MAGHERAMORE WIND FARM

Environmental Statement

Volumes 1 - Non Technical Summary

MANAGEMENT SYSTEM CERTIFICATION
ISO 9001 = ISO 14001 = OHSAS 18001
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Preface

This document is Volume 1 of the ES. The ES comprises:

- Volume 1: Non-Technical Summary (NTS)
- Volume 2: Main Report
- Volume 3: Figures (Maps & Illustrations)
- Volume 4: Technical Appendices

The aim of the NTS is to summarise the content and main findings of the ES in a clear and concise manner to assist the public in understanding what the environmental effects of the Magheramore Wind Farm are likely to be. The full ES provides a more detailed description of the Development and the findings of the Environmental Impact Assessment (EIA) process.

The ES has been prepared by RES in consultation with Causeway Coast & Glens BC, various consultees and in collaboration with the subject specialists outlined below.

Specialism	**Author**
Introduction & Planning Policy; Proposed Development (including Electromagnetic Interference and aviation); Design Evolution & Alternatives; Noise; Transport and Shadow Flicker;	RES
Landscape and Visual	Shanti McAllister Landscape Planning & Design
Archaeology and Cultural Heritage	Headland Archaeology
Ecology	Blackstaff Ecology
Ornithology	David Steele
Fisheries	Paul Johnston Associates
Geology and Water Environment *Peat Slide Risk & Peat Management Plan*	McCloy Consulting *Natural Power*
Socioeconomics	Oxford Economics

Commenting on the ES

The full ES, together with supporting documents submitted as part of the planning application (Design and Access Statement and Pre-Application Community Consultation Report) will be available (and CD copies available free of charge) for viewing during normal opening hours at the address below:

Viewing Location	Address
Dungiven Library	107 Main Street Dungiven County Londonderry BT47 4LE Phone: 028 7774 1475

An electronic version of the reports supporting the application, including the ES, will be available to download free of charge from http://www.magheramore-windfarm.co.uk

Copies of the ES can be obtained at a cost of £50 from the address below:

RES Ltd
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1. Introduction

1. This Non-Technical Summary (NTS) has been prepared in support of a planning application by RES Ltd for the proposed Magheramore Wind Farm, hereinafter referred to as 'the Development', which is located approximately 4 km south of Dungiven, County Derry/Londonderry.

2. A planning application has been submitted to Causeway Coast & Glens BC in accordance with the Planning (Environmental Impact Assessment) Regulations, 2017. The regulations require an Environmental Impact Assessment (EIA) to be carried out and the results of the EIA to be included in an Environmental Statement (ES) to accompany the planning application. The application follows a detailed assessment of the environmental and technical aspects of the site's suitability for development.

3. The Development, which comprises 6 three-bladed, horizontal axis wind turbines, each up to a maximum of 149.9 m to tip height, with a total installed capacity of up to 21.6 MW. The Development would include associated external electricity transformers, underground cabling, a newly created site entrance, access tracks, turning heads, crane hardstandings, control building and substation compound and energy storage containers. 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.

4. Final wind farm capacity will vary depending on the outcome of planning permission and the turbine type selected. It is estimated that the wind farm could produce enough electricity to meet the needs of 22,700 homes each year.[1] This is equivalent to 40.6 percent of the housing stock in Causeway Coast and Glens Borough Council area.[2]

The Applicant

5. RES is one of the world's leading independent renewable energy project developers with operations across Europe, the Americas and Asia-Pacific. At the forefront of renewable energy development for over 30 years, RES has developed and/or built almost 12,000 MW of renewable energy capacity worldwide. In the UK alone, RES currently has more than 1,000 MW of projects either constructed, under construction or consented. RES is active in a range of renewable energy technologies including onshore and offshore wind, solar, as well as enabling technologies such as energy storage.

6. RES has developed 16 onshore wind farms in Northern Ireland totalling 229 MW, which equates to 36% of Northern Ireland's onshore wind capacity. RES currently operates

[1] For Magheramore, a load fact of 0.46 was provided by RES and applied to Oxford Economics' calculations. This load factor allows us to account for wake and electrical losses using typical wind speeds/directions etc. to give a realistic prediction of electricity output (rather than using a theoretical maximum level whereby it is assumed that wind blows for 24 hours a day 365 days a year on every wind farm site.)

[2] Oxford Economics Internal Model Suite.

over 83 MW of wind capacity across Northern Ireland, has secured planning permission for a further 112 MW awaiting construction and has 92 MW in the planning system.

The Application Site

7. There are a number of key technical and environmental factors that influence the suitability of a site for a wind farm. The following are key attributes that contribute to a viable site, which the application site possesses:
    - Good wind speeds
    - 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
    - Sufficient area to accommodate the number of wind turbines required for economic viability
    - Adequate vehicular access for wind turbine components (abnormal loads)
    - Suitable terrain and topography, which affect wind flow across a site and need to be considered in relation to turbine performance, specification and life-span
    - Suitable ground conditions for the construction of wind turbine foundations, erection of the machines and the provision of access tracks and cables.

8. The Site is positioned on an upland plateau in the north eastern part of the Sperrins Area of Outstanding Natural Beauty (AONB). The Site is accessed via the Magheramore Road and is linked to the tertiary road network to Dungiven.

9. The Site is currently used for sheep and cattle grazing and predominantly comprises improved agricultural land, with small distinct areas of wet marshy grassland and wet heath. The lands are well managed with extensive stoned farm tracks providing access to agricultural fields bounded by mature double row hedgerows and strategically placed coniferous shelter belts. The Site is open and exposed to the north but is bounded to the south by the Altnaheglish River and associated broadleaf woodland within Banagher Glen. Further south there are extensive areas of commercial forestry that form Banagher Forest.

The Need for the Development

Climate Change

10. The Paris Agreement (12 December 2015) sets out the need to hold the increase in global average temperature to "well below 2^{o}C above pre-industrial levels and to pursue "efforts to limit the temperature increase to 1.5^{O}C". To achieve this long-term temperature target, the text states "parties aim to reach global peaking of greenhouse gas emissions as soon as possible". The document also includes a ratcheting mechanism on climate action, with countries having to communicate nationally determined contributions to reducing global emissions.

11. It is clear that moving to a low carbon economy is now a globally shared goal and will require absolute emission reduction targets. For the first time, some 195 countries, including the world's largest emitters have now committed to act together to address climate change and to be held equally accountable. Countries will also be legally obliged to make new post-2030 commitments to reduce emissions every five years.

12. In October 2018, the landmark Intergovernmental Panel on Climate Change (IPCC) Report highlighted the importance of the limiting temperature increases to 1.5 degrees C. The report concludes that human-induced warming reached approximately 1°C above pre-industrial levels in 2017 and at the present rate, global temperatures would reach 1.5°C around 2040. *The IPCC's report recognises that in order to meet our climate change targets, up to 85% of global power generation needs to come from renewables by 2050.*

13. In February 2019, the Committee on Climate Change published a paper on "*Reducing emissions in Northern Ireland*", which was prompted by the Permanent Secretary for the of the Department of Agriculture, Environment & Rural Affairs (DAERA) in Northern Ireland requested the Committee's advice on how Northern Ireland could reduce greenhouse gas emissions between now and 2030.

14. Whilst Northern Ireland does not have any specific climate change legislation, greenhouse gas *emissions* from Northern Ireland contribute to the UK total under the Climate Change Act and therefore Northern Ireland has a key role to play in meeting our obligations under the Paris Agreement.

Net Zero

15. In May 2019, following a request from the Governments of the UK, Wales and Scotland, asking the Committee to reassess the UK's long-term emissions targets. The new emissions scenarios draw on ten new research projects, three expert advisory groups, and reviews of the work of the IPCC and others.

16. The report's key findings are that:

    - The Committee on Climate Change recommends a new emissions target for the UK: net-zero greenhouse gases by 2050.
    - In Scotland, we recommend a net-zero date of 2045, reflecting Scotland's greater relative capacity to remove emissions than the UK as a whole.
    - In Wales, we recommend a 95% reduction in greenhouse gases by 2050.

17. A net-zero GHG target for 2050 will deliver on the commitment that the UK made by signing the Paris Agreement. It is achievable with known technologies, alongside improvements in people's lives, and within the expected economic cost that Parliament accepted when it legislated the existing 2050 target for an 80% reduction from 1990.

18. However, this is only possible if clear, stable and well-designed policies to reduce emissions further are introduced across the economy without delay. Current policy is insufficient for even the existing targets.

19. Following the publication of this report, the UK Government committed to enshrining in law a commitment to reach net zero carbon emissions by 2050 through an amendment to the Climate Change Act.

Security of Supply

20. A key policy driver for the development of renewable energy in Northern Ireland is the need to increase security of supply. There are also potential adverse impacts on local populations and the *economy* through high volatile fuel costs, contributing to fuel poverty and high energy costs for businesses and industry. In addition, increasing focus on renewable energy can deliver environmental and climate change gains, reductions in carbon emissions, as well as investment and employment opportunities. With a lack of indigenous fossil fuels and no nuclear power stations, Northern Ireland is keen to develop the full range of its available renewable energy resources to optimise the contribution that renewables make to the overall energy mix.

21. Wind is a free and inexhaustible resource which has an important role to play as part of a balanced energy mix. Wind energy enables us to generate our own electricity without reliance on imports and is not subject to sudden price fluctuations or the uncertainty of global markets. New onshore wind is now the cheapest source of electricity generation bar none. This makes onshore wind developments not only beneficial for the environment but also for bill payers in Northern Ireland.

22. The Development will result in a reduction in greenhouse gas emissions from the electricity generating industry by harnessing wind as an alternative to the burning of fossil fuels, in line with the government's energy goals. It is also important to highlight that energy production is not static and additional renewable generation will be required to be connected to maintain the NI targets and subsequently achieve and maintain the UK renewable targets.

2. Description of the Development

23. The main elements of the Development are as follows:

- 6 three-bladed horizontal axis wind turbines of up to 149.9 m tip-height
- Turbine foundations
- Hardstanding areas at each turbine location for use by cranes erecting and maintaining the turbines
- Electricity transformers
- Approximately 2.2 km of new access track and 2.1 km of upgraded access track
- Wind farm substation compound containing a control building
- Energy Storage Containers
- On-site electrical and control network of underground (buried) cables
- Connection from the substation to the local grid network
- Temporary construction compound
- Permanent and temporary drainage works
- Associated ancillary works
- Temporary enabling works compound
- New site entrance from the public road.

24. The wind farm layout is shown in **Figure 2.1: Infrastructure Layout**.

25. The actual area of permanent land take is limited to the control room and substation compound, energy storage area, wind turbine towers, permanent crane hardstandings and on-site access tracks, which collectively account for approximately 3.13 ha, which is approximately 7.63% of the area within the planning application boundary. In addition, there will be an estimated 0.55 ha of hardstanding required on a temporary basis during construction.

26. Prior to construction the locations of the proposed wind turbines would be subject to micrositing, which allows for a small degree of flexibility in the exact locations of turbines and routes of 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. The micrositing allowance has been taken into account in the EIA.

Wind Turbines

27. 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 Development has not yet been made. The most suitable machine will be selected before construction, with a maximum tip height of 149.9 m.

28. For visual and acoustic assessment purposes, the most suitable candidate turbine available in the market place (currently of 3.6 MW nominal capacity and with an overall tip height of 149.9 m) has been assumed. Exact tower and blade dimensions vary marginally between manufacturers. A diagram of a typical 149.9 m tip height turbine is given in **Figure 2.2: Typical Wind Turbine Elevation**.

29. It is proposed to install infrared lighting on the turbines in a pattern that is acceptable to the Ministry of Defence (MoD) for aviation visibility purposes. Infrared lighting allows military aircraft with night vision capability to detect and avoid wind farms. Infrared lighting cannot be detected with the naked eye, thereby reducing visual impact.

30. Each turbine would have a transformer and switchgear. Depending on the turbine supplier, the transformer and switchgear may be located inside or outside each turbine.

31. The wind turbines would be erected on steel re-enforced concrete foundations. During the erection of the turbines, crane hardstanding areas would be required at each turbine base consisting of both permanent and temporary elements. After construction is complete, the temporary crane pad areas will be reinstated.

Site Tracks

32. The site entrance is located at an existing access to farm lands on the south side of the Magheramore Road where two stone pillars and walls mark a well-defined farm entrance.

33. Approximately 2.2 km of new access tracks and 2.1km of upgraded access tracks are required within the site to enable the turbine components and construction materials to be transported to their locations, and to enable ongoing access during the operational period for maintenance visits.

34. The on-site access track layout has been designed to minimise environmental disturbance by utilising existing track locations and avoiding sensitive habitats where possible whilst keeping the length of track commensurate with the minimum required for operational safety. The track route takes cognisance of the various identified environmental constraints.

35. Seven watercourse crossings will be required as part of the track layout. These crossings would be designed to ensure that fish and mammal movements are not restricted, in addition to ensuring the crossing size is adequate for potential flood flows.

    - Two crossings of a significant watercourse (Stream C and tributary), both at locations where an existing culverted track exists.

- Five crossings of minor watercourses, the majority of which comprise existing track-side drains.

Electrical Connection, Control Building & Substation and Energy Storage

36. Assuming the use of the currently available models, each wind turbine would generate electricity at 690 V 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.

37. The wind farm control building and substation is proposed to be located on the eastern part of the site as shown in **Figure 2.1: 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.

38. The control building will be designed and constructed to the standard required by NIE for the accommodation of substation 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. The building will be staffed by maintenance personnel on a regular basis.

39. Four permanent containers housing an energy storage device, inverters and other ancillary equipment will be positioned adjacent to the control building and substation compound on hardstanding used originally for the temporary construction compound. These units are a means of storing electrical energy just like a rechargeable battery, cell phone or electric car. These are means by which power can be stored and released. The application is of course of a larger scale but the basic principle is the same.

Construction Management

40. An Outline Construction Environmental Management Plan (oCEMP) is included within the Environmental Statement and a Construction and Decommissioning Method Statement (CDMS) will be prepared if planning consent is granted. This will be submitted to Causeway Coast & Glens BC prior to any construction works taking place. This will describe the detailed methods of construction and working practices, work to reinstate the site following completion of construction activities and methods to reinstate the site post operation. The CDMS will:

    - 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;
    - 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.

41. The wind farm drainage system will be designed to mimic natural conditions to mitigate against increased flashiness in water courses and reduced groundwater recharge. The drainage system will protect the status of water courses and ground waters.

42. 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 CDMS.

43. It is anticipated that the construction would take 18 months (worst case). 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.

44. A programme of 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 Development, therefore the main crane hardstanding will remain uncovered.

Operation

45. The expected operational life of the Development is 30 years from the date of commissioning. Wind turbines and wind farms are designed to operate largely unattended. Each turbine 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.

46. The 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.

47. 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 Development and would be on-site intermittently.

48. 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.

49. A Habitat Management Plan will be implemented during the construction and operational phases of the Development, working with the site landowners, which will provide for the restoration and enhancement of currently degraded blanket bog and wet heath habitats on site.

Decommissioning

50. 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.

51. If the Development obtains planning approval it is expected that a planning condition would be set to provide for the decommissioning of the site in accordance with a scheme agreed in writing with Causeway Coast & Glens BC.

52. The Development will be decommissioned in accordance with best practice and/or in compliance with any planning conditions. Current best practice includes the removal of all above ground structures; the removal of all underground structures where required; 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.

3. The Environmental Impact Assessment (EIA) Process

53. The purpose of EIA is to provide adequate environmental information to enable stakeholders to understand the potential environmental effects of a project. The EIA identifies and assesses the potential environmental effects associated with the construction, operational and decommissioning of the Development. The assessment and potential effects are recorded in the ES.

Consultation

Public Consultation

54. 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 over four months prior to the submission of the planning application, to facilitate a constructive consultation process which helped RES to understand and address any concerns as the project developed.

55. A public exhibition was held in March 2019 which included detailed information about the proposals, including: a map of the proposed layout; photomontages representing how the proposed layout would appear from a range of viewpoints; 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 to answer questions and feedback was encouraged.

56. A Pre-Application Community Consultation (PACC) Report has been produced and is available for viewing at the location listed in Section 1 of this NTS.

EIA Consultation

57. RES and the various chapter authors have undertaken pre-application consultation with relevant consultees, which has informed the EIA process and is detailed in each of the technical chapters within the Volume 2 (Main Report) of the ES.

Wind Farm Design Evolution & Alternatives

58. In accordance with EIA process and best practice the project team employed an iterative approach to the design of the Development. The design evolved throughout the EIA process as different constraints and adverse/ beneficial effects were identified and evaluated. This approach allowed mitigation measures to be integrated into the design in order to alleviate or remove significant effects of the proposed development. It also allowed measures to enhance beneficial effects of the proposed development to be incorporated into the design.

59. Following consultation and baseline characterisation of the Site, the following key topics were identified:

- Landscape and visual
- Archaeology and cultural heritage
- Ecology
- Ornithology
- Fisheries
- Geology and water environment
- Noise
- Shadow flicker
- Traffic and transport.

60. The topics listed above were considered through the design with the aim of designing out significant effects. Where it was not possible to mitigate by design, the issues were considered further as part of the EIA.

61. A key tool in this process was the combined constraints drawing, which identifies constraints to development and sensitive features on the site. This drawing was iteratively updated as new information from surveys, site visits and consultation was received.

Initial Turbine Layout (Feasibility Stage)

62. 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 at the time and in accordance with the design principles, prior to baseline surveys having been commenced. The layout was informed by the following constraints:

- Preliminary watercourse buffers
- Slope
- Known private water supply locations
- Separation from housing (1000m) / Double the minimum separation distance of 500 m.
- 164.9 m buffer (tip height + 10%) to public roads, in accordance with the Best Practice Guidance to PPS 18[3].

63. This identified that the Site could potentially accommodate 7 turbines with a 112m rotor diameter.

64. This initial feasibility layout was reviewed by the Landscape Consultant. A Zone of Theoretical Visibility diagram (ZTV) and wirelines were produced for a provisional 7-turbine layout and the potential landscape and visual issues that would need to be considered if a wind farm were to be proposed on this site were considered in broad terms based on previous experience of assessing wind farms in other this part of the Study Area. This included a preliminary analysis of the site in its wider landscape

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

context, including its location within the Sperrin AONB and its potential relationship with other wind farms.

65. The feasibility appraisal concluded that the site was likely to meet the criteria for acceptable development as set out in planning policy and supplementary guidance. The 7-turbine layout presented a small ZTV in terms of its geographical coverage, but the wirelines illustrated some clustering of turbines in the centre of the layout, which may need to be reviewed to create a more balanced layout.

Primary Turbine Layout (EIA Baseline Stage)

66. Prior to detailed site assessments being undertaken by external consultants, RES technical analysts undertook site visits to check that there were no physical characteristics on site that may impact upon the turbine performance such as topography and the proximity and height of forestry in relation to the turbines.

67. RES engineering and construction undertook site visits with ecological and geology/hydrology consultants to review the turbine locations and to agree principles for the design of the onsite infrastructure based on the constraints determined to date.

68. Following further consultation with landowner(s), Turbine 7 was omitted, and this necessitated other changes to maximise the efficiency of the turbines and to create a balanced layout.

69. The revised layout was informed by the original constraints with the following amendments:

- 165 m buffer to power lines;
- Hydrological buffer 50 m;
- Hydrological buffer 10 m;
- Archaeological features;

70. The removal of Turbine 7 from the western-most side of the wind farm enabled some refinements to the layout.

- T4 moved south west (turbine separation);
- T1-T3 moved closer together (to avoid boundary overfly).

71. The resulting 6 turbine layout with 112.0 m rotor diameter produced a more compact layout.

Combined Constraints

72. To ensure that all requirements were captured a combination of desktop and site-based surveys were undertaken to refine constraints. Detailed environmental and technical surveys were carried out to characterise the baseline environmental

conditions on the Site and associated study areas, as described in more detail in chapters 4 to 13 of this Environmental Statement. Any constraints to development resulting from the baseline surveys were used to build up the combined constraints drawing.

Landscape & Visual

73. As mentioned above a Landscape Consultant was involved throughout the design process to provide advice regarding the scale of the Development and turbine heights and geometry.

74. The 6-turbine option that is that is presented in the EIA is the result of this iterative design process. The ZTV for the 6-turbine layout is not significantly altered from the 7-turbine layout but the reduction in the number of turbines has resulted in several benefits, namely:

- The turbines can be more evenly spaced in relation to each other and to the site topography which has resulted in a simpler layout with fewer variations in tip heights in relation to contour AOD levels;
- There are fewer instances where 'stacking' of turbines occurs. Stacking is where two or more turbines will appear directly in front of each other in a view and will therefore result in a 'heavier' or more solid, and hence more prominent appearance;
- The reduction in the number of turbines has allowed the turbines to be located at elevations away from the summit of Teeavan Hill and this has slightly reduced the level of visibility from the following parts of the Sperrin AONB: around the summit of Slieve Gallion to the south; Banagher Road to the west; B40 North Sperrins Scenic Drive to the south west.
- Ensuring that the turbines remain clear of the summit of Teeavan Hill also means that the Development is viewed as a small feature that is subordinate to the wider sequence of summits which stretch in a crescent-shaped arc from Binevenagh in the far north of the Study Area into the main Sperrin Mountain range across the western part of the Study Area. Visual effects on the AONB and this sequence of views along the Binevenagh and Sperrin ranges of uplands are minimised in all instances.

75. Provisional Viewpoints were analysed as part of the LVIA and the cultural heritage assessment (Chapter 5) to identify potentially significant effects that might result from the turbine layout, as well as from the effects of the wind farm as a whole. The Provisional Viewpoint were discussed with the Planning Department of Causeway Coast & Glens BC and the Department of Communities: Historic Environment Division, (DfC:HED) and their suggestions fed into the selection of a final list of Viewpoints that are presented and analysed in detail in **Chapters 4: Landscape & Visual** and **Chapter 5: Archaeology & Cultural Heritage**.

Environmental Constraints & Assessments

76. Following baseline surveys, the combined constraints drawing incorporated the following, which are shown in **Figure 3.3: Combined Constraints and Infrastructure**:

- There is an existing 11kV line that runs through the site and NIE Networks safety policy for clearance distances to 11kV is tip height plus 6 metres. A 165 m buffer has been applied to provide a setback distance of at least tip height plus 10% between turbines and overhead line.
- There are two scheduled monuments within the site boundary / land under applicant control. These sites were mapped and avoided accordingly. No construction works would occur within the fenced area of moorland where they are situated.
- 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. Upstream abstraction constraints were added to identified private water supplies;
- All turbines have been positioned to maintain a minimum 57.57m buffer (50m stand-off distance from the tip of the turbine blade to the top of the adjacent habitat feature). This is based on a (blade length of 56m, hub height of 94m and a feature height of 25m). In addition, it is proposed to clear-fell the existing coniferous shelterbelts for a distance of 100m surrounding all turbines (as shown on Figure 6.2);
- There is an existing 11kV line that runs through the site and NIE Networks safety policy for clearance distances to 11kV is tip height plus 6 metres. A 165 m buffer has been applied to provide a setback distance of at least tip height plus 10% between turbines and overhead line.

77. Before the turbine layout could be confirmed, noise and shadow flicker assessments were carried out. Both assessments conclude that there would be no significant effects on any surrounding residential properties.

78. The final turbine layout consists of 6 turbines of 149.9 m tip height.

Infrastructure Design Evolution

79. The infrastructure design evolved through the EIA process. The following principles were taken into consideration when designing the supporting infrastructure:

- 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, to avoid unnecessary amounts of excavation and reduce adverse hydrological impacts using the following methods:
  - Maximise the use of existing track locations via upgrades;
  - 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 (except where existing farm access tracks where in situ);
- Incorporation of measures to improve the visual appearance of the scheme, including reinstatement of temporary infrastructure following the construction period;
- Sympathetically locating control room building / substation / energy storage facility within the site surroundings.

Environmental Effects

80. The following sections summarise the technical chapters of the ES. The term 'Site' refers to the Preliminary Site Boundary of the wind farm, which is shown in **Figure 1.1: Site Location**, which is a larger area than the final planning application boundary, which is shown in **Figure 2: Infrastructure Layout**.

Landscape and Visual

81. The Landscape and Visual Impact Assessment (LVIA) methodology was specifically developed for wind farm development in Northern Ireland in accordance with best practice guidance. The Landscape and Visual Impact Assessment (LVIA) considered a 30 km radius Study Area and used a combination of existing desktop information (maps, planning policy and existing landscape character assessment documents), detailed site analysis of the Study Area and computer modelling.

82. The LVIA was carried out by an independent consultant and Chartered Landscape Architect with over 17 years' experience of preparing LVIAs. The LVIA methodology was specifically developed for wind farm development in Northern Ireland in accordance with best practice guidance. The aims 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 Development;
    - Identify the potential effects of the Development on these baseline conditions including direct, indirect, permanent, temporary and cumulative effects;
    - Clearly distinguish between *landscape effects* – the effects on the physical landscape as a resource in its own right – and *visual effects* – the effects on specific views and general visual amenity as experienced by people;
    - 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.

83. Potential landscape and visual effects were assessed as separate but linked issues. The magnitude of landscape effects was derived from the extent to which physical changes would cause changes in landscape character and value. Visual effects relate to changes in the composition of views and people's perception of/responses to these physical changes. Viewers / visual receptors include local residents, tourists, walkers, farmers, general road users etc.

84. For both landscape and visual effects, the Significance of effect was derived from the assessment of Landscape Value, Sensitivity and Magnitude of change and by using objective professional judgement in relation to site circumstances.

85. An assessment of cumulative impact was also carried out. The purpose was to measure the incremental effect of the Development on the Cumulative Baseline, i.e. in combination with other wind farm developments, including operational, consented and proposed projects. In accordance with best practice guidelines existing and consented wind farms are considered to be part of baseline landscape and visual character as well as in the cumulative assessment. The assessment of effects of the Development takes consideration of their presence, or anticipated presence. 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 Development and other wind farms

86. The proposed site is located around the north western to south western side slopes of a small rounded hill – Teeavan Hill – which has a summit at 329 m AOD. It is in the townland of Magheramore approximately 4 km to the south of Dungiven town centre. Teeavan Hill is the lowest and northern-most hill within a small group of hills which form an outlying upland area on the north western edge of the Sperrin Mountain range where these mountains meet and merge with the Binevenagh and Glenshane uplands. Together they combine to physically contain the southern end of the Roe Valley.

87. The proposed site is located within the Sperrin AONB near its north eastern edge overlooking the Roe Valley and within the Sperrin Mountains Landscape Character Area (LCA) as defined in the Northern Ireland Landscape Character Assessment (NILCA), both of which are described in the LVIA. Aside from the AONB there are no statutory designations of relevance to the LVIA within or immediately adjacent to the site. There are however a number of landscape classifications in proximity to the Development which allow public access and enjoyment of this part of the Sperrin AONB including a section of the Ulster Way, the North Sperrins Scenic Drive, footpaths in Banagher Glen and a number of other scenic drives, footpaths and cycle routes in the wider Study Area. These have been taken into account in the assessment.

88. 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. The Sperrin AONB 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.

89. The overall conclusion is that the Development would have no significant landscape effects and a significant visual effect on only one of the 22 Viewpoints which were chosen to represent typical views within the Study Area. In recognition of its location within the Sperrin AONB and the Sperrin Mountains LCA the layout and position of the Development has been designed to minimise its effect on the AONB as a whole and this has been achieved by locating it away from the core area containing the majority of visitor attractions and key landscape features. The proposed site is used primarily for grazing. Adjacent areas are 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. In relation to the LCA and the wider AONB, Teeavan Hill on which the Development would be located is a low rounded hill that is surrounded on all sides by higher ground and occupies a relatively discreet position within the wider landscape.

90. The location of the Development is neither prominent nor highly visible from the majority of the Study Area and most notably from the Sperrin AONB or other parts of the Study Area with good views to the core part of the AONB. This is illustrated by the very small extent of its ZTV in relation to the wider Study Area, the Sperrin AONB and also in relation to the very low levels of additional visibility indicated on the cumulative ZTV diagrams. The Development would have a simple compact layout and where it would be visible from elevated locations from where the best views towards the heart of the AONB may be appreciated, it would generally be viewed against a backdrop of land rather than on the skyline. Where it does appear on the skyline it would either form a minor and subordinate element in much more expansive view or it would be seen at close range where it would be, as is to be expected, a prominent feature but often for relatively short periods of time (for example along the middle section of the Magheramore Road).

91. The Development is generally deemed to have No Significant effects on visual character for similar reasons. Of the 22 viewpoints that have been analysed, only one was deemed to experience a significant visual effect resulting from the Development (Viewpoint 6) and none would experience significant cumulative effects. In respect of Viewpoint 6, significant visual effects would occur in relation to a tertiary road in close proximity to the Development where there would be no views into the wider landscape such as those that occur more commonly across the rest of the Study Area. The Development would therefore become the dominant feature in this Viewpoint. However, this level of effect would be limited to the area

in immediate proximity to this Viewpoint and would not be experienced from other roads in the area or from the other Viewpoints that have been selected to represent close range views. The Development would appear in views along a relatively short section of the road corridor in and around Viewpoint 6 (Magheramore Road) and would be appreciated largely by road users. From elsewhere along the Magheramore Road views including the Development would either be wider in extent, or restricted by roadside vegetation where the Development would appear less prominent or, in some instance, not visible.

92. The Development is not located within a cluster and would be well separated from clusters of wind farms within the Study Area. It would also be located in a manner which reflects the general pattern of locating wind farms on the outward facing edges of the AONB. It would occupy a relatively discreet position on the side slopes of a low hill which is surrounded on all sides by higher ground. The effect of this location on the visibility of the Development is illustrated by the very small extent of its ZTV in relation to the wider Study Area, the Sperrin AONB and the cumulative ZTVs. It would more often be visible in sequential rather than simultaneous cumulative views from close range viewpoints where it is likely to be more prominent and therefore its effect on cumulative views would be of a lesser magnitude. In instances where it appears simultaneously with other wind farms in the Study Area it will be viewed with good separation distances and often also from transient viewpoints on busy road corridors such as the A6. Wind energy development is already a prominent visual element in all parts of the Study Area and the Development would have a negligible incremental effect on the manner in which wind energy development is perceived generally across the Study Area. Furthermore it reflects the general pattern of the location of wind farms on the outer-facing slopes of the Sperrin AONB where they may be perceived as small, subordinate features within wider views along these extensive upland areas but where they will have little to no visibility from within the majority of the AONB.

93. 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 no parts of the Study Area are deemed to experience significant landscape or cumulative effects and only one of the 22 viewpoints assessed as part of the LVIA are deemed to experience significant visual effects, the LVIA concludes that the Development is acceptable in landscape and visual terms.

Archaeology and Cultural Heritage

94. A desk-based study, walkover survey and site visits have been carried out in order to identify heritage assets that may be affected by the Development. These studies have also informed an assessment of the potential for currently unknown archaeological remains to remain within the planning application boundary.

95. There are no recorded heritage assets within the planning application boundary. There is some potential for previously unrecorded archaeological features to be present. This potential is greatest in the area neighbouring the Magheramore Court and Portal Tomb (LDY030:064 & LDY030:079) where there is moderate potential. However, the majority of the proposed wind farm layout lies in areas of low archaeological potential. Potential construction impacts will be mitigated through a programme of archaeological works, to be agreed with NHED.

96. The predicted operational impacts of the proposed development have been assessed for the cultural heritage assets in the surrounding area. The impact on Magheramore Court Tomb (LDY030-064) and Portal Tomb (LDY030-079) will be of minor significance and there will be an impact of negligible significance on Dungiven Castle (HB02/06/003 A) Aughlish stone circle and alignments (LDY030:021) Templemoyle stone circle (LDY030:045) Banagher Old Church (LDY030:029). No further operational impacts have been identified.

97. Any combination of the developments in the surrounding area will not result in a significant cumulative effect on heritage assets.

Visual Impact Analysis

98. For visual impact analysis, a 10 km search radius was used to identify monuments of regional importance and listed buildings. A total of 40 regionally important monuments, 4 historic gardens and 15 historic buildings were identified. Through the use of ZTV mapping, wireframe production and site inspections it was established that only twelve monuments and one historic garden would be potentially inter-visible with the Development.

99. Consultation with DFC:HED was conducted to establish which of these would require further analysis. The assessment found that the introduction of the Development into the local landscape will have a negligible-slight effect upon their setting.

100. Given the presence of the known monuments within the proposed application boundary and the extent of archaeological sites within the wider area, a mitigation strategy was recommended for the construction phase. The aim of this is to identify any potential archaeological deposits uncovered during the construction phase of the project.

101. An assessment of cumulative impacts on the archaeology and cultural heritage of the area was undertaken, and it was concluded that there will be no significant effects.

Ecology

102. The study methodology for the Ecological Impact Assessment included both desktop and field survey methods in order to assess the potential impact on local ecological and nature conservation interest. The purpose of an ecological survey is to identify 'valued ecological receptors', those species and habitats that are valued in some way for their ecological function, their contribution to biodiversity or are protected by

specific legislation. The following specialist surveys were undertaken during 2018 on the site including suitable buffer zones:

- Habitats
- Bat survey
- Red squirrel survey
- Badger & otter survey
- Common lizard survey
- Smooth newt habitat survey
- Argent & sable moth habitat survey
- Marsh fritillary butterfly habitat survey

103. Features of conservation interest and importance were recorded and their locations were one of the key criteria that affected the wind farm layout. The location of the wind farm infrastructure avoids habitats and species of conservation interest where possible, and where this was not possible, mitigation and/or enhancement measures have been incorporated into the design to balance any detrimental impact.

104. The principal habitats on the site are extensive areas of improved & semi-improved grassland, degraded blanket bog and wet heath. Several small blocks of coniferous forestry shelterbelts are also present within the Planning Application Boundary, as are numerous hawthorn hedges along existing tracks and around some fields. Overall, the habitats on site are of lower conservation value, while the degraded blanket bog/wet heath is of moderate value.

105. Ecological constraints determined from extensive site surveys have been used to evolve the layout and design of the Development. The impact assessment is therefore based on a wind farm design that already includes a number of important mitigation measures.

106. A series of generic and specific mitigation measures including a Habitat Management Plan, hedgerow replacement/translocation and regeneration of native woodland have been proposed to mitigate effects on degraded blanket bog/wet heath vegetation and to compensate for the hedgerow removal.

107. The Development will result in permanent habitat loss of 0.5 hectares (ha) and temporary habitat loss of 0.3ha, largely comprising degraded blanket bog/wet (dwarf shrub) heath, although small areas of other habitats will also be lost, such as marshy grassland, coniferous forestry shelterbelts and poor semi-improved grassland.

108. The extent of habitat loss has been used to inform the prescriptions detailed in the Habitat Management Plan, including a commitment to establish at least twenty times the area lost for NI Priority Habitats (degraded blanket bog/wet dwarf shrub heath). There is the requirement to remove 2.1km of hawthorn hedging in order to facilitate the widening of existing site tracks. The same length of hedgerow (2.1km) will be replaced/translocated a few metres to form the new boundary of the upgraded tracks. In addition, 1.1ha of native woodland will be created via natural regeneration over the 30-year lifetime of the Development.

109. After implementation of the mitigation measures proposed in this chapter it is assessed that there would be no significant residual adverse effects on Northern Ireland priority habitats (wet heathland) as a result of the Development. Indeed, it is assessed that the Habitat Management Plan would deliver a net beneficial effect during operation by enhancing currently degraded wet heath/marshy grassland habitats.

110. There is no recorded usage of the area by otter, smooth newt, marsh fritillary or argent & sable moth, therefore no impacts to these species is likely. Mitigation for the herpetofauna found on site (common lizard) is proposed. This involves the mowing/hand clearance during the construction phase. No badger setts were found during survey, although individual animals were observed foraging in fields within the LUAC. No red squirrels were recorded from within the coniferous forestry shelterbelts on the site.

111. The layout of the Development, in terms of the separation distance between the wind turbines and relevant habitat features, and the maintenance of this throughout the lifetime of the wind farm, will ensure that any potential impacts to bats will be neutral. This includes clearing a 100m buffer around those turbines which will be located within or adjacent to any coniferous forestry shelterbelts on the site. In conclusion, and based on current knowledge, this would appear to be a Site posing little risk to bats or bat populations, however a BMMP (Bat Monitoring Mitigation Plan) has been recommended as a precaution.

112. Information to Inform a Habitat Regulations Assessment (HRA) has been provided and a 'shadow' HRA screening has been completed. This assessed the potential impacts upon both the nearby Banagher Glen and River Roe & Tributaries SAC's. The shadow HRA screening has determined that the Development will not have a significant effect on the designation features of the SAC's.

113. Therefore, 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.

114. An assessment of cumulative impacts on the habitats and fauna of the area was also undertaken, and it was concluded that there will be no significant effects.

Ornithology

115. 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 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.

116. The ornithology assessment focuses on assessing potential displacement effects and collision risk effects of the Development. The assessment considers the potential effects on the bird communities found within the site and in defined surrounding buffer areas (including the adjacent Banagher Glen ASSI / SAC). Where relevant, the assessment also considers the potential cumulative effects resulting from other existing or proposed wind farms in the vicinity of the Development.

117. Breeding bird surveys have been completed in four different years starting with an initial scoping visit in June 2013. This was followed by two consecutive years of breeding bird surveys (2014 and 2015) and then a further year of survey (2018) was completed in order to update the earlier surveys. Surveys for wintering and migrating birds were carried out over the same area (and were contemporaneous with) the breeding bird surveys.

118. An assessment of activity by raptors and other relatively large aerial species (e.g. migrating swans and geese) was completed from three vantage points in 24 consecutive months during the period November 2013 to October 2015. Additional survey (by way of update) was then completed in 12 further consecutive months during March 2018 to February 2019.

119. Surveys of activity by nesting raptors were carried out in the wider area (up to 2 km) around the Development. The surveys focused on Annex 1 species (hen harrier, peregrine and merlin) although signs of breeding activity by non-Annex 1 species (buzzard, sparrowhawk and kestrel) were also looked for.

120. No significant displacement effects have been identified for bird communities, including for red grouse, moorland passerines (e.g. skylarks and meadow pipits), wintering birds and bird communities found within the adjacent Banagher Glen ASSI / SAC. No breeding waders (e.g. snipe or curlew) were found within the site or surrounding buffer areas.

121. For buzzards collision risk modelling has indicated a collision risk equivalent to one bird every 3.1 years however when assessed in the context of the favourable conservation status, breeding productivity and very widespread distribution of this species then the predicted collision rate is extremely unlikely to be significant. For other raptor species the comparatively low levels of activity recorded and an assessment of other relevant factors indicate that collisions are extremely unlikely to be a significant issue for these species.

122. Habitat management measures proposed as part of the Outline Habitat Management Plan are likely to provide significant beneficial effects for several moorland passerine species (including meadow pipits, skylarks, reed buntings, grasshopper warblers and stonechats) occurring within the Development site and surrounding buffer area. The developer would also implement an Ornithological Mitigation Strategy in order to avoid any adverse effects on breeding birds during the construction phase of the Development.

123. It is concluded that the Development is extremely unlikely to have any adverse effects on bird communities, including those occurring within the adjacent Banagher Glen ASSI / SAC. The nearest other wind farm (existing or proposed) is located 6.7 km distant and no potential cumulative effects have been identified for bird communities. For several moorland passerine species, the likely beneficial effects of the proposed habitat management measures indicates a potential overall net beneficial effect of the Development for these species.

Fisheries

124. The key receptors for this assessment are the Altnaheglish, Owenrigh and Roe rivers, together with a series of small tributary streams which drain the area within the Site Boundary.

125. The study focussed on the streams draining the proposed site and also on connected reaches of the Altnaheglish the Owenrigh rivers. Field surveys were carried out to assess stream quality, fish habitats and fish stocks. The approach was based on the selection of six principal survey sites to establish a baseline for any future monitoring required during construction or operational phases, with control and impact sites on the main channel of the Altnaheglish and Owenrigh rivers.

126. The proposed site lies within the Owenrigh sub-catchment of the wider River Roe catchment which is designated as both an Area of Special Scientific Interest (ASSI) and a Special Area of Conservation (SAC) with Atlantic salmon noted as the primary reason for designation. With regard to fisheries administration and legislation, the proposed Development is located within the Loughs Agency's geographic area of responsibility. The River Roe is also a high-quality recreational fishery for both salmon and sea trout.

127. In general, the streams draining the site to the Altnaheglish or Owenrigh River are of little fisheries value in terms of usable salmonid habitat due mainly to their diminutive size, lack of significant flow and absence of fish. The headwaters of the Altnaheglish River have been impounded in Banagher Dam which provides a public water supply. The Altnaheglish and Owenrigh rivers are of Good to High water quality with good physical habitat supporting sensitive invertebrate species and a significant level of salmon spawning in the reach to the west of the proposed Development.

128. The potential effects on fisheries and aquatic ecology were assessed for the construction, operational and decommissioning phases of the Development, and a series of mitigation measures ae proposed to address significant effects.

129. Potential effects are mainly associated with ground disturbance during the construction phase and the entrainment of sediments in surface water drainage. Mitigation measures to address these impacts are recommended and focus on a bespoke surface water management plan and site drainage design using the principles of Sustainable Drainage, which promote the principles of on-site retention of flows and use of buffers and other silt removal techniques.

130. It is concluded that, provided the mitigation measures are implemented as specified, construction and operation of the proposed Development will have a Neutral effect on the fish stocks and aquatic biology of the Altnaheglish/ Owenrigh 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.

Geology and Water Environment

131. An assessment of the likely effects of the Development on geology and the water environment has been undertaken. The impact assessment involved a combination of desk study, site visits and consultation with various stakeholders including; Causeway Coast & Glens Borough Council; Department of Agriculture, Environment & Rural Affairs; Northern Ireland Water; Department for Infrastructure, and Department for Economy.

132. The assessment identifies the potential impacts on geology, hydrology and hydrogeology, including surface water, groundwater, abstractions, the potential for pollution of watercourses and flooding. It summarises the relevant legislation and guidance and provides appropriate baseline information enabling potential effects to be identified.

133. The assessment determined that the site is located on 'moderate quality agricultural land' and 'poor quality agricultural land', and the loss (or partial loss), of agricultural function is not significant and does not constrain the Development. The underlying geology is a mixture of clay, sand, gravel, and boulders varying widely in size and shape, with areas of peat also identified. Bedrock is composed largely of metamorphic psammite with an area of sandstone to the north of the site. Groundwater flow within the bedrock is expected to be mainly shallow, discharging locally to surface waters (especially in upland areas), and there is no significant potential superficial aquifer underlying the site.

134. The current hydrology of the site consists of a number of natural source watercourses and streams and artificially modified drainage ditches and peat drains. All on-site surface water features drain to the Owenrigh River. The Owenrigh River is a sub-catchment of the designated River Roe and Tributaries SAC[4] and ASSI that joins the main branch of the River Roe approximately 2 km north of the site. The Roe River flows into Lough Foyle 8.2 km to the north-west of the Site.

135. Aspects of the design, construction, operation, and decommissioning of the Development that may impact on the receiving geological and water environment have been identified and the pathways of potential effects assessed. It has been determined that without mitigation, the Development would likely cause adverse effects on the water environment due to the sensitivity of fisheries interests

[4] Joint Nature Conservation Committee. (2015). Natura 2000 Standard Data Form - River Roe and Tributaries. Available from: http://jncc.defra.gov.uk/ProtectedSites/SACselection/n2kforms/UK0030360.pdf. [Accessed: 17/5/2019].

downstream of the Site. Mitigation measures integrated as part of outline design, and others to be implemented throughout the lifetime of the Development to minimise potential adverse effects include:

136. Design of site elements to minimise impact on the geological and water environment (e.g. careful consideration of the positioning of wind turbines, foundations, and areas of hard standing);

- Avoidance of significant water features based on baseline constraints mapping (i.e. establishing zones around watercourses where construction works are to be avoided);
- Careful management of minor water features where they come into contact with new infrastructure or upgraded access tracks.
- Implementation of a comprehensive surface water management plan comprising the use of SuDS (drainage) and silt management to prevent pathways for pollution reaching the wider environment as well as minimising the risk of flash flooding downstream;
- Establishing pollution prevention procedures in accordance with NIEA requirements and guidance to minimise the risk to the wider environment posed by construction, operation and decommissioning-phase activities (e.g. spillage of oils or chemicals).

137. Implementation of the mitigation proposed would result in no significant residual effects to the receiving geology and water environment as a result of the Development. Monitoring the effect of the Development on the water environment and fisheries habitat will be provided through water quality monitoring.

138. An assessment of cumulative impacts was also undertaken, and it was concluded that there are no predicted significant water environment or geological effects arising from the Development in conjunction with any other pre-existing or consented Development.

Peat

139. A Phase 1 Geotechnical Study including Peat Slide Risk Assessment was undertaken and concluded that the majority of the site exhibits a peat depth of under 0.5m, which is generally considered to have a negligible peat slide potential. Peat depth in areas where development is proposed has been determined by the assessment to vary to a maximum depth of 1.3m. Peat in many of these areas is noted to have appeared to have been historically treated resulting in an increased shear strength further reducing the risk.

Noise

140. An assessment of the acoustic impact from both the construction and operation of the proposed Magheramore Wind Farm was undertaken taking into account the identified nearest residential properties.

141. The operational noise impact was assessed according to the guidance described in the ‘The Assessment and Rating of Noise from Wind Farms’, referred to as ‘ETSU-R-

97', as recommended for use in relevant planning policy. The methodology described in this document was developed by a working group comprised of a cross section of interested persons including environmental health officers, wind farm operators and independent acoustic experts. It provides a robust basis for assessing the noise impact of a wind farm and has been applied at the vast majority of wind farms currently operating in the UK.

142. ETSU-R-97 makes clear that any noise restrictions placed on a wind farm must balance the environmental impact of the wind farm against the national and global benefits that would arise through the development of renewable energy sources. The assessment also adopts the latest recommendations of the Institute of Acoustics 'Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise'.

143. Representative baseline conditions (the "background noise level") at nearby residential properties were established by undertaking noise surveys. These measured levels were then used to infer the background noise levels at other nearby residential properties as the ETSU-R-97 document recommends. As background noise levels depend upon wind speed, as indeed do wind turbine noise emissions, the measurement of background noise levels at the survey locations were made concurrent with measurements of the wind speed and wind direction. These wind measurements are made at the wind turbine site rather than at the survey locations, since it is this wind speed that would subsequently govern the wind farm's noise generation.

144. A sound propagation model was used to predict the noise levels due to the proposed wind farm at nearby residential properties over a range of wind speeds, taking into account the position of the proposed wind turbines, the nearest residential properties, and the candidate wind turbine type. The model employed (which considered downwind conditions at all times) took account of attenuation due to geometric spreading, atmospheric absorption, ground effects and barriers. It has been shown by measurement-based verification studies that this model tends to slightly overestimate noise levels at nearby residential properties.

145. The relevant noise limits were then determined through analysis of baseline conditions and the criteria specified by the ETSU-R-97 guidelines. The general principle regarding the setting of noise criteria is that limits should be based relative to existing background noise levels, except for very low background noise levels, in which case a fixed limit may be applied. This approach has the advantage that the limits can directly reflect the existing noise environment at the nearest residential properties and the impact that the wind farm may have on this environment. Different limits are applicable depending upon the time of day. The daytime limits are intended to preserve outdoor amenity, whilst the night-time limits are intended to prevent sleep disturbance.

146. The predicted operational noise levels are within noise limits at nearby residential properties at all considered wind speeds with the adoption of a noise management strategy. The proposed Magheramore Wind Farm therefore complies with the relevant guidance on wind farm noise and the impact on the amenity of all nearby properties would be regarded as acceptable.

147. A cumulative operational noise assessment has also been undertaken. Considering the mitigation measures identified the predicted cumulative noise levels are within noise limits at nearby residential properties. Compliance with relevant guidance implies that the cumulative impact on the amenity of nearby properties would be regarded as acceptable.

148. A construction noise assessment, incorporating the impact due to increased traffic noise, indicates that predicted noise levels likely to be experienced at the nearest residential properties exceed construction noise criteria for a short period of time at certain locations, however appropriate mitigation measures have been identified.

149. An acoustic assessment of the proposed energy storage facility in accordance with BS 4142: 2014 shows that the impact would be low and the levels insignificant in comparison to the wind farm noise levels.

Traffic & Transport

150. An assessment of the potential impact of the Development on traffic and transport was undertaken, involving consultation with Department of Infrastructure (DfI) Roads.

151. The proposed access route for AILs from Lisahally Port has been used previously for the construction of various wind farms that have subsequently utilised the A6. From Lisahally, the route will travel onto Maydown Road and turn west onto the Clooney Road and travel west for approximately 2.5km to Cresent Link and continuing west to the Altnagelvin Roundabout before heading east along Glenshane Road (A6) for approximately 26km and turning south on to the Feeney Road for 2.5km before heading east on the Bangaher Road, turning left onto the Carnanbane Road and continuing south until the junction with the Magheramore Road. AIL vehicles would turn right and travel southwest until the delivery vehicle had cleared the junction before reversing northeast along the Magheramore Road for approximately 320 metres before turning left into an existing farm entrance on the Magheramore Road that will be modified to create a suitable Site Entrance.

152. It is proposed that Normal HGV load delivery routes (including stone and concrete) will utilise the Banagher and Carnanbane Roads from the Feeny Road and / or the Magheramore Road, with sources of material to be confirmed prior to construction. No passing bays will be required as the roads are largely two-way with adequate passing bays located where the road is narrower to accommodate traffic to and from the existing quarry on the Magheramore Road.

153. The main traffic impacts are associated with the increase in HGV vehicle movements along the Banagher - Carnanbane Road section from the Feeny Road and the Magheramore Road during the construction stage of the project. These roads have low levels of existing traffic and a small number of receptors will be affected. At worst, the frequency of vehicle movements is expected to be one vehicle every five minutes during the 6 days when the construction of each wind turbine foundation would occur.

154. 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.

155. A Traffic Management Plan will be developed and agreed with the relevant stakeholders post consent and pre-construction in order to control and mitigate impacts associated with increased vehicles movements.

156. 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.

Shadow Flicker

157. A shadow flicker analysis of the Development was performed. Under certain combinations of geographical position, time of day, time of year and meteorological conditions, the sun may pass behind the turbine rotor and cast a shadow over neighbouring buildings' openings (i.e. windows and doors) where the contrast between light and shade is most noticeable. To a person within that room the shadow, depending on its intensity, may appear to flick on and off, giving rise to an effect referred to as shadow flicker.

158. The Best Practice Guidance to Planning Policy Statement 18 (PPS18) states that at distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low.

159. An analysis of shadow flicker throughout the year from Development was carried out, taking into account the behaviour of the sun, the local topography and the turbine layout and dimensions[5]. The analysis was performed using a turbine layout consisting of 6 turbines, each with maximum tip heights of 149.9 m and maximum rotor diameters of 112.0 m.

160. With due reference to The Best Practice Guidance to Planning Policy Statement 18 "Renewable Energy" (2009) there are two inhabited houses within 10 rotor diameters

[5] Turbine ref 03219D0001-06, house ref 03219D0201-01

of the wind farm. It is predicted that one of these houses (H3 – see Noise Figure 10.1) would receive a maximum of 11.5 hours of shadow flicker a year.

161. It should be emphasised that this analysis provides an extremely conservative estimate of the extent that houses will be affected by shadow flicker. Due to frequent cloud cover, turbines not turning on at all times and turbine rotors not being aligned with the sun in a way to cast maximum shadow onto habitations, the actual amount of shadow flicker seen in these areas is likely to be much less.

162. Due to both the distance of the nearest residential properties to the Development, and proposed mitigation if required, it is concluded that the Development should not cause a material reduction to residential amenity owing to shadow flicker.

Socioeconomics

163. A socioeconomic assessment of the Development was carried out. The Development will offer a much-needed impetus to the local and regional economy. Job creation and economic activity will result throughout its construction, with a strong likelihood of local labour involvement. Both the construction and operational phase will generate increased tax and business rates revenue payable to central, regional and local government.

164. Investment of this type and scale can provide positive 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. Other local areas within Northern Ireland may also benefit as a result, helping to reduce the inequality across the region. Funding for such developments are usually project specific and involve a considerable amount of sunk costs. Therefore, if the development does not take place the benefits, including the catalytic impact, are unlikely to be realised elsewhere in the Northern Ireland economy.

165. The Development is estimated to involve a capital spend of £18.46 million. Of this total, £6.08 million (nominal prices) will be realised within the Northern Ireland economy. The projected 12-month construction phase is estimated to create or sustain 56-73 total (direct, indirect and induced) job years of employment, £1.53-£2.02 million (2016 prices) of wages and £2.64-£3.41 million (2016 prices) of GVA to the Northern Ireland economy.

166. The estimated total (direct, indirect and induced) benefits realised in Northern Ireland by the operational phase of the proposed Development includes wages of £3.3 million (2016 prices) and £10.5 million (2016 prices) in GVA over the 30-year operating period.

167. We also expect a fiscal injection from the Development. During the construction, the UK Exchequer is estimated to benefit from increased tax revenue and benefits saving of £0.70-£0.87 million (including direct, indirect and induced wage impacts). [6] Over

[6] This analysis relates to results from Method 1.

the 30-year operational phase, an estimated £1.42-£1.69 million revenue and benefits savings will be generated.

168. Based on rateable values of £27,000 per MW—we calculate that the Development will increase rateable value by £583,200 each year, or by £17.50 million over the project horizon. From these values business rates are calculated and collected for local Councils and the Northern Ireland Assembly. By applying Causeway Coast and Glens Borough Council non-domestic poundage rates, we estimate additional business rates of £343,246 each year and £10.30 million over the 30-year lifetime of the project.

169. Over the lifetime of the project, rates and taxes will collectively amount to approximately £11.45 million.

4. Conclusion

170. The potential effects of the Development have been assessed in accordance with regulatory requirements and good practice. The ES incorporates technical assessments of the Development based on the requisite legislation and the relevant planning policy framework. The ES has demonstrated that significant environmental effects associated with the construction, operation and decommissioning of the Development have been avoided or minimised through the use of the iterative design process and with the application of mitigation measures.

171. The Development is a 21.6 MW wind farm consisting of six x 3.6 MW turbines. The amount of electricity that could be produced by the Development is estimated at 87 gWh per year which is enough electricity to meet the needs of 22,700 homes each year.[7] This is equivalent to 40.6 percent of the housing stock in Causeway Coast and Glens Borough Council area.[8] In addition, the Development is also estimated to reduce CO_2 emissions by 40,000 tonnes each year. This equivalent to 25,200 newly registered cars.[9]

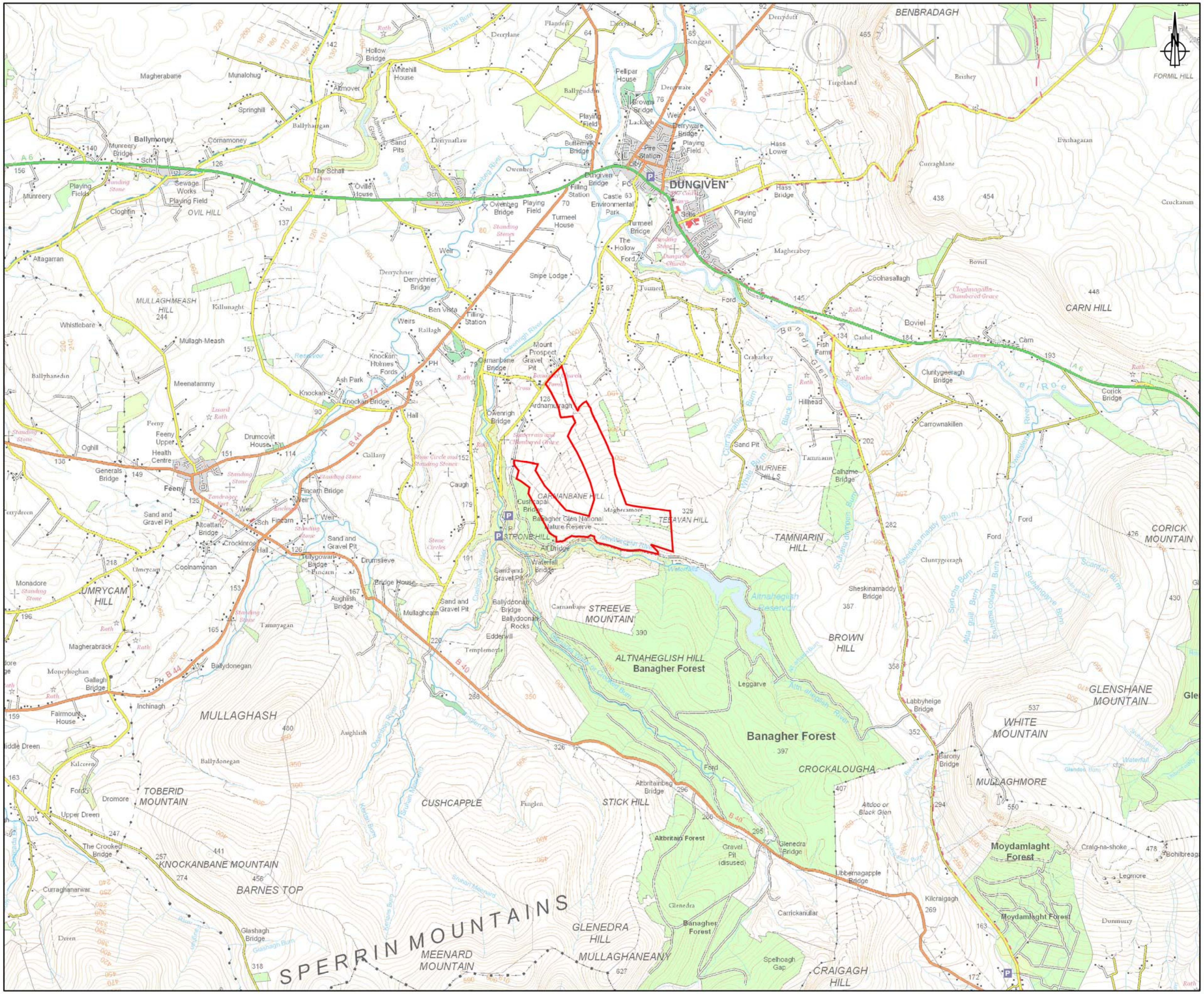
172. The Development will result in a reduction in greenhouse gas emissions from the electricity generating industry by harnessing wind as an alternative to the burning of fossil fuels, in line with the government's energy goals. It is also important to highlight that energy production is not static and additional renewable generation will be required to be connected to maintain the NI targets and subsequently achieve and maintain the UK renewable targets. Therefore, it is imperative that we maximise the production of electricity from renewable sources in suitable locations such as Magheramore, which with an estimated connection date of 2022/2023, can make an important contribution to Northern Ireland and the UK meeting and maintaining their respective renewable targets.

[7] For Magheramore, a load fact of 0.46 was provided by RES and applied to Oxford Economics' calculations. This load factor allows us to account for wake and electrical losses using typical wind speeds/directions etc. to give a realistic prediction of electricity output (rather than using a theoretical maximum level whereby it is assumed that wind blows for 24 hours a day 365 days a year on every wind farm site.)

[8] Oxford Economics Internal Model Suite.

[9] https://www.gov.uk/government/publications/new-car-carbon-dioxide-emissions

Figures



MAGHERAMORE WIND FARM

FIGURE 1.1

SITE LOCATION MAP

KEY:

SITE LOCATION

LAYOUT DWG	N/A	T-LAYOUT NO.	N/A

DRAWING NUMBER **03426D2202-01**

SCALE - 1:50,000 @ A3

ENVIRONMENTAL STATEMENT

MAGHERAMORE WIND FARM

FIGURE 2.1

INFRASTRUCTURE LAYOUT

KEY

- PLANNING APPLICATION BOUNDARY
- WIND TURBINE LOCATION
- TURBINE MICROSITING
- NEW SITE TRACKS
- UPGRADED SITE TRACKS
- EXISTING TRACKS
- WATERCOURSE CROSSING
- CRANE HARDSTANDING AREA
  - PERMANENT
  - TEMPORARY
- TEMPORARY ENABLING CONSTRUCTION COMPOUND
- TEMPORARY CONSTRUCTION COMPOUND/ ENERGY STORAGE AREA.
- CONTROL BUILDING & SUBSTATION COMPOUND WITH PERMANENT HARDSTANDING AREA
- FORESTRY TO BE RETAINED
- FORESTRY TO BE REMOVED
- SITE ENTRANCE LOCATION

T1 T2 T3 T4 T5 T6

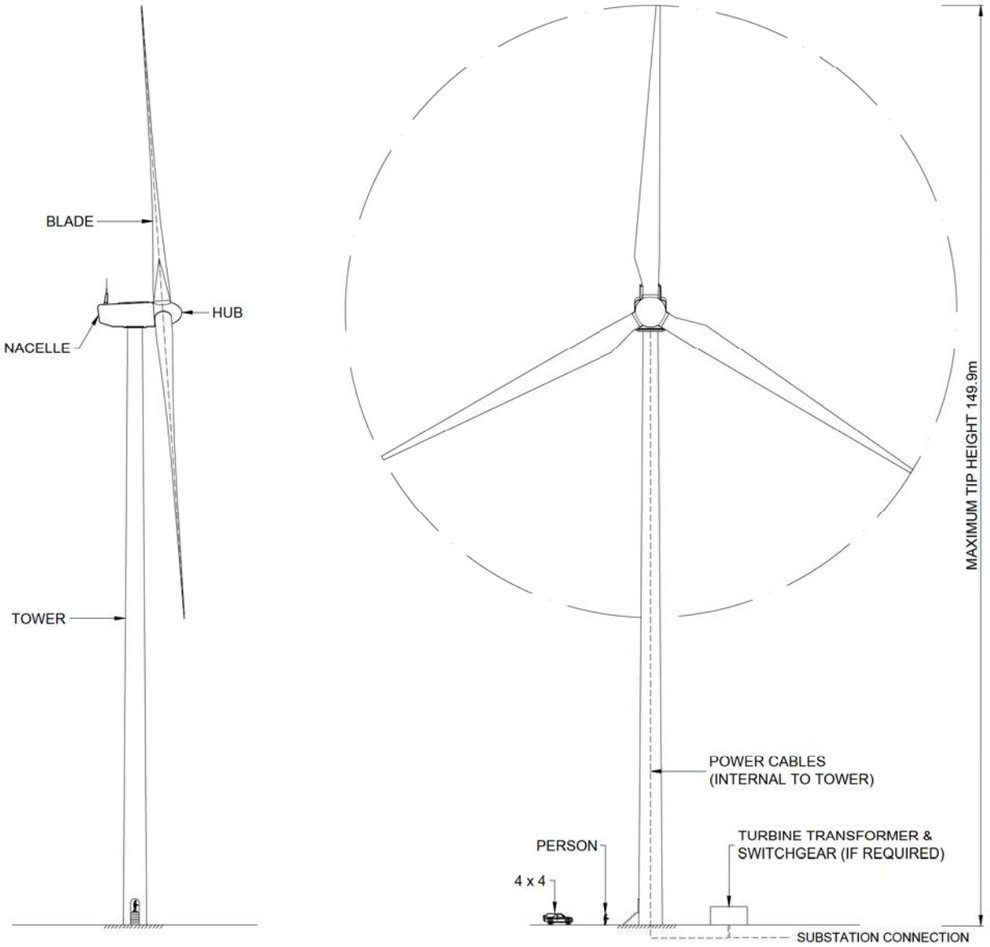
LAYOUT DWG	03426D0001-06	T-LAYOUT NO.	PNIRmgh020

DRAWING NUMBER

03426D1001-01

SCALE - 1:10,000 @ A3

ENVIRONMENTAL STATEMENT



SIDE VIEW

FRONT VIEW

PHOTOGRAPH OF TYPICAL TURBINE

MAGHERAMORE WIND FARM

FIGURE 2.2

TURBINE ELEVATION

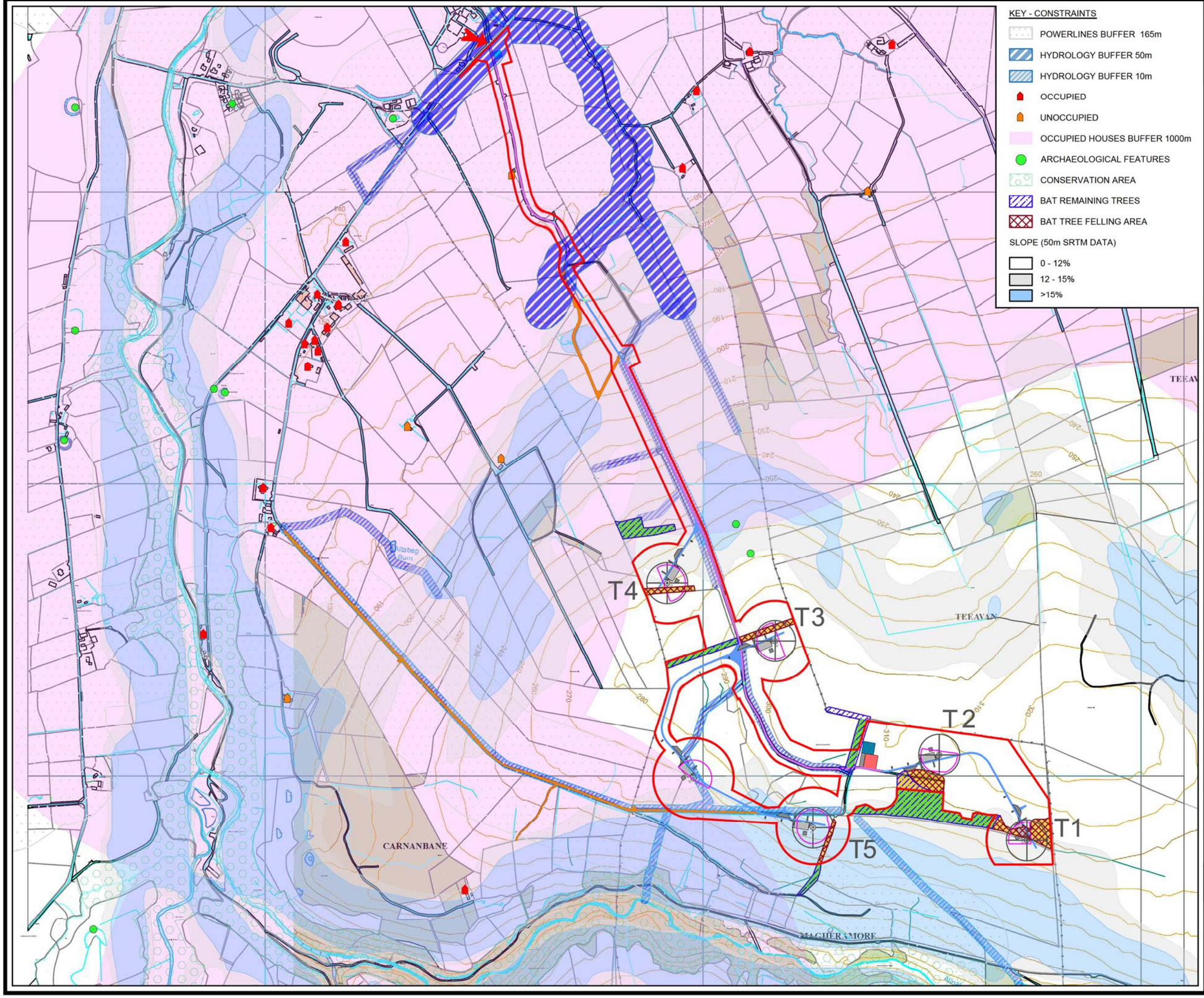
LAYOUT DWG	T-LAYOUT NO.
N/A	N/A

DRAWING NUMBER

03426D2902-01

SCALE - 1:1000 @ A3

ENVIRONMENTAL STATEMENT



KEY - CONSTRAINTS

- POWERLINES BUFFER 165m
- HYDROLOGY BUFFER 50m
- HYDROLOGY BUFFER 10m
- OCCUPIED
- UNOCCUPIED
- OCCUPIED HOUSES BUFFER 1000m
- ARCHAEOLOGICAL FEATURES
- CONSERVATION AREA
- BAT REMAINING TREES
- BAT TREE FELLING AREA

SLOPE (50m SRTM DATA)

- 0 - 12%
- 12 - 15%
- >15%

MAGHERAMORE WIND FARM

FIGURE 3.3

COMBINED CONSTRAINTS & INFRASTRUCTURE

KEY - INFRASTRUCTURE

- PLANNING APPLICATION BOUNDARY
- WIND TURBINE LOCATION
- TURBINE MICROSITING
- NEW SITE TRACKS
- UPGRADED SITE TRACKS
- EXISTING TRACKS
- WATERCOURSE CROSSING
- CRANE HARDSTANDING AREA
  - PERMANENT
  - TEMPORARY
- TEMPORARY ENABLING CONSTRUCTION COMPOUND
- TEMPORARY CONSTRUCTION COMPOUND/ ENERGY STORAGE AREA.
- CONTROL BUILDING & SUBSTATION COMPOUND WITH PERMANENT HARDSTANDING AREA
- FORESTRY TO BE RETAINED
- FORESTRY TO BE REMOVED
- SITE ENTRANCE LOCATION

LAYOUT DWG	03426D0001-06	T-LAYOUT NO.	PNIRmgh020

DRAWING NUMBER

03426D2233-01

SCALE - 1:10,000 @ A3

ENVIRONMENTAL STATEMENT