs) will increase by more than 30%).
- **Rule 2** – include any other specifically sensitive areas where the traffic flows have increased by 10% or more.

11.14. Where the change is less than the above thresholds, the impact shall be considered 'negligible'.

Scope of the Assessment

11.15. The main transport effects will be associated with the movement of commercial Heavy Goods Vehicles (HGVs) and Abnormal Indivisible Loads (AILs) (i.e. turbine component delivery) to and from the site during the construction phase of the proposed development.

11.16. Once operational, it is envisaged that the volume of traffic associated with the proposed development would be minimal, comprising service and maintenance visits. Occasional visits may also be made to the site for more extensive maintenance/ repairs. The vehicle used for maintenance visits is likely to be a 4x4 vehicle (or similar) but there may be an occasional need for HGV deliveries, road-going cranes or AILs to access the site for heavier maintenance and repairs. However, it is considered that the effects of such operational traffic will be negligible and therefore, detailed consideration of the operational phase of the proposed development is not included in this assessment.

11.17. The expected lifetime of the proposed development is 35 years. Decommissioning traffic will likely include the delivery of plant to site to undertake the works and the removal of turbine components, and is expected to be at lower volume than during the construction period. It is expected that should the proposed development be consented, a planning condition would be included to require the agreement of a decommissioning method statement with the relevant authorities prior to decommissioning.

11.18. For details of the assessment of construction noise associated with deliveries, see **Chapter 11: Noise**. The proposed access routes for AILs (turbine delivery) is illustrated on **Figure 11.1 – Turbine Delivery Route**. It is proposed that HGV deliveries of concrete and stone respectively will also utilise the Broad Road (A37) but could do so from either direction depending on the source of material and subject to confirmation with DFI Roads.

Abnormal Indivisible Loads (turbine component delivery)

11.19. Specialist vehicles are required to transport components to the site. One vehicle would transport turbine blades, while another type would transport the tower sections. The proposed access routes for AILs (turbine delivery) from the A44 to site is illustrated in **Figure 11.1 –Turbine Delivery Route.** Swept path analyses have been undertaken for blade delivery as this is the more onerous scenario, to determine the works required to allow passage through pinch-points on the route. This is illustrated in **Technical Appendix 11.1: Delivery Analysis.**

11.20. The proposed access route for AILs from Lisahally Port has been used previously for the construction of Dunbeg Wind Farm which also utilises access directly onto the Broad Road (A37). From Lisahally, the route will travel onto Maydown Road and turn east onto the Clooney Road and travel east for approximately 28km via both Greysteel and Ballykelly before bypassing Limavady town on the Ballykelly Road and travelling southeast onto Broad Road. The site entrances are located on the Broad Road.

11.21. The proposed return route for the delivery vehicles is similar to the proposed delivery route noted above. Once the turbine components have been delivered, the vehicles will be shortened so they are no longer than a typical articulated HGV.

11.22. Where required, approval to temporarily remove street furniture (for the minimum period as is reasonably practical), will be obtained from the appropriate bodies prior to deliveries post planning consent.

11.23. AIL delivery will be timed to avoid peak local traffic times, such as commuting hours and school start and end times to minimise disruption.

Normal HGV Delivery

11.24. Normal HGV load delivery routes (including stone and concrete) will utilise the Broad Road, with sources of material to be confirmed prior to construction. No passing bays will be required.

11.25. Where agreed by DfI Roads, circular HGV haul routes may be implemented for the construction phase of the project.

11.26. Post consent, a further detailed review of all bridges/structures along the preferred route will be undertaken and, if required, structural surveys will be carried out. The requirement (if any) of any subsequent improvement works will be undertaken following consultation with DfI Roads and detailed in the Traffic Management Plan (TMP).

Site Entrance

11.27. The site entrance for the northern portion of the site is located on the Broad Road where an existing access is provided to an unoccupied building. The southern section will either be accessed via the approved Dunbeg South Wind Farm entrance, or via a separate entrance along Broad Road, directly opposite the entrance to the northern portion of the site. The construction of wind farms has previously directly accessed the Broad Road (A37) for access and egress of both HGV and AIL deliveries (PAC 2009/A0363 (B/2007/0560/F).

11.28. The proposed site entrance is shown in ***Figure 1.7*** and has been constructed in accordance with the requirements of Development Control Advice Note (DCAN) 15, 2nd Edition.

11.29. As specified in DCAN 15, visibility splays measuring 215m x 4.5m are provided in both directions. Provision is included to allow fully laden AIL delivery vehicles to access the site and stop clear of the carriageway when the gates are closed during the construction period.

Consultation

11.30. Consultation with stakeholders relevant to traffic, roads and infrastructure on and near the delivery routes were sent to DFI Roads, however no response was received. The route is similar to the approved Dunbeg South Site, the consultation response for the approved Dunbeg South site is outlined below.

Table 11.1: Consultation Responses - Approved Dunbeg South Site

Consultee	Issue	Solution/ Further Steps
DfI Roads,	**Structures** L'Derry to Limavady Bridge crossing River Faughan Bridge crossing River Roe Limavady to site entrance. Belfast to Broad Road (A37) Bridge crossing River Bann (at Coleraine).	Post consent, a review of the condition of structures along the entire route will be conducted and if required, remedial works will be proposed taking into account all DfI Roads requirements. All required permits will be applied for prior to delivery of the turbine components.
	Protected Route The A37 is a protected route and the DfI Roads have a DfI Roads - Strategic Routes Improvement Team have a proposal for a climbing lane at this location (NAP 2016 – Proposal TRA 1).	The DfI Roads - Strategic Routes Improvement Team has previously reviewed the approved entrance proposal for the Dunbeg South Development site and advised that it is unlikely to affect the climbing lane proposal. Currently no allocated budget for the climbing lane scheme. Due to its proximity to the newly proposed site, no further consultations have been conducted to date.

12.1 Please note, further consultation is required post consent with stakeholders relevant to traffic, roads and infrastructure on and near the delivery routes to finalise the preferred HGV access route strategy to the development.

Assessment Methodology

12.2 The assessment has been undertaken in accordance with the Institute of Environmental Assessment's 'Guidelines for the Environmental Assessment of Road Traffic' (1993).

12.3 The IEA Guidelines (1993) is the only document available that sets out a methodology for assessing potentially significant environmental impacts where a proposed development is likely to give rise to changes in traffic flows.

12.4 The IEA Guidelines (1993) suggest that, in order to determine the scale and extent of the assessment and the level of impact the development will have on the surrounding network, the following two 'rules' should be followed:

1. Include highways links (public roads) where traffic flows are predicted to increase by 10% or more.
2. Include any other specifically sensitive areas where traffic flows are predicted to increase by 10% or more.

12.5 Where possible, the significance of each impact is considered against the criteria within the IEA Guidelines (1993). However, the IEA Guidelines (1993) State that:

> *"for many effects there are no simple rules or formulae which defines the thresholds of significance and there is, therefore, a need for interpretation and judgement on the part of the assessor, backed-up by data or quantified information wherever possible. Such judgements will include the assessment of the numbers of people experiencing a change in environmental impact as well as the assessment of the damage to various natural resources."*

12.6 In the absence of established significance criteria for traffic and transport impacts, professional judgement has been used to assess whether the impacts on traffic and transport are considered to be significant, using the IEA Guidelines (1993) to identify the scale and extent of the assessment to be undertaken. The significance falls into two categories; 'not significant' and 'significant', the latter corresponding to significant impacts in accordance with IEA Guidelines (1993).

12.7 The IEA Guidelines (1993) state projected changes in traffic of less than 10% creates no discernible environmental impact, given that daily variations in background traffic flow may fluctuate by this amount, and that a 30% change in traffic flow represents a reasonable threshold for including a highway link (public road) within the assessment. The threshold for a detailed assessment therefore has been set at a 30% change in HGV traffic flow.

12.8 The following receptors have been used for this assessment:

- Census Point 308, A37 Coleraine - Limavady, at Fernlester

12.9 Automatic Traffic Count (ATC) surveys were undertaken during a period of seven consecutive days starting on 24th February 2021 (note that no traffic data was available for 2022 or 2023 within the vicinity of the site) and covering all roads listed in as listed in ***Table 11.2***.

Table 11.2 ATC Summaries

Road Reference	24hr Average Daily Flow
Census Point 308, A37 Coleraine - Limavady, at Fernlester	16,400

Potential Significant Effects

12.10 The construction of the proposed development is anticipated to take approximately 18 months. Construction site working hours will be from 0700 to 1900, Monday to Friday and 0700 to 1300 on Saturdays but deliveries may occur outside these times to minimise disruption to local residents and/ or to comply with Health and Safety, quality or any specific environmental requirements. During both turbine erection and decommissioning periods site workings could be seven days a week.

12.11 The associated traffic flows will vary over that time as different elements of the proposed development are constructed and will depend on the chosen contractor's preferred method of working. A Traffic Management Plan (TMP) will be prepared by the Applicant or the chosen contractor once the construction schedule, plant requirements and the turbine model have been defined, pre-construction. This will ensure impacts to the users of the delivery route are minimised where possible. The TMP will be submitted to Dfl Roads for approval prior to the start of construction.

12.12 Estimated traffic generation during the construction stage assumes the following activities will take place:

- Delivery of components for site set-up;
- Delivery of materials for road and hard standings;
- Delivery of materials and components associated with the foundation construction;
- Delivery of components associated with turbines;
- Delivery of components and materials associated with cable installation;
- Delivery of substation components and materials;
- Other miscellaneous deliveries/ removal; and
- Construction workers commuting.

12.13 ***Table 11.3*** provides the estimated traffic generation across an assumed 18 month construction period. The assessment has been based on the assumption that all material has to be imported to site, including ready mixed concrete for the turbine foundations and all aggregate for the access tracks and areas of hardstanding, thus providing a worst case assessment.

Table 11.3 Estimated Traffic generation across an assumed 18 month construction period

Phase	Purpose	Delivery Vehicle	Approx. No. of deliveries for project duration	Approx. highest No. of daily deliveries	Approx. delivery period
Site Set-Up	Portacabin delivery	Low Loader	5	5	1
	Skip delivery	Low Loader	5	5	1
	Generator delivery	Low Loader	2	2	1
	Water & fuel tank delivery	Low Loader	1	1	1
	Excavator delivery	Low Loader	4	2	1-2
	Tool container delivery	Low Loader	2	2	1-2
	Roller-compactor	Low Loader	3	1	1-2
	Articulated dumper	Tipper Lorry	3	1	1-2
Site tracks & hard standings	Stone for site tracks	Tipper Lorry	840	40	1-8
	Stone for control building & substation compound	Tipper Lorry	13	13	2-8
	Stone for construction compounds	Tipper Lorry	20	20	1-8
	Stone for pathways	Tipper Lorry	30	30	2-15
	Stone for crane hardstandings	Tipper Lorry	50	40	2-8
Foundation construction	Excavator delivery	Low loader	2	2	3-5
	Misc works	Backhoe loader	2	2	3-5
	Concrete for turbine foundations, piles & transformer plinths	Mixer truck	260	65	4-8
	Steel delivery	Flat bed	8	4	3-8
	Foundation bolts or steel insert delivery	Flat bed	4	2	3-8
	Place foundation	30t – 50t crane	1	1	5-8

Phase	Purpose	Delivery Vehicle	Approx. No. of deliveries for project duration	Approx. highest No. of daily deliveries	Approx. delivery period
	bolt cage or steel insert				
Turbine Erection	Tower section delivery	Clamp lift trailer	16	4	12-14
	Blade delivery	Extendible trailer	12	6	12-14
	Nacelle	Low loader	4	2	12-14
	Hub and rotor	Low loader	4	2	12-14
	Drive train	Low loader	4	3	12-14
	Large crane delivery & removal	1000t – 12000t crane	2	1	12-14
	Crane associated equipment delivery & removal	Low loader	20	10	12-14
	Smaller crane delivery & removal	150t – 200t crane	2	1	12-14
Cable Installation	Cable delivery	Flat bed	4	4	8-9
	Sand delivery	Tipper lorry	50	20	8-9
	Excavator delivery	Low loader	2	1	8-9
	Cable laying	Tele handler	2	1	8-9
Substation and Control Building	Concrete delivery	Mixer truck	36	36	8-9
	Brick delivery	Flat bed	3	3	8-9
	Roofing & Cladding	Flat bed	3	3	9-12
	Switchgear	Flat bed	2	2	9-12
	Misc. electrical equipment	Flat bed	3	3	9-12
Reinstatement	Removal of temporary compound	Tipper lorry	50	40	16-18
	Removal of temporary hardstanding stone	Tipper lorry	370	40	16-18
Misc.	Waste removal	Skip lorry	60	1	1-18

Phase	Purpose	Delivery Vehicle	Approx. No. of deliveries for project duration	Approx. highest No. of daily deliveries	Approx. delivery period
	Water/ fuel deliveries	Small tanker	60	1	1-18
Site Demobilisation	Portacabin removal	Low loader	5	5	18
	Skip removal	Low loader	5	5	18
	Generator removal	Low loader	2	2	18
	Water & fuel tank removal	Low loader	1	1	18
	Excavator Removal	Low loader	4	2	16-18
	Tool container removal	Low loader	2	2	16-18
	Roller-compactor	Low loader	3	1	16-18
	Articulated Dumper	Tipper Lorry	3	1	16-18
	Misc. works	Low loader	2	2	16-18
TOTAL Heavy Goods Vehicles			**1,991**		
Site Staff & Deliveries	Staff	Cars & minivans	5,000	20	1-18
	Miscellaneous	Vans	800	5	1-18
TOTAL Cars & Light Vehicles			**5,800**		
TOTAL VEHICLES			**7,791**		

12.14 ***Table 11.3*** has been derived from experience gained from previous wind farm construction phases and assumes approximately 40 stone deliveries per day.

12.15 It is estimated that the greatest concentration of construction traffic occurs on the days when concrete is delivered to the proposed development for the construction of turbine foundations.

12.16 Technical 'best practice' construction requirements may necessitate that the concrete for an individual turbine base foundation will have to be delivered and poured in one day to prevent 'cold' joints forming in the structure. As a result, there may be a period in which there will be an increased number of delivery vehicles, compared with the rest of the construction period, entering and leaving the site. The total number of concrete deliveries for each turbine base may be up to 65 journeys per day. It is assumed that all other HGV deliveries, such as stone, sand, general deliveries, etc., will be suspended on concrete pouring days and planned accordingly. Therefore, a maximum of 65 HGV deliveries per day to the site will be maintained.

12.17 This equates to approximately one vehicle movement every five minutes over the working day (0700 – 1900). ***Table 11.4*** illustrates the worst case percentage change of traffic flow

(i.e. based on the busiest 6 days) along the proposed access route during the turbine base construction stage of the proposed development.

Table 11.4 Summary of Percentage Increase in Traffic on Local Roads

Road Reference	24hr Average Daily Flow	Average Recorded Daily HGV Flow as a percentage (No. of HGVs)	Percentage increase of HGVs (No. of HGVs)	Is the IEA (1993) threshold of 30% increase in HGV Traffic Flow exceeded?
Census Point 308, A37 Coleraine – Limavady, at Fernlester	16,400	8.8% (1,443)	9% (130)	No

12.1 The IEA threshold of 30% is not exceeded on any of the aforementioned roads and therefore an assessment of potential significant impacts has not been undertaken.

12.2 The above table takes into account maximum HGVs deliveries (65 per day) accessing the site from east or west and returning by the same route.

Cumulative Impacts

12.3 There are a number of operational, consented and proposed projects within 10km of the Site (Table 11.5).

Table 11.5: Pre-construction Wind Farms in the Vicinity of the Proposed Development

Name	Status	Number of Turbines	Distance from Proposed Site Boundary
Cam Burn	Consented	6	8.5km
Croaghan	Consented	5	4.5km
Dunbeg South	Consented	9	-
Rigged Hill Repower	Consented	7	4.2km

12.1 There is one consented wind farm (Dunbeg South Wind Farm) within close proximity to the development that could theoretically result in cumulative traffic impacts. If the construction periods of Dunbeg South (maximum HGV deliveries of 65 per day which is 130 trips if same route used) and Dunbeg South Extension Wind Farms were to coincide, the percentage increase of HGVs would be 18% (260) and would therefore not exceed the 30% threshold.

Mitigation

12.2 A Traffic Management Plan (TMP) will be prepared by the Applicant in accordance with the requirements of Department of Infrastructure NI, the local PSNI, Causeway Coast & Glens BC and if required, any other relevant stakeholders. Features of the TMP will include:

- Details of the access route, conformation of any points along the access route that require street furniture removal, details of traffic numbers, delivery timings, and signage and escort requirements

- A delivery schedule for normal and abnormal loads to minimise disruption as far as reasonably practicable
- Details of how any movements will comply with legislation regarding the movement of abnormal loads e.g. notice procedures and notice periods
- Details on the use of escorts where required. Where long vehicles and abnormal loads would have to use the wrong side of the carriageway or need to swing into the path of oncoming vehicles a lead warning vehicle would be used. One escort vehicle would drive ahead and pull oncoming traffic into identified passing places. An escort vehicle would travel directly in front of the convoy and pull over any oncoming traffic that comes onto the road after the first escort vehicle has passed. A further convoy escort vehicle would follow the convoy
- Information about marking of vehicles as long/abnormal loads

12.3 Information will be given on how warning signs will be used. These will be used to advise other road users of 'Caution Slow Plant Turning Ahead' and will be placed at intervals from both directions along the main road approaching the site entrance during the construction phase. The TMP will also detail additional measures to ensure impacts from traffic movements are minimised where possible, for example provision of road sweepers and/or wheel wash facilities.

12.4 If required, the wheel wash facilities will include a waterless drive over wheel wash for lorries. This will be provided at the site entrance to prevent mud and dust being brought out from the Site onto the public highway and anything being brought onto Site from public highway. Although experience has shown the majority of mud is shaken off wheels on site before the vehicle reaches the public road, the site entrance and adjacent public highway will also be monitored and cleaned if necessary.

12.5 The TMP will include details about Video Surveying and Road Repairs. A video survey of the pre-construction condition of all public roads will be recorded around the site entrances and access routes (but including the site entrance and access roads), to provide a baseline record of the state of the roads prior to construction work commencing. This will enable any repairs and maintenance work required to the relevant road due to any damage caused by the passing of heavy vehicles associated with the wind farm construction to be identified following the construction phase. The roads will be returned, at minimum, to the baseline condition at the end of the construction phase. Any damage caused by wind farm traffic during the construction period, which would be hazardous to public traffic, will be repaired immediately. These works will be carried out under permits with DfI Roads, as appropriate.

12.6 The TMP will include plans for notifying relevant stakeholders in advance of delivery periods, including the emergency services, DfI Roads, local residents, local business, local services and schools. The local community will be informed prior to the commencement of construction and prior to the commencement of turbine deliveries by letter and through local press. The contact details of the Construction Site Manager will be made available as a contact point for enquiries. Local schools on the delivery routes will be contacted to identify school and nursery drop-off and

pick up locations and times. Construction deliveries will be scheduled to avoid these busy periods as far as reasonably possible.

12.7 If cutting or removal of hedges and trees is required, then this should be done outside the bird breeding season (1st March to 31st August) unless otherwise agreed. If work is to be done during the breeding season, then there should be a survey to establish whether nesting birds are present.

Summary

12.8 The main traffic impacts are associated with the increase in HGV vehicle movements along the Broad Road during construction stage of the project. As this road has relatively high levels of existing traffic, the percentage increase in HGV vehicle movements is not significant. At worst, the frequency of vehicle movements is expected to be one vehicle every five minutes during the construction of each wind turbine foundation.

12.9 Consideration has been given to the effect of increased HGV traffic flow on Severance, Driver Delay, Pedestrian Delay, Pedestrian Amenity, Fear and Intimidation, Accidents and Safety and Cumulative Impacts. Furthermore, consideration has been given to the environmental effects of any road improvement/widening works.

12.10 A TMP will be developed and agreed with relevant stakeholder's post consent and pre-construction in order to control and mitigate impacts associated with increased vehicles movements.

12.11 Taking into account the existing vehicle movements on the affected roads, and the proposed type and frequency of vehicle numbers, it is considered that with the appropriate mitigation measures as set out above, there will be no significant impacts.

List of References, Figures and Appendices

References

Department of Environment (2009); Best Practice Guidance to Planning Policy Statement 18 – Renewable Energy, Planning and Environmental Policy Group.

Department of Environment (2005); Access, Movement and Parking Planning Policy Statement 3, PPS 3, The Planning Service.

Department of Environment (2015); Northern Area Plan 2016. Institute of Environmental Assessment (1993);

The Institute of Environmental Assessment's Guidelines for the Environmental Assessment of Road Traffic.

Figures

Technical Appendices

12. Shadow Flicker & Reflected Light

Introduction & Background

12.1 In sunny conditions, any shadow cast by a wind turbine will mirror the movement of the rotor. When the sun is high, any shadows will be confined to the wind farm area but when the sun sinks to a lower azimuth moving shadows can be cast further afield and potentially over adjacent properties. Shadow flicker is generally not a disturbance in the open as light outdoors is reflected from all directions. The possibility of disturbance is greater for occupants of buildings when the moving shadow is cast over an open door or window; since the light source is more directional.

12.2 Whether shadow flicker is a disturbance depends upon the observer's distance from the turbine, the direction of the dwelling and the orientation of its windows and doors from the wind farm, the frequency of the flicker and the duration of the effect, either on any one occasion or averaged over a year.

12.3 In any event and irrespective of distance from the turbines, the flickering frequency will depend upon the rate of rotation and the number of blades. It has been recommended (Clarke, 1991) [1] that the critical frequency should not be above 2.5 Hz, which for a three-bladed turbine is equivalent to a rotational speed of 50 rpm. The candidate turbines proposed at Dunbeg South Extension Wind Farm would rotate at 12.6 rpm, which is well below this threshold.

Reflected Light

12.4 A related visual effect to shadow flicker is that of reflected light. Theoretically, should light be reflected off a rotating turbine blade onto an observer then a stroboscopic effect would be experienced. In practice a number of factors limit the severity of the phenomenon and there are no known reports of reflected light being a significant problem at wind farms.

12.5 A limiting factor is that wind turbines have a semi-matt surface finish which means that they do not reflect light as strongly as materials such as glass or polished vehicle bodies.

12.6 Secondly, due to the convex surfaces found on a turbine, light will generally be reflected in a divergent manner.

12.7 Thirdly, as with shadow flicker, certain weather conditions and solar positions are required before an observer would experience this phenomenon.

12.8 It is therefore concluded that Dunbeg South Extension Wind Farm will not cause a material reduction to amenity owing to reflected light.

Policy and Guidance

12.9 The update to Shadow Flicker Evidence Base (2011) [2], published by the then Department for Energy and Climate Change (DECC), states that assessing shadow flicker effects within ten times the rotor diameter of wind turbines has been widely accepted across different European countries, and is deemed to be an appropriate area.

12.10 The Best Practice Guidance to Planning Policy Statement 18 "Renewable Energy" (2009) [3] further describes that,

"…at distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low".

Assessment Methodology

12.11 Analysis was performed on all properties within 10 rotor diameters of any turbine.

12.12 This shadow flicker assessment is based on turbines with a 117 m rotor diameter and the planning application includes a 50 micro-siting distance for infrastructure. As such, this 50 m distance is added to the ten-rotor diameter (1170 = 10 * 117) m distance to give a total distance of (1220 = 1170 + 50) m from any turbine.

12.13 Analysis was undertaken for shadow flicker at all properties within 1220 m from any wind turbine.

12.14 The assessment area and properties included therein are shown in Figure 12.1.

12.15 This analysis takes into account the motion of the Earth around the Sun, the local topography and the turbine locations and dimensions. The analysis was performed using a layout of four turbines, each with a maximum tip height of 149.9 m.

Results

12.16 With due reference to the DECC report, and allowance for 50m micro-siting, the potential shadow flicker is given in Table 12.1.

Table 12.1: Predicted maximum annual potential shadow flicker.

RES Property ID	Property Address	Maximum Hours of Flicker Per Year
H41	153 Bolea Road, Limavady BT49 0QU	30.0
H107	153 Bolea Road, Limavady BT49 0QU*	34.7
H108	153 Bolea Road, Limavady BT49 0QU*	28.0

* Only one address point is listed in Pointer Plus, the address dataset used by RES for Northern Ireland. The Pointer Plus dataset is produced by Land & Property Services with help from local councils and Royal Mail. RES also undertakes checks in addition to use of Pointer Plus. In this case, there were three inhabitable properties visible in aerial imagery, despite only one property being listed in Pointer Plus. All three have been included in the analysis.

12.17 The above predictions in Table 12.1 represent a worst-case scenario for the following reasons:

- The analysis assumes that there is always sufficient lack of cloud cover, for there to be sufficient sunlight for shadows to be cast by the turbine.
- The analysis assumes that there is always enough wind for the turbine blades to be turning.
- The analysis assumes that the wind is always coming from the right direction for the turbine rotor to be facing towards the house, to thus cast a shadow.
- The analysis assumes that the property has windows and/or glazed doors facing towards the turbine.
- The analysis assumes there is no shielding, e.g. in the form of trees or outbuildings, between the turbine and the property.

Mitigation

12.18 Mitigation measures can be incorporated into the operation of the Wind Farm to reduce the instance of shadow flicker. Mitigation measures include planting tree belts between the affected dwelling and the responsible turbine(s) and shutting down individual turbines during periods when shadow flicker could theoretically occur.

References

[1] Clarke A.D (1991), A case of shadow flicker/flashing: assessment and solution, Open University, Milton Keynes

[2] Brinckerhoff, Parsons (2011) 'Update of UK Shadow Flicker Evidence Base', Department of Energy and Climate Change, UK Government

[3] Planning Policy Statement 18 "Renewable Energy" (including Best Practice Guidance to Planning Policy Statement 18) August 2009

13 SOCIOECONOMICS

13.1 Introduction

Background to the Study

13.1.1 RES UK & Ireland Ltd ('the applicant') commissioned Oxford Economics in the spring of 2024 to undertake a socioeconomic impact report on the proposed extension to the Dunbeg South windfarm, hereafter referred to as 'the proposed wind farm', which is located in the Causeway Coast and Glens council area.

13.1.2 The proposed wind farm extensions consists of 4 three-bladed turbines, with a planned operational lifespan of 35 years. The total megawatt (MW) capacity of the proposed wind farm is expected to be 16.8 MW, with each turbine having a 4.2 MW capacity.

13.1.3 This report presents estimates relating to the direct, indirect, and induced benefits that could be generated by the construction and operation of the proposed wind farm extension. It also provides a discussion on the current socioeconomic environment in which the investment would take place, and the energy and environmental benefits associated with a development of this type and scale.

About the Applicant

13.1.4 The applicant is the world's largest independent renewable energy company. At the forefront of the industry for over 40 years, the applicant has delivered more than 24 GW of renewable energy projects across the globe and supports an operational asset portfolio exceeding 12 GW worldwide for a large client base. The applicant employs more than 4,500 people and is active in 24 countries working across onshore and offshore wind, solar, energy storage and transmission and distribution.

13.1.5 Since it was established in the UK in 1981, the applicant has been a pioneer in renewable energy, developing the UK's second ever wind farm in 1992. The applicant has a significant portfolio of projects covering onshore and offshore wind, solar, and energy storage. The applicant is responsible for keeping ten percent of the UK's renewable energy projects operating and it provides support services—asset management and operations & maintenance—to a sizeable portfolio for leading clients in the industry.

13.1.6 RES has been building wind farms in Ireland since the early 1990s and from their office in Larne, Co. Antrim, they have a team of over 20 working across a range of disciplines. RES has developed 26 onshore wind farms in Northern Ireland totalling in excess of 400 MW and operates over 134 MW of wind capacity across Northern Ireland including the Cruig Wind Farm in County Antrim, constructed in 2009.

Structure of the Report

13.1.7 This report is structured as follows:

- Firstly, the estimated quantifiable economic benefits of the construction and on-going phases of the proposed wind farm are presented. We provide estimates of the economic benefits in terms of employment, Gross Value Added (GVA),[1] and wages. An assessment of the potential fiscal benefits is also included;
- Secondly, an overview of the socioeconomic conditions, both at the regional and local levels, is provided as context;

[1] Gross Value Added (GVA) measures the value of goods and services produced in an area, industry, or sector of an economy and is equal to output minus intermediate consumption.

- Thirdly, the energy and environmental context is considered, highlighting the contribution the proposed wind farm could make towards emissions targets at the regional and national level; and
- Finally, the overall conclusions in respect to the proposed wind farm are set out.

13.2 Quantifiable Economic Benefits

13.2.1 This section analyses the estimated quantifiable benefits of the construction and operational phases of the proposed wind farm. All results relate to the benefits at the regional level (Northern Ireland), unless otherwise stated.

13.2.2 A key assumption behind Oxford Economics' analysis relates to displacement.[2] Zero displacement has been assumed during both the construction and operational phases of the proposed wind farm. This assumption is in part based on an analysis of the Northern Irish construction sector (see section 13.3), which is likely to have enough spare capacity to accommodate the proposed wind farm. Additionally, although the site for the proposed wind farm is currently common land used for grazing, the applicant has informed Oxford Economics that no economic activity would be displaced. Given the above, and the fact that the total amount of on-going employment would be limited in number, the estimated benefits arising from the operational phase assume no material displacement of economic or leisure activity.

13.2.3 Renewable energy developments such as onshore wind will collectively and in the long-run displace demand for fossil fuels. However, the UK Government has set a target of net zero carbon emissions by 2050, promoting a transition away from fossil fuels towards renewable energy.[3] As such, any potential displacement is consistent with nationally stated policy aims.

Economic impact of the construction phase

13.2.4 The benefits associated with the construction phase of the proposed wind farm (in terms of employment, wages, and GVA) are presented below.[4] These results are based on data provided by the applicant regarding the expected value of investment to be realised in Northern Ireland as well as the expected levels of employment required for construction, based on previous projects. By assigning this employment and investment data to sectors of the economy, it is possible to estimate the associated direct GVA and wage impacts (using published and/or forecast data).

13.2.5 An input-output model is then used to estimate the indirect and induced impacts that are likely to flow from a given level of investment/activity. An input-output table provides information on how sectors purchase from one another, and how households spend their income. UK input-output tables, published by the ONS, have been adjusted to account of regional characteristics—please see Annex 1 at the end of this Chapter for further discussion.

[2] Displacement is the degree to which the effects which produce additional economic activity may lead to consequent reductions in activity elsewhere in the economy that would not have occurred if the intervention had not been made.
[3] UK Government. Web article: https://www.gov.uk/government/publications/net-zero-strategy..
[4] Please be aware that total values presented throughout this Chapter may not sum due to rounding.

13.2.6 The proposed wind farm is estimated to result in a capital spend of approximately £30.6 million (in nominal prices).[5] This figure is based on information provided by the applicant and includes the estimated cost of turbines, Balance of Plant (BoP), local and miscellaneous spend, grid connection, and professional services. Only a portion of this investment, however, would be realised in Northern Ireland.

13.2.7 The total construction spend realisable within Northern Ireland is approximately £11.8 million (in nominal prices).[6] This includes, for example, the cost of connection to the electricity grid, as well as five percent of the estimated cost of turbines through activities such as the use of local haulage and crane companies. Any remaining construction spend not taking place within the region is assumed to be imports.For modelling purposes, all expenditure information has been converted into 2019 real prices, to ensure consistency with the model's inputs and national accounts publications.[7]

13.2.8 For the purposes of this assessment, we assume a constant spend per month over the course of the construction phase. This results in an assumption of 75 percent of total spend being realised in 2027 and the remaining 25 percent in 2028. As such, Oxford Economics' baseline forecasts for GVA, productivity, and wages have been used to estimate the future economic impacts.

13.2.9 The applicant has developed 24 onshore wind projects in the UK & Ireland over the last 10 years. Based on this experience, the applicant has provided estimated figures for the total number of employees that would be required for the wind farm's construction, and the estimated length of their employment. In order to conduct the below analysis, these figures have been adjusted into job years terms and split across the relevant sectors of the economy.[8]

Direct construction phase impacts

13.2.10 The proposed wind farm's construction phase is estimated to create or sustain 49 direct job years of employment in Northern Ireland, 38 of which are involved with construction related activities, with the remaining job years split across other sectors in the economy (Table 13.1). This direct construction phase employment would be likely to create or sustain £1.7 million of direct wages in the Northern Irish economy, generating £3.9 million in GVA.

[5] As the international geopolitical landscape continues to change so does the level of uncertainty around economic growth and inflation prospects in the UK. The nominal cost of the proposed wind farm, provided by RES, is an accurate estimate at the time of writing. While prices are likely to rise in the short term, we isolate the effects of inflation by calculating the economic impact in real terms.

[6] For this analysis, the total construction phase spend in Northern Ireland is defined as the cost realised regionally for turbines, Balance of Plant (BoP), food, fuel, plant hire, road maintenance, grid connection, and miscellaneous. It does not include the cost of professional services.

[7] The construction phase and operational phase benefits presented within this section, which have been estimated using an Economic Impact Model, are expressed in real/constant prices with 2019 as the base year. This is consistent with the base/reference year within the ONS' National Accounts (the Blue Book 2022) and Oxford Economics' suite of forecasting models. This is not to say 2019 data has been used: the latest available data and the relevant forecast year have been taken in every case. The construction-spend figures provided by the applicant have been adjusted accordingly for consistency.

[8] The nature of employment in the majority of sectors means that the jobs directly sustained by the construction of the proposed wind farm are on-site and based in the local area in which the proposed wind farm is located. Employment in the professional services sector sustained during the construction phase could, however, be located off-site and/or be remote in nature. This is also the case for employment sustained once the proposed wind farm is operational.

Table 13.1: Direct benefits from the construction phase, Northern Ireland

Sector	Job years	Wages	GVA
Construction	38	1.1	2.9
Professional, scientific & technical	7	0.4	0.7
Transport & storage	2	0.1	0.2
Other sectors	2	0.1	0.2
Total	**49**	**1.7**	**3.9**

Source: RES/Oxford Economics. Note: May not sum due to rounding.

Indirect and induced construction phase impacts

13.2.11 The indirect (or supply chain) effects arising from the construction related activity have been estimated using the 2019 UK input-output tables adjusted to take account of the structure and size of the Northern Irish economy. In doing so, the methodology uses so-called 'Flegg-adjusted Location Quotients (FLQs)', which are consistent with the latest approaches and evidence in regional input-output modelling and regional science.[9]

13.2.12 Construction activity typically has strong "backward linkages" with sectors such as building materials, architectural services, legal services and insurance. These linkages tend to result in employment creation elsewhere in the local economy. This makes investment in construction particularly effective in fuelling economic growth, typically offering high output multipliers. The proposed investment could offer a regional employment multiplier of 2.3, and a regional GVA multiplier of 1.9 (once the indirect and induced effects have been accounted for). This means that for every 1 job year and £1 of GVA directly stimulated in the construction sector in Northern Ireland, an additional 1.3 job years and £0.90 of GVA could be supported through indirect and induced impacts.[10]

13.2.13 Indirect GVA impacts in Northern Ireland are therefore estimated to be approximately £2.1 million, creating or sustaining an estimated 38 job years of employment, with associated wages of £1.0 million (Table 13.2).

Table 13.2: Total (direct, indirect, and induced) benefits from the construction phase, Northern Ireland

	Job years	Wages (£2019m)	GVA (£2019m)
Direct	49	1.7	3.9
Indirect	38	1.0	2.1
Induced	27	0.6	1.4
Total	**114**	**3.3**	**7.4**

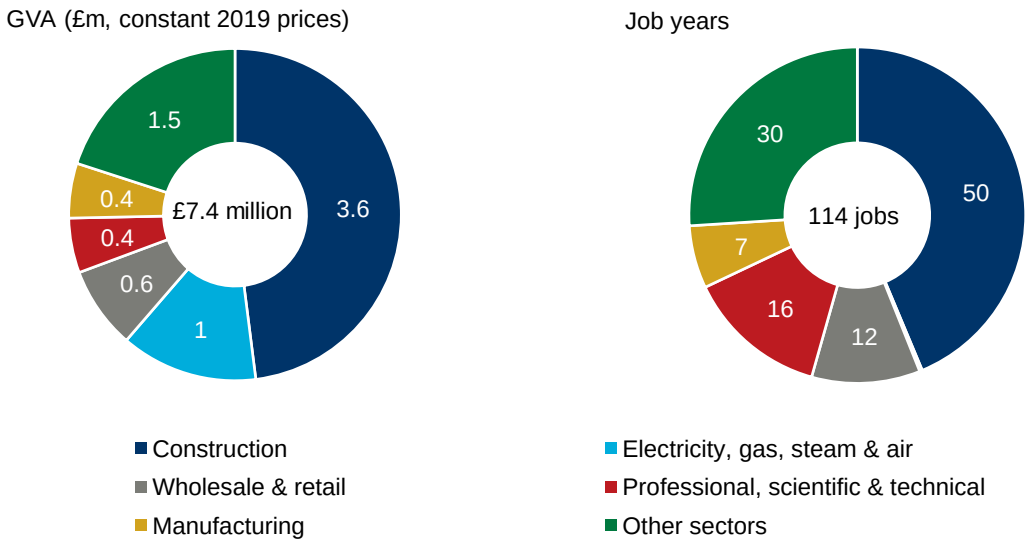
Source: RES/Oxford Economics. Note: May not sum due to rounding.

[9] Flegg, A. T. and Tohmo, T. (2013) "Regional input-output tables and the FLQ formula: A case study of Finland" (Regional Studies, 47 (5). pp. 703-721).
[10] These figures relate to Oxford Economics' estimates of Type II output multipliers for the UK. Type II multipliers capture direct, indirect, and induced effects.

13.2.14 As both direct and indirect wages generated through the construction phase are spent on goods and services in the wider economy, a further round of benefits would spread through the region. This helps to support activity in sectors like retail and leisure outlets, companies producing consumer goods, and a range of service industries. It is estimated that this induced effect would generate £1.4 million in GVA, supporting wider employment of approximately 27 job years alongside £0.6 million of wages. As a result of the numerous rounds of supply-chain and consumer spending that occur in addition to the direct impacts, the total benefits (direct, indirect, and induced) are spread across multiple sectors in the Northern Irish economy (Figure 13.3).

13.2.15 It is worth reiterating that impacts laid to date in this chapter relate to the regional level. An exact amount attributable to Causeway Coast and Glens is more difficult to identify and outside the scope of this report. Invariably it depends on the location of the companies appointed that enjoy the direct benefits and the location of the suppliers who provide them with the materials. However, the applicant has informed Oxford Economics that their previous projects have utilised local contractors wherever possible and it remains their intention to use local suppliers and labour for much of the Balance of Plant (BoP) work. It makes sense, not least in terms of the costs and distance argument, to use local firms. That is, local firms can prove to be more cost efficient given the closer proximity to required capital, personnel, and resources. This means that most of the economic benefits are likely to be realised within Northern Ireland, with Causeway Coast and Glens enjoying some uplift at the local level.

Figure 13.3: Total sectoral (direct, indirect, and induced) GVA and employment benefits from the construction phase, Northern Ireland



Source: RES, Oxford Economics. Note: May not sum due to rounding.

Economic impact of the operational phase

Direct operational impacts

13.2.16 The applicant has informed Oxford Economics that the proposed wind farm would sustain four direct full-time equivalent (FTE) jobs a year in Northern Ireland once operational in April 2028, three of which are in the professional, scientific & technical sector, and one of which is in the electricity, gas, steam & air conditioning sector (Table 13.4). Using forecasts for productivity in these sectors, the associated direct GVA and wage impacts have been estimated.

13.2.17 The total direct wage impact is estimated to be £100,000 per year. After applying productivity estimates, the on-going direct employment is expected to generate £270,000 of GVA a year. Given the 35-year lifetime of the proposed wind farm, this equates to a cumulative £3.5 million of direct wages and £9.5 million of direct GVA in Northern Ireland over the entirety of the operational phase.[11]

13.2.18 The electricity industry plays a significant role in enabling other parts of the economy. Electricity, gas, steam & air conditioning is one of the most productive sectors in Northern Ireland, with output per worker significantly above that of the region overall. As a result, the majority of the GVA impacts would be realised in this sector.

Table 13.4: Direct annual benefits from the operational phase, Northern Ireland

	Job years	Wages (£2019m)	GVA (£2019m)
Professional, scientific & technical	3	0.06	0.09
Electricity, gas, steam & air	1	0.04	0.18
Total	**4**	**0.10**	**0.27**

Source: RES/Oxford Economics. Note: May not sum due to rounding.

Indirect and induced operational impacts

13.2.19 Using the adjusted UK input-output tables to identify the supply-chain spending, it is estimated that the proposed wind farm is likely to create or sustain a further three indirect jobs in the Northern Irish economy each year, with wages of approximately £70,000 and GVA of £190,000 per year (Table 13.5). As those employed directly and indirectly spend part of their wages, there could be a further two jobs sustained in the Northern Irish economy, with associated induced wages of approximately £40,000 and GVA of £100,000.

13.2.20 Consequently, we estimate the proposed wind farm would support eight jobs in Northern Ireland per year with associated wages of £210,000 and GVA contributions of £560,000.

[11] Oxford Economics' productivity forecasts over the operational phase have been taken into account in calculating the cumulative GVA and wage impacts.

Table 13.5: Total (direct, indirect, and induced) annual benefits from operational phase, Northern Ireland

	Jobs	Wages (£2019m)	GVA (£2019m)
Direct	4	0.10	0.27
Indirect	3	0.07	0.19
Induced	2	0.04	0.10
Total	**8**	**0.21**	**0.56**

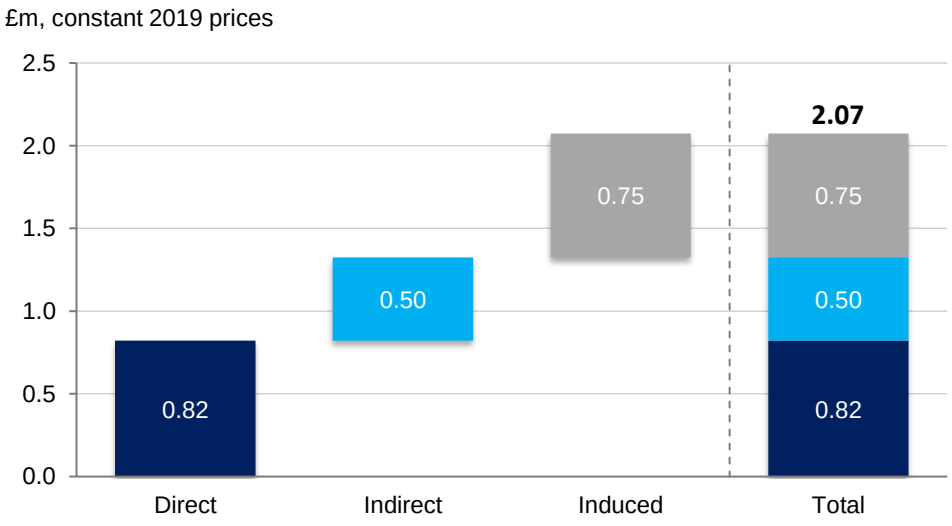
Source: RES/Oxford Economics. Note: May not sum due to rounding.

Fiscal benefits

13.2.21 The economic activity arising from the proposed wind farm would also lead to a range of fiscal benefits as a result of the tax receipts that are contributed to the public purse. These tax benefits occur through several channels, including directly through payments of corporation tax, income tax, national insurance contributions (NICs), and other direct taxes. Additionally, further tax revenues would be collected as a result of supply chain (indirect), and wage consumption (induced) effects.[12]

13.2.22 During the construction period of the proposed wind farm, tax receipts could reach £2.07 million (including direct, indirect, and induced impacts). £0.7 million of this would be generated through direct activity, with an additional £0.7 million and £0.7 million through indirect and induced impacts, respectively.

Figure **13.6: Total fiscal impact of the proposed wind farm's construction phase, UK**



Source: RES, Oxford Economics. Note: May not sum due to rounding.

13.2.23 Sustaining eight operational jobs per year could provide fiscal revenues of £60,000 per year from labour taxes. Over the course of the project's 35-year lifetime, this could lead to a cumulative £1.9 million in tax revenue.

[12] Wages that would be generated directly from the operations of the proposed wind farm would be subject to income tax and national insurance contributions (NICs). In modelling labour tax revenues that could be collected by the Treasury, we use the latest income tax and NIC rates, thresholds, and personal allowance information, and apply these to the expected sectoral earnings by decile.

13.2.24 Alongside increased tax revenue from wages throughout the operation of the proposed wind farm, the Northern Irish Government would also benefit from business rates revenue. Business rate calculations in Northern Ireland rely on the Rateable Value (RV) of a property and the non-domestic multiplier ("poundage", or non-domestic rate (NDR)), minus any applicable reliefs. The RV is determined by the Valuations Office Agency (VOA), while the NDR is set by the Northern Irish Assembly each year. The 2024-2025 NDR for the Causeway Coast and Glens council area is 58.5p for every £1 of RV, of which 29.0p is a regional rate paid to the Northern Irish Assembly, and 29.5p of which is paid to the local council.

13.2.25 Based on the estimated RV provided by the client for a similar wind farm in Nothern Ireland, this extension will have aRV of approximately £320,727 per year for the proposed wind farm. Multiplying the estimated RV by the NDR multiplier provides an estimated figure of almost £188,000 in annual business rates payable to the Northern Irish Government. This is equivalent to an estimated £6.5 million over the course of the project (given a 35-year operational phase).

13.3 Socioeconomic Context

13.3.1 The following section considers the recent and future labour market performance of the overall economy, and the construction sector more specifically, at both the regional and local level.

13.3.2 The Northern Irish labour market has shown moderate growth over the last decade. Employment growth in the region averaged 1.2 percent per year between 2014 and 2024, above the equivalent rate for the UK (1.0 percent). Growth within Causeway Coast and Glens, however, has under performed relative to the regional level, growing by 0.5 percent per year on average.

13.3.3 Within the construction sector itself, growth in employment was fairly positive over the same time period. At the regional level, construction employment grew at an average rate of 1.2 percent per annum, adding 600 jobs on average each year. The construction sector in Causeway Coast and Glens recorded a marginal decrease in employment over the same time period with an average decrease of 0.03% per annum.

13.3.4 The current economic climate suggests that the labor market may struggle to maintain simliar rates of growth. Interest rates are expected to remain high throughout 2024, and cool econmic growth. Consequently, we forecast total employment in Northern Ireland to grow by 0.9 percent in 2024, slighly slower than the UK at 1.1 percent. Total employment in Causeway Coast and Glens is forecast to continue underperforming with growth of just 0.5 percent.

13.3.5 Across Northern Ireland, employment in the construction sector is expected perform above the regional average expanding by 1.7 percent in 2024—adding almost 1,000 jobs. Construction in Causeway Coast and Glens is expected to grow too, by 1.4 percent in 2024, though this is the slowest rate of construction growth across Nothern Ireland's council areas.

13.3.6 Over the medium term, Oxford Economics' labour market forecasts suggest subdued employment growth is expected over the next decade across the UK at 0.9 percent per annum. Total employment growth in Northern Ireland will be even more disappointing at 0.6 percent per annum between 2024 and 2034. Employment growth in Causeway Coast and Glens is forecast to remain broadly unchanged over the decade.

13.3.7 The muted forecast for labour market performance is in part a reflection of a weak demographic outlook, as total and working age populations are forecast to fall in Northern Ireland —a trend reflected across the majority of Northern Irish local authorities across the next decade but felt most strongly in Causeway Coast & Glens where the decrease in the working age population is forecast to be 8.2%, the largest of any local authorityin Northern Ireland and over five times that of the regional average (1.6%).

13.3.8 Given the above outlook, the local economy faces some significant short and medium-term economic challenges. For example. the weak employment outlook is likely to make it more

challenging for the Council to address economic needs and development. The unfavourable outlook for population growth will also provide economic, social and health challenges.

13.3.9 It is within this context that investments like the one proposed by RES should be considered. Although the proposed development will create only a limited number of jobs, this should be welcomed in the local economy. In addition, private sector investment and development can encouage investment from other soruces. Furthermore the rates will provide the Conucil with additional funding that can be channelled into economic growth and priority areas outlined in their Economic Development Stragey such as labour market activition, a more connected borough and Town/ Village renewal[13].

13.3.10 Also, investment into local climate change assets would help to support the employment recovery within the Council area, but also more widely via multiplier effects. Investment into such projects would also strengthen the UK's overall energy networks, helping to achieve the Government's target of net zero emissions by 2050 and reducing the UK's reliance on energy imports—which has become increasingly important in the aftermath of Russia's invasion of Ukraine. Given this, the proposed wind farm would also help to mitigate against rising energy costs and instability in the energy market.

13.4 Energy and environmental benefits

Contribution to emissions targets

13.4.1 Although the proposed wind farm would bring positive economic benefits to the local and regional economies, its key role should be seen as its contribution towards achieving governmental environmental targets.

13.4.2 The UK Government published its Net Zero Strategy in 2021, laying out policies and proposals for decarbonising all sectors and regions of the UK economy in order to achieve net zero carbon emissions by 2050.[14] For their part, the Northern Ireland Assembly published their own 'Path to Net Zero' energy strategy in 2021.[15]

13.4.3 Renewable energy will clearly have a huge role to play in meeting these goals. As such, the Northern Irish Assembly has set a target to achieve 80 percent of electricity demand being met from renewable electricity sources by 2030, as its energy system transitions to net zero. Northern Ireland has steadily increased its renewable energy usage over the past decade, and the latest statistics for the 12-month period from July 2022 to June 2023 show that 45.5 percent of total electricity consumption was generated from renewable sources located in the region. However, this is a 1.2 percentage point decrease on the previous 12-month period (July 2021 to June 2022).

13.4.4 Wind power is the most important source of renewable energy in Northern Ireland, with 83.5 percent of all renewable electricity generation over the 12-month period from July 2022 to June 2023 coming from wind[16].

13.4.5 Wind power is also set to account for the highest proportion Co2 emsission redcutions by 2050 accounting for over 20% accoriding to a IPPR study this report also found that the UK has a comparative advantage in green manufactoring listing the 'green manufactoring priorities' as

13
https://www.causewaycoastandglens.gov.uk/uploads/general/Causeway_Coast_and_Glens_Socio_Economic_Profile_2020.pdf
14 UK Government. Web article: https://www.gov.uk/government/publications/net-zero-strategy..
15 Northern Ireland's Department for the Economy. Web article: https://www.economy-ni.gov.uk/articles/northern-ireland-energy-strategy-path-net-zero-energy.
16 Northern Ireland's Department for the Economy. Web article: https://www.economy-ni.gov.uk/news/electricity-consumption-and-renewable-generation-northern-ireland-year-ending-june-2023.

wind manufactoring, heat pumps and green transport. This further demonstrates the importance of wind farms along with their economic and environmental benefits[17].

13.4.6 The proposed wind farm extension has a 16.8 MW capacity, consisting of 4 turbines with a capacity of 4.2 MW each. The amount of electricity that could be produced by the proposed wind farm is estimated at 56 GWh per year, which is equivalent to the electricity needs of over 16,000 homes each year.[18] This equates to one-quarter of the total housing stock within Causeway Coast and Glens.

13.4.7 In addition to providing a valuable contribution to meeting electricity demand in the region, the proposed wind farm is also estimated to reduce CO_2 emissions by 23,800 tonnes each year. While this estimate represents a gross reduction in CO_2 emissions, it is acknowledged that the construction of wind farms would also produce emissions. Current literature shows that the carbon payback period—the time frame needed for a turbine to offset the carbon emissions generated throughout its life cycle—is relatively short for onshore wind farms. A recent study, 'Space, time, and size dependencies of greenhouse gas payback times of wind turbines in Northwestern Europe',[19] which focused largely on onshore wind farms, finds that the payback period of wind turbines across the region averaged 5.3 months. In addition, the Director of Centre for Energy and the Environment at the University of Exeter said that the carbon payback for onshore wind farms reduces with turbine size. He states that "[y]ou can achieve this payback with a small turbine and as the turbine size increases the payback is shorter. For large three-megawatt turbines we are talking about a 75-day payback. That is very quick".[20]

13.5 Conclusions

13.5.1 The proposed wind farm would aid the Northern Ireland Assembly in meeting its climate target of 80 percent of electricity demand being met by renewable energy by 2030. With an estimated annual electricity production of 56 GWh, the proposed wind farm could provide electricity equivalent to the needs of over 16,000 homes each year, or 25% percent of the total current housing stock in Causeway Coast and Glens. Additionally, the proposed wind farm could reduce CO_2 emissions by 23,800 tonnes each year.

13.5.2 The proposed wind farm would also provide an economic boost to the Causeway Coast and Glens council area and the regional economy, creating employment and stimulating economic activity during its construction and operational phases. There is a strong likelihood of local labour involvement during the construction of the proposed wind farm, providing an economic boost to the local areas.

13.5.3 The local and regional economy face a challenging economic environment, with employment expected to contract next year and experience muted growth over the remainder of the forecast period. However, the construction sector is expected to be a leading contributor to growth both locally and regionally during this time. Therefore, it is important to ensure continued investment in the sector due to its importance for future growth. Investment of the type and scale of the proposed wind farm could provide benefits across the region, helping to support employment opportunities that would not otherwise have existed. It can also bring about catalytic benefits which can in turn attract further investment into Northern Ireland. For example, the knowledge, expertise and skills accumulated can act as a contributing factor to future investments in the area. Funding for such developments is usually project specific and involves considerable sunk costs. Therefore, if the proposed wind farm does not take

[17] Narayanan P, Dibb G, Vanino E and Gasperin S (2024) Manufacturing matters: The cornerstone of a competitive green economy, IPPR. http://www.ippr.org/articles/manufacturing-matters
[18] The UK average domestic household electricity consumption (temperature adjusted) is taken from figures published by the Department of Business, Energy and Industrial Strategy (BEIS): https://www.gov.uk/government/statistics/energy-consumption-in-the-uk-2023.
[19] Dammeier et al (2019). *Space, Time, and Size Dependencies of Greenhouse Gas Payback Times of Wind Turbines in Northwestern Europe*. Environmental Science Technology. Volume 53, Issue 15, p. 9289-9297.
[20] Web article: *Devon can become the heart of a 'Southwest powerhouse' fuelled by onshore wind*..

place, the benefits, including the catalytic impact, are unlikely to be realised elsewhere in the Northern Irish economy.

13.5.4 The proposed wind farm is estimated to involve a capital spend of approximately £31 million in nominal prices. Of this total, £12 million would be realised within the regional economy. The projected construction phase is estimated to create or sustain 115 total (direct, indirect and induced) job years of employment, £3.3 million of wages, and £7.4 million of GVA to the Northern Irish economy.

13.5.5 The estimated total (direct, indirect, and induced) annual benefits realised in Northern Ireland by the operational phase of the proposed wind farm includes 8 jobs, £210,000 of wages, and £560,000 in GVA.

13.5.6 The proposed wind farm is also expected to provide a fiscal injection in terms of increased tax revenues. Estimated tax revenues over the construction phase are estimated to be £2.1 million, with an additional £60,000 expected in labour taxes for each year of operation. Additionally, annual business rates for the proposed wind farm are estimated at almost £188,000.

13.6 Annex 1

Glossary of definitions

Backward linkages: refers to the channels through which money, materials, or information flows between a company and its suppliers, creating a network of economic interdependence. In terms of this study, it refers to the fact that the construction phase of the proposed wind farm would require the purchase and use of raw materials from sectors like building materials, steel, architectural services etc., which themselves would create supply-chain jobs in the economy.

Full-time equivalents (FTE): all the modelling completed by Oxford Economics, and all the effects associated with this modelling, assumes that employment is expressed in terms of FTE, which is important given the prevalence of part-time working especially in the construction sector. Accordingly, two part-time workers make up one full-time equivalent worker.

Gross value added (GVA): measures the value of goods and services produced in an area, industry or sector of an economy and is equal to output minus intermediate consumption.

Direct impact: defined as the economic activity and number of people employed by the proposed wind farm (both in construction and in on-going roles).

Indirect impact: defined as economic activity that is supported because of the procurement of goods and services during construction and operations, throughout the economy. It includes not just purchases by occupiers of the proposed wind farm, but subsequent rounds of spending throughout the supply chain.

Induced impact: defined as economic activity and employment supported by those directly or indirectly employed spending their wage income on goods and services in the wider UK economy.

Job years: any references to the employment benefits from the construction phase of the proposed wind farm are expressed in terms of "job years". This is necessary given that construction phase activity normally spans more than a single year. A job year does not necessarily mean one job. Instead, it refers to the amount of activity that is required. For example, two people could be employed for six months—this would equate to one job year of work. Alternatively, one person could be employed for two years—this would equate to two job years of employment. The term job years is not needed when talking about the on-going phase, as these benefits are all expressed in per annum terms.

Nominal prices: those which reflect the current situation and are not adjusted for seasonality or inflation.

Real prices (2019 prices): refers to values that have been adjusted to remove the effects of inflation and are thus measured in terms of the general price level in some base reference year. This measure of prices is more accurate. In this case, 2019 is the base year as it is consistent with the base/reference year used within UK ONS National Accounts, The Blue Book 2022.

Understanding economic impact assessments

Introduction

Economic impact modelling is a standard tool used to quantify the economic contribution of an investment or series of investments in an economy. As set out earlier in the report, the economic impact analysis outlined here estimates the contribution of the proposed wind farm through three channels (direct, indirect, and induced impacts).

These three channels form the estimates of the quantifiable economic benefits of the proposed wind farm. However, in practice there may be a range of wider economic benefits that occur as other economic agents respond 'dynamically' to the investment and operations of the proposed wind farm. While not typically quantifiable, these benefits nevertheless form an important part of the economic benefits of the proposed wind farm. These effects can include for instance the proposed wind farm acting as a catalyst for further clustering and agglomeration effects, providing employment opportunities for local residents, and unlocking additional growth in particular sectors.

Direct impacts

The applicant has provided Oxford Economics with the expected capital expenditure for the construction phase and provided estimates of the direct employment the proposed wind farm would create once fully operational.

The economic output produced in these sectors is translated to GVA, jobs (using local, regional, or national productivity, where appropriate), and wages, using data from published input-output tables. Oxford Economics' forecasts of sectoral productivity are also used at the national, regional and/or local level.

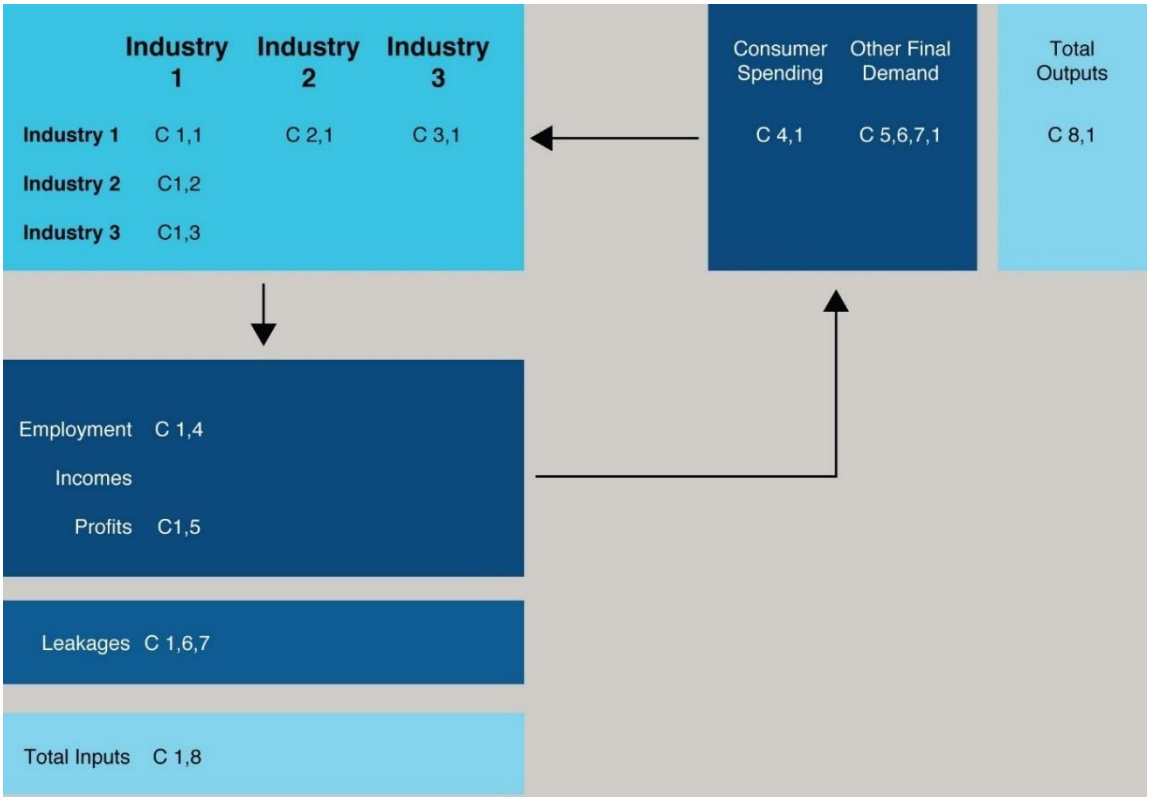
Indirect and induced impacts

Indirect and induced impacts were estimated using an input-output model. An input-output model gives a snapshot of an economy at any point in time. The model shows the major spending flows from: final demand (i.e., consumer spending, government spending, investment, and exports to the rest of the world); intermediate spending patterns (i.e., what each sector buys from every other sector—the supply chain in other words); how much of that spending stays within the economy; and the distribution of income between employment and other forms such as corporate profits. Diagram 13.7 provides an illustrative guide to a stylised input-output model.

In building the impact model, the latest UK input-output tables published by the Office for National Statistics (ONS) have been adopted.[21] To calculate regional economic impacts, the national input-output tables are adjusted to account for the characteristics of the Northern Irish economy—namely the overall size and degree of specialism within each sector. This reflects academic guidelines set out in papers such as Flegg & Tohmo (2013).[22]

[21] ONS, *UK input-output analytical tables—industry by industry*, 2022, accessed 2022.
[22] Flegg, A. T. and Tohmo, T. (2013), *Regional input-output tables and the FLQ formula: A case study of Finland*, Regional Studies (47 (5). pp. 703–721).

Diagram 13.7: A stylised input-output model



Source: Oxford Economics

Displacement

Displacement can be defined as the proportion of impacts generated by the proposed wind farm which are offset by reductions in economic activity elsewhere.

In order to consider the potential for displacement in the construction sector, the current level and capacity of the sector was reviewed, and its outlook for growth. This analysis indicates that the sector would have capacity to absorb the additional activity arising from the proposed wind farm, which is unlikely to result in a significant degree of displacement, when placed into context of the sizeable construction sector. It is therefore assumed that no displacement occurs within the construction phase.

Similarly, the analysis of recent trends across the Northern Irish economy indicate that the operational phase is not likely to result in significant displacement effects. Displacement is unlikely to occur when considering the scale of the proposed wind farm within the sizeable Northern Irish economy. Furthermore, the current site at the proposed wind farm is common land used for grazing and the applicant have stated that no economic activity would be affected by the proposed wind farm. It is therefore assumed that no displacement occurs within the operational phase.

Caveats

Specific information relating to the proposed wind farm was provided where possible by the applicant. The estimated benefits are based on a mix of this information, published data, and reasonable assumptions.

The cost of construction could inflate or deflate depending on movements in variables such as exchange rates, demand for wind turbines, and metal prices. As such the information is the best current estimate at the time of writing.

This economic impact study has been developed to form part of the environmental information to be provided as part of the planning application. As such, if and when the time comes that the proposed wind farm is granted full planning permission and has been built, the economic environment may look different. The analysis assumes all facilities contained on the site are fully developed.

There is no analysis within the report focusing on how the proposed wind farm would affect income distribution and deprivation levels in the area. This is outside of the scope of this piece of work.

The quantifiable impacts calculated by Oxford Economics and outlined in this report come from an Economic Impact Model which uses an input-output framework, standard economic underpinnings, published data and few clearly documented reasonable working assumptions. The modelling presented here does not factor in industry support mechanisms.

14 Summary of Mitigation

This chapter summarises the mitigation measures that have been proposed to offset the potential impacts of the Proposed Development. These mitigations have been proposed to reduce the level of impact to not significant. Alongside each mitigation measure identified, the proposed mechanism by which it will be adopted, implemented or enforced has been provided as well as the period by and /or timing which the mitigation measure will be undertaken.

ES Chapter	Potential Effect	Mitigation Proposed	Means of Implementation and timing
Chapter 3 Design Evolution & Alternatives	Impact on Television Reception	RES would agree a scheme of mitigation with the planning authority, the link operator and provider, to be implemented prior to erection of turbines, and funded by the wind farm operator. Proposed condition wording: No turbine shall be erected until a scheme for the mitigation of impacts on telecommunication links within the site (operated by SONI) has been submitted to and agreed in writing with the Council, and implemented in full at the cost of the developer. Reason: To protect existing telecommunication links within the site	By condition.
Chapter 3 Design Evolution & Alternatives	Impact on Aviation	RES would agree a scheme of lighting scheme with the planning authority and the MOD, to be implemented prior to erection of turbines, and funded by the wind farm operator. A Full Instrument Flight Procedure (IFP) Safeguarding assessment will be completed to establish the exact infringement, its magnitude and any possible actions that could be used to mitigate this infringement, reducing that safety impact. As required RES would agree with Derry City Airport on the most appropriate possible actions to mitigate the (if any) infringement.	By condition.
Chapter 4 Landscape and Visual Impact	Landscape and visual effects	The exterior surfaces of the turbines will be painted in a recessive, non-reflective light grey colour to minimise their visual prominence against the sky in most weather conditions.	By condition.
		Ancillary facilities, such as the control building, substation and energy storage compounds, have been designed in a manner that is sensitive to the immediate landscape character with regards to location, scale, colour, and choice of materials.	By condition. A Construction & Environmental Management Plan (CEMP) will be agreed with the Planning Authority prior to construction and implemented during construction.

		There is the potential that the site entrance could be shared with the consented Dunbeg South wind farm which is located directly off the A37 (Broad Road) and utilises an existing farm access point adjacent to a derelict farm building and associated agricultural enclosures. The site entrance will be widened to accommodate both construction traffic and abnormal indivisible loads (AILs) during construction. Once operational the site entrance will closely resemble the existing frontage with strengthened field boundaries. Due to the physical and visual relationship with existing built structures the amendments to the site entrance will improve the frontage adjacent to the site entrance.	
Chapter 5 Archaeology and Cultural Heritage	Direct construction effects upon previously unknown cultural heritage assets	A programme of archaeological works will be implemented. The programme of works should include the following recommendations: Archaeological monitoring of the removal of topsoil for the footprint of the development should be conducted. The topsoil will be excavated using a back acting machine fitted with a toothless bucket and under strict archaeological supervision. It will be excavated to the level of undisturbed subsoil or archaeological strata, whichever is highest. The test trenches will be a minimum of 1.8 m wide. Those carrying out site works should work closely with the archaeologist and provide all necessary access and other arrangements. Care will need to be taken to avoid over excavation. The advice of the archaeologist on-site should be adhered to regarding this. It is recommended that each excavating machine should be watched by at least one archaeologist at all times (1:1 ratio). This means that sufficient archaeological staff will need to be on site to provide this cover. Work should not begin on site until this cover has been set up.	By Condition. To be outlined in a written scheme of investigation and agreed with the Planning Authority prior to construction and implemented during construction.

		The archaeologist must be given every reasonable aid by contractors to enable the archaeological work to be carried out. Contractors may need to use differing work practices on site than usual to enable the archaeologist to identify any archaeological features and complete the work. This must be catered for and adhered to. DFC:HED be consulted to agree the appropriate course of action in the event of the discovery and identification of any archaeological remains, which may include preservation in situ or excavation and recording. Any unexpectedly significant or complex discoveries, or any other unexpected occurrences or conditions, which might affect the agreed project work or its timetable, should be notified immediately to the client and the DFC:HED. Revised arrangements will be required and the archaeologist must organise a site meeting with the client and DFC:HED to agree a course of action. No further archaeological work should take place upon the features requiring extra time until the meeting has been held and appropriate arrangements agreed. In the meantime site works may continue on other areas within the site. It is recommended that on completion of site works, the archaeologist should undertake post-excavation works, including artefact processing and analysis, sample processing, specialist reports and report writing. Once any post-excavation work is completed the archaeologist must prepare a full report on the results to publication standard. At all stages of the archaeological site works, the DFC:HED Inspector should be kept informed.	
Chapter 6 Ecology	General	Measures required to address ecological concerns described in this ES during the construction phase will be incorporated within a Construction and Environmental Management Plan), which will be submitted to and agreed with the Planning Authority at the pre-construction stage, including:	By Condition. A CEMP will be agreed with the Planning Authority prior to construction and implemented during construction.

		• Consideration will be given to the provenance of fill materials for roads, in terms of the similarity of their physicochemical properties (particularly pH) to the present substrate. • The contractor will prepare a CEMP prior to construction activities to provide a method statement for working practices that will include measures, among others, to prevent adverse impacts on rivers and other watercourses. Please also refer to the SUDS design Statement in Technical Appendix 10. • A "no access" buffer will be implemented along sensitive watercourses to prevent damage to banks and to prevent disturbance of riparian habitats, apart from the narrow corridor required during construction. • Access of all machinery and personnel will be limited to the working area corridor. • Site compounds and stores will be sited away from any features of conservation interest, including watercourses. Any of these features in close proximity to the works or to compounds will be fenced to prevent damage by plant or stored materials. • Dust suppression filters and appropriate wetting of running and work surfaces will be used to prevent masking of vegetation outside construction corridors, where appropriate. • Appropriate speed limits will be imposed to reduce the potential for dust production.	
	Loss of semi-natural marshy grassland habitat; mobilisation of silt and introduction of water-borne pollutants to watercourses; excavation of turbine bases and cable trenches	Mitigation to reduce to an absolute minimum any disturbance or damage to vegetation, over and above the strict controls provided in the CEMP, is habitat restoration and vigorous supervision by the ECoW of all activities and at all stages of the Development.	By Condition. A final CEMP will be agreed with the Planning Authority prior to construction /DAERA and implemented during construction and operation.

	potentially severing hydrological routing and causing dewatering of areas of soils		
	Potential collision of bats with turbine blades	A Bat Mitigation Monitoring Plan (BMMP) will be implemented and will consist of post-construction monitoring in the form of casualty searches, undertaken during the first 3 years post construction and will be reviewed annually to determine whether remedial action is required to mitigate the effects of the Development on bats. In the event that a bat carcass is found, NIEA NED will be immediately contacted in order to discuss/ agree the implementation of mitigation measures.	By Condition. A BMMP will be agreed with DAERA / Planning Authority prior to turbine erection and implemented during operation of the wind farm.
	Potential collision of newts during construction	Should any smooth newt be found during construction, they will be translocated to a minimum distance of 30m from construction activities by a suitably qualified ecologist, under NIEA licence. The receptor area will be habitat considered suitable for smooth newt by the appointed ecologist. Details of any such translocation must be recorded and submitted to Council / NIEA	By Condition.
Chapter 7 Ornithology	Impacts on breeding birds during construction	No development activity will take place on the Site between 1 March and 31 August in any year until an Ornithology Mitigation Strategy (OMS) has been prepared by a suitably experienced ornithologist and approved by the Planning Authority.	By condition. OMS to be agreed with the Planning Authority prior to construction and implemented during construction.
	Monitor the effects of the Proposed Development on bird species	No development activity will take place until an Ornithology Management and Monitoring Plan (OMMP) has been prepared by a suitably experienced ornithologist and approved by the Planning Authority.	By condition. OMMP to be agreed with the Planning Authority prior to construction and implemented during construction and operation.

Chapter 8 Fisheries	Timing of Works	All works at stream crossings will adhere to the measures outlined in the Guidance for Pollution Prevention: Works and maintenance in or near water: GPP 5 (Environment Agency, 2018). It is also recommended that to minimise the risk of suspended sediment entrainment in surface water run-off, the site drainage system should only be constructed during periods of low rainfall and therefore low run-off rates.	During construction
	Effects of construction on surface water	A surface water management plan (SWMP) will be developed using the principles of Sustainable Drainage, based on the on-site retention of flows and use of buffers, swales, check-dams and other silt removal techniques. Implementation of the management plan will prevent any adverse effects on the ecology of the principal receiving watercourses during the construction phase of the project. An outline SWMP is contained in Technical Appendix 9.	By condition. SWMP to be included in CEMP, which will be agreed with the Planning Authority prior to construction and implemented during construction
	Effects of development on surface water	Implementation of a water quality monitoring programme to examine the effects of the infrastructure construction works on surface water quality. It is recommended that the monitoring programme be continued through the operation and decommissioning phases of the Proposed Development.	By condition. WQMP to be included in CEMP, which will be agreed with the Planning Authority prior to construction and implemented during construction, operation and decommissioning
	Release of pollutants	A Pollution Prevention Plan will be included as part of the Construction Environmental management Plan (CEMP) for the Proposed Development, to be agreed with the local planning authority at the pre-construction stage. This will incorporate a contingency plan setting out the procedure to be followed in the event of a significant spillage occurring.	By condition. PPP to be included in CEMP, which will be agreed with the Planning Authority prior to construction and implemented during construction, operation and decommissioning.
Chapter 9 Geology & Water Environment	Site Drainage Management & SuDS Design	The Proposed Development will adopt a surface water management plan / site drainage design using the principles of Sustainable Drainage, promoting the principles of onsite retention of flows and use of buffers and other silt removal techniques. See Technical Appendix 9.1: Surface Water Management Plan. All drainage related mitigation measures	By condition. To be included in the CEMP, which will be agreed with the Planning

		proposed will be encompassed by a robust and proven Sustainable Drainage System (SuDS) design which will be used to control drainage and silt management on the site. Onsite drainage design will minimise modification and disruption of the existing natural hydrology by: • Maintaining existing overland flow routes and channels. Existing natural flow paths lateral to access roads will be maintained through the use of piped crossings under road alignments at natural depressions and at regular intermediate intervals. The spacing of cross drains will be specified at detailed design stage; • Avoiding transporting rainfall runoff in long linear drainage swales by providing regular channel "breakouts", whereby water is encouraged to flow overland, thus maintaining existing natural hydrological patterns; • Reducing surface water flow rates and volumes by attenuating runoff from tracks and hard standings "at source" by providing check-dams in swales, whereby the flow velocity and rate of discharge is artificially reduced to mimic natural properties; • Providing settlement ponds at turbine hard standing areas and other main surface water discharge locations, where runoff from significant new impermeable areas is treated and attenuated before being released overland; • All swales, crossings and other hydraulic features will be engineered to ensure that dimensions are suitable to convey predicted flows and so prevent build-up of surface water and / or flooding. Drainage design will reduce chemical, silt and other suspended pollutant transport by providing a "treatment train" of two to three stages of pollutant removal to all surface water runoff, nominally by: • Ensuring that drainage swales are designed to convey flows at a low velocity by using a wide, flat bottomed drain;	Authority prior to construction and implemented during construction.

		• Providing settlement and filtration features in all linear drainage swales (check dams, filtration dams) to reduce flow velocity and encourage settlement; • Encouraging appropriate vegetation growth in the base of all linear drainage to provide additional filtration to flows; • Providing settlement ponds at turbine hard standing areas and other key discharge locations in order to provide treatment to contaminated runoff prior to discharge; • Discharging surface water runoff over undisturbed vegetated ground, hence allowing any remaining silts and other pollutants to drop out of flows before entering the watercourse (having the effect of polishing the runoff); • Preventing the discharge of surface water runoff flows directly to existing watercourses or drainage. All discharges shall seek to be via SuDS and buffer zones which will act as a filter strip, allowing deposition of suspended solids and other pollutants.	
	Watercourse crossings	Design measures: Culverts will be designed to accommodate track crossings and minimise length of affected channel in order to comply with Revised PPS15 policy FLD4. Hydraulic design of crossings will be undertaken as per the guidance and requirements provided in CIRIA C689 "Culvert Design and Operation Guide" (or other standard as may be required by DfI Rivers in post-consent consultation), with primary parameters likely to include: • Width of the culvert will be greater than the width of the active drainage channel; • Alignment of the culvert will suit the alignment of the drainage channel, i.e. preserve the existing direction of flow; • The slope of the culvert will not exceed the slope of the bed of the existing drainage channel.	Through CEMP, which will be agreed with the Planning Authority prior to construction and implemented during construction. Operational phase. Decommissioning Method Statement Schedule 6 consents will be sought for watercourse crossing design.

		• Detailed design of crossings will assume a hydraulic capacity requirement of 1% Annual Equivalent Probability flow including factor for climate change as required by DfI Rivers Technical Flood Risk Guidance in relation to Allowances for Climate Change in Northern Ireland as a conservative measure. Detailed hydraulic design of culverts and similar structures post permission is normal and accepted practice for wind farms in Northern Ireland. • Fisheries shall be protected by adopting the guidance stated in Guidelines for Fisheries Protection during Development Works as published by Loughs Agency. Consultation and approval will be sought from all relevant parties as required by the DAERA Surface Waters Alteration Handbook (November 2017), including and DfI Rivers in particular, at the pre-construction detailed design stage for all works in and affecting watercourses and drains, as per the requirements of Schedule 6 of the Drainage (Northern Ireland) Order 1973 and subsequent amendments. The resultant structures comprise clear span crossings of the significant watercourses, which have been demonstrated to ensure that the effect on flood conveyance is satisfactorily managed and would have no significant adverse effect on flood levels and flood extent within the Site and no adverse effect elsewhere. Preliminary DfI Rivers approval has been sought for the significant watercourse crossings.	
	Water Quality Monitoring	A water quality monitoring program will be implemented to monitor effects on the surface water quality regime during the infrastructure construction, operational and decommissioning phases of the proposed development, in order to; • Demonstrate that the mitigation measures and surface water management is performing as designed;	By condition. To be included in CEMP, which will be agreed with the Planning Authority prior to construction and implemented during construction.

		• Provide validation that the in-place mitigation measures are not having an adverse effect upon the environment; • Indicate the need for additional mitigation measures to prevent, reduce or remove any effects on the water environment, such as additional temporary settlement or filtration structures or short-term flocculant dosing to suit observed site conditions. It is intended that the water monitoring extent, duration and frequency will be agreed with the planning authority or the relevant regulating body (nominally DAERA WMU) post consent and will nominally consist of physicochemical and biological monitoring. The extent, duration and frequency of the monitoring will be proportionate to the level of activity during each phase of the Proposed Development and the associated perceived risks.	
	Pollution Prevention	A detailed Pollution Prevention Plan (PPP) will be implemented and monitored by the site manager as part of the CEMP, to be submitted post-consent following detailed site investigations and agreed with the local planning authority. Although this will be of particular importance during construction, it will apply to potentially polluting activities during all phases of the Proposed Development. The detailed PPP will be produced following consultation and agreement with DAERA, and all appropriate personnel working on the Proposed Development will be trained in its use. As a minimum, the PPP will comply with Guidance for Pollution Prevention (GPP) and Pollution Prevention Guidelines (in particular GPP 21: Pollution Incident Response Planning) and best practice as advocated by CIRIA. The PPP will identify site-specific measures and incorporate a Pollution Incident Plan, which will include emergency contact details, details of spill kits on the Proposed Development and instructions on actions in case of spillage / emergency.	

	Storage	All equipment, materials and chemicals on the Proposed Development will be stored away from any watercourse (i.e. outwith previously stated buffer zones). Chemical, fuel and oil stores will be sited on impervious bases in accordance with GPP2 and within a secured bund of 110% of the storage capacity, within the temporary storage compound.	
	Vehicles and Refuelling	Standing machinery will have drip trays placed underneath to prevent oil and fuel leaks causing pollution. Refuelling of vehicles and machinery will be carried out on an impermeable surface in designated areas, well away from any watercourse or drainage ditches (i.e. outwith previously stated buffer zones) and will adhere to best practice as detailed in PPG 7.	
	Maintenance	Onsite maintenance to construction plant will be avoided in all practicable instances, unless vehicles have broken down necessitating maintenance at the point of breakdown. Suitable measures in accordance with a Pollution Prevention Plan (PPP) will be put in place prior to commencement of maintenance in this instance.	
	Cement and concrete batching	Preference shall be given to construction techniques that do not require use of cementitious materials where suitable practicable alternatives exist. When concrete / cement is used, concrete batching will not be permitted on site. Wet concrete operations will not be carried out within watercourses or adjacent to watercourses. Measures to prevent discharge of alkaline wastewaters or contaminated storm water to watercourses will be outlined in a detailed PPP for the Proposed Development to be approved by the planning authority before commencement of works. Wastewater spillage will be minimised by using settling tanks and recycling water.	
	Mess and welfare facilities	Mess and welfare facilities will be required during construction and decommissioning and will be located at the construction compound. Foul effluent disposal shall be via chemical facilities with periodic tankered removal by a licensed waste haulier for licensed offsite disposal (i.e. there shall be no emission on site).	

	Construction in the vicinity of Watercourses	The following procedures apply to the general construction activities either within the watercourses or in defined watercourse buffer zones: • Due consideration will be given to the prevailing ground and weather conditions when programming the execution of the works in order to ensure that in-channel works are undertaken during periods of predicted low flow and low rainfall in order to minimise contact with water. • Ensure that roadside drains do not discharge directly into watercourses, but rather through a riparian buffer area of intact vegetation as denoted on design drawings.	
	Construction of Watercourses	Construction of watercourse crossings will be programmed to coincide with periods of predicted low flow in the affected channel (determined by rainfall and would generally coincide with summer months). Construction will be strictly as per the design for each identified watercourse crossing and will fully implement all SuDS and additional mitigating measures proposed at the detailed design stage. For purposes of outline design, the proposed mitigation will include: • Installation of silt fences parallel to the watercourse channel in the vicinity of the proposed crossing; • Installation of small cut-off drains to prevent natural surface runoff entering area of construction activity; • Installation of filtration or other silt entraining features within the watercourse channel immediately downstream of the works location; • Use of and over pumping to allow a dry working environment where deemed appropriate.	

	Temporary SuDs	Temporary drainage and silt management features (SuDS) will be constructed prior to earthworks (including preliminary or enabling works) proceeding to construct any linear works (tracks / hardstanding areas / cable routes), turbine bases, and other infrastructure. Drainage will be provided to temporary works and reinstated to suit the final footprint of the completed development. Temporary drainage measures in particular will be employed in enabling works to facilitate widening of existing tracks and diversion of minor watercourses where specifically proposed. Temporary measures may include: • Temporary silt fences erected in areas where risk of pollution to watercourses has been identified e.g. watercourse crossing locations and areas where tracks or other infrastructure lie within watercourse buffer zones. • Placing temporary filtration silt fences within drainage channels where siltation is observed. • Installing temporary constructed settlement features such as sumps or settlement ponds / lagoons where required. • Upslope cut-off drainage channels approximately parallel to the proposed track alignment installed in advance of any excavated cuttings for the track or turbine hardstanding areas. • Watercourses, drains, natural flow paths and cut-off drain outlet locations should be identified and charted, in order to ensure that piped crossings can be installed in advance of or adjacent to the track construction. • Settlement ponds should be constructed in advance of commencing excavations for foundations and at any other locations identified as required at detailed design stage. • Trackside drainage swales should be installed in parallel with track construction. Note that this may require that drainage swales are reformed on an ongoing basis as temporary track alignments are modified to their eventual finished design level. Suitable prevention measures should be in place at all times to prevent the conveyance of silts to receiving watercourses.	

	Electrical Cable Laying	Due consideration will be given to the prevailing ground conditions and season when programming the execution of cable trench excavations in order to ensure works are undertaken during periods with low rainfall and elevated shallow groundwater levels in order to reduce the likelihood of runoff entering the excavations. Excavation of cable trenches will be carried out over short distances, with frequent backfilling of trenches to minimise opportunity for the ingress of water into open trenches, temporary silt traps will be provided in longer trench runs and on steeper slopes and spoil will be stored in line with a spoil management plan, which will be produced as part of the CEMP at the pre-construction stage.	
	Excavations and Spoil Management	Soil and subsoil excavation and movement will be undertaken in accordance with best practice guidelines such as Good Practice Guide for Handling Soils (MAFF, 2000) in order to minimise potential for silt laden runoff from spoil and excavations. Areas of stockpiled spoil including stored peat: • will not be permitted within previously identified watercourse buffer zones; and • will not be permitted to obstruct the flow of overland surface water with specific drainage to spoil mounds to be provided. Material produced from excavations on the Site will be reused where reasonably practicable in the reinstatement of the site. Excavated materials will be separated into rock material, subsoil, reusable peat and vegetated sod material and will be stored in the designated temporary stockpile zones, under the supervision of a geotechnical expert. These materials will be reused where possible to re-grade slopes, and to re-vegetate and stabilise the sides of access tracks and hard standing areas. Spoil drainage will be designed on a bespoke basis for spoil storage areas to allow controlled dewatering and prevent washout of suspended solids to the receiving water environment. As part of the detailed CEMP a spoil management strategy will be developed by the appointed competent contractor for the development. Outline designs for drainage arrangements for temporary spoil areas are shown on the	By condition. Peat Slide Risk Assessment and Peat Management Plan to be incorporated into CEMP and agreed with the planning authority prior to construction.

		Drainage Management Drawings within Appendix 10.1: Surface Water Management Plan. The mitigation identified in the Peat Slide Risk Assessment (Technical Appendix 10.3) and Peat Management Plan (Technical Appendix 10.4) will be adhered to.	
	Dewatering of excavations	The majority of the turbine base foundations will be on bedrock or other hard strata above bedrock (to be confirmed by detailed site investigation prior to detailed design); therefore, deep excavations within bedrock and the associated bedrock aquifer are not anticipated and dewatering below the bedrock aquifer groundwater table is therefore not anticipated. Shallow groundwater (e.g. in areas of glacial sand and gravel) or rainfall runoff collected in excavations will be discharged via settlement ponds or filter strips prior to entry to the receiving water environment. Any settlement lagoons or filter strips associated with dewatering will be regularly inspected, particularly after periods of heavy rainfall and prior to periods of forecast heavy rainfall. Maintenance (to clear blockages or remove silt) will be carried out in periods of dry weather where practicable. Maintenance requirements are further considered in Appendix 10.1: Surface Water Management Plan.	By condition To be included in CEMP, which will be agreed with the Planning Authority prior to construction and implemented during construction.
	Dust Management	Loose track material generated during the use of access tracks and the construction compound will be prevented from reaching watercourses by maintenance to surface water drainage systems installed at aggregate based hard standing areas. In dry weather dust suppression methods such as by dust suppression bowser will be employed.	
	Borrow pits	For the avoidance of doubt, no borrow pits are proposed at the Proposed Development, therefore associated pollution risks associated with rock extraction activities are not a consideration.	
	Operational Phase	Ensure best practice is adhered to on the Site and avoid pollution release to watercourses by incorporating DAERA Pollution Prevention Guidance notes into management policy.	Outline maintenance programme included in Technical Appendix 10.1

		In the event that permanent welfare facilities are installed as part of control building / substation facilities, foul effluent will be disposed of through the use of sealed cesspools or chemical facilities with periodic tankered removal by a licensed waste haulier for licensed offsite disposal (i.e. there shall be no emission on the site). Cyclical maintenance of permanent SuDS drainage features installed during the construction phase, including unblocking of drains, maintenance of access road and other hard standing surfaces, and removal of silt build-up from settlement features. An outline maintenance programme is included in Appendix 109.1: Surface Water Management Plan.	
Chapter 10 Acoustic Assessment	Operational noise	If planning permission is granted for the Proposed Development, planning conditions can be proposed to provide a degree of protection to nearby residents in the form of limits relating to noise level and tonality. Technical Appendix 10.4 contains a set of conditions that RES considers appropriate.	By condition. Technical Appendix 10.4 contains a set of conditions that RES considers appropriate.
	Potential for noise to be created during general construction activities and by construction traffic	Due regard to practicality and cost as per the concept of 'best practicable means' as defined in Pollution Control and Local Government (NI) Order 1978. A range of noise mitigation measures could be implemented where appropriate: • Consideration would be given to noise emissions when selecting plant and equipment to be used on site; • All equipment should be maintained in good working order and fitted with the appropriate silencers, mufflers or acoustic covers where applicable; • Stationary noise sources would be sited as far away as reasonably possible from residential properties; and • The movement of vehicles to and from the site would be controlled and employees instructed to ensure compliance with the noise control measures adopted.	Through CEMP, which will be agreed with the Planning Authority prior to construction and implemented during construction

		Site operations would be limited to 0700-1900 Monday to Saturday except during turbine erection and commissioning or during periods of emergency work.	By condition
Chapter 11 Traffic & Transport	Impact on other road users	A Traffic Management Plan (TMP) will be prepared by the Applicant in accordance with the requirements of DfI, the local PSNI, and if required, any other relevant stakeholders. Features of the TMP will include: • Details of the access route, conformation of any points along the access route that require street furniture removal, details of traffic numbers, delivery timings, and signage and escort requirements • A delivery schedule for normal and abnormal loads to minimise disruption as far as reasonably practicable • Details of how any movements will comply with legislation regarding the movement of abnormal loads e.g. notice procedures and notice periods • Details on the use of escorts where required. Where long vehicles and abnormal loads would have to use the wrong side of the carriageway or need to swing into the path of oncoming vehicles a lead warning vehicle would be used. One escort vehicle would drive ahead and pull oncoming traffic into identified passing places. An escort vehicle would travel directly in front of the convoy and pull over any oncoming traffic that comes onto the road after the first escort vehicle has passed. A further convoy escort vehicle would follow the convoy • Information about marking of vehicles as long/abnormal loads • Information will be given on how warning signs will be used. These will be used to advise other road users of 'Caution Slow Plant Turning Ahead' and will be placed at intervals from both directions along the main road approaching the site entrance during the construction phase. The TMP will also detail additional measures to ensure impacts from traffic movements are	By condition. Through TMP, which will be submitted to and agreed with the planning authority and DfI Roads prior to the commencement of development

		minimised where possible, for example provision of road sweepers and/or wheel wash facilities. • If required, the wheel wash facilities will include a waterless drive over wheel wash for lorries. This will be provided at the site entrance to prevent mud and dust being brought out from the Site onto the public highway and anything being brought onto Site from public highway. Although experience has shown the majority of mud is shaken off wheels on site before the vehicle reaches the public road, the site entrance and adjacent public highway will also be monitored and cleaned if necessary. • The TMP will include details about Video Surveying and Road Repairs. A video survey of the pre-construction condition of all public roads will be recorded around the site entrances and access routes (but including the site entrance and access roads), to provide a baseline record of the state of the roads prior to construction work commencing. This will enable any repairs and maintenance work required to the relevant road due to any damage caused by the passing of heavy vehicles associated with the wind farm construction to be identified following the construction phase. The roads will be returned, at minimum, to the baseline condition at the end of the construction phase. Any damage caused by wind farm traffic during the construction period, which would be hazardous to public traffic, will be repaired immediately. These works will be carried out under permits with DfI Roads, as appropriate. • The TMP will include plans for notifying relevant stakeholders in advance of delivery periods, including the emergency services, DfI Roads, local residents, local business, local services and schools. The local community will be informed prior to the commencement of construction and prior to the commencement of turbine deliveries by letter and through local press. The contact details of the Construction Site Manager will be made available as a contact point for enquiries. Local schools on the delivery routes will be contacted to identify school and nursery drop-off and pick up locations and times. Construction deliveries	

		will be scheduled to avoid these busy periods as far as reasonably possible. • If cutting or removal of hedges and trees is required, then this should be done outside the bird breeding season (1st March to 31st August) unless otherwise agreed. If work is to be done during the breeding season, then there should be a survey to establish whether nesting birds are present.	
Chapter 12 Shadow Flicker	Material reduction to residential amenity	In the event of shadow flicker causing a nuisance mitigation measures can be incorporated into the operation of the Proposed Development to reduce the instance of shadow flicker. Mitigation measures include planting tree belts between the affected dwelling and the responsible turbine(s) or installing blinds at the effected property. In the unlikely event that there is extreme nuisance mitigation could include shutting down individual turbines during periods when shadow flicker could theoretically occur.	By condition A shadow flicker mitigation scheme to be agreed with the planning authority prior to erection of turbines.