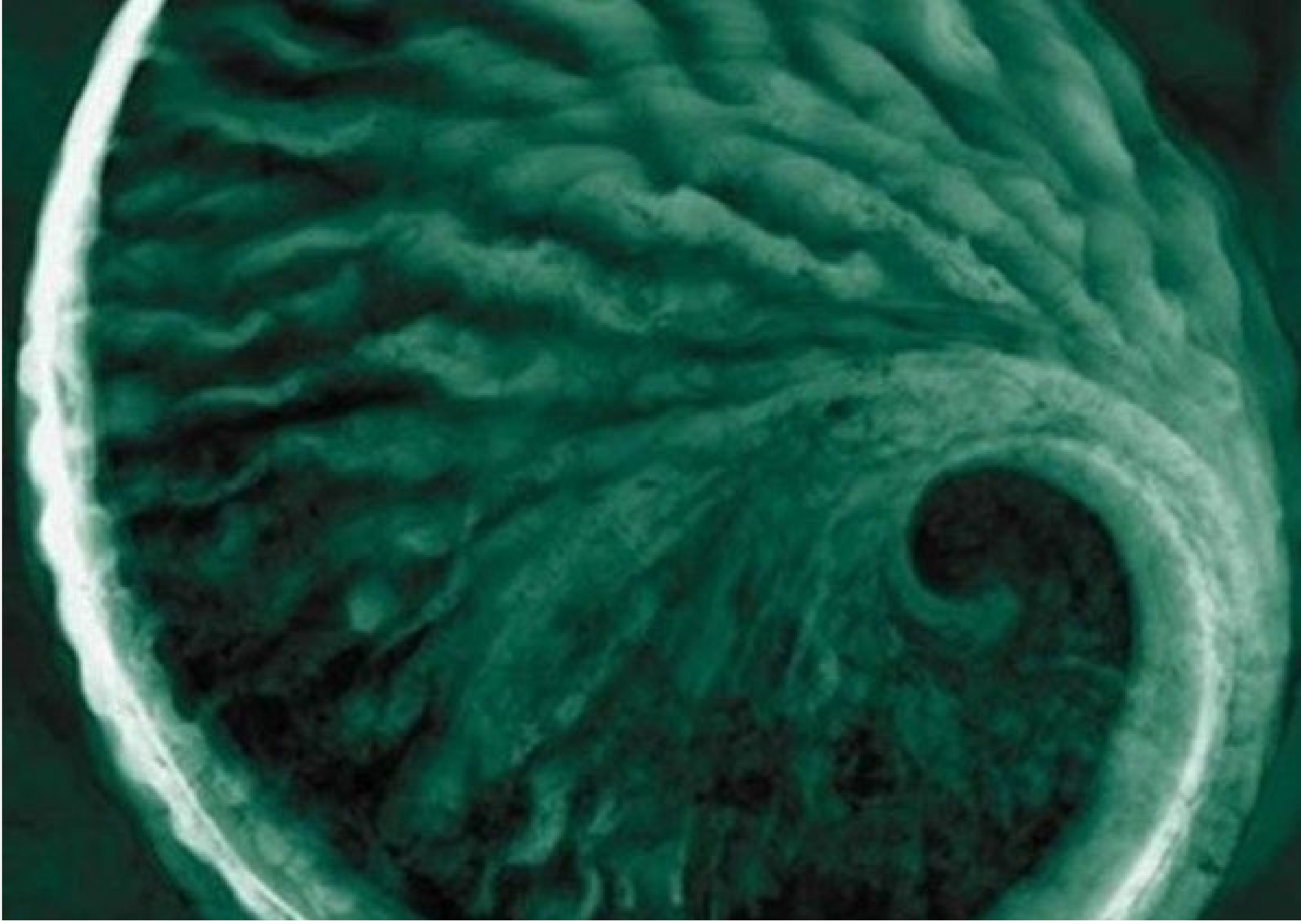

Owenreagh-Craignapple Wind Farm

Ørsted Onshore Ireland Midco Limited

Environmental Statement- Chapter 1 Introduction

06 September 2023

Project No.: 0696177

The business of sustainability

Signature Page

06 September 2023

Owenreagh-Craignapple Wind Farm

Environmental Statement- Chapter 1 Introduction

Ian S Grant

Ian Grant
Managing Consultant

Peter Rodgers
Partner

Environmental Resources Management Ireland Limited

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Dublin 14

D14 X343

Ireland

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Acronyms and Abbreviations

Name	Description
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
ASSI	Areas of Special Scientific Interest
DfI	Department for Infrastructure
D&AS	Design & Access Statement
EIA	Environmental Impact Assessment
ES	Environmental Statement
INGR	Irish National Grid Reference
LVIA	Landscape and Visual Impact Assessment
MW	Megawatt
NNR	National Nature Reserves
OPEN	Optimised Environments
ROC	Renewable Obligation Certificates
SAC	Special Area of Conservation
SBTi	Science Based Targets initiative

1. INTRODUCTION

1.1 Introduction

This Chapter of the Environmental Statement (ES) has been prepared to accompany the application by Ørsted Onshore Ireland Midco Limited ('the Applicant') for consent to install and operate Owenreagh/Craignagapple Wind Farm ('the Development'), which is anticipated to have a generation capacity between 48.3 and 67.2 megawatts (MW) depending on the turbine model used. The Development includes:

- Decommissioning of the operational Owenreagh I and Owenreagh II sites;
- Repowering of the Owenreagh I and II sites, and modification and extension of the consented Craignagapple site through construction of 14 wind turbines with tip height up to 156.5 m and rotor diameter up to 136 m; and,
- Associated ancillary infrastructure, including but not limited to the following:
  - Substation compound including control building and other electrical infrastructure;
  - New and upgraded access tracks including turning heads;
  - Crane hardstands;
  - Construction compound(s); and,
  - Cable trenches.

Further information on the Development is included within Section 1.4 and **Chapter 3: Project Description**. The Development is located within Derry City and Strabane District Council ('the Council') approximately 5 kilometres (km) east of Strabane, in County Tyrone ('the Site') as shown on Figure 1.1: Site Location.

The Development's generation capacity will exceed 30MW, which exceeds column 3 of the Thresholds Table (regulation 3 and the Schedule of The Planning (Development Management) Regulations (Northern Ireland) 2015). This Thresholds Table details thresholds or criteria prescribed for the purpose of section 26(1) of The Planning Act (Northern Ireland) 2011 (the Planning Act 2011), i.e. to identify major development for assessment as to whether it is of regional significance or not.

Following a request for a Section 26 Determination, Department for Infrastructure (DfI) Planning confirmed on 13th May 2021 that in their opinion the development would be of significance to the whole or substantial part of Northern Ireland. In line with Section 26(4) of the Planning Act 2011, DfI confirmed that any future planning application made for the Development be made to them.

The Application will be submitted with this Environmental Statement (ES) provided as an accompanying Environmental Impact Assessment (EIA) in accordance with The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 (as amended) as amended ('the EIA Regulations') in order to inform the consideration of the Application.

As required by the EIA Regulations, this ES presents information on the likely significant environmental effects which may occur as a result of the Development. The ES also informs the reader of the nature of the Development and the measures proposed to protect the environment during site preparation, decommissioning/construction, operation, and decommissioning.

This Chapter of the ES is supported by the following figures provided in Volume 3a (ES Figures):

- Figure 1.1: Site Location; and,
- Figure 1.2: Site Boundary Plan.

1.2 The Applicant

Ørsted Onshore Ireland Midco Limited is a fully owned subsidiary of Ørsted A/S. Ørsted develops, constructs, and operates offshore and onshore wind farms, solar farms, energy storage facilities, renewable hydrogen and green fuels facilities, and bioenergy plants, and provides energy products to its customers.

Ørsted is the only energy company in the world with a science-based net-zero emissions target as validated by the Science Based Targets initiative (SBTi), and Ørsted aims to deliver a net-positive biodiversity impact from all new renewable energy projects it commissions from 2030 at the latest. Ørsted ranks as the world's most sustainable energy company in Corporate Knights' 2022 index of the Global 100 most sustainable corporations in the world and is recognised on the CDP Climate Change A List as a global leader on climate action. Headquartered in Denmark, Ørsted employs over 7000 people worldwide. Across the island of Ireland, Ørsted owns and operates a portfolio of onshore wind farms with a combined capacity of more than 300 megawatts (MW) including the Owenreagh I and Owenreagh II Wind Farms located at the Site. Their ambition is to increase this by more than 600 MW in the coming decade.

1.3 Site Context

The Development is located approximately 5 km east of Strabane and 6 km southeast of Artigarvan, in County Tyrone. As shown on Figure 1.2, the Development is centred on Irish National Grid Reference (INGR) coordinates X: 242862, Y: 396786.

1.3.1 Within the Site

The topography of the Development and the immediate surrounding areas comprises undulating upland. The Development itself varies significantly in elevation, with new infrastructure proposed at elevations as low as from 228 m Above Ordnance Datum (AOD; approximately sea level) in the northern portion, to 368 m AOD in the south-western portion. There are several hilltops bordering the Development, but no summits are located within the actual boundaries of the Development. These hilltops include Owenreagh Hill to the south (453 m AOD), Evish Hill to the west (249 m AOD) and Koram Hill to the south-west (372 m AOD).

There are 4 watercourses that run from the Development to the north and west and drain into the Glenmornan River, located approximately 500 m north of the Site. There is also one water body nearby in Moor Lough, which is approximately 1.2 km north-east of the nearest proposed turbine.

Habitats within the Development include improved acid grassland, acid grassland, improved grassland, modified blanket bog and blanket bog. Further details on the habitats within the Development are provided in **Chapter 10: Ecology** and **Technical Appendix A10.3: National Vegetation Classification.**

The Development is currently host to the operational Ownenreagh I and Owenreagh II Wind Farms. The operational Owenreagh I Wind Farm (Planning Ref: J/93/0286) comprises eight turbines with an operational capacity of 5 MW and tip height of 60 m that have been operational since 1997. The consent for the wind farm development is for 16 turbines, however, only ten were constructed with one subsequently being decommissioned. The operational Owenreagh II Wind Farm (Planning Ref: J/2004/1015/F) comprises a further six turbines with an operational capacity of 5.1 MW and tip height of 66 m and has been operational since 2008. Owenreagh II Wind Farm was consented as a result an amendment to the Owenreagh I Wind Farm planning permission.

The Development also includes land which was subject to the planning permission (Planning Ref: Planning Ref: J/2010/0481/F) for Craignagapple Wind Farm, comprising six turbines with tip height up to 111 m. When planning permission for Craignagapple Wind Farm was first submitted in 2010, there was Government support in the form of ROCs (Renewable Obligation Certificates) that made onshore Wind Farms with smaller turbines economically viable. The planning process was delayed, and planning permission was only granted in 2018. By this time, ROCs were no longer available and as a result, the project was no longer economically viable with the smaller turbines proposed. Therefore, these turbines were not constructed, and the planning application consent period expired in January 2023.

1.3.2 Around the Site

Glenmornan is the closest notable settlement to the Development, approximately 2.3 km to the north from the nearest proposed turbine. The closest residential property is located at Koram Road, situated approximately 9 km west of the closest proposed turbine location. This property is financially involved in the project. The closest property that is not financially involved in the project is located at Napple Road, approximately 1.2 km east of the closest proposed turbine location. There are also multiple residential properties situated intermittently around the Development.

The Development is located entirely within the Sperrins Area of Outstanding Natural Beauty (AONB).

There are no ecologically designated sites within the Development; however, there are a number of ecological designations located within 15 km of the Site. It should be noted that 15 km is an arbitrary distance within which the initial desktop search was undertaken; in some cases, the zone of influence of a proposal may extend significantly beyond this distance, for example where there is direct hydrological connectivity via a river network. A summary of key ecologically designated sites is presented below. Further details about the rationale behind the ecology Study Areas used in this ES and on the ecologically designated sites within these Study Areas are provided **Chapter 10: Ecology** and **Technical Appendix A10.1: Ecological Impact Assessment**.

- River Foyle and Tributaries Special Area of Conservation (SAC), approximately 6.6 km west of the nearest proposed turbine;
- Owenkillew River SAC, approximately 6.3 km south of the nearest proposed turbine;
- River Faughan and Tributaries SAC, approximately 10.3 km north-east of the nearest proposed turbine;
- 18 Areas of Special Scientific Interest (ASSI). The closest ASSI is Lisnaragh (ASSI288) located approximately 3.3 km north-east of the nearest proposed turbine; and,
- There is one National Nature Reserves (NNR) within 15 km of the Site, the closest being Boorin NNR which is located 12.4 km south-east of the nearest proposed turbine.

A 15 km study area for cultural heritage receptors was selected based on professional judgement, considering local topography and trans-boundary views, along with consultation with relevant statutory bodies. There are no designated heritage features and four non-designated assets within the Development footprint. One non-designated asset, a modern clearance cairn, within the Development footprint had the potential for direct effects from the Development’s construction and was located approximately 100m south-west of turbine T1. A number of designated and non-designated assets are located within 15 km of the Development, both within Northern Ireland and the Republic of Ireland. Further information on the cultural heritage receptors with the potential for effects from the Development is provided in **Chapter 7: Archaeology and Cultural Heritage**.

There are other operational wind farms and wind energy proposals in the vicinity of the Development, these are listed in **Technical Appendix A2.4: Cumulative Developments** and are included in the assessment as described in **Chapter 2: EIA Methodology**.

1.4 Overview of the Development

The Development will consist of up to 14 three-bladed horizontal axis wind turbines with a maximum tip height of 156.5 m and rotor diameter up to 136 m and associated infrastructure, as shown on Figure 3.1 of **Chapter 3: Development Description**.

The layout of the Development has evolved via the iterative EIA Process as summarised in **Chapter 4: Site Selection and Design**, with full details of the final Development layout provided in **Chapter 3: Development Description**.

The Development involves the:

- Decommissioning of the operational Owenreagh I Wind Farm (Planning Ref: J/93/0286) and Owenreagh II Wind Farm (Planning Ref: J/2004/1015/F); and,
- Repowering of the Owenreagh I and II sites, and modification and extension of the consented Craignagapple Wind Farm (Planning Ref: J/2010/0481/F) through construction of up to 14 wind turbines with tip height up to 156.5 m and rotor diameter up to 136 m.

The decommissioning of the operational Owenreagh I Wind Farm and Owenreagh II Wind Farm and the construction of the repowering turbines is likely to occur partly in tandem, lasting for a shorter duration but having a greater effect than if the two processes were to arise at different times. This represents a worst-case environmental assessment scenario than compared to the decommissioning of the existing wind turbines alone and is the scenario that has been considered in this ES.

The ancillary infrastructure will likely include, but is not limited to; hardstanding areas, transformers, access tracks, cabling and cable trenches, a substation and two temporary construction compound(s). Further details are provided in **Chapter 3: Development Description**.

The purpose of the Development is to generate electricity from a renewable source of energy, offsetting the need for power generation from the combustion of fossil fuels. Consequently, the electricity that will be produced results in a saving in emissions of carbon dioxide (CO2) with associated environmental benefits, which is discussed in **Chapter 15: Other Issues** of this ES.

1.5 Project Team

This ES has been compiled by Environmental Resources Management Incorporated (ERM) on behalf of the Applicant. The ERM Group are accredited under IEMA's EIA Quality Mark Scheme. The full project team is listed in Table 1.1 below and further details on the team's qualifications is provided as Appendix A of this Chapter.

For each topic, the detailed assessment of likely significant effects has been undertaken by organisations with relevant specialist skills, drawing on their qualifications, experience of working on other development projects, good practice in EIA and on relevant published information.

Table 1.1. Project Team

Chapter Number	Title	Organisation Responsible	Subject Matter Expert
1	Introduction	ERM	Ian Grant/ Paul Phillips
2	EIA Methodology	ERM	Ian Grant/ Paul Phillips
3	Development Description	ERM	Ian Grant/ Paul Phillips
4	Site Selection & Design	ERM	Ian Grant/ Paul Phillips
5	Policy and Legislative Context	Juno Planning & Environmental Ltd	Orlaith Kirk
6	Landscape and Visual Impact Assessment (LVIA)	Optimised Environments Ltd (OPEN)	Jo Phillips
7	Archaeology and Culture Heritage	ERM	Chris Swales
8	Hydrology and Hydrogeology	ERM	Adam Cambridge
9	Geology and Peat	ERM	Tomos Ap Tomos

10	Ecology	Woodrow APEM Group (Woodrow)	Róisín NigFhloinn
11	Ornithology	Woodrow APEM Group (Woodrow)	Róisín NigFhloinn
12	Noise	ERM	Bilal Ahmed
13	Traffic and Transport	ERM	Frank Ocran
14	Land-Use, Socioeconomics, Tourism and Recreation	ERM, BiGGAR Economics	Ian Grant/ Paul Phillips/ Simon Cleary
15	Other Issues: Shadow Flicker, Telecommunications & Utilities, Climate Change and Carbon Balance, Aviation and Health & Safety (Including Major Accidents & Disasters)	ERM	Ian Grant/ Paul Phillips
16	Summary of Mitigation	ERM	Ian Grant/ Paul Phillips

1.6 Structure of the Environmental Statement

The ES will consist of the following volumes:

- **Volume 1** – ES Non-Technical Summary;
- **Volume 2** – ES Main Text;
- **Volume 3** – ES Figures;
- **Volume 3a** – Figures excluding Landscape and Visual Impact Assessment (LVIA);
- **Volume 3b** – LVIA Figures;
- **Volume 3c** – LVIA Visualisations; and,
- **Volume 4** – ES Technical Appendices.

An outline of **Volume 2** of the ES which is split into 16 separate chapters is presented below:

- **Chapter 1: Introduction** – Provides background information about the Applicant and an overview of the Development and Site;
- **Chapter 2: EIA Methodology** – Provides an overview of the EIA process, its regulatory context and an outline of the methodology used to assess environmental effects and ensure a consistent and transparent approach to assessment. It describes the scoping and consultation process that assisted in the identification of likely significant environmental effects to be given further consideration;
- **Chapter 3: Development Description** – Provides a detailed description of the Development including details of the construction, operational and decommissioning arrangements;
- **Chapter 4: Site Selection and Design** – Provides details of the site selection exercise and alternative layouts that were considered within the design evolution process;
- **Chapter 5: Planning and Legislative Context** – A summary of the legal and planning policy context that is relevant to the assessment of environmental effects. Note that this is not an assessment of compliance of the Development with planning policy; this is provided in the Planning Statement that accompanies the planning application in parallel to the ES;
- **Chapters 6 – 15: Technical EIA Chapters** – Each technical chapter as shown in Table 1.1 will provide a description of the baseline environmental conditions specific to the relevant topic and will identify and assess the potential likely significant l environmental impacts effects (positive or negative) due to the Development in line with the EIA methodology. This will include a

description of any proposed mitigation or enhancement measures and a statement of predicted residual impacts; and,

- **Chapter 16: Summary of Mitigation** – Provides a summary of the findings of the EIA, including a tabular summary of all residual effects and proposed mitigation.

1.7 Additional Documents

A Planning Statement has been prepared to accompany the application. The Planning Statement sets out an assessment of the Development in the context of national planning, energy policy, the local development plan, and emerging planning policies. It also considers the potential benefits and harm which may arise and concludes as to the overall acceptability of the proposal in relation to the planning context. Also included are the (i) Design & Access Statement (D&AS) and the Pre-Application Community Consultation (PACC) report.

The Planning Statement, D&AS and PACC report do not form part of the ES.

1.8 Obtaining Further Information

The ES and supporting documentation to the Application, together with a public notice of the application, can be viewed on the Development project website: https://www.craignagapplewindfarm.com. Copies of the Non-Technical Summary and CD copies of the complete application submission are available free of charge whilst stocks last. Hard copies of the application submission may be obtained for a fee in line with the cost of printing the documents.

To request a copy of the application submission please contact:

erm.com	Or	info@craignagapplewindfarm.com	Or	info@junoplanning.com
ERM		Ørsted Craignagapple Ext		Juno Planning & Environmental Services
D5 Nutgrove Office Park		Floor 5, City Quarter, Lapp's Quay		409 Lisburn Road
Dublin, Ireland		Cork, Ireland		Belfast
D14 X343		T12 A2XD		BT9 7EW

APPENDIX A CV'S

Adam Cambridge, B.Sc M.Sc C.WEM C.Env C.Sci

Associate Director – Hydrology & Integrated Water

Adam Cambridge has worked as a hydrology and integrated water consultant in the UK and overseas (Angola, France, Sweden, Australia, Guinea, Saudi Arabia, and France). His experience has been focused on leveraging digital technology to develop computational models to bring forward change, with a heavy focus on progressing integrated water management. This has developed a wide appreciation of numerical modelling techniques (predictive, stochastic, statistical), led to the preparation of advice for industry, as well as policy for Government. His integrated water experience has centred on urban planning, flood risk management, enablement of green infrastructure, optimisation of asset management measures (Quasi TOTEX), investment strategies for infrastructure construction, sedimentation and scour, and water neutrality design to support urban living in cities.

Experience: 17 years' experience in hydrology and integrated water.

LinkedIn: https://www.linkedin.com/in/adam-c-9a5960181

Email: adam.cambridge@erm.com

Education
- MSc. Water Resources, Technology, and Management, University of Birmingham, United Kingdom, 2006
- BSc. Geography, University of Wales, Swansea, United Kingdom, 2005

Professional Affiliations and Registrations
- Chartered Water & Environmental Manager (C.WEM)
- Chartered Scientist (C.Sci)
- Chartered Environmentalist (C.Env)

Languages
- English, native speaker

Fields of Competence
- Hydrology (FEH / WINFAP / AR&R / StormPac)
- Integrated Water (InfoWorks ICM / MIKE FLOOD)
- Sedimentation & Scour (HEC-RAS)
- Water Quality (InfoWorks ICM / HEC-RAS)

Key Industry Sectors
- Water
- Urban Planning
- Infrastructure

Honours and Awards
- Liveable Cities R&D Programme – Expert Panellist
- UK Water Partnership: Urban Simulators Task Force – Advisor
- CIWEM RCG – Committee Member
- University of Birmingham – Lecturer on Sustainable Drainage

Publications
- Cambridge, A. J. et al. (2017) *"Understanding the impact of water management on people for investment in sustainable infrastructure in the UK"*. Smart Infrastructure & Construction (170) pp. 28-38
- Innovate UK (2017) *"Future Cities Dialogue: a project investigating urban system integration in the UK"*
- Parliamentary Office of Science & Technology (2016) *"Adapting Urban Areas to Flooding"*

Key Projects

ERM Dolphyn Drainage Strategy
Preparation of an outline drainage strategy for onshore enabling works for offshore wind turbines and associated infrastructure.

Tormsdale – Flood Risk Assessment
Preparation of an InfoWorks ICM model of the River Thurso (Scotland) to design a bridge crossing for a proposed wind farm.

Bilboa Drainage Strategy
Preparation of an outline drainage strategy for wind turbines and associated infrastructure in Ireland

Ministry of Energy, Industry and Mineral Resources – Red Flag Review
Review of hydrological and hydraulic modelling undertaken for wind farms in Saudi Arabia.

Owenreagh Drainage Strategy
Preparation of an outline drainage strategy for wind turbines and associated infrastructure in Northern Ireland.

Lound PFA – Flood Risk Assessment
Preparation of a Flood Risk Assessment for a Pulverised Fuel Ash deposit.

Venator, Calais – Flood Risk Assessment
Preparation of a rapid desk-based Flood Risk Assessment to support legal settlement from the sale of land and property at the Port of Calais, France.

Project Bear – Feasibility Study
Preparation of an InfoWorks ICM model of the River Severn for a Solar Farm. The feasibility study considered fluvial and tidal sources of flooding in assessing whether the site remain safe and operational during times of flood.

Key Projects Prior to Joining ERM

B4224 (Fownhope) Flood Repair Work External Review
External Review of the Council's response (and their stakeholders and partners) in a politically motivated scheme. The External Review identified lessons to be learnt in reviewing 12 questions and provided recommended steps to improve the Council and their stakeholders in responding to flood events.

Wastewater Quality Investigations - UPM Studies
Review of an InfoWorks ICM model for assessing Urban Pollution Management (UPM).

Saint Dunstans Model Audit
Review and update of an InfoWorks ICM model to assess the performance of a constructed scheme for DG5 flood risk drivers as part of a model audit.

Goole – Attlee Drive & Fire Station
Review and update of an InfoWorks ICM model to assess the performance of a constructed scheme for DG5 flood risk drivers.

Ribble Valley Batch – Hyndburn
Review and update of an InfoWorks ICM model to assess the performance of a constructed scheme for Urban Pollution Management (UPM).

Strategic Projects for Growth
Review of InfoWorks ICM models (Bordon & Tottenham Hale) developed to represent the underground drainage system for assessing detriment caused by urban growth.

Technical Support
Sub-consultancy to Capita providing advice and support in undertaking flood risk studies.

Buckinghamshire Natural Flood Management
Preparation of Natural Flood Management (NFM) measures that required the development of InfoWorks ICM models of the underground drainage system (foul, storm, and combined), river network, land surface, and urban fabric for flood mapping, economic appraisal, and concept design.

Oxford Asset Optimisation Study
Preparation of asset optimisation regimes (flooding, urban growth, hydrogen sulphide, sedimentation,

operational regime) for supporting quasi-TOTEX investment decisions.

Old Oak Common & Park Royal Environmental Standards
Establishment of high-level environmental targets for different densities of development considering constraints such as, land take, engineering feasibility, economics, and broad sustainability aspirations.

Isle of Sheppey Integrated Asset Management Plan
Preparation of a multi-stakeholder Integrated Asset Management Plan (IAMP) that required the development of an InfoWorks ICM model of the underground drainage system (foul, storm, and combined), river network, land surface, and urban fabric. The IAMP considered improvements to asset maintenance and management, asset ownership, and operation.

Downs Road Flood Investigation
Review of InfoWorks ICM modelling undertaken, model improvements, and assessment of options to reduce flood risk using the enhanced model. The project of works required surveys (topographic, flow, and post flood event), model development, calibration, and historical verification.

Caterham Bourne Flood Alleviation Scheme
Development of a StormPAC model for generating stochastic rainfall in an InfoWorks ICM model of the underground drainage system (foul, storm, and combined), river network, groundwater, land surface, and urban fabric. The model was used for flood mapping, economic appraisal, and outline design.

Woking Surface Water Management Plan
Preparation of a Surface Water Management Plan (SWMP) that required the development of an InfoWorks ICM model of the underground drainage system (foul, storm, and combined) river network, land surface, and urban fabric. The project of works required surveys (topographic, flow, and post flood event), model development, calibration, and historical verification. The SWMP prepared flood mapping, economic appraisals, outline designs, and an action plan.

Bullando Flood Study
Development of an InfoWorks ICM model of the land surface to prepare strategic flood risk maps for informing urban planning.

Barnham Surface Water Management Plan
Preparation of a Surface Water Management Plan (SWMP) that required the development of a pioneering InfoWorks ICM model of the underground drainage system (foul, storm, and combined), river network, groundwater, coastal boundary, land surface, and urban fabric. The project of works required surveys (topographic, flow, and post flood event), model development, calibration, and historical verification. The SWMP prepared flood mapping, economics appraisals, outline designs, and an action plan that was presented to industry due to the inclusion of groundwater modelling.

Lake Bala Flood Study
Development of an InfoWorks ICM model of the reservoir and river network for assessing dam break scenarios.

Margate Surface Water Management Plan
Preparation of a Surface Water Management Plan (SWMP) that required the development of an InfoWorks ICM model of the underground drainage system (foul, storm, and combined), 2-Dimensional rainfall, river network, coastal boundary, land surface, and urban fabric. The project of works required surveys (topographic and flow), model development, calibration, and historical verification. The SWMP prepared flood mapping, economic appraisals, outline designs, and an action plan.

Rainscape Studies
Preparation of an approach to screen for sites suitable for Rainscape (surface water reduction) across Herefordshire and other locations in Wales.

Rotherham SWMPs

Preparation of Surface Water Management Plans (SWMPs) that required the development of InfoWorks ICM models of the underground drainage system (foul, storm, and combined), river network, land surface, and urban fabric. The SWMPs prepared flood mapping, economic appraisals, outline designs, and action plans.

Lower Lee
Review of InfoWorks CS models and the appropriateness for use in MIKE 11 and water quality modelling.

Mount Nimba
Preparation of sedimentation management measures for mining activities using a range of empirical methods to estimate rates of erosion and sediment transport, as well as the development of 2-Dimensional CAESAR model.

Boodarie Stockyards
Preparation of scour protection designs for a 5km earth embankment crossing the Port Hedland estuary that required consideration of storm surge loading and preservation of salinity level in the mangroves.

Robe River – 33kv Transmission Crossings
Preparation of scour protection designs for 33kv electrical transmission crossings using HEC-RAS, empirical techniques, and long-term geomorphological assessments for ephemeral rivers. Review of an

Basic Canoe / Kayak Course
Development of a InfoWorks ICM (2D only) model of the river for preparing a concept canoe/kayak course concept design. The project of works required topographic surveys, model development, and preparation of course design parameters.

Happy Valley Dam Break Study
Development of a MIKE FLOOD (MIKE 11 & MIKE 21) model to assess dam break scenarios.

La Trobe Flood Risk Study
Development of an InfoWorks ICM model of the underground drainage system (foul & storm), open channel network, land surface, lake features, and urban fabric to prepare flood mapping, concept options, and engineering cost estimates.

Southern Beaches Surface Water Flood Study
Development of an InfoWorks ICM model of the land surface to prepare strategic flood risk maps for informing urban planning.

Wivenhoe Dam
Review and updates to a MIKE 11 flood model to assess reservoir operation scenarios.

Birmingham Strategic SWMP
Preparation of a methodology to strategically screen for locations suitable for SWMPs across the city.

Birmingham Level 1 SFRA
Preparation of a Strategic Flood Risk Assessment (SFRA) that considered the suitability of existing flood mapping, urban planning guidance, and proposed urban development to prepare recommendations for flood management.

Milnathort FAS
Development of a detailed InfoWorks CS model of the underground drainage system (foul, storm, and combined), land surface, and urban fabric that required surveys (topographic, IAS, flow), model development, calibration, and historical verification. The model was used for flood mapping, economic appraisal, and outline design in a politically motivated scheme following scheme failure.

River Cole LFRMP
Development of an InfoWorks CS model of the underground drainage system (foul, storm, and combined), river network, reservoirs, land surface, and urban fabric that required surveys (topographic, flow, post flood event), model development, calibration and historical verification. The model was used for flood mapping, economic appraisal, outline design, and reservoir inspections that was subsequently used to benchmark InfoWorks ICM.

UKWIR CL10 – Climate Change Modelling for Sewerage Networks
Preparation of guidance for accounting for climate change in sewerage systems. The project used outputs from a stochastic Weather Generator to simulate a range of scenarios from the UK Climate Projections 2009 (UKCP09) in a range of InfoWorks CS models that varied in complexity for incorporating impacts into modelling, assessment, and design.

Pennan Mud Slide
Development of an InfoWorks 2D model of the land surface for flood mapping, outline design, and detailed design for construction.

Flood Risk Assessments (Level 1 / Level 2 / Level 3)
Preparation of various site specific Flood Risk Assessments in accordance with planning requirements.

Gloucestershire County Council – Highways Bridge & Culvert Investigations & Repairs – 2007 floods
Development of HECRAS river models for bridge and culvert investigation and sizing following the 2007 floods. River modelling was used for consultation purposes and design.

Wood Brook FAS
Development of a pioneering InfoWorks CS model of the underground drainage system (foul, storm, and combined) with the river and land surface fully integrated into the model for flood mapping and initial optioneering. The project of works required surveys (topographic, flow, and post flood event), model development, calibration, and historical verification.

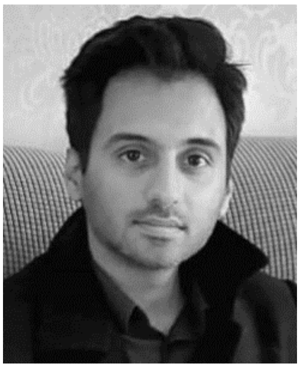
River Ancholme Flood Map Improvements
Development of an ISIS hydraulic model of the river and extensive floodplain for flood mapping that required topographic surveys, model development, calibration, and historical verification.

Rivers Alde, Ore, and Deben Flood Risk Study
Development of ISIS hydraulic models of the rivers for fluvial flood mapping, developing maintenance regimes, and flood warning and forecasting. The project of works required topographic surveys, model development, calibration, and historical verification.

Bilal Ahmed

Senior Acoustic Consultant
MEng (Hons) AMIOA

Bilal has over seven years of experience in acoustic consultancy, undertaking a wide range of services including; noise impact assessments, noise at work assessments, demolition/ construction noise & vibration monitoring, HAVs / WBV assessments, Windfarm EIA assessments, grid and reserve power infrastructure noise assessments, and IPPC/BAT assessments.



In particular, he has worked on projects involving the assessment of impact from large scale power production such as solar farms, wind farms, and battery storage facilities. His experience covers all aspects of environmental noise assessment, from scoping, consultation, surveys, modelling, to EIA reporting.

As an associate member of the Institute of Acoustics (AIOA), Bilal undertakes noise surveys and assessments across the UK and has completed the Institute of Acoustics Diploma in Acoustics course.

Experience: Over seven years' experience in acoustics.

Email: Bilal.Ahmed@erm.com

LinkedIn: https://www.linkedin.com/in/bilal-ahmed-74829569/

Education

- MEng (Hons) Chemical Engineering, University of Edinburgh, 2011
- Diploma in Acoustics, Institute of Acoustics, 2019

Professional Affiliations and Registrations

- Associate Member of the Institute of Acoustics

Publications

- "Noise Impact Assessment for BESS in UK", AWE International Magazine – October 2022 Edition.

Fields of Competence

- Noise at work
- Vibration monitoring
- Noise monitoring
- Noise modelling
- Noise impact assessments
- EIA
- Mitigation and control
- Compliance
- Complaint investigation
- Permitting
- Planning conditions
- Industrial systems
- Construction Noise & vibration
- IPPC/BAT assessment

Key Industry Sectors

- Solar Energy
- Wind Energy
- Reserve Power
- Energy Storage Systems
- Construction
- Infrastructure
- Industrial

Key Projects

Cleve Hill Solar Park – Cleve Hill Solar Park Ltd, 2022
Detailed modelling of proposed construction strategy to BS 5228 for input on piling distances and buffer zones to receptors and strategy input to CNMP.

Large-scale Solar Farm, Thornton – Statkraft, 2022
Modelling and assessment of the solar farm and energy park including battery storage and synchronous flywheel. Assessments undertaken to BS 4142 for application submission.

Harborough Field Solar Park - Mytilineos, 2023
Noise modelling and assessment of solar park and energy storage compound undertaken to BS4142 assessment, including input to CNMP to discharge planning conditions for the Development.

Tees Solar Farm - Yearby, 2022
Noise modelling for construction work consisting of solar panel installation near sensitive receptors, Provision of buffer zones, mitigation strategy, and modelling results for panel support beam piling activities and heavy plant operation within the solar fields.

Wind Farm Developments – Noise Monitoring, Modelling and Assessment
Monitoring, modelling, and assessment for numerous wind farm projects throughout Scotland to ETSU-R-97 and local authority criteria, from scoping to full EIA. Includes assessment of construction noise to BS 5228, as well as noise from associated grid connections.

Reserve Power – Noise Monitoring, Modelling and Assessment for Planning Applications, UK
Numerous assessments of reserve power and energy storage facilities across the UK, including battery storage, gas peaking plants and synchronous condenser flywheel systems. Assessments undertaken to BS 4142, including background noise surveys, noise modelling, and mitigation design to ensure significant noise effects are avoided and adverse effects minimized.

Clyde Waterfront & Renfrew Riverside - Sweco UK Ltd
Vibration assessment Lead for riverside construction works and HGV movements, assessing vibration levels against potential residential property damages and likelihood of human complaint.

York City Centre Road Development, York, - John Sisk & Sons Ltd, 2020
Provision of noise & vibration monitoring as baseline and during construction phases to determine construction threshold in accordance with BS5228 and input best practices in CNMP.

William Grant Distillery, Noise Modelling - William Grant & Sons Distillery, Ayr, UK
Lead acoustic consultant for noise modelling of improvements and new site building/plant and machinery to assess against Site IPPC permit and inform on compliance status. Including BAT assessments and noise control engineering.

Erskine Bridge Pipeline - Advanced Group UK Ltd
Construction noise & vibration monitoring include baseline and during construction, noise modelling and assessment to BS 5228-1 for mitigation of impacts on nearest receptors during construction phases.

Winchburgh Marina Works - Winchburgh Developments Ltd
Ongoing maintenance and support for construction noise & vibration monitoring and assessment to set limits for construction phases.

Aberdeen Offshore Noise Assessment - European Offshore Wind Development Centre
Provision of noise monitoring along the coast of Aberdeen to measure noise from operating offshore wind farms and assess operational noise levels to consented wind farm Development limits. Included address noise complaint, data and audio analysis, and assessment to specific Development noise limits.

Chris Swales

Senior Heritage Consultant

Chris has worked in commercial archaeology for twenty years with a background in the delivery of fieldwork projects across the UK. For the past 8 years Chris has worked as a Project Manager, tendering for fieldwork projects across the renewables, transport, utilities and housing sectors, with works ranging from small scale watching briefs through to multi hectare excavations, managing delivery of fieldwork and through to the delivery of grey literature reports and publications.

Specialisms include project management; preparation of Cultural heritage inputs of EIA scoping reports and environmental assessments, as well as the management of large-scale schemes of archaeological fieldwork, including strategy documentation, procurement and monitoring. With a background in the delivery of fieldwork projects Chris can help clients anticipate costs and source reliable suppliers of heritage services that comply with all H&S legislation as well as national standards and guidance heritage work. Chris has significant experience in working with clients to establish clearly defined scopes of work with local planning departments and national agencies that are proportionate to the sensitivity of both heritage assets and the anticipated impact of a development, with the ultimate aim of helping clients to discharge planning conditions in line with their programme of works and at reasonable cost.

Experience: 20 years experience in commercial archaeology. 8 years project manager experience, tendering for fieldwork projects across the renewables, transport, utilities and housing sectors.

LinkedIn: https://www.linkedin.com/in/christopher-swales-36741590/

Email: Chris.Swales@erm.com

Education

- BA (Hons.) Archaeology & Prehistory. University of Sheffield

Languages

- English, native speaker

Fields of Competence

- Liaising with project stakeholders
- Scoping and Feasibility Assessment
- Desk-based Assessment and Environmental Impact Assessment
- Ensuring compliance with national standards and guidance
- Geomatics/Metric survey
- Design, procurement and management of archaeological investigation and mitigation
- Health, safety and welfare
- Discharge of Archaeological Conditions

Key Industry Sectors

- Commercial Archaeology

Key Projects

Priestgill Onshore Windfarm, South Lanarkshire
Delivery of DBA and inputs into mitigation strategy (Muirhall Energy)

Owenraegh Onshore Windfarm, Northern Ireland
Delivery of DBA and EIA inputs (Orsted)

Neart na Goithe Offshore Windfarm
Consultation with local planning authority – scoping advice – delivery of a combined fieldwork programme along the 12km cable route and substation inclusive of trial trenching, open area excavation and watching brief (EDF)

Various solar farms and Battery Storage sites throughout Scotland and England (in planning)
Production of heritage impact assessment reports and setting appraisals;

A66 Northern Trans Pennine Upgrade
Archaeological trial trenching across two lots of the A66, totalling 800 trenches (National Highways)

RAF Lossiemouth runway refurbishment
Archaeological trial trenching adjacent to the runway (MOD)

V-Route overhead Line replacement scheme
Consultation with the local planning authority – delivery of a combined fieldwork programme across Scottish Borders and Cumbria inclusive of evaluation trial trenching and watching brief (Scottish Power)

Highfield Farm, Findern

Consultation with the local planning authority – a 3ha open area excavation targeting a complex Romano-British settlement (RPS)

Knutsford to Bowden road scheme A556
Consultation with the local planning authority and Historic England – delivery of a combined programme of geophysical survey, trial trenching, open area excavation and watching brief (Costain/National Highways)

Frank Ocran, MSc

Traffic and Transport Lead

Frank is a Principal Transport Planner with over 12 years' experience working on transport planning projects in the UK and has gained a breath of experience on a wide range of topics including development planning and management, transport appraisal, travel planning and traffic engineering. He has gained experience in the different stages of the development planning process from policy reviews, stakeholder engagement, access strategies through to detailed transport assessments and using modelling techniques to develop future ready solutions to mitigate the impact of developments for a wide range of projects including wind farms, mixed-use developments and government & local authority projects.

Frank is accustomed to project management and is an efficient task manager, with experience in coordinating resources effectively to achieve targets within often stringent constraints.

Experience: Over 12 years of experience in Transport Planning

Email: frank.ocran@erm.com

Education

- MSc. Transport Planning & Engineering, Edinburgh Napier University, 2007

Languages

- English, native speaker

Fields of Competence

- Transport Assessments & Statements
- Construction Traffic Management Plans
- DMRB and Local Design Standard
- Access Strategies

Key Industry Sectors

- Offshore Wind Farms;
- Coordination of Transport and Traffic EIAR input;
- Ensure compliance with key Irish and EU legislation.

Key Projects

Owenreagh Wind Farm, Northern Ireland, 2023 (On-going)
Project Manager Managing the transport inputs of the EIAR for the Environmental Impact Assessment (EIA) Submission.

Cloud Hill Wind Farm, Section 36 EIA, 2023 (On-going)
Project Manager Managing the transport inputs of the EIAR for the Environmental Impact Assessment (EIA) Submission.

Armadale Wind Farm, North Sutherland, Section 36 EIA, 2022
Project Manager Managing the transport inputs of the EIAR for the Environmental Impact Assessment (EIA) Submission.

Baillie Greener Grid Park, Thurso, 2021
Project Manager Managing the transport inputs of the Transport Assessment for the planning submission.

Grayside Wind Farm, Section 36 EIA, 2022
Project Manager Managing the transport inputs of the EIAR for the Environmental Impact Assessment (EIA) Submission.

Cloich Wind Farm, Section 36 EIA , 2021
Senior Engineer responsible for the preparation of the Transport and Traffic Chapter of the EIAR.

Tormsdale Wind Farm, Section 36 EIA, 2021
Senior Engineer responsible for the preparation of the Transport and Traffic Chapter of the EIAR.

Heathland Wind Farm Section 36 Application 2021
Senior Engineer responsible for the preparation of the Transport and Traffic Chapter of the EIAR.

Ian Grant, MSc

Senior Consultant- Renewables

Ian is a Senior Consultant based ERM's Dublin offices with over 7 years' international environmental consulting experience implementing complex environmental remediation projects in the US and providing project management oversight for renewable energy developments in Ireland. Ian has a comprehensive background in environmental assessment, permitting, waste management, energy policy consultation and regulatory engagement for a variety of industrial, commercial and government Clients. He also has a strong project management background, where he oversaw projects and developed bids for projects with budgets exceeding 1 million USD. Ian has proven to be adaptable and dynamic, having worked in multiple sectors including renewables (onshore wind, landfill gas, and solar), contaminated sites remediation, and waste management.

Experience: Over 7 years in Environmental Consultancy on shore and offshore projects

Email: ian.grant@erm.com

Education

- MSc. Environmental Policy, University College of Dublin
- BA History, Hamilton College
- BA Geology, Hamilton College

Languages

- English, native speaker

Fields of Competence

- Environmental Impact Assessment;
- Contaminated Land, Hydrology, and Vapor;
- Project Management;
- Regulatory Policy Consultation; and
- Hazardous/Solid Waste Characterization, Management, and Disposal.
- Landfill Gas and Waste to Energy Development

Key Industry Sectors

- EIA management on off-shore and on-shore wind projects;
- Consenting experience across Ireland;
- Renewable energy sourcing and procurement including PPAs;
- Technical input for land, soils, hydrology, and geology;
- Managed the drafting and submission of regulatory consultation responses on energy policy, specifically within Ireland; and
- Provided energy efficiency audits and cost analysis of renewable technologies for waste to energy facilities.

Key Projects

Celtic Horizon and Realt na Mara Offshore Wind Farms
Project management of the onshore environmental aspects for a proposed offshore wind farm in the Celtic Sea.

Confidential Client
Project management of the onshore environmental aspects for a proposed offshore wind farm and hydrogen project in the Celtic Sea.

Owenreagh Onshore Wind Farm Repowering
Project manager overseeing the repowering and EIAR of an onshore wind farm in Northern Ireland.

Celtic Sea Array
Project management of the onshore environmental aspects for a proposed offshore wind farm in the Celtic Sea.

Bilboa Wind Farm
Project manager overseeing the EIAR of an onshore wind farm in Ireland.

Fort Monmouth Remediation Project
Project manager overseeing the remediation of a complex military site with multi-media contamination.

Cape May County Airport
Project manager overseeing the remediation of cyanide contaminated soils and unexploded ordnance at a former military airfield that was converted into an industrial park and commercial airfield.

Jo Phillips BA Hons LA DipUD CMLI

Associate at Optimised Environments Ltd (OPEN)

Jo Phillips is a Chartered Member of the Landscape Institute and an Associate of Optimised Environments Limited (OPEN). Prior to her joining the office in 2010 she was an Associate Director at AECOM Design + Planning (formerly EDAW). Jo is an experienced landscape architect and urban designer, the past twenty-six years having been spent covering a wide range of environmental projects, including Landscape and Visual Assessments, Townscape Assessments, Urban Regeneration and Masterplanning. Jo's experience in energy projects includes the preparation of representations on strategies and guidance, initial feasibility studies, organisation of and participation at public exhibitions and presentations, preparation of landscape and visual impact assessments, preparation of materials for public inquiry and attendance as an expert witness at informal hearings. Offshore wind farm Seascape Landscape and Visual Assessment (SLVIA) and LVIA for the associated onshore transmission infrastructure has been the main aspect of Jo's work over the past five years, during which time she has been the project lead on Pentland Firth, East Anglia 3, Norfolk Vanguard, Norfolk Boreas, Moray West and Dublin Array. Jo has recently been involved in the onshore site search work for the Five Estuaries Offshore Wind Farm.

Experience: 26 years of experience

Education

- Dip Urban Design, University of the West of England, 1996
- MA (Hons) Landscape Architecture, Heriot-Watt University, 1995

Professional Affiliations

- Chartered member of the Landscape Institute
- Member of the Urban Design Group

Languages

- English, native speaker

Key Projects

Pentland Firth Floating Offshore Wind Farm, Copenhagen Offshore Partners
Project manager for the SLVIA for the offshore infrastructure and LVIA for the onshore infrastructure for this pioneering project located in the Pentland Firth, off the north Caithness coast. This project has involved input into establishing the maximum design parameters for the offshore infrastructure and site selection for the onshore infrastructure. Specific issues being dealt with through the assessment include potential impacts on national and regional designations, as well as Wild Land, visual impacts on coastal settlements and roads, and cumulative impacts in relation to extent of onshore wind farm developments and nearby Dounreay Nuclear Power Plant.

Norfolk Vanguard, Vattenfall
Project manager for the LVIA of a large-scale offshore wind farm and associated onshore infrastructure. The focus of this project related to the impacts of the onshore transmission infrastructure during construction, operation and decommissioning. A series of site selection assessments were undertaken to determine the comparative effects of alternative sites

for the landfall, cable relay station, onshore substation and National Grid substation extension, with LVIA input playing an important role in the iterative process and final selection.

Norfolk Boreas, Vattenfall
Project manager for the LVIA of the sister project to Norfolk Vanguard, with the assessment focussing also on the impacts of the onshore transmission infrastructure. The assessment was required to consider two scenarios in which Norfolk Vanguard would or would not be consented to ensure that it was future-proofed to cover both outcomes.

East Anglia Offshore Wind Farm, Scottish Power Renewables / Vattenfall
Project manager for the LVIA of a large-scale offshore wind farm and associated onshore transmission infrastructure. The onshore effects associated with the onshore substation formed the main focus of this project, with landscape and visual assessment highlighting the importance of careful siting, especially in light of consented and future East Anglia onshore substations proposed on adjacent sites and predicting the cumulative effects associated with the clustering of these developments.

Moray West Onshore, EDPR
Project manager for the LVIA of the onshore transmission infrastructure of the Moray West project. The LVIA considered options for the landfall in respect of the sensitive Sandend Bay location. OPEN played an important role in influencing the site selection for the substation, proposing an alternative site that benefitted from existing woodland screening and avoided the over-concentration of cumulative developments at Balckhillock to the north, thus reducing significant solus and cumulative effects.

Dublin Array, RWE
Project manager for the LVIA of this offshore wind farm close to the well populated east coast of the Republic of Ireland, between Dublin and Wicklow. Extensive site work has been carried out in order to ensure the coastal settlements and roads are fully represented in the assessment both in terms of their sensitivity and the potential magnitude of change relating to the offshore wind farm. The evolving cumulative context, which is leading to widespread offshore development along this coastal edge, will be a key focus in the latter stages of this project.

Site Selection Project, Ridgewind
Involved as part of the OPEN team to conduct a nationwide search for remaining onshore wind farm site. This project drew on the collective knowledge of landscape architects and GIS specialists at OPEN, who have been involved in wind farm projects all over Scotland over the past 5 to 25 years.

Feasibility Studies, Various
Responsible for the preparation of a number of offshore and onshore feasibility studies across Scotland and parts of England, for a variety of Clients. Studies have required good working knowledge of planning policy, guidance and advice with regard to wind farm development, as well as understanding of seascape capacity, landscape capacity and visual sensitivities.

Wind Farm Project Manager Experience

- Owenreagh Cragnagapple, Strathbane, Orsted
- Tom na Clach Extension, Highland, Infinergy
- Grayside Wind Farm, Scottish Borders, Riversdale Enterprises
- Faray Wind Farm. Orkney, Orkney Islands Council
- Hoy Wind Farm, Orkney, Orkney Islands Council
- Quanterness Wind Farm, Orkney,Orkney Islands Council
- Rigghill Wind Farm, North Ayrshire, ERG
- High Constellation Wind Farm, Argyll, Blue Energy
- Corkey Wind Farm Repowering, County Antrim, SPRenewables
- Hadyard Hill Wind Farm Extension, South Ayrshire, SSE Renewables
- Lochluichart Wind Farm Extension II, Highland, Infinergy
- Lochluichart Wind Farm Extension, Highland, Infinergy
- Tom nan Clach Wind Farm, Highland, Infinergy
- Dorenell Wind Farm, Moray, Infinergy
- Carn Gorm Wind Farm, Highland, PI Renewables

- Outh Muir Wind Farm, Fife, REG Windpower
- Limekiln Wind Farm, Highland, Infinergy
- Musdale Wind Farm, Argyll & Bute, Infinis
- Beinneun Wind Farm Extension, Highlands, Blue Energy
- Beinneun Wind Farm, Highlands, Ridgewind Limited
- Dersalloch Wind Farm, South Ayrshire, ScottishPower Renewables
- Dunsland Cross, Devon, Bolsterstone Innovative Energy
- Srondoire Wind Farm, Argyll, Lomond Energy/ Ormsary Estate
- Allt Dearg Wind Farm and Extension, Argyll, Lomond Energy/ Ormsary Estate

Orlaith Kirk, BA(Hons) MSc

Principal Town Planner at JUNO Planning & Environmental Ltd

Orlaith joined JUNO Planning & Environmental Ltd in 2012 and is a Principal Planner with over 18 years professional planning experience, having worked for both private planning consultancies (BDP and Tom Philips & Associates Ltd) and local authorities (Louth County Council) in Northern Ireland and the Republic of Ireland.

Orlaith has extensive experience on all aspects of planning and renewable energy development, including repowering windfarm schemes, grid connections and large-scale battery storage. She has significant experience on dealing with complex major planning applications and has excellent professional relationships with Statutory Consultees and Planning Authorities across Northern Ireland.

Experience: 18 years.

Education

- MSc. In Town Planning
- BA (Hons) Sociology

Professional Affiliations

- Irish Planning Institute Member & Social Value UK

Languages

- English, native speaker

Key Projects

Owenreagh/ Craignagapple Wind Farm Repowering Project

Orlaith leads the multidiscipline team and is Principal planning consultant for a regionally significant planning application for the repowering of the existing Owenreagh I and II wind farms for a 50MW plus Development. Orlaith is managing the project EIA team, coordinating the pre-application community consultations, liaising with DfI Planning and Statutory Consultees and overseeing the final wind farm design and layout. It is anticipated that the planning application and EIA will be submitted in Q3 2023.

Corkey Repower Windfarm (Scottish Power Renewables UK Ltd) Ongoing

Principal planner responsible for the planning application (consented in 2022) to repower the existing Corkey Windfarm comprising decommissioning of the existing 10 turbines, removal and restoration of the existing substation building & compound and other redundant infrastructure, and replacement with 5 no. turbines with height of up to 137m and an output of up to 29MW.

On the planning application submission Orlaith worked with Arcus, SPR and their legal advisors to agree the project Planning Strategy and determination pathway having regard to the legislative provisions. Working with

SPR and Arcus Orlaith oversaw the Proposal of Application Notice (PAN) and Pre-Application Community Consultation process culminating in the preparation of the statutory 'Pre-Application Community Consultation Report. ("PACC Report")' Orlaith coordinated the Pre-Application Discussion (PAD) process in association with Arcus who were responsible for the EIA scoping process. Orlaith, in association with Arcus and SPR legal advisors undertook a legal review of all planning application submission documents including the project EIA. Orlaith coordinated the planning application submission and was responsible for the completion of the submitted Planning Statement, PACC Report, planning application forms and Design & Access Statement (with Arcus). Orlaith liaised with the Planning Authority to ensure the validation of the planning application.
Post submission of the planning application, Orlaith was responsible for managing the application and liaised with all statutory consultees and the Planning Authority collaboratively to address planning and technical issues. Orlaith represented SPR at the planning committee meeting, where the Council decided to formally approve the planning application.

Rigged Hill Repower Windfarm (Scottish Power Renewables UK Ltd)
Principal planner responsible for the planning application (consented in 2023) for the repower of the existing Rigged Hill wind farm comprising decommissioning of the existing 10 turbines, removal and restoration of the existing substation building & compound and other redundant infrastructure, and replacement with 7 no. turbines with height of up to 137m and an output of up to 29MW.

On the planning application submission Orlaith worked with Arcus, SPR and their legal advisors to agree the project Planning Strategy and determination pathway having regard to the legislative provisions. Working with SPR and Arcus, Orlaith oversaw the PAN and Pre-Application Community Consultation process culminating in the preparation of the statutory 'Pre-Application Community Consultation Report. ("PACC Report")'. Orlaith coordinated the PAD process in association with Arcus who were responsible for the EIA scoping process. Orlaith, in association with Arcus and SPR legal advisors undertook a legal review of all planning application submission documents including the project EIA. Orlaith coordinated the planning application submission and was responsible for the completion of the submitted Planning Statement, PACC Report, planning application forms and Design & Access Statement (with Arcus). Orlaith liaised with the Planning Authority to ensure the validation of the planning application.

Post submission of the application Orlaith was responsible for managing the planning application process which involved consultation with the planning authority and statutory consultees and 2 no. FEI submissions. Orlaith has liaised with all statutory consultees and the Planning Authority collaboratively to address planning and technical issues. Orlaith represented SPR at the planning committee meeting, where the Council decided to formally approve the planning application.

Ballykeel Windfarm, Larne (Brookfield now Orsted)
Orlaith acted as planning consultant providing due diligence on the Ballykeel, Larne windfarm 'Red Flag Review' on Brookfield purchase of the windfarm. Orlaith undertook a review of the planning conditions, and project ES to identify potential 'red-flags', liaising with the legal advisors on significant issues raised. Orlaith was responsible and oversaw the discharge of the pre-commencement planning conditions, liaising directly with the Planning Authority and Statutory Consultees. Orlaith liaised with NIE on the grid connection element of the development, to oversee the delivery of the grid connection consent (via NIE's permitted development rights) in line with the project construction programme.

She was responsible for securing planning approval for a number of post consent design amendments, including a change of turbine tip height. Orlaith advised the client during the construction process addressing planning compliance queries.

Smulgedon Windfarm, Co.Derry (private client)
Orlaith provided strategic planning advice in respect of the 7-no. turbine scheme that was approved in November 2022, following amendments to the originally approved windfarm design. On behalf of the client, Orlaith oversaw the input of the EIA and planning consultant to ensure that the application was approved at planning committee.

Broughshane, Co. Antrim (Sorne Wind)
Senior planner responsible for securing planning permission for a 10-no. turbine scheme (Enercon E-70s- 23 Mw scheme) at Broughshane Co. Antrim. The initial stages on this windfarm proposal involved the preparation of feasibility study reviewing the environmental site constraints, wind-speed efficiency, residential amenity and a preliminary landscape and visual amenity assessment. The feasibility study informed pre-application discussions with the Strategic Projects Team (Planning Service) prior to the submission of the planning application. Orlaith was responsible for the coordination and preparation of the Environmental Impact Assessment, oversaw the iterative design process and the submission of the planning application. Orlaith managed the planning application through the planning application process and secured planning permission.

Shantavny Scotch, Co. Tyrone (Sorne Wind)
Senior planner responsible for securing planning permission for a 7 no. turbine scheme (Enercon E70s-16 Mw) at Shantavny Scotch, Co.Tyrone. Responsible the coordination and preparation of the EIA following a significant Further Environmental Information Request which culminated in a significant re-design of the proposed windfarm. Orlaith managed the submission of the amended windfarm proposal and Further Environmental Information package. Orlaith managed the application and secured planning permission for the windfarm.

Post consent Orlaith was responsible for the preparation of additional feasibility studies on alternative site layouts and proposed turbine type. Orlaith liaised directly with Northern Ireland electricity (NIE) to agree a mitigation solution to address NIE telecommunications links issues on site. Orlaith was responsible for discharging all the pre-commencement of development planning conditions with Mid-Ulster Council. Orlaith also assisted the client in the commercial sale of the windfarm, liaising with the project funders and windfarm vendors on project due diligence.

Tullinoid, Co. Fermanagh (BDP)
Senior planner responsible for the preparation of a feasibility study for a 4 no. turbine proposal (9.2Mw wind farm, comprising 4 no.136m high 2.3MW turbines) at Tullinoid, Co. Fermanagh. The feasibility study was informed by a comprehensive constraints mapping exercise, largely focused on the avoidance of blanket bog on site and the provision of a 50m buffer zone to the Roogagh River. Following the completion of the feasibility study significant consultations with the Department were undertaken. Orlaith was responsible for the coordination of the site layout and design with the project designers and for the coordination and preparation of an EIA report.

Rossinure, Co.Fermanagh (BDP)
Senior planner responsible for the preparation of a feasibility study for a site at Rossinure, Co. Fermanagh. The feasibility study involved the initial mapping of site constraints such as ecology, geology and hydrogeology, landscape sensitivity analysis and traffic and haulage routes to the site. The feasibility study informed preliminary layouts that were discussed with the Client and Planning Service.

Republic of Ireland- Renewable Energy Projects

Barnesmore Windfarm, Co.Donegal (Client- SPR, Commission- Ongoing
Orlaith was the planning consultant responsible for securing planning permission for a series of infrastructural upgrade projects at the existing Barnesmore windfarm including an upgraded transformer and new site met mast. Orlaith was responsible for securing planning permission for a 6 MW Battery Storage at the existing Barnesmore windfarm site.

Graffy Windfarm, Co.Donegal (Client- Sorne Wind, Commission- Ongoing)

Orlaith provided strategic planning advice in respect of a 8 turbine scheme including battery storage and grid connection (110Kv) at Graffy, Co.Donegal (30MW-52MW). Orlaith was responsible for liaising with the client team and legal advisors to determine the planning strategy and planning determination pathway. Orlaith oversaw the initial pre-application queries with An Bord Pleanala including queries in respect of the grid element of the development.

Upgrades of Windfarm Infrastructure across ROI, Sorne Wind (Client- Sorne Wind, Commission- Ongoing)

Orlaith acted on behalf of the Client, to secure planning permission for upgrades of existing windfarm infrastructure across their wind energy portfolio in the ROI, including wind energy projects in Co.Sligo, Mayo and Donegal. The infrastructural upgrades include amendments to site access roads, replacement transformers, and sub-station amendments.

Energy Projects

100MW Battery Storage at AES Power Station, Kilroot (AES)

Planning Consultant responsible for the submission of a 'Certificate of Lawful Development for a Proposed Use' and securing permission for 100MW Battery Storage Unit utilising Clients permitted development rights, as an 'Electricity Statutory Undertaker' in 2018. The process involved significant consultations with the Planning Authority and the Client's legal advisors to agree the project 'Planning Strategy' and planning pathway for determination.

100MW Battery Storage at AES Power Station, Ballylumford (AES)

Planning Consultant responsible for the submission of a 'Certificate of Lawful Development for a Proposed Use' and securing permission for 100MW Battery Storage Unit utilising Clients permitted development rights, as an 'Electricity Statutory Undertaker' in 2018. The process involved significant consultations with the Planning Authority and the Client's legal advisors to agree the project 'Planning Strategy' and planning pathway for determination.

6MW Battery Storage, Barnesmore Windfarm (SPR)

Planning Consultant responsible for securing 10MW Battery Storage at the existing Barnesmore windfarm site.

Bombardier Energy from Waste

Planning and environmental advisor to Bombardier Aerospace in respect of a Feasibility Study, planning application and Environmental Impact Assessment for a large-scale CHP plant (and associated grid connections) processing 240,000 tonnes of Refuse Derived Fuel (RDF) per annum and generating 23MW of electricity / 16MW of heat to supply Bombardier, Belfast Harbour Estate and the Grid.

Project Experience: 'Major Developments'

Northern Ireland Fire & Rescue Service- New Learning Centre, Cookstown (NIF&RS)

Planning Consultant responsible for the coordination and submission of the planning application for a new Fire & Rescue Service Learning & Development Centre at Cookstown, Co.Tyrone (Construction Value- £42 Million) submitted in Q4, 2020. Orlaith was responsible for preparing the Planning Strategy, submission of the PAN, PAD process and coordination of the Pre-Application Community Consultation. Orlaith was responsible for the coordination of the environmental reports including the Habitat Regulations Assessment, agreeing the scope and content of the application with the Planning Authority and Statutory Consultees. Planning approval was issued on May 2021.

Old Bushmills Distillery- Maturation Sheds Development

Senior Planner responsible for developing and project managing planning strategy for a new large scale off-site maturation facility outside Bushmills in the Causeway Coast & Glens District Council area. As part of the JUNO team, Orlaith undertook a detailed site selection exercise managing sub-consultants to find a suitable site for an off-site maturation site within the Council area. Orlaith coordinated and managed the EIA team for the development and was responsible for the submission of the planning application in January 2017. Planning permission was granted for the proposal in

2018 and construction is well underway on site with part of the site operational.

Belfast Transport Hub – Belfast Grand Central Station (Translink)

Senior planner responsible for advising Translink on securing planning permission for the redevelopment of the 9.5Ha city centre Hub site to include a regional transport interchange (£200+ million). Orlaith assisted in the development of the planning strategy for the proposed development which involved the preparation of (i) Public Consultation Strategy including the submission of the Proposal of Application Notice (PAN) (ii) Pre- Application Discussions including EIA Scoping. Orlaith assisted in the coordination and submission of the planning application in 2017 and was responsible for the preparation of the' Pre-Application community Consultation' Report. Orlaith liaised with DfI Planning throughout the planning process and assisted in the preparation of Further Environmental Information submissions (3) throughout the planning process. Planning permission was granted for the scheme in 2019.

Dr Paul Phillips

Director at Envams Ltd

Paul provides environmental project co-ordination and advice services to developers. Paul has 25 years experience in environmental management and impact assessment. For the last 18 years he has been UK-based, focused on the environmental effects of new construction projects, principally delivering Environmental Impact Assessment (EIA) for project proposals. Paul is an IEMA Registered EIA Practitioner.

Paul has project managed the environmental and planning work supporting applications for consent for developments in a wide range of sectors, and particularly in renewable energy. Paul has led numerous wind farm and solar farm applications over the last 15 years, including some of the largest onshore windfarm applications ever made in the UK, and is experienced in all aspects of the windfarm project development cycle. To date, all of the renewable energy projects for which Paul has been project manager for which applications have been submitted have received planning consent, a 100% track record. This includes c. 600 MW of onshore wind farm consents. Paul has provided EIA advice and support on a wide range of development types, including road schemes, mixed-use developments, bio-fuel plants, urban redevelopments, chemical manufacturing plants and thermal power plants, in addition to on- and off-shore wind farms and large-scale solar sites. Paul has extensive experience of the consenting process for planning applications, DCO consent applications and Section 36 applications, as well as environmental permitting and other consenting regimes.

Experience: 25 years of experience

Email: Paul.Phillips@envams.co.uk

Education

- MSc EIA, Auditing and Management Systems, Distinction, UEA, 2005
- PhD, High Energy Physics, Manchester University and CERN, Geneva, 1995
- BSc (1st class honours) Physics with Astrophysics, Manchester University, 1992

Professional Affiliations

- IEMA Registered EIA Practitioner (2014-present)
- Associate member of the IEMA (2003-present)

Languages

- English, native speaker

Key Projects

EIA Project Manager (ScottishPower Renewables)
EIA co-ordination, review and post-submission support (including FEI) for Corkey Windfarm (24 MW) and Rigged Hill Windfarm (29 MW), in Causeway Coast and Glens, Northern Ireland (consented February 2022 and October 2022, respectively).

EIA Project Manager (North Star)
EIA screening and ES co-ordination and review for the Roman Quarter development within York's city walls (consented October 2022).

EIA/NSIP Project Director (Cleve Hill Solar Park – the first solar DCO to be granted, in May 2020)
Project direction and EIA co-ordination for the 350 MW solar and battery storage park in Swale, Kent. Submission and Examination phases, expert witness on EIA and air quality topics in Examination hearings.

EIA Project Manager (ScottishPower Renewables)
Project Management of the Kilgallioch Windfarm (Arecleoch Phase 2) EIA, Section 36 application and post-submission support. This proposal was consented and constructed with 96 wind turbines (288 MW: Section 36, Dumfries and Galloway, Scotland).EIA Project Director (Firth of Forth Offshore Wind Farm): Project direction and EIA review of an

application to alter the onshore grid connection route near Balhungie, Angus, Scotland.

Developer role (Enel Viento)
Project management of Harburnhead Windfarm in Scotland, from initial site feasibility through to pre-construction management. Subsequently co-ordinated the Harburnhead team through the conjoined public inquiry and acted as expert witness on 5 technical areas (July 2013). Consent was received July 2014. Paul managed the project through investment phases and construction, and now oversees the operational phase environmental monitoring.

EIA Scoping Project Director (ScottishPower Renewables)
Kilgallioch Windfarm Extension, including large-scale solar panel implementation (the first proposed in a Scottish upland environment). Scoping request submitted to the Energy Consents Unit in April 2019 (11 turbines; 55 MW, plus 20 MWp solar; Section 36, Dumfries and Galloway, Scotland).

EIA External Review (Seagreen offshore windfarm)
Part of a team undertaking second review of the offshore windfarm EIA on behalf of the developer, ensuring that the ES met the requirements of the EIA Regulations and best practice.

Due Diligence
Overseeing role in providing due diligence advice to a client selling 22 large-scale solar sites (2018).

Project Manager (Bia Power)
Drumlithie Battery Energy Storage System: Led the multi-disciplinary team to design and submit the application for planning permission for this 50 MW, 100 MWh battery scheme in Aberdeenshire (2023).

Project Manager role
EIA, windfarm design, project co-ordination and application submission of several wind farms over a period of 17 years, including the following (all consented with consent dates provided):

- Hawton Windfarm (3 turbines; Bolsterstone; Sept 2014).
- Sisters Wind Farm (4 turbines; Infinis; Feb 2012);
- Fewcott Windfarm (4 turbines; Bolsterstone; July 2010);
- Wingates Wind Farm (6 turbines; Novera Energy; May 2011);
- Bullamoor Wind Farm (4 turbines; Novera Energy, June 2010);
- Burton Pidsea Wind Cluster (2 turbines; Aeolian Holderness; Dec 2008);
- Black Law Windfarm Extension (23 turbines; ScottishPower Renewables; March 2011);
- Kilgallioch Windfarm (96 turbines; ScottishPower Renewables; Feb 2013);
- Harburnhead Windfarm (22 turbines; Enel Viento; July 2014);
- Corkey Windfarm (5 turbines; ScottishPower Renewables; February 2022); and
- Rigged Hill Windfarm (7 turbines; ScottishPower Renewables; October 2022).

Róisín NigFhloinn, BA Mod MSc MCIEEM

Ecological Consultant at Woodrow APEM Group

An experienced ecologist, Róisín NigFhloinn has worked for over twelve years on complex and strategic environmental impact assessments and mitigation design for development projects.

As a project manager and field ecologist she carries out multidisciplinary surveys, specialising in habitat and botanical identification, including protected species and habitat surveys. She is a skilled Ecological Clerk of Works for infrastructure projects.

Experience: 12 years of experience in Environmental Impact Assessment.

Education

- MSc. Ecology and Management of the Natural Environment, University of Bristol, 2011
- BA Mod (BSc) (Hons) Natural Sciences, Botany, Trinity College Dublin, 2008

Professional Accreditations

- Full member Chartered Institute of Ecology and Environmental Management (CIEEM)
- Member Botanical Society of Britain and Ireland (BSBI)

Languages

- English, native speaker

Professional Training & Qualifications

- Bat Tree Roost Identification Endoscope Training (Bat Conservation Ireland) 2019
- Management Training (Rural Enterprise Skillnet) 2019
- CIEEM Surveys & Management for Marsh Fritillary (Will Woodrow Dolores Byrne) 2017
- NBDC Vegetation ecotopes & peat forming sphagnum mosses of raised bogs (IPCC) 2017
- NBDC Bryophyte Identification (Joanne Denyer) 2017
- NBDC Introduction to Bryophytes 2017
- QGIS 2016
- Mountain Skills MS1 MS2 (Led by Niall Ennis of Mountain Leaders) 2015 & 2016
- Safe Pass Certification
- In house Training: Appropriate Assessment; Mammal Surveys, Methodologies Mitigation; Radio tracking Lesser Horseshoe Bats; Recognising Annex I Calcareous Grassland, Karst Limestone, Turloughs and Calcareous Springs (2014- 2016)
- ArcGIS 2014
- Bird ID and Survey Skills (Wildlife Trust of South West Wales) 2012
- Bat Ecology (Field Studies Council) 2012
- Great Crested Newt Training Day, Advanced Level (2012)
- Full UK Driving Licence 2010

Fields of Competence

Surveying, Monitoring and Reporting

- A dvice recommendations throughout project lifetime including developments in the planning application process.

- Method statements in relation to protected species valuable habitats.
- Comprehensive desk studies.
- Research and compilation

Clerk of Works and Supervision
- Plantation maintenance schemes.
- Construction in upland habitats.
- Checks searches for nesting birds protected species prior to vegetation removal.
- Amphibian translocation work.
- Tree felling supervision for construction projects.

Project Management
- Project/Lead Ecologist on multiuser area
- action plans, residential, commercial public
- sector schemes.
- Assessment Screenings Natural Impact Statements.
- Organising, undertaking and writing Ecological Impact Assessments and Flora Fauna Chapter for EIA.
- Consultation with statutory authorities stakeholders.
- Fee proposals managing budgets.
- Organising overseeing sub consultants.

Skills
- Surveying
- Monitoring & Reporting
- Clerk of Works & Supervision
- Project Management
- Appropriate Assessment
- Ecological Impact Assessment
- Post Construction Monitoring
- Field Surveys
- Habitat Surveys
- Plant Recording Surveys
- Budgeting
- Contaminated Land, Hydrology, and Vapor;
- Project Management;
- Regulatory Policy Consultation; and
- Hazardous/Solid Waste Characterization, Management, and Disposal.
- Landfill Gas and Waste to Energy Development

Key Projects

- Senior Ecologist for EcIA AA for residential commercial developments, quarries, wind farms, flood alleviation schemes, multiuser routes walking trails
- Ecologist for the following schemes: water treatment works; building developments; highways maintenance works; overhead pylon line maintenance; railway schemes for Network Rail
- Lead Ecologist on overhead power line project for Electricity Alliance (Framework with National Grid) SQE for BREEAM

Volunteering

- Botanical Society for Britain Irela nd (Recording
- Birdwatch Ireland Countryside Bird Survey.
- UK Bristol Bat Group Bat Box Checks.
- UK Somerset Reptile and Amphibian Group Adder Survey in the Quantock Hills.
- SIMBIOSYS (Hedgerow surveys and pollinator line transect surveys for research programme partly funded by the EPA).
- Groundwork (Rhododendron eradication programme in Killarney National Park, Ireland);
- Coastwatch Ireland (Surveying coastlines).

Simon Cleary, MA (Hons)

Economics Director at BIGGAR Economics

Simon joined BiGGAR Economics in 2011, after graduating from the University of Aberdeen with a first class honours in Economics and Mathematics. Since joining BiGGAR Economics, Simon contributed to a variety of renewable energy projects and has developed expertise in modelling the economic impact of individual renewable energy projects and industry wide developments.

Simon has contributed to socio-economic impact assessments of over 50 wind farm developments around the UK including projects in island economies. Simon has particular experience of assessing the economic impact of wind farms and has designed the economic models that are currently used to assess impacts of individual projects and the model used as part of our work for DECC and RenewableUK on the economic contribution of the onshore wind energy sector to the UK economy.

Education

- MA (Hons) Economics & Mathematics

Languages

- English, native speaker

Key Projects

South Kyle Wind Farm

An economic impact assessment and supply chain analysis which is currently being developed by Vattenfall in South West Scotland.This includes consultations with Tier 1 contractors to understand the opportunities and barriers for local firms becoming involved in the onshore wind supply chain.

SSE Renewables

Economic impact and supply chain analysis for two clusters of SSE Renewables projects in Highland, namely SSE in the Great Glen and SSE Projects in Sutherland. Both projects involved analysing spend during the construction and operation phases, to assess the proportion of economic impact that was retained ‘locally’. This also included case studies with supply chain companies in the area to understand how cluster development of onshore wind farms has supported their diversification into the sector.

Crossdykes Wind Farm
An economic impact assessment and supply chain analysis for the Crossdykes Wind Farm near Lockerbie. This included case studies of local companies who had provided goods and services during the development and construction of the Project.

Loganhead Wind Farm and Hopsrig Wind Farm
Socio-economic, tourism and recreation impact assessments of the proposed Loganhead Wind Farm and Hopsrig Wind Farm in Dumfries and Galloway, which are being developed by Muirhall Energy.

Quantans Hill Wind Farm and Whiteneuk Wind Farm
Socio-economic, tourism and recreation impact assessments of the proposed Quantans Hill Wind Farm and Whiteneuk Wind Farm in Dumfries and Galloway,which are being developed by Vattenfall.

Onshore Wind sector in Iceland
the development of an economic impact model to assess the potential benefits of the onshore wind sector in Iceland, this included the potential catalytic role it could have in supporting other industries such as aluminium smelting.

European Marine Energy Centre (EMEC)
Led the economic impact assessment of the European Marine Energy Centre (EMEC) in Orkney in 2018/19. Since its establishment we have also carried out scenario analysis of future usage of the testing facilities at EMEC, based on the scenarios considered in the Sixth Carbon Budget, to support EMEC’s section 36 application for a new testing site.

Islands Centre for Net Zero
Managed the contributions towards the economic case when BiGGAR Economics was commissioned by EMEC to provide an economic impact assessment of proposals for the development and operation of the Islands Centre for Net Zero, part of the Islands Growth Deal.

Scottish Power Renewable's East Anglia ONE
Research and expert witness to public a Hearing on the relationship between renewable energy infrastructure and the tourism sector, in support of the application for Scottish Power Renewable's East Anglia ONE North and East Anglia TWO Offshore Wind Farms.

Bhlaraidh Wind Farm, Bhlaraidh Extension Wind Farm, Culachy Wind Farm and Stronelairg Wind Farm
Socio-economic, tourism and recreation impact assessments of the proposed Bhlaraidh Wind Farm, Bhlaraidh Extension Wind Farm, Culachy Wind Farm and Stronelairg Wind Farm in Highland, which are being developed by SSE Renewables;

MeyGen Data Centre
An outline economic impact assessment of the proposals for the MeyGen Data Centre in Highland that was being developed by SIMEC Atlantis;

Ros a Mhil port
An assessment of the role that the potential redevelopment of the Ros a Mhil port in County Galway could have in supporting the development of the floating wind energy sector on the west coast of Ireland.

Cumberhead West Wind Farm
A socio-economic, tourism and recreation assessment of the proposed Cumberhead West Wind Farm in South Lanarkshire that is being developed by 3r Energy and Scottish Power;

RenewableUK and the Department of Energy and Climate Change (DECC)
Designed the economic model used in our 2012 study of the direct and wider economic impacts of the onshore renewable energy sector in the UK, on behalf of RenewableUK and the Department of Energy and Climate Change (DECC), which was based on case studies of a number of operational wind farms. This was subsequently updated in 2015.

Tomos Ap Tomos

Technical Director - Engineering

Tomos joined ERM to establish and develop an Engineering Team. He has a strong background in infrastructure design, planning and construction supervision based on previous experience in design consultancy, maintenance operations and site management.

Since joining ERM, Tomos has been heavily involved in both pre and post consent phases of renewable energy projects ensuring buildability and construction risk management are a consideration from inception stage.

He has extensive experience in preparing contract documentation for a variety of contract forms, including FIDIC, bespoke Design and Build and NEC and has acted as both Owners Engineer and Technical Advisor under these forms of contract for several wind farm projects since joining the company.

Experience: Over 25 years' experience in Engineering

Email: tomos.aptomos@erm.com

LinkedIn: https://www.linkedin.com/in/tomos-aptomos-01666133/

Education

- BEng (Hons) Civil Engineering, University of Salford, 1996
- HND Civil Engineering, University of Wales NEWI, 1994

Professional Affiliations and Registrations

- Institution of Highways and Transportation 2007 MIHT

Languages

- Welsh and English, native speaker

Fields of Competence

- Preparation of contract documents
- Contract administration
- Construction supervision
- Design management
- Transport assessments
- Project management
- Construction planning, programming and method statements

Key Industry Sectors

- Renewables
- Infrastructure

Key Projects

Doggerbank Offshore Wind Farm HVAC Corridor & OCS, North Yorkshire.
Overseeing ground investigation at Onshore Converter Station and providing analysis of results and advising further monitoring. Responsible for the Contaminated Land and Ground Condition Assessment including CoCP and CEMP relating to waste management, pollution control and soil management.

Beatrice Offshore Wind Farm Onshore Works
Production Construction Environmental Plan in support of the planning application for the onshore infrastructure works required for the Beatrice onshore project.

Heathland Wind Farm Section 36 EIA
Tomos was the Principal Designer and Engineering lead for the Site Design and Peat and Geology assessments of the consented EIA submission.

Tormsdale Wind Farm Section 36 EIA | Principal Designer Engineering Lead.
Tomos was the Principal Designer and Engineering lead for the Site Design and Peat and Geology assessments of the EIA submission**.**

Corriegarth 2 Wind Farm Section 36 EIA | Principal Designer Engineering Lead.
Tomos was the Principal Designer and Engineering lead for the Site Design and Peat and Geology assessments of the EIA submission.

Corkey Wind Farm Repower, Northern Ireland | Principal Designer Engineering Lead
Tomos was the Principal Designer and Engineering lead for the Site Design and Peat and Geology assessments of the EIA submission.

Rigged Hill Wind Far, Northern Ireland | Principal Designer Engineering Lead
Tomos was the Principal Designer and Engineering lead for the Site Design and Peat and Geology assessments of the EIA submission.

Kenly Wind Farm, St Andrew, Fife
Pre-construction phase Technical Advisor and Principal Designer support for 15km private wire connection between the proposed wind farm development and St Andrews University.

High Wood Wind Farm EIA, East Riding of Yorkshire.
Pre-application engineering support and production of Traffic and Transportation chapter for the Environmental Statement including Abnormal Load Route assessment report.

Inverclyde Wind Farm, Inverclyde.
Pre-construction phase Technical Advisor and Principal Designer support producing Balance of Plant tender including full infrastructure outline design for and 8 Turbine Windfarm development near Greenock.

Harburnhead Wind Farm, West Lothian.
Preparation of contract documents for BOP. Production of Traffic Management Plan in support of planning conditions discharge on the above consented development.

Beinnuen Wind Farm
Planning conditions discharge engineering support, production of Construction Environmental Management Plan and provisional onsite access track and crane platform design.

Goole Fields II, East Riding of Yorkshire.
Post consent engineering support, production of Construction Environmental Management Plan and Traffic Management Plan. Outline site access design.

Fair Isle, Shetland
Technical Advisor and Principal Designer for community renewable project to bring 24 hour energy to the remote island through a combination of wind, solar and battery storage. Involved from inception to completion including planning consent, BOP design, contract preparation and construction management.

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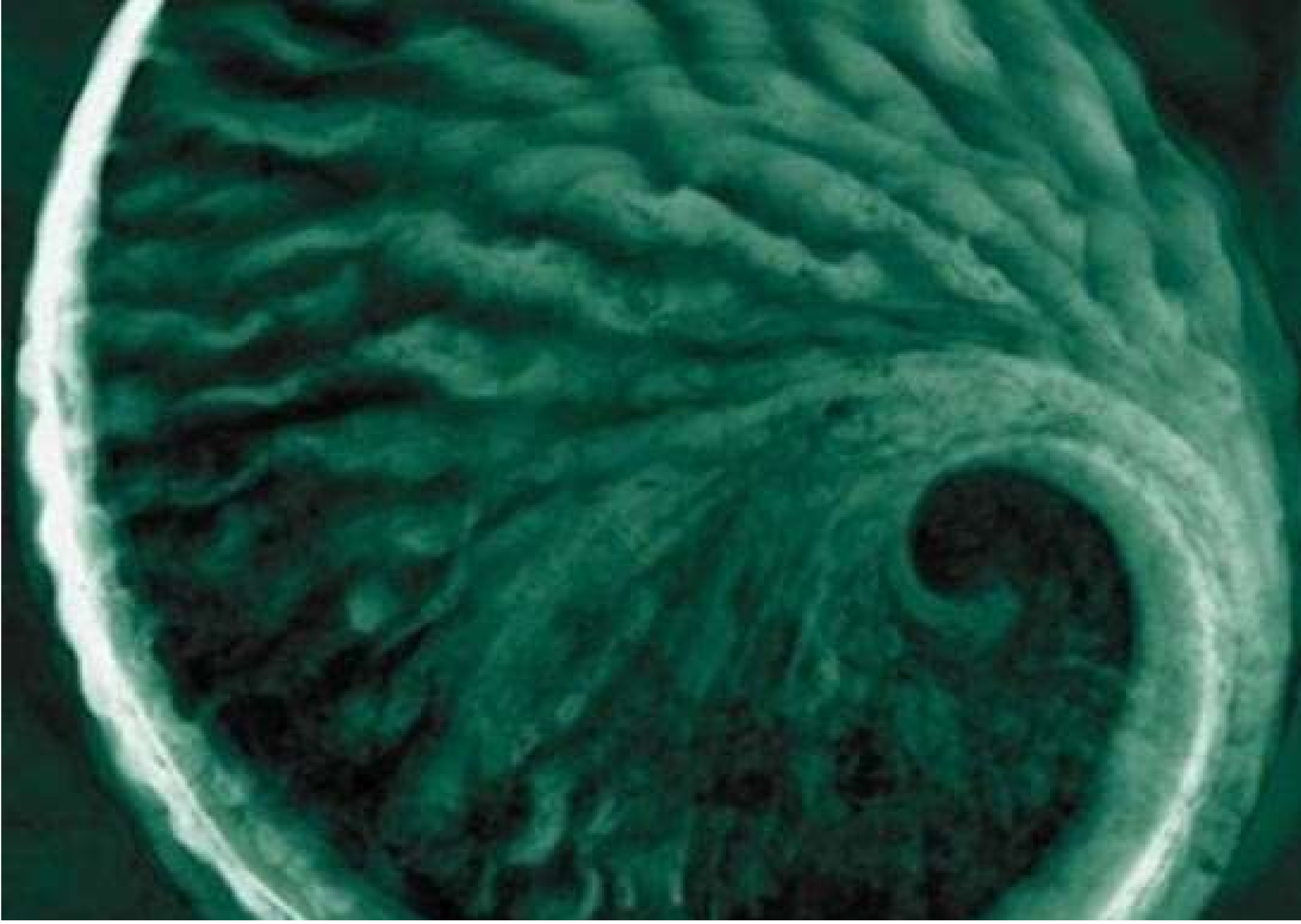

Owenreagh/Craignagapple Wind Farm

Ørsted Onshore Ireland Midco Limited

Environmental Statement – Chapter 2
Methodology

06 September 2023

Project No.: 0696177

The business of sustainability

ERM

Signature Page

06 September 2023

Owenreagh/Craignagapple Wind Farm

Environmental Statement – Chapter 2 Methodology

Magnus Woods Consultant	Ian S Grant Ian Grant Senior Consultant
Peter Rodgers Partner	

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CONTENTS

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Acronyms and Abbreviations

Name	Description
CAA	Civil Aviation Authority
DAERA	Department of Agriculture, Environment and Rural Affairs
DS&SDC	Derry City and Strabane District Council
DfI	Department for Infrastructure
EIA	Environmental Impact Assessment
ES	Environment Statement
GSNI	Geological Service Northern Ireland
IEMA	Institute of Environmental Management and Assessment
NED	Natural Environment Division
NI	Northern Ireland
NIEA	Northern Ireland Environment Agency
PACC	Pre-Application Community Consultation

2. EIA METHODOLOGY

2.1 Introduction

Environmental Impact Assessment (EIA) is a process aimed to ensure that permissions for developments with potentially significant effects likely on the environment are granted only after assessment of the likely significant environmental effects has been undertaken. Best practice is for the assessment to be carried out following consultation with statutory consultees, other interested bodies and members of the public. This Chapter of the Environmental Statement (ES) describes the EIA process for the Owenreagh/Craignagapple Wind Farm ('the Development') and is supported by the following Technical Appendices including in **Volume 4**:

- **Technical Appendix A2.1: Scoping Report**;
- **Technical Appendix A2.2: Scoping Opinion**;
- **Technical Appendix A2.3: Abnormal Load Route Works**; and,
- **Technical Appendix A2.4: Cumulative Developments**.

2.2 EIA LEGISLATIVE CONTEXT

The Development falls under the Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 (as amended) (referred to here as the "EIA Regulations")[1] . Should changes apply to the EIA Regulations during the ES examination, Ørsted Onshore Ireland Midco Limited ('the Applicant'), will provide any necessary updates or changes to this document to reflect those changes.

The EIA Regulations aim to ensure that a planning authority granting planning permission for a development proposal makes its decision with the full knowledge of any likely significant effects on the environment by setting out a procedure known as EIA to assess such effects.

The findings of the EIA are presented within this ES which accompanies the application for planning consent for the Development.

The following paragraphs under Schedule 2 of the EIA Regulations are of relevance to the Development:

- Paragraph 3(j) includes "installations for the harnessing of wind power for energy production (windfarms) where: (i) the development involves the installation of more than 2 turbines; or (ii) the hub height of any turbine or height of any other structure exceeds 15 metres." ; and
- Paragraph 13 (a) includes "Any change to or extension of development of a description listed…where that development is already authorised, executed or in the process of being executed"

The Development falls under Paragraph 3 (j) and Paragraph 13 (a) of Schedule 2 of the EIA Regulations because of the proposed height and total number of turbines. The Applicant determined that an EIA should be carried out and are submitting an ES as part of the Application. Regulation 11 (2) of the EIA Regulations specifies the information required within the ES. These specifications are as follows:

- "(2) An environmental statement is a statement which includes at least—
- A description of the proposed development comprising information on the site, design, size and other relevant features of the development;
- A description of the likely significant effects of the proposed development on the environment;

[1] UK Government (2017). The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017. Available at: https://www.legislation.gov.uk/nisr/2017/83/contents [accessed on 10/07/2023].

- A description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;
- A description of the reasonable alternatives studied by the applicant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the likely significant effects of the development on the environment;
- A non-technical summary of the information referred to in sub-paragraphs (a) to (d); and,
- Any information specified in Schedule 4 relevant to the specific characteristics of the particular development or type of development and to the environmental features likely to be significantly affected."

Per 11(2)(f) the following paragraphs under Schedule 4 of the EIA Regulations are of relevance to the Development and this ES:

- Paragraph 3: "A description of the relevant aspects of the current state of the environment (the "baseline scenario") and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of relevant information and scientific knowledge."; and,
- Paragraph 4: " A description of the factors specified in regulation 5(2) likely to be significantly affected by the development: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape."

The results of the EIA are presented in this ES which, as prescribed in the EIA Regulations, is required to include a "description of the likely significant effects" of the Development; the effects which are not considered to be significant do not need to be described. It is therefore necessary for the scope of the EIA to be appropriately and clearly defined to ensure that any likely significant effects are described and assessed.

2.3 EIA METHODOLOGY

The ES has been prepared following a systematic approach to EIA and project design. The process of identifying environmental effects is iterative and cyclical, running concurrently with the design process, whereby the design of the Development is refined in order to avoid or reduce likely significant effects, using mitigation as necessary.

The EIA process follows a number of stages broadly in line with the following:

- Site selection and feasibility;
- Screening – to determine if an EIA is required (unless an Applicant volunteers an ES, as is the case with the Development);
- Pre-application consultation with statutory and non-statutory consultees, which continues throughout the pre-application stage;
- Scoping – to identify the parameters of the assessment issues on which the EIA should focus;
- Baseline studies – to establish the current environmental conditions at the Site;
- Identification of potential effects, including cumulative effects;
- Mitigation to avoid or reduce the effects through iterative design process;

- Assessment of residual effects;
- Preparation of an ES;
- Submission of the application including the ES to the Department for Infrastructure (DfI);
- Consideration of application and environmental information by the DfI and statutory and non-statutory consultees;
- Determination of the application; and,
- Implementation and monitoring.

The EIA Regulations require that an ES should include a range of information including: a description of the development, a description of reasonable alternatives, baseline information relevant to the likely significant effects, a description of the likely significant effects of the development, and mitigation measures amongst other factors.

This ES has been prepared in accordance with the EIA Regulations and includes the required information.

2.4 CONSULTATION

Consultation has formed an essential part of the EIA. The EIA team and the Applicant have proactively engaged interested parties (refer to Table 2.1) throughout the EIA process to determine their views on the Development and assessment methodology, and to collect baseline information. This engagement has principally been undertaken within the following key stages:

- Pre-scoping – procuring initial feedback on the Development and agreeing extent of consultation;
- Scoping – outlining EIA methodology and seeking consultation on which issues are to be included in the ES;
- Further Technical Consultation – gathering baseline information from relevant organisations and confirming survey methodologies; and,
- Public Engagement – Informing site design following feedback from a live website and Public Exhibitions. This included communication with local communities and consideration of baseline information.

Further detail on each stage is included in the following subsections.

2.4.1 Pre-Scoping

On 29th April 2021, the Applicant issued a Section 26 Determination Request to DfI Planning in respect of the Development. On 13th May 2021, DfI Planning confirmed that in their opinion the development would be of significance to the whole or substantial part of Northern Ireland. In line with Section 26(4) of the Planning Act 2011[2] , DfI confirmed that any future planning application made be made to the Department for Infrastructure. This consultation enable the Applicant to commence the formal Scoping process with DfI Planning.

2.4.2 Scoping

The aim of the Scoping process is to identify key environmental issues at an early stage; determine which elements of the Development are likely to cause significant environmental effects; and identify issues that can be 'scoped out' of the assessment. This exercise for the Development established the work and level of detail required to inform the ES.

[2] Northern Ireland Assembly (2011), Planning Act (Northern Ireland) 2011. Available at: https://www.legislation.gov.uk/nia/2011/25/contents.

Table 2.1 provides an overview of the issues raised by the consultees at the Scoping stage. The detail of the individual responses received during the EIA, including at the Scoping stage, is set out in the relevant technical chapters. Where appropriate, reference is provided as to where the comments have been addressed within this ES. Copies of the scoping report, opinion and responses are provided in **Technical Appendix A2.1: Scoping Report** and **Technical Appendix A2.2: Scoping Opinion**.

Table 2.1. Scoping Responses

Consultee	No Response	No Comments	Landscape and Visual	Cultural Heritage	Ecology / Ornithology	Hydrology / Hydrogeology	Geology, Soils and Peat	Traffic and Transport	Noise	Aviation & Telecoms	Socio-economics / Recreation	Climate Change / Carbon Balance	Other Issues	Overarching EIA Comments	Relevant Chapter
Adelphi Net1 Ltd										✓					15
Arqiva										✓					15
Belfast International Airport										✓					15
BT Radio Network Connection										✓					15
CAA Directorate of Airspace Policy		✓													15
City of Derry Airport										✓					15
DAERA Countryside Management Branch	✓														
DAERA Northern Ireland Environment Agency			✓		✓	✓	✓					✓			6, 8, 9, 10
DAERA Forestry													✓		15
Derry City & Strabane District Council Environmental Health Department									✓				✓		12, 15
DfE Energy Division		✓													
DfC Historic Environment Division				✓											7
DfI Strategic Planning Directorate			✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	6 - 12, 15	
DfI Economics											✓				14
DfI Rivers Agency						✓									8
DfI Roads								✓							13
Everything, Everywhere Ltd	✓														
Geological Survey Northern Ireland							✓								8,9,10
Lough Agency					✓	✓									8, 9, 10

Consultee	No Response	No Comments	Landscape and Visual	Cultural Heritage	Ecology / Ornithology	Hydrology / Hydrogeology	Geology, Soils and Peat	Traffic and Transport	Noise	Aviation & Telecoms	Socio-economics / Recreation	Climate Change / Carbon Balance	Other Issues	Overarching EIA Comments	Relevant Chapter
National Air Traffic Services										✓					15
NI Water- Strategic Applications					✓	✓									8, 10
NIE Windfarm Developments														✓	15
Ofcom Northern Ireland										✓					15
PSNI Information and Communication Services										✓					15
RSPB NI					✓										10
Shared Environmental Services					✓	✓								✓	8, 10, 15
UK Crown Bodies- D.I.O Safeguarding										✓					15
Vodafone (formerly Cable & Wireless) (On behalf of SONI and NIA Networks)										✓					15

2.4.3 *Further Technical Consultation*

In addition to the formal Scoping process, where appropriate, authors of technical assessments within this ES engaged directly with statutory and non-statutory consultees throughout the duration of the ES preparation stage to further refine the scope for each assessment. Consultees contacted in this manner include (amongst others) Geological Service Northern Ireland (GSNI), Northern Ireland Environment Agency - Natural Environment Department (NIEA-NED), DfI Roads, the Department for Communities Historic Environment Division, DfI Economics, Derry City and Strabane District Council (DS&SDC) Tourism Manager and Access Officer, Tourism NI, Sustrans, and Outdoor Recreation (NI).
Public Engagement Pre-Application Community Consultation

The public have been consulted on the Development to date using multiple methods of communication including print and digital formats, along with in person consultation. This consultation was conducted over two main rounds of consultation exercises and is detailed in the Pre-Application Community Consultation (PACC) Report, which will be submitted as a separate document to this ES.

The first round in 2021 comprised:

- Leaflets distributed to all houses within 3 km of the Site in September and November 2021 by the project Community Liaison Officers. An update note delivered by a third party in October 2021. These contained information and updates about the Development and the upcoming consultation events;
- A project website which was regularly updated;
- A virtual exhibition room; and,

- Public consultation events held on: 24th November 2021 at Fir Trees Hotel, Strabane and 25th November 2021 at Owen Roes GAC Club rooms. These were advertised in local newspapers, via posters in the local community and via invitations delivered to all houses within 3km of the Site.

The principal responses that were received in the first consultation round included:

- Support for renewable energy in general;
- Interest on potential impacts of the Development on the existing habitat and wildlife in the area including potential future habitat management proposals;
- Interest on how the new taller turbines would appear in the local area;
- Concerns about noise generated by the existing Owenreagh I & II wind turbines and interest on how the noise output from the Development could be controlled in the future; and,
- Interest in the Community Benefit Fund associated with the Development.

The second round in 2022 comprised:

- Update letter posted to all houses within 3 km of the Site in March 2022;
- Leaflets delivered to all houses within 3 km of the Site in November 2022, by the Community;
- Liaison Officers, with further information about the Development and invitations to the upcoming consultation events;
- A project website which was regularly updated;
- A virtual exhibition room; and,
- Public consultation events held on: 30th November 2022 at Fir Trees Hotel, Strabane; 1st December 2022 at Owen Roes GAC Club rooms; and 29th November at Rouse's Barn on Koram Road for local residents. These were advertised in local Newspaper, via posters in the local community and via invitations delivered to all houses within 3km of the Site.

The project ecologist and landscape consultants attended the consultation events in 2022 to provide further details in respect of ecology and landscape and visual amenity considerations. The principal responses that were received in the second consultation round included:

- Support for renewable energy in general;
- Interest in the results of the ecology surveys, particularly the bat surveys;
- Interest in the increase in turbine height and how this will impact existing residential properties;
- Concerns about noise generated by the existing wind turbines and how noise output from the Development could be controlled in the future, i.e., through the use of noise planning conditions;
- Queries regarding carbon impact of the Development; and
- Interest on the future Community Benefit Fund and expressions of interest on the future use of the fund.

In addition to these general rounds of consultation, the Applicant's team have engaged with individual local people directly, in response to information requests. This has been facilitated by appointing two locally resident Community Liaison Officers, setting up a project email address (info@craignagapplewindfarm.com) which was shared with the community and providing the phone number of the lead Community Liaison Officer to enable members of the public to raise any queries they had about the project.

2.5 TECHNICAL ASSESSMENTS

2.5.1 Phases of Development Assessed

The assessment will consider the likely significant effects of the Development during the following phases of the Development:

- Initial decommissioning and construction (decommissioning of the Operational Owenreagh I and II Wind Farms and construction of the Development);
- Operation of the Development; and
- Final decommissioning of the Development.

The decommissioning of the operational Owenreagh I Wind Farm and Owenreagh II Wind Farm and the construction of the repowering turbines is likely to occur partly in tandem, lasting for a shorter duration but having a greater effect than if the two processes were to arise at different times. This represents a worst-case scenario for assessment purposes. Any effects arising as a result of the future decommissioning of the Development are considered to be no greater than the effects arising when these two phases are combined. As a result, the final decommissioning phase has not been considered further in the assessment chapters.

2.5.2 Abnormal Load Route Works

The focus of the ES is on the main area of land that is proposed to be subject to the Development, as described in **Chapter 3: Development Description**. In addition to this, minor works will be required outside the highway boundary, at certain points along the abnormal load route, these are described and assessed in **Technical Appendix A2.3: Abnormal Load Route Works**. Aside from potential traffic and transport impacts associated with using this route (which are described in **Chapter 13: Traffic and Transport**), all potential environmental impacts of these minor works are not significant in terms of EIA Regulations and are not considered further in the technical assessments provided in chapters 6-15. These minor works are, therefore, scoped out of the EIA.

2.5.3 Structure of Technical Chapters

Each of the technical assessments (in chapters 6 to 15 of this ES) follows a systematic approach with the main steps as follows:

- Introduction, assessment methodology and significance criteria;
- Description of the baseline conditions;
- Assessment of likely significant effects;
- Mitigation measures and residual effects;
- Cumulative effects assessment;
- Summary of effects (residual effects); and,
- Statement of significance.

A summary of each step is highlighted below.

2.5.4 Introduction, Assessment Methodology and Significance Criteria

Each technical assessment sets out the relevant legislation, policy and guidance together with scope and methodology used to carry out the assessment of potential effects, including the criteria that are used to establish which effects are significant. The methodology seeks to ensure transparency in the assessment since each technical assessment has the criteria set out for assessing significance. Where a level of significance is attributed to an effect, this is based on technical guidance and professional judgement, informed by consideration of the sensitivity of the receptor and the degree of the effect.

This section also sets out the scoping requirements and pre-application consultation responses that form the framework and scope of the specialist assessment work for the topic.

2.5.5 Description of Baseline Conditions

In order to evaluate the potential environmental effects, the existing environmental conditions relating to potential effects were recorded through field and desktop research. Prior to the initiation of fieldwork studies, desktop studies were undertaken to gain a better understanding of the study area. Site-specific baseline field surveys were then undertaken by experienced professionals to provide an understanding of the current condition of the development site and the surrounding area.

This forms the baseline, alongside a prediction of these conditions into the future. Such predictions can involve a high number of variables and be subject to large uncertainties, and as a result, in some cases, the current baseline condition is assumed to remain unchanged throughout the timeframe of the Development.

The baseline has been used to assess the sensitivity of receptors within the study areas. Wind farms that are operational or consented at the time of commencing the assessments are treated as being part of the existing baseline except where specific guidance advises to the contrary.

The approach to describing baseline conditions is set out in each relevant technical chapter. Baseline information is used to inform the layout of the Development. From baseline information, constraints were identified which were considered as part of the design process. Further detail on the design process adopted for the Development is detailed in **Chapter 3: Development Description** and **Chapter 4: Site Selection and Design**.

2.5.6 Assessment of Potential Effects

The prediction of potential effects covers the three phases of the Development: (i) initial decommissioning and construction, (ii) operation and (iii) final decommissioning, as different environmental effects are likely to arise during the different stages. The effects during phases (i) initial decommissioning and construction and (iii) final decommissioning are generally considered to be short term effects, and those arising as a result of the operation of the Development are generally considered to be long term effects. Each technical assessment considers the nature of effects and includes cumulative effects with other developments where appropriate.

Following identification of potential environmental effects, the baseline information is used to predict changes to existing conditions and conduct an assessment of these changes.

The significance of effects resulting from the Development will be determined through a combination of the sensitivity of the receiving environment (the sensitivity) and the predicted degree of change (the magnitude) from the baseline state.

2.5.6.1 Sensitivity of Receptors

Environmental sensitivity may be categorised by multiple factors, such as the presence of rare or endangered species, transformation of natural landscapes, soil quality and land-use, etc. The initial assessment, consultation and scoping stages identified these factors along with the implications of the predicted changes.

The sensitivity classification of the receiving environment varies between the different technical areas of assessment e.g. landscape and visual, ecology, noise etc. Sensitivity is normally defined as high, medium, or low. Table 2.2 details a general framework for determining the sensitivity of receptors, informed by NatureScot Guidance[3] ; however, each technical assessment will specify their own appropriate sensitivity criteria that will be applied during the EIA and details will be provided in each technical chapter.

Table 2.2. Framework for Determining Sensitivity of Receptors

Sensitivity of Receptor	Definition
Very High	The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance.
High	The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance.
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value, or is of regional importance.
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance.
Negligible	The receptor is resistant to change or is of little environmental value.

2.5.6.2 Magnitude of Change

For the purposes of environmental assessment, the magnitude of an ‘effect’ is generally dependent on the degree to which the change affects the feature or asset, from a fundamental, permanent or irreversible change that changes the character of the feature or asset, to barely perceptible changes that may be reversible. Magnitude would also encompass the certainty of whether an impact would occur. Magnitude is generally classified as high, medium, low, or negligible. General criteria for assessing the magnitude of an effect are presented in Table 2.3, informed by NatureScot Guidance. Each technical assessment will apply their own appropriate magnitude of effects criteria during the EIA, with the details provided in the relevant EIA chapter.

Table 2.3. Framework for Determining Magnitude of Change

Magnitude of Effects	Definition
High	A fundamental change to the baseline condition of the asset, leading to total loss or major alteration of character.
Medium	A material, partial loss or alteration of character.
Low	A slight, detectable, alteration of the baseline condition of the asset.
Negligible	A barely distinguishable change from baseline conditions.

If the effects of zero magnitude (i.e. none / no change) are identified, this will be made clear in the assessment.

[3] Scottish Natural Heritage (NatureScot) and Historic Environment Scotland (2018), Environmental Impact Assessment Handbook [Online] available at: Publication 2018 - Environmental Impact Assessment Handbook V5.pdf (nature.scot) (Accessed: 25/04/2023)

2.5.6.3 Significance of Effect

The sensitivity of the asset and magnitude of the predicted impacts will be used as a guide, in addition to professional judgement, to assess the level of effects. Table 2.4 summarises guideline criteria for assessing the significance of effects, informed by NatureScot Guidance.

Table 2.4. Framework for Assessment of the Significance of Effects

Magnitude of Effect	Sensitivity of Receptor				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Major / Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

Effects predicted to be of major or moderate significance are generally considered to be 'significant' in the context of the EIA Regulations and are shaded in light grey in the above table. However, professional judgement will be used by the authors and may differ from this slightly – where this is the case, it is explained.

Zero magnitude effects upon a receptor will result in no effect, regardless of sensitivity.

This ES generally follows the above principles in relation to the identification of significant effects; however, some technical assessments may adopt a variation process. The assessment criteria used to determine the significance of effects are made explicit in each technical assessment chapter within this ES.

2.5.7 Mitigation Measures and Residual Effects

The institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Impact Assessment[4] explains how EIA is an iterative process rather than a unique, post design, environmental appraisal. In adopting this approach, the outcomes of the technical environmental assessments are used to advise the design of the Development, and hence attain a 'best fit' with the environment. This approach has been adopted in respect of the Development, where potentially significant effects have been identified, their avoidance or reduction has been prioritised at the design stage. This is referred to within this ES as 'embedded mitigation', i.e. mitigation that is implemented within the project design, and includes best practice in implementing the design, as well as design features.

The design strategy of 'avoidance, reduction and remediation' is a hierarchical one, which seeks to:

- Avoid all potential effects;
- Reduce those which remain; and,
- Where no measures are possible, to propose compensatory measures.

Proposed mitigation measures are discussed within each technical chapter of this ES.

[4] IEMA (2016) Environmental Impact Assessment Guide to: Delivering Quality Development. Available online at: https://www.iema.net/assets/newbuild/documents/Delivering%20Quality%20Development.pdf [Accessed 28/11/2022]

2.5.8 Cumulative Effects Assessment

In accordance with the EIA Regulations, the assessment has considered 'cumulative effects'. By definition, these are effects that result from incremental changes caused by past, present or reasonably foreseeable developments together with the Development being assessed. For the cumulative assessment, the combined effects of several developments in isolation may be insignificant but cumulatively when considered with other developments have a significant effect.

Cumulative assessment addresses the combined effects from the addition of the Development to a baseline of identified wind farms on landscape and visual, hydrology, ecology, ornithology, noise, cultural heritage, traffic and transport, recreation, tourism and other impacts.

Other developments which may come forward in the future, but which do not currently have sufficient information available in relation to their likely effects to make an informed cumulative assessment (e.g., those within scoping), are not considered in detail in this ES.

The extent of any cumulative assessment is defined in each technical assessment chapter and can include both existing and proposed wind farm developments and other forms of development. The potential landscape and visual effects, for example, which relate to the intervisibility of individual wind farm development schemes, will be much more wide-ranging than noise effects which will be limited to receptors in the more immediate vicinity of the Development.

Consideration of cumulative effects has been undertaken for all technical assessments. Where no cumulative effects are likely, this is stated. Operational wind farms are considered to be part of the baseline in the majority of assessments. In relation to some of the technical chapters, specific guidance and policy exists advising that effects associated with existing wind farm developments should be considered as cumulative effects. Where relevant, these are noted within each chapter. A list of planned and operational wind farms used for the cumulative effects assessment is provided in **Technical Appendix A2.4: Cumulative Developments** and was agreed with DfI planning.

2.5.9 Summary of Effects

The residual effects of the Development are those that remain following successful implementation of the identified mitigation and enhancement measures.

Residual effects are identified in each technical assessment alongside an assessment of whether any residual effects are significant or not in terms of the EIA Regulations.

2.6 Assumptions and Limitations of EIA

A number of assumptions have been made during preparation of this ES, as set out below.

The assumptions are:

- The principal land uses adjacent to the Development Site remain as they are at the time of the submission of the Application, except in cases where permission has already been granted for development. In these cases, it is assumed that the approved development will take place, and these have been treated as contributing to "cumulative" effects; and,
- Information provided by third parties, including publicly available information and databases is correct at the time of submission.

The EIA has been subject to the following limitations:

- Baseline conditions are accurate at the time of the physical surveys but, due to the dynamic nature of the environment, conditions may change during the site preparation, construction, and operational phases; and,
- The assessment of cumulative effects has been reliant on the availability of known information as of 26th January 2023 relating to existing wind farm developments within a 30 km radius.

Assumptions specific to certain environmental aspects are discussed in the relevant Chapters of this ES.

The Netherlands
New Zealand
Norway
Panama
Peru
Poland
Portugal
Puerto Rico
Romania
Singapore
South Africa
South Korea
Spain
Sweden
Switzerland
Taiwan
Tanzania
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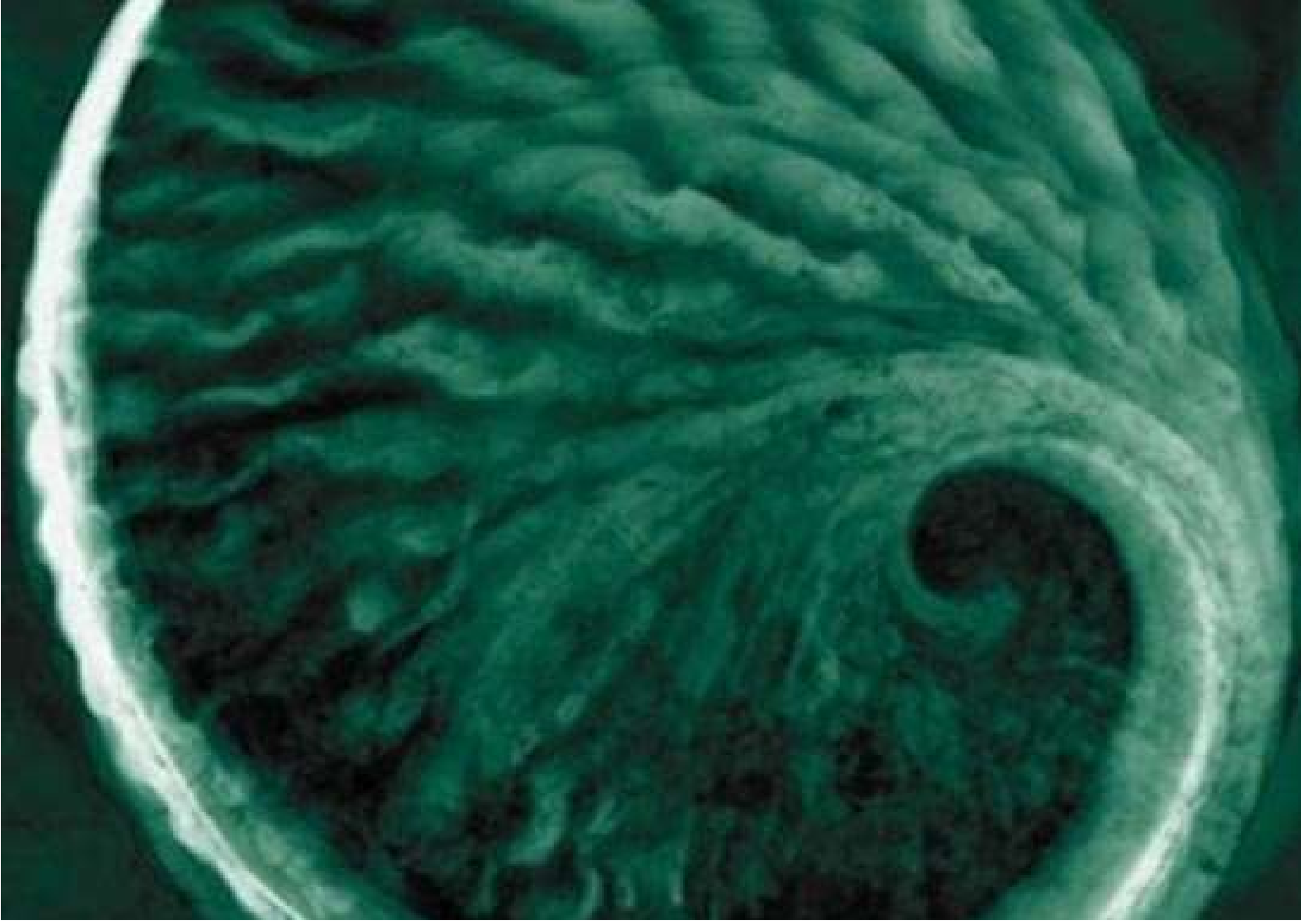

Owenreagh/Craignagapple Wind Farm

Ørsted Onshore Ireland Midco Limited

Environmental Statement – Chapter 3
Development Description

06 September 2023

Project No.: 0696177

The business of sustainability

ERM

Signature Page

06 September 2023

Owenreagh/Craignagapple Wind Farm

Environmental Statement – Chapter 3 Development Description

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Acronyms and Abbreviations

Name	Description
CAA	Civil Aviation Authority
DAERA	Department of Agriculture, Environment and Rural Affairs
oDCEMP	Outline Decommissioning and Construction Environmental Management Plan
DS&SDC	Derry City and Strabane District Council
DfI	Department for Infrastructure
ECoW	Ecological Clerk of Works
EIA	Environmental Impact Assessment
ES	Environment Statement
GCoW	Geological Clerk of Works

GSNI	Geological Service Northern Ireland
GRP	Glass Reinforced Plastic
DHMEP	Draft Habitat Management Enhancement Plan
IEMA	institute of Environmental Management and Assessment
m/s	Metres per Second
MW	Megawatt
m^3	Cubic Metres
NED	Natural Environment Agency
NI	Northern Ireland
NIEA	Northern Ireland Environment Agency
PACC	Pre-Application Community Consultation
oPMP	Outline Peat Management Plan
rpm	Revolutions per Minute
SAC	Special Area of Conservation
SCADA	Supervisory Control and Data Acquisition
T	Tonne(s)
V	Volts
kV	Kilovolts

3. DEVELOPMENT DESCRIPTION

3.1 Introduction

This Chapter of the Environmental Statement (ES) provides a description of Owenreagh/Craignagapple Wind Farm (the Development) which forms the basis of the assessments presented within Chapters 6 to 15. It provides details of the different phases of the Development:

(i) Decommissioning and construction;

(ii) Operation; and,

(iii) Final decommissioning.

This chapter includes an overview of the Development followed by a description of the main components and their method of construction. Measures that have been built into the design of the Development to reduce effects, also known as 'embedded' mitigation measures, are set out. In addition to these embedded mitigation measures, Chapters 6 to 15 present mitigation and enhancement measures where specifically relevant to their assessment topic, with a summary of mitigation provided in **Chapter 16: Summary of Effects and Mitigations**.

The main Development components are shown on plan in **Figure 3.1: Development Layout**.

This Chapter of the ES is supported by the following Technical Appendix documents provided in **Volume 4** ES Technical Appendices:

- **Technical Appendix A3.1: Outline Decommissioning and Construction Environmental Management Plan (oDCEMP);**
- **Technical Appendix A3.2: Draft Habitat Management Enhancement Plan (DHMEP); and,**
- **Technical Appendix A3.3: Outline Peat Management Plan (oPMP).**

This Chapter of the ES is supported by the following Figures provided in **Volume 3a**:

- **Figure 3.1: Development Layout;**
- **Figure 3.2: Comparison of the Development, Operational Wind Farms, and the Consented Wind Farm;**
- **Figure 3.3: Micrositing Area;**
- **Figure 3.4a: Indicative V136 Turbine Elevation;**
- **Figure 3.4b: Indicative N133 Turbine Elevation;**
- **Figure 3.5: Indicative Turbine Foundation;**
- **Figure 3.6: Indicative Crane Hardstanding;**
- **Figure 3.7: Indicative External Transformer;**
- **Figure 3.8: Indicative Cable Trench Detail;**
- **Figure 3.9: Indicative Substation Compound;**
- **Figure 3.10: Indicative Substation Elevations;**
- **Figure 3.11: Indicative Substation Floor Plans;**
- **Figure 3.12a: Indicative Primary Temporary Construction Compound;**
- **Figure 3.12b: Indicative Secondary Temporary Construction Compound;**
- **Figure 3.13: Indicative Culvert Details;**
- **Figure 3.14: 'Cut Track' Access Track Design;**
- **Figure 3.15: 'Floating Track' Access Track Design; and,**
- **Figure 3.16: Potential Grid Routing Options.**

3.2 EXISTING DEVELOPMENT AT THE SITE

The Development and its context are described in Section 1.3 of **Chapter 1: Introduction** and further detail where relevant to the assessment of likely significant effects is provided in chapters 6 to 15.

The operational Owenreagh I and Owenreagh II Wind Farms, and the consented Craignagapple Wind Farm are located within the proposed Development, as detailed in the following section. A comparison between the Development and the operational Owenreagh I and II Wind Farm and the consented Craignagapple Wind Farm is shown in Figure 3.2.

3.2.1 Description of the Operational Owenreagh I and II Wind Farms

The operational Owenreagh I Wind Farm was constructed in 1997, comprising 10 turbines with 40 m hub height and 40 m blade diameter. One turbine has since been decommissioned and removed. The operational Owenreagh II Wind Farm comprises 6 turbines, operational since 2008, with 40 m hub height and 52 m blade diameter.

3.2.2 Description of the Consented Craignagapple Wind Farm

Planning permission (Planning Ref: Planning Ref: J/2010/0481/F) for Craignagapple Wind Farm was granted in January 2018. The consent included for six turbines with tip height up to 111 m. As outlined in **Chapter 1: Introduction**, these turbines were not constructed, and the planning application consent period expired in January 2023.

3.3 OVERVIEW OF THE DEVELOPMENT

The Development comprises the decommissioning and repowering of the Operational Owenreagh I and II Wind Farms.

The Development will comprise of the following main components:

- Decommissioning and removal of the existing turbines;
- Two temporary construction compound/laydown areas (some areas may be reinstated temporarily if required for future operational and decommissioning purposes);
- Removal and restoration of the existing crane hardstandings, access tracks and any other above-ground infrastructure in accordance with the **Technical Appendix A3.1: oDCEMP** and **Technical Appendix A3.2: DHMEP**;
- Construction and/or upgrading of seven Site access points onto the public highway;
- Construction of approximately 3,947 m of new access tracks;
- Upgrade of approximately 382 m of existing access tracks;
- Construction of turning heads and passing places on the access tracks;
- The erection of up to 14 three bladed horizontal axis wind turbines of up to 156.5 m tip height;
- Construction of temporary and permanent hardstanding areas for each turbine to accommodate turbine component laydown areas, crane hardstanding areas and internal or external transformers and/or switchgear;
- Construction of turbine foundations;
- There are no upgraded water crossings and two new water crossings;
- Installation of buried underground electrical and communication cables;
- Construction of a substation and control building, and associated compound, including windfarm and grid connection operating equipment; and,
- Associated ancillary works.

In addition to the above, there is a requirement for minor works along the abnormal load route. These are assessed and scoped out of the EIA in **Technical Appendix A2.3: Abnormal Load Road Works**.

The layout of the Development is shown in Figure 3.1 and details of each component are provided below in Table 3.1. The additional land-take for the Development is shown below and compared to that of the operational Owenreagh I and II Wind Farms footprint. The total land-take required for the operational phase will require 0.337 ha of redundant land to be reinstated and 22.186 ha of additional land take.

Table 3.1. Temporary and Permanent Land-Take and Re-instatement Areas

Development Element	Redundant area to be re-instated (ha)	Additional Land-take for the Development (ha)	Total Site area for the Operational Phase (ha)
Turbine Foundations	0	0.439	0.439
Crane Hardstandings, including earthworks and verges	0	9.208	9.208
Blade Laydown Areas, including earthworks and verges	0	3.805	3.805
Access Tracks, including junction improvements	0.337	5.165	5.502
Substation Compound including Energy Storage Units compound	0	2.28	2.28
Windfarm Construction Compound	0	1.379	1.379
Total	**0.337**	**22.276**	**22.613**

3.3.1 Micrositing

A micrositing allowance is included in the application and is assessed in this ES to allow the layout to respond to detailed pre-construction ground surveys and the final choice of turbine model and installation equipment. This is common practice for wind farm developments as it facilitates adaptive mitigation and optimisation at the detailed design stage, post-consent. The micrositing allowance is for the layout of the proposed infrastructure to be varied by up to 50 m (in all directions) from the indicative design footprint, subject to all of the following limitations being met:

- Approval is given by the Ecological Clerk of Works (ECoW) and Geological Clerk of Works (GCoW) appointed for the change;
- Infrastructure will not be relocated such that there is an impact on active peat as assessed in the ES;
- Infrastructure will not be relocated to within 50 m of, or if it is already within 50 m then any closer to, a watercourse that is within the catchment of the River Foyle, to minimise potential effects on the River Foyle and Tributaries SAC; and
- Planning conditions relating to noise would be complied with.

The potential micrositing areas, are shown on Figure 3.3. The potential for micro-siting was considered when the detailed survey and assessment work was undertaken. For example, the habitat and archaeological surveys covered a wider area than just the footprint of the proposed turbine and access track locations (full details of survey areas can be found in the relevant assessment chapters).

Any likely significant effects arising from micrositing have been considered in the preparation of this ES, and specific areas to be avoided have been identified in technical chapters where necessary.

3.4 THE DEVELOPMENT COMPONENTS

3.4.1 Wind Turbines

Planning permission is being sought for the erection of up to 14 three-bladed horizontal axis wind turbines with a maximum height from base to tip that will not exceed 156.5 m. Figure 3.4a and Figure 3.4b illustrates the turbines of this type that are being considered for the Development. The blades will be made of fiberglass reinforced epoxy and mounted on a tapered tubular steel or steel and concrete tower. The turbines will be of a typical modern, three blade, horizontal axis design, light grey in colour and the finish of the tower and blades will be semi-gloss and semi-matt respectively.
Each of the turbines comprises of the following components:

- Blades;
- A tower;
- A nacelle;
- A hub; and,
- An external transformer and/or external switchgear.

The final choice of turbines will be guided by an assessment of the wind conditions, this ES together with feedback from consultation, and a pre-construction tendering exercise which will take account of the available technology at the time of construction. Currently it is considered likely that turbines with up to 4.8 MW capacity may be available within the envelope of the proposed physical parameters as defined within Table 3.2. For the purposes of the assessments a “candidate turbine” has been selected based on the precautionary principle of assessing the worst-case scenario.

Table 3.2. Turbine Physical Parameters

Turbine Parameter	Assessment Envelope
Turbine tip height	Up to 156.5 m
Rotor diameter	Up to 136 m
Tower section length	Up to 90 m
Tower section diameter	Up to 4.38 m

The assessment of the candidate turbine has been based upon a maximum rotor of 136 m as this is deemed to be worst case scenario.

Turbines are typically of a variable speed type, so that turbine rotor speed will vary according to the energy available in the wind. Turbines with parameters similar to those set out in Table 3.2 typically have a rotational speed of between 9 and 19 revolutions per minute (rpm), depending on variations in wind speed, generating power for all wind speeds between c. 4 and c. 25 metres per second (m/s). At wind speeds greater than c. 25 m/s, the turbines will automatically shut down for self-protection.
The turbines are computer controlled to ensure that at all times, the turbine faces directly into the wind to ensure optimum efficiency. The rotors of all 14 turbines will rotate in the same direction relative to the wind direction, however, the localised wind conditions will determine the orientation of each turbine individually.

In high wind speeds, the wind turbines will ‘yaw’ out of the wind as instructed by their own control software, to maintain their operation prior to cutting out should the high wind speed conditions exceed the wind turbine’s safe operating limits.

When operating, the rotational speed of the blades is transferred and increased through a gearbox, to drive a generator which is located in the hub of the turbine. This produces a three-phase power output typically at 690 Volts (V), which is transferred from the generator to a turbine transformer that is typically located close to the base of the turbine but external to the turbine. The turbines will be controlled and monitored from within the substation and will also be remotely monitored including recording performance details and statistical information for each turbine. Staff servicing the turbines on a routine basis will be based in Ireland. Table 3.3 details the locations of the turbine bases (subject to micrositing, as set out in Section 3.3.1).

Table 3.3. Proposed Turbine Location Co-ordinates

Turbine ID	Co-ordinates	
	Easting	Northing
1	241749	397104
2	241697	396512
3	242279	397038
4	242607	396876
5	242209	396377
6	242982	396705
7	243326	397192
8	243450	396645
9	243748	396357
10	243345	395923
11	242969	396059
12	242525	396115
13	243895	397108
14	244218	396755

3.4.2 Turbine Foundations and Crane Hardstandings

A full ground investigation will be completed prior to construction; however, a typical turbine foundation will consist of an octagonal or circular reinforced concrete base approximately 20-25 m in diameter. An indicative turbine foundation is shown in Figure 3.5 and accounts for the 'worst case' scenario to allow for any potential variations in turbine foundation diameter at the time of construction. The area of excavation will be sized accordingly to allow for a stable, clear, and safe working area around the concrete turbine foundation.

Construction of the turbine foundations will require the excavation of subsoil to expose a suitable formation material. The formation will be levelled off prior to the in-situ casting of a steel-reinforced concrete foundation. It is estimated that each foundation will require approximately 450 cubic metres (m^3) of concrete and up to 100 tonnes (t) of steel reinforcement. Cable ducts and other ancillaries will be installed within and adjacent to the foundation. The area above the foundations will be backfilled using suitable fill materials up to the turbine foundation plinth and will form part of the permanent crane hardstanding area for each turbine. The final foundation design will be specific to the turbine model selected and the Site conditions as verified during detailed site investigations undertaken prior to construction commencing.

Each turbine requires an area of hardstanding adjacent to the turbine foundation to provide a stable base on which to site the turbine components and crane for the erection of the turbine. The working area at each hardstanding area will be a maximum size of 173.75 m by 62.8 m. However, the final arrangement of the hardstanding will depend on the selected turbine manufacturer and model, the method of erection and exact specification of the cranes chosen by the turbine erection contractor. The hardstandings will be sufficiently level and with a suitable load-bearing capacity to ensure the safe storage of turbine components and operation of the cranes. Turning areas are provided to facilitate the transportation of turbine components, assembly cranes, and construction traffic onsite. An indicative hardstanding arrangement that accounts for the 'worst case' scenario to allow for any potential variations in hardstanding arrangements at the time of construction is shown in Figure 3.6, and their indicative location and configuration including turning areas are shown in Figure 3.1. The crane hardstandings and turning areas will remain in place during the lifetime of the Development to facilitate maintenance works.

Surface water and groundwater levels will be managed to ensure that natural drainage patterns are maintained and that water levels within excavations do not rise beyond appropriate and safe limits. Cable ducts and other ancillaries will be installed within the foundations and under the access track crossing points. Further detail on drainage is included within **Technical Appendix A3.1: oDCEMP** and **Technical Appendix A8.5: Outline Surface Water Drainage Strategy**.

The hardstanding pads will be left in place during the operation phase in case there is a need to repair or replace any blades. The surrounding areas will be reinstated following construction in accordance with **Technical Appendix A3.2: DHMEP**.

3.4.3 Transformers, Switchgear and Cabling

Depending on the final choice of turbine, transformers will either be located within the nacelle which sits at the top of each turbine tower (with internal switchgear), within the tower itself or externally, close to the base of the tower. An external transformer will normally be placed within steel or glass reinforced plastic (GRP) housing along with an external switchgear, on a concrete foundation pad as allowed for as part of the Development. An indicative design of the external transformer is illustrated in Figure 3.7 and accounts for the 'worst case' scenario to allow for any potential variations in the external transformer design. The size of the High Voltage transformer and switchgear will depend on the type of turbine selected and indicative dimensions are shown in Figures 3.9 and 3.10.
The transformers will be either oil-filled with a bunded footing to remove any risk of spillage or a solid cast resin type which is effectively non-polluting. The transformers will increase the electrical voltage typically from 690 V to 33 kilovolts (kV).

Turbines will typically each be connected by 3 no. single phase power cables which will be laid in shallow trenches alongside the access tracks. The excavated trenches will also include SCADA cables or fibre optic cables. This will allow interrogation and control of individual turbines as well as remote monitoring. A copper cable will also be located in the trench and will be connected to the substation and each turbine to provide an earthing system for protection against lightning strikes and electrical faults. Details of typical trenches are shown in Figure 3.8 and accounts for the 'worst case' scenario to allow for any potential variations in cable trench design specifications at the time of construction.

3.4.4 Onsite Substation and Associated Compound

A new substation will be required as part of the Development. This will be sited within the substation compound and be designed to the standard required by Northern Ireland Electricity (NIE) Networks for the accommodation of substation equipment and will include an operations compound. Subject to NIE approval, the existing substation will be decommissioned, the ground surface will be cut 1.0 below ground surface and backfilled with reused soils.

The area for the substation is proposed to a maximum size of 90 m by 180 m to account for potential future substation design specifications that may be required by NIE, which will be further refined with the grid connection application (refer to Section 3.4.9). The area for the substation will contain a substation building and ancillary equipment, including the transformers, switch gear, fault protection, metering, component storage, car parking and other ancillary elements necessary for the operation of the Development. This new substation will be in addition to the Applicant's own IPP substation infrastructure that will be developed on site, which will include 2 structures measuring 90 m by 55 m. The indicative substation design is represented on Figure 3.9.

The appearance and finish of the substation buildings will be similar to an agricultural building, while the final appearance would be agreed with DfI Planning via the use of an appropriately worded planning condition.

The wastewater will drain to a cesspit located adjacent to the substation building which will be emptied when necessary. If technically feasible, a rainwater harvesting system will be installed as a source of non-potable water for flushing of toilets, etc. Any rainwater not captured by this system will be drained from the substation building compound footprint to a soakaway or a suitable surface water discharge point located in a suitable area nearby, as detailed in **Technical Appendix A8.5: Outline Drainage Strategy**. The proposed location and indicative layout of the substation compound are shown in Figure 3.1 and 3.9, respectively. The indicative elevation drawings and floor plan for the substation building are presented in Figure 3.10 and Figure 3.11, respectively. These indicative designs account for the 'worst case' scenario to allow for any potential variations to substation infrastructure design.

3.4.5 Temporary Construction Compounds and Laydown Areas

The temporary construction compounds will be located as shown in Figure 3.1. These locations have been selected to minimise environmental effects. The compound close to T8 will have dimensions of approximately 100 m by 80 m, while the compound close to T1 will have dimensions of approximately 70 m by 35 m. Indicative compound arrangements are shown in Figure 3.12a and Figure 3.12b, respectively. These indicative designs account for the 'worst case' scenario to allow for any potential variations temporary construction compound design.

The compounds will comprise a hardstanding area for parking and for receipt and storage of plant, equipment and delivered materials. In addition, they will form a laydown area for the decommissioned turbine components prior to their removal from the Site. A waste management area will also be provided along with temporary office and welfare facilities, including Portakabin-style toilets with provision for sealed waste storage and removal. Facilities will be provided for diesel storage and generators and an area designated for re-fuelling. The compounds will be restored following the completion of construction works.

The area will be stripped of topsoil and subsoil to expose a suitable formation. The stripped material will be stored close by for future re-instatement. A geosynthetic material base or similar will then be laid, followed by a layer of suitable rock material, and then a further geosynthetic material laid prior to the top surface of blended finer aggregate.

Following completion of the decommissioning and construction phase, the compound will be removed, and the areas restored. These areas may be reinstated in support of any future maintenance or decommissioning activity as required.

3.4.6 Access to the Development

Turbine components and other construction vehicles will access the Site via the local road network. The proposed haul route is shown in Figure 13.1.

Minor works are required to land away from the Site, along the haul route, to facilitate the movement of large components along local roads during the construction phase. Where works are required, best practice measures will be followed. These measures include minimising the length of time any outages or diversions occur, with residents notified of the planned works, in order to minimise any disruption to those residents potentially affected.

The Development will be accessed from the public roads via seven access points along Glenmornan road and Napple road. This was the result of a design process that aimed to minimise the effect on active peat on the Site, such that more use of the public road and a lower on-site footprint was chosen in preference to an extensive network of on-site tracks. The access points are shown on Figure 3.1. The access point locations have been selected to maximise visibility of and for vehicles entering and leaving the Site. Visibility splay figures are provided for each access point as planning application figures and assessed in **Technical Appendix A13.4: Access Junction Design and Visibility Splay Assessment**.

A transport assessment has been undertaken in support of the application for the Development and this provides details on access route options for decommissioning/construction vehicles and provides an estimate of trip generation during this period. The transport assessment includes a routing study to establish the feasibility of the access route for turbine delivery from Foyle Port Derry/Londonderry to the Site entrances. Details of this and assessment of traffic impacts during the initial decommissioning/construction and operational phases of the Development are provided in **Chapter 13: Traffic and Transport**.

3.4.7 Onsite Access Tracks

Where possible the existing access tracks will be retained, utilised and upgraded as necessary to access the proposed turbine positions. Tracks required to access new elements of the Development will be retained throughout the operational life of the Development to enable maintenance of the turbines and replacement of any turbine components. In total, approximately 3.947 km of new access tracks will be required, with approximately 382 m of existing track requiring localised widening.
The access track layout has been designed considering a range of environmental and technical constraints, including breeding birds, active peat, sensitive habitats and steep slopes. All tracks are designed to respond to turbine supplier track requirements and will provide a 5 m wide running surface with localised widening on corners or areas of steeper slopes and will enable access to the turbine locations. The track spurs will have ‘dead-ends’ with turning heads provided where necessary; these turning heads will reuse areas of existing and redundant infrastructure where possible. Tracks will have passing places where necessary.

Access tracks will be constructed with a ‘cut track’ design where there is less than 1 m depth of peat and using a ‘floating track’ design elsewhere (as shown in Figure 3.15 and 3.14 respectively). Analysis of peat-depth survey data, collected as part of the EIA process (see **Chapter 9: Geology and Peat**), suggests that the average peat depth at proposed new track is 0.7 m and the majority is within topsoil or peat of depth less than 1 m.

Access tracks will be constructed with graded stone aggregate won from cut activities, re-use of existing materials from redundant infrastructure or stone imported from local quarries to provide a level surface and will incorporate geosynthetic layers to strengthen the track as necessary. The running surface will be made of a durable surfacing material resistant to crushing, formed from selected crushed and compacted stone.

Construction of a ‘cut track’ design involves the topsoil and peat being stripped to expose a suitable formation on which to build the track. The track will then be constructed on the formation by laying and compacting crushed rock to a depth dependent on ground conditions and topography, although generally the surface of the track will be flush with, or raised slightly above, the surrounding ground level. Geosynthetic layers will be incorporated at the formation and/or within the crushed rock as required to minimise the amount of material required. The upper soil/peat horizon, together with any vegetation, will be placed to one side for later reinstatement, if appropriate.

The construction of the ‘floating track’ will not require the removal of surface vegetation or peat near the surface. Instead, a geogrid layer will lie on the surface of the ground, with the road being built on an embankment above this base layer.

3.4.7.1 Access Track Drainage and Watercourse Crossings

Access track drainage will be designed to maintain the existing hydrological environment as far as practical. More information on this is provided within the **Technical Appendix A3.1: oDCEMP**.

The number of watercourse crossings has been minimised through the design process. More information on proposed watercourse crossing locations and designs is provided in **Technical Appendix A8.4: Watercourse Crossing Inventory**.

3.4.8 Site Signage

During the decommissioning and construction phase, the Site will have suitable signage to protect the health and safety of workers, contractors, and the general public.

During the operational phase, there will be a sign giving the operator’s name, the name of the Development and an emergency contact telephone number. On the turbines and the substation, there will be further signs giving information about the component, potential hazards, the operator’s name, the location grid reference and the emergency telephone number. The final location and design of the signage will be defined prior to the Development becoming operational.

Several surrounding landowners utilise the existing access tracks within the Development design and will be directly affected by the Development. The proposed new access tracks will mitigate these effects and where required, be left in situ after the final decommissioning (Refer to Section 3.7).

3.4.9 Grid Connection

The grid connection will be subject to a separate planning application, which will be accompanied by its own ES. This will either be done by SONI (Northern Ireland’s transmission system operator) or by the Applicant.

In initial discussions with SONI, they identified two potential grid connection points: Strabane 110kV substation and Killymallaght 110kV substation. Once an application is made, SONI will conduct studies post consent to determine which is the best point of connection. The windfarm will connect to the substation via either an overhead line (OHL) or underground cable along the public road system. The potential grid connection routes and connection points are illustrated on Figure 3.16.

There will also be an electricity substation on site with control and safety equipment for the grid connection. The substation will be located adjacent to the Glenmornan Road for ease of access. The substation building is included in the Development planning application.

Underground cabling, laid where possible alongside the new access tracks, will link the turbine transformers to the onsite substation building. Where existing track is being re-used, the cables will be laid in a cable trench alongside the existing track. Generally, the redundant cable will be removed and recycled or cut off and left in situ as appropriate and in accordance with the **Technical Appendix**

A3.1: oDCEMP and **Technical Appendix A3.2: DHMEP**, in order to minimise disturbance to the environment.

3.5 DECOMMISSIONING AND CONSTRUCTION PROGRAMME

The first phase of the Development will comprise the initial decommissioning phase and removal of the existing turbines, external transformers, and wind monitoring masts from the Site. It is anticipated that the turbines and external transformers will be carefully dismantled and transported offsite, possibly for resale in the second-hand market. For the purposes of undertaking the EIA, it is assumed that the initial decommissioning and construction phases are likely to commence in 2025 at the earliest. The date can only be confirmed following consent for the Development and confirmation of the grid connection timelines by NIE. It will also be influenced by any prevailing market conditions and requirements.

The decommissioning of the operational Owenreagh I and II Windfarms is expected to take approximately three months following an initial period of four weeks, during which the temporary construction compounds will be constructed and existing tracks and crane hardstandings will be cleared of vegetation and upgraded for use by decommissioning vehicles as required.

Following initial track construction and upgrade, cranes will be used to split the turbines into suitable sections, which will then be transported from the Site by heavy goods vehicles (HGVs). Following removal of the blades, power cables will be disconnected and lowered with control cables left in place before the tower sections are lowered.

In those locations where the areas of the turbine and transformer bases will not form part of the new crane hardstanding and laydown areas, they will be cut to 1 m below the surface and backfilled with suitable topsoil, generated from the construction activities elsewhere in the Site. Those areas of hardstanding and access track which are being reused will be retained, whilst unaffected areas of hardstanding and access track that have already naturally regenerated will either be left in situ, or removed and reinstated, with materials reused in the construction activities elsewhere on the Site and in accordance with **Technical Appendix A3.1: oDCEMP** and **Technical Appendix A3.2: DHMEP**.

It is expected that the construction phase of the Development will run in parallel with the decommissioning of the operational Owenreagh I and II Wind Farms and take approximately 12 months in total. This period is somewhat weather dependent and could be affected by onsite conditions. It is envisaged that the decommissioning/construction programme would follow the broad outline as detailed in Table 3.4.

Table 3.4. Indicative Decommissioning/Construction programme

Month / Activity	1	2	3	4	5	6	7	8	9	10	11	12
Site Establishment												
Decommissioning of existing turbines												
Access road, upgrade,												

widening, removal and construction												
Substation Construction												
Excavation and construction of turbine foundations and hardstandings												
Cable installation and electrical works												
Turbine delivery and erection												
Turbine commissioning												
Site restoration												

It is advantageous for works within the peatland areas of the Site to take place at the driest time of year to minimise disturbance to the peatland habitats and minimise any potential peat slide risk. Whilst the programme for decommissioning and construction will be developed to account for the bird breeding season, should works be required over the summer months best practice measures will be utilised to avoid disturbance to birds. Any such works would be undertaken in line with the mitigation measures described in **Chapter 11: Ornithology**. These measures include but are not limited to:

- Utilisation of an ECoW during decommissioning and construction;
- Limiting the use of fencing; and,
- Water quality monitoring.

3.5.1 Working Hours

In general, working hours for the decommissioning and construction phase will be from 07:00 to 19:00 throughout the week, with reduced working hours at weekends. It should be noted that during the turbine erection phase, operations may proceed around the clock to ensure that lifting operations are completed safely.

3.5.2 Site Restoration

Following construction activities, areas of land used temporarily will be restored. These would include the construction compounds and any other working areas around the infrastructure. **Technical Appendix A3.3: oPMP** includes methods used for reinstatement of both disturbance from the decommissioning and construction activities as well as re-instatement of redundant infrastructure. This forms an integral part of the post-construction restoration programme to be carried out in accordance with **Technical Appendix A3.1: oDCEMP** and **Technical Appendix A3.2: DHMEP**. These methods will be agreed with DfI Planning in consultation with relevant statutory authorities prior to the commencement of restoration works.

Should future works be required to maintain the Development the temporary construction areas may be reused and temporarily reinstated as required for maintenance purposes.

3.5.3 Decommissioning and Construction Environmental Management Plan

The Applicant will appoint an Infrastructure Contractor who will have overall responsibility for environmental management on the decommissioning/construction site (the Contractor). The services of specialist advisors will be retained as appropriate, such as an archaeologist, project ECoW, ecologist, and geo-technical engineer to be called on as required to advise on specific environmental issues. The appointed Contractor will ensure construction activities are carried out in accordance with the mitigation measures outlined in this ES.

Technical Appendix A3.1: oDCEMP sets out guidance and best practice for adoption during the decommissioning and construction phases of the Development. The oDCEMP provides an overview of the environmental management and decommissioning, and construction best practice designed to reduce the potential for any environmental effects during these phases.

To ensure that the mitigation and management measures detailed within this ES are carried out, construction personnel and contractors will be required to adhere to the oDCEMP which will form an overarching document for all decommissioning and construction site management requirements.

Contractors will also be required to adhere to the following to minimise environmental effects of the decommissioning and construction process:

- Conditions required under the planning permission; and,
- Any other relevant mitigation measures identified in **Chapter 16: Summary of Effects and Mitigation**, of this ES, including how the Contractor will implement this mitigation and monitor its implementation and effectiveness e.g. the control of noise and dust, and waste.

The final DCEMP used in the decommissioning and construction phase would be based on the oDCEMP provided with this ES and will be agreed with DfI Planning and the relevant statutory consultees prior to commencement of construction. Performance against the DCEMP will be monitored by the Applicant’s Construction Project Manager throughout the decommissioning and construction phases.

Particular environmental impacts and associated mitigation measures required to be addressed within the DCEMP are discussed in the relevant sections of this ES. Such as:

- Noise and vibration;
- Dust and air pollution;
- Surface water and groundwater;
- Ecology and ornithology (including the protection of habitats and species);
- Cultural heritage;
- Waste, pollution and incidence response; and,
- Site operations, including working hours and health and safety onsite.

The DCEMP will work in conjunction with other documents produced prior to construction, whereby there will also be a requirement to manage other aspects of the Development such as the movement of traffic, to and from the site, including for the movement of abnormal loads and daily workers commute, including mitigation for impacts to public transport and local private access arrangements.

3.6 Operational Phase

A 40-year operational lifespan of the Development has been assumed for the purposes of this assessment.

If a turbine is non-operational for a period of 1 year or more, it will be decommissioned. When the last turbine is decommissioned, the whole Development (including tracks and other infrastructure) will be decommissioned. The potential effects of decommissioning are included in this ES. More information is provided in Section 3.7.

3.6.1 Turbine and Infrastructure Maintenance

Turbine maintenance will be carried out in accordance with the manufacturer’s specification. The following routine turbine maintenance will be undertaken:

- Initial service;
- Routine maintenance and servicing;
- Gearbox oil changes;
- Blade, gearbox and generator inspections; and,

- Replacement of blades and components as required.

Operational site inspections will be undertaken by the Applicant's staff, on a weekly basis and the servicing of turbines will be undertaken as per the turbine manufacturers requirements, usually once per year, but with monthly visits by the manufacturer's servicing team.

Ongoing track maintenance will be undertaken to ensure safe access is maintained to all parts of the Development all year round.

It is expected that the Development will continue to employ a site supervisor on a permanent basis, for regular operational and maintenance activities.

3.7 Final Decommissioning

It is assumed that the Development will at some point require to be decommissioned, whether because the maintenance of the turbines becomes too expensive or for other reasons. When this happens, the process would be similar to the decommissioning of the operational Owenreagh I and II Wind Farms described above, although it is likely that some of the access tracks may be left in situ if required by the land owners, to facilitate ongoing land management at that time.

The potential effects arising from such decommissioning will be less than the effects arising as a result of the combined initial decommissioning and construction phase described above. The initial decommissioning and construction phase, therefore, represents the worst-case parameters for the final decommissioning phase for assessment purposes.

As for the decommissioning and construction phase, it is assumed that the final decommissioning phase can be addressed via a decommissioning planning condition. The suggested wording for this planning condition is outlined in the **Planning Statement**.

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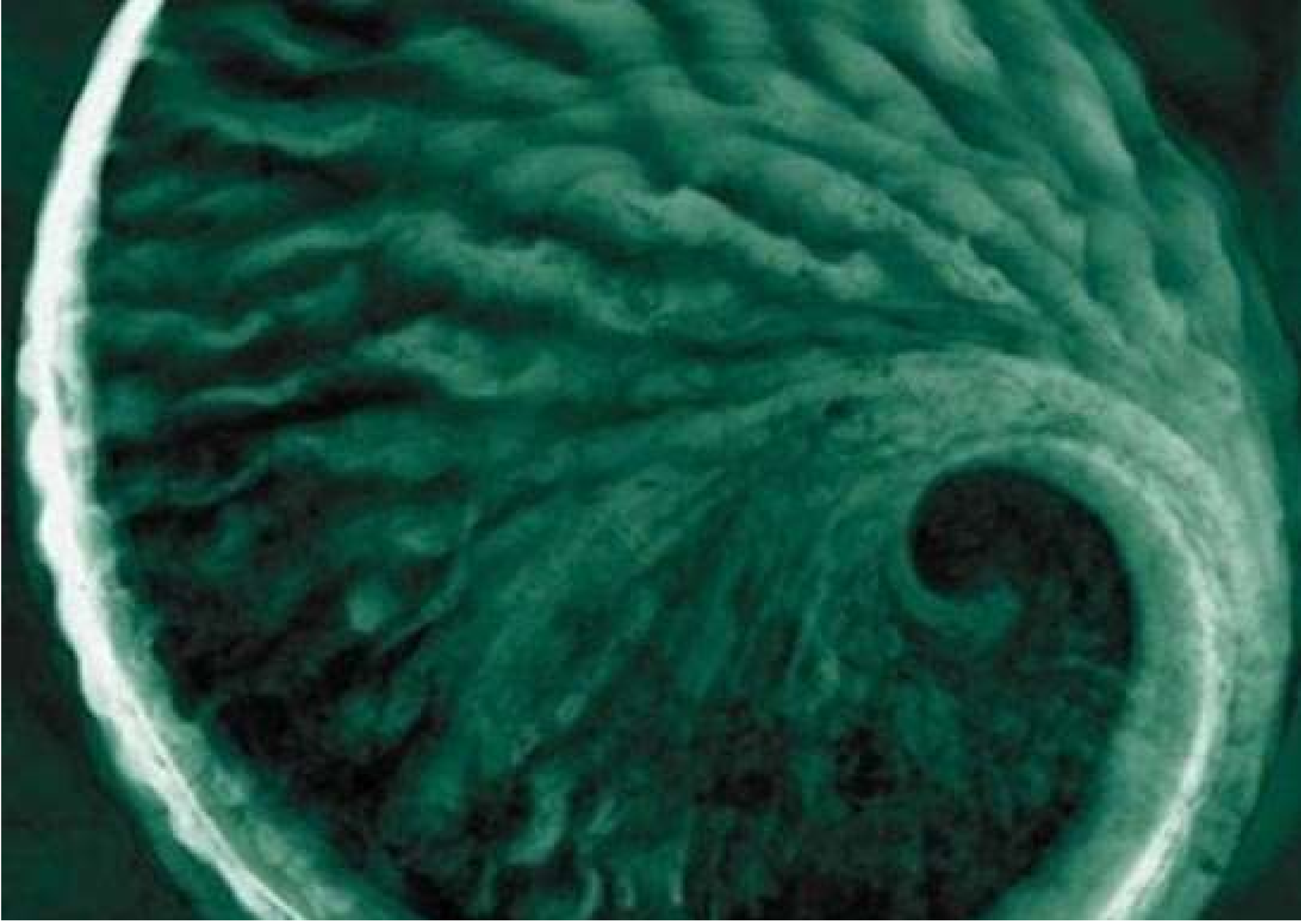

Owenreagh/Craignagapple Wind Farm

Ørsted Onshore Ireland Midco Limited

Environmental Statement – Chapter 4 Site Selection and Design

06 September 2023

Project No.: 0696177

The business of sustainability

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06 September 2023

Owenreagh/Craignagapple Wind Farm

Environmental Statement – Chapter 4 Site Selection and Design

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CONTENTS

Acronyms and Abbreviations

Name	Description
AONB	Areas of Outstanding Natural Beauty
DfI	Department of Infrastructure
GSNI	Geological Service Northern Ireland
EIA	Environmental Impact Assessment
ES	Environmental Statement
ETSU	Energy Technology Support Unit
LVIA	Landscape Visual Impact Assessment
NIEA	Northern Ireland Environment Agency
OSNI	Ordnance Survey of Northern Ireland
SAC	Special Area of Conservation
SPPS	Strategic Policy Planning Statement

4. SITE SELECTION AND DESIGN

4.1 Introduction

This chapter of the Environmental Statement (ES) contains a description of the site selection process and design iterations that were undertaken, arriving at the final design of the Development (Figure 3.1), which is described in detail in **Chapter 3: Development Description**.

This chapter contains the following sections:

- Site Selection Process;
- Do Nothing Scenario;
- Development Brief;
- Development Design Strategy;
- Key Environmental Design Considerations;
- The Design Iteration Process; and,
- Summary.

This chapter contains the following figures:

- **Figure 4.1: Layout Evolutions and Comparison**

4.2 Site Selection Process

The Site was considered appropriate for the following reasons:

- The Site already contains the Operational Owenreagh I and II Wind Farms which have been operational since 1997 and 2008, respectively. The Site also includes land which was subject to the planning permission for Craignagapple Wind Farm, comprising 6 turbines with tip height up to 111 m. There is already a meteorological mast and LiDAR measurements which show that there is an excellent, proven wind resource at the site;
- The existing technology is no longer state-of-the-art, and modern wind turbines are capable of producing more power from fewer turbines;
- The repowering of the site (removal of existing Owenreagh I and II turbines and installation of new turbines) allows an existing wind farm to continue operating and contributing towards renewable energy targets albeit with more modern and more efficient turbines. The benefit of this is an increased overall generating capacity and output, contributing to the local economy and Northern Ireland's climate targets;
- Repowering the Operational Owenreagh I and II Wind Farms increases renewable energy generation capacity and re-uses the existing infrastructure wherever possible. This results in a development with a smaller footprint and fewer environmental effects compared to a similar development without existing infrastructure;
- The Applicant has been conducting detailed ecology and ornithology surveys on the site since 2018 and is familiar with the importance of local habitats in this area. Survey information gathered has been used to inform best practice measures to protect existing habitats and species of concern;
- It is a location in which a development can accord with the principles set out in Energy Policy in relation to the need for renewable energy as described in **Chapter 5: Policy & Legislative Context**;
- The Applicant has collated an extensive database of information in relation to the Site and its environs through their experience of managing the Operational Owenreagh I and II Wind Farms and gaining consent for Craignagapple Wind Farm. This existing information has been utilised to inform the Development design process;
- Alongside the generation of renewable energy, agriculture, such as cattle and sheep farming, is the other principal land use, the use of the Site as a wind farm is and will continue to be a compatible use; and,
- There are no reasonable alternative locations for the Development since the advantage/benefit of repowering an existing site removes the need to consider alternative sites.

4.3 'Do Nothing' Scenario

If the Development was not to proceed, the operational Owenreagh I and II Wind Farms would continue to operate as they do at present, with a generation capacity of 4.4 MW and 5.1 MW, respectively. The operational Owenreagh I and II Wind Farms are consented in perpetuity and for the purposes of the baseline scenario it is assumed that the Wind Farms would continue to operate and be maintained under their current management systems. The 'Climate Change Act (Northern Ireland) 2022[1] (the Climate Change Act) outlines the part that Northern Ireland will aims to play in the UK and Global effort to tackle climate change. Part 1, section 12 of the Climate Change Act specifies that "The Department for the Economy must ensure that at least 80% of electricity consumption is from renewable sources by 2030.". As such, in the 'Do nothing' scenario the operational Owenreagh I and II Wind Farms will not be contributing further generating capacity towards this high target set by government.

The environmental baseline conditions will not remain static for the lifetime of the Development. In addition to any changes arising from economic and agricultural policies and economic market conditions, it is predicted that biodiversity and the landscape are likely to undergo some level of change as a result of global climate change. However, owing to the complexities and uncertainties inherent in attempting to predict the nature and extent of such changes to landscape and biodiversity during the lifetime of the Development, it has been assumed for the purposes of assessment that the current baseline will persist. This represents a precautionary and appropriate approach for EIA purposes.

4.4 Development Brief

The purpose of a wind farm development is to harness the power in the wind to generate electricity. The rationale is, therefore, to locate wind farms in areas exposed to high wind speeds, with turbines arranged in an optimum formation, maximising efficiency and energy output. However, this rationale alone does not consider the likely significant effects of a wind farm. The design of a wind farm must, therefore, be a balance between achieving an acceptable level of environmental effects whilst maximising energy yield.

The development brief is, therefore, to design a repowered wind farm representing an optimum fit within the technical and environmental parameters of the Site, whilst maximising the use of existing infrastructure.

4.5 Development Design Strategy

Current best practice guidance provides a framework for the consideration of key design issues, including turbine size, layout composition, windfarm design in relation to landscape character, and designing for multiple wind farms is set out in the following documents:

- The Northern Ireland Environment Agency (2010). Wind Energy Development in Northern Ireland's Landscapes[2];
- Department of the Environment (2015), The Strategic Planning Policy Statement (SPPS)[3]
- Department of the Environment (2009). Planning Policy Statement 18: Renewable Energy[4];
- Northern Ireland Environment Agency (NIEA) (2010). Wind Energy Development in Northern Ireland's Landscapes: Supplementary Planning Guidance to accompany Planning Policy Statement 18: Renewable Energy[5]; and,
- Scottish Natural Heritage (SNH) (2017). Siting and Designing Windfarms in the Landscape[6].

[1] Northern Ireland Executive, 2022, The 'Climate Change Act (Northern Ireland) 2022, Available at: https://www.legislation.gov.uk/nia/2022/31/contents/enacted

[2] Department of Agriculture, Environment and Rural Affairs (2010). Wind Energy Development in Northern Ireland's Landscapes (Accessed 28/11/2022)

[3] Department of the Environment (2015), The Strategic Planning Policy Statement (SPPS). The Strategic Planning Policy Statement | Department for Infrastructure (infrastructure-ni.gov.uk). (Accessed 14/02/2023).

[4] Department of the Environment (2009). Planning Policy Statement 18: Renewable Energy. (Accessed 28/11/2022)

[5] Northern Ireland Environment Agency's (NIEA) Wind Energy Development in Northern Ireland's Landscapes: Supplementary Planning Guidance (SPG) to accompany Planning Policy Statement 18 Renewable Energy (Accessed 28/11/2022)

[6] Scottish Natural Heritage (2017). Siting and Designing Windfarms in the Landscape (Accessed 28/11/2022)

Scottish Guidelines are used as they represent best practice within the framework of UK legislation. The following principles were adopted by the aforementioned guidance, which, in turn, informed the design iterations to ensure that the final design of the Development was the most suitable for the Site:

- The avoidance of inconsistent turbine spacing leading to relatively large gaps, outliers and excessive turbine overlapping to minimise visual confusion and ensure a balanced/compact array from key views. The distance between turbines is usually a function of rotor diameter and prevailing wind direction;
- Achieving an appropriate scale of turbine, taking account of the landscape context;
- The maintenance of turbine manufacturers recommended spacing between turbines in order to minimise turbulence and turbine fatigue, leading to reductions in energy yield, taking account of the prevailing wind direction for a site;
- Understanding and respecting the ground conditions and topography of the Site, taking account of turbine manufacturers' specifications;
- Maximising the separation from residential dwellings; and,
- Respecting other environmental constraints and associated buffers.

The identification of environmental effects is an iterative process, running in tandem with the wind farm design process. An analysis of the key design considerations for each technical discipline is given in Section 4.6 of this Chapter. The layout of turbines within the Development has undergone a series of design iterations to avoid or reduce potential adverse effects, (Figure 4.1). This process has resulted in the final layout presented and assessed in this ES (Figure 3.1 and Figure 4.1) which represents the optimum fit within technical and environmental parameters considered.

In addition to the turbine locations, the other elements of the Development shown in Figure 3.1 and Figure 4.1 have been designed to minimise potential adverse environmental effects. These elements include access tracks, the substation compound, crane hardstanding areas, and temporary construction compounds. The potential adverse environmental effects of these elements have been minimised through careful design and best practice construction methods.

4.6 Key Environmental Design Considerations

The specific environmental factors considered in the design of the Development are set out in this section for each relevant environmental aspect, with their influence on the design discussed.

4.6.1 Landscape and Visual

The iterative design process considered the potential landscape and visual effects, with the primary objective being to keep the proposed turbines contained within the upland landscape and avoid encroachment into the surrounding lowland landscapes. The successive layouts have been modified to avoid stacking and gapping of the proposed turbines, as seen from the key viewpoints representative of visual receptors in the local area. Landscape and visual considerations have been balanced against other environmental and technical considerations to ensure a holistic approach to design.

4.6.1.1 Design Viewpoints

Multiple key viewpoints were selected as design viewpoints, against which to test the acceptability of views using wirelines for each turbine layout option. Design viewpoints have been selected based on an understanding of where the Development would be visible from, where static views will be gained, such as popular hilltops, or where there is a particular concentration of residential properties. Design viewpoints were selected and agreed during pre-application discussions with the Council. Additional representative LVIA viewpoints were added after discussions with DfI Planning. Further details regarding the selected viewpoints and justification on the viewpoints selection, taking account of the DfI Planning advice, are provided in **Chapter 6: Landscape and Visual Impact Assessment**.

4.6.1.2 Design Principles

The landscape and visual design objectives are as follows:

- To consider the latest wind turbine technology available, larger rotor sizes and turbine hub heights to arrive at a turbine tip height considered appropriate for the Development;

- To create a visually legible design, taking account of other environmental and technical issues and constraints where relevant, and create a simple, positive layout, viewed consistently from different positions;
- To ensure that the views of the Development appear legible, and the turbines relate well to the landform and each other;
- To create a compact scheme which relates to the underlying landform;
- To group turbines to create a balanced and coherent image, avoiding where possible 'stacking' or overlapping of turbine rotors in lines, favouring an evenly spaced and elevated group, that reflects the nature of the undulating landscape; and,
- To avoid locating turbines such that they would have an overwhelming or overbearing effect on residential amenity.

The iterative design process has refined the original layout to achieve the optimum design and scale of turbine for the Development, helping avoid and mitigate effects on the landscape and visual receptors wherever possible.

4.6.2 Ecology

In recognition of the high importance afforded to active peatland in the Department of the Environment's *'Planning Policy Statement 18: Renewable Energy'* (2012) and the *'Strategic Planning Policy Statement for Northern Ireland: Planning for Sustainable Development'* (2015, under review), additional assessments were undertaken for any habitats that may qualify as 'active peat', in accordance with NIEA, Natural Heritage, Development Management Team Advice Note (2012) *Active Peatland and PPS18*.

Minimising direct and indirect effects on active peat was the principal design driver for turbine infrastructure locations, as described in **Chapter 10: Ecology.**

4.6.3 Hydrology and Hydrogeology

During the EIA process, a desktop and site-based survey was carried out to inspect and identify all water features with the potential to be substantially affected. The aim of the design process was to achieve a layout that avoids effects on hydrological sensitive receptors. The principal receptors were on-site active peat and watercourses, and off-site watercourses including the River Foyle and Tributaries Special Area of Conservation (SAC) and the River Faughan and Tributaries SAC. During design the following hydrological design principles were applied where possible:

- Avoid development in areas of active peat and where development would lead indirectly to effects on active peat (e.g., by changing groundwater levels);
- Minimise watercourse crossings;
- Achieve a separation distance of 50 m between construction activity and watercourses (natural) mapped at a 1:50,000 scale; and,
- Utilise existing infrastructure such as access tracks where possible.

Further information regarding the potential effects of the Development on hydrology and hydrogeology, along with a summary of mitigation measures is provided in **Chapter 8: Hydrology and Hydrogeology**.

4.6.4 Peat Depth and Stability

Peat depth and stability have been considered in the site design. Peat, including active peat, has been the key design constraint within the Site.

There has been repeat engagement with the Northern Ireland Environment Agency (NIEA) and the Geological Service Northern Ireland (GSNI) throughout the design process. There has been detailed peat probing to measure the depth of peat across the site, with a greater density of probing in areas where infrastructure is planned. The depths found have ranged from 0 m to 4.3 m with almost 75% of the areas probed being less than 1.5 m deep and 90% of the areas being less than 2 m deep.

The layout avoids areas of active peat. A peat slide risk assessment has been carried out for the Site and has been discussed with GSNI prior to submitting the planning application. This includes mitigation for any residual slide risk. Further information regarding peat depth and stability is provided in **Chapter 9: Geology and Peat** and **Technical Appendix A9.1: Peat Slide Risk Assessment**.

4.6.5 Ornithology

Potential ornithological constraints to the design of the Development were identified from the baseline surveys and assessment and the objective in the design process was to avoid or minimise these effects:

- Disturbance and displacement to breeding birds; and,
- Collision risk during operation.

No specific design constraints for ornithological receptors were required. Mitigation through construction practice and habitat enhancement are proposed in **Chapter 11: Ornithology** and **Technical Appendix A3.2: Draft Habitat Management Enhancement Plan (HMEP)**.

4.6.6 Noise

A key factor in the initial selection of the Site was the distance that could be achieved between properties and turbines to minimise the effects of noise from the Development. With regard to the wind turbines, the closest residential properties are located approximately 1.2 km to the north, 950 m to the west and 1,300 m to the south-east of the proposed wind turbines. All other nearby noise-sensitive receptors are located at sufficient distance from the proposed wind turbines that the combined noise levels from the Proposed Development and other nearby cumulative wind developments will be below 37.5 dB, and therefore comply with the applicable noise limits in line with relevant guidance and consultation (see **Chapter 12: Noise** for more details).

It is of critical importance that the layout of turbines, using a candidate turbine model which represents the range of turbine models, which are being considered for the Development, can meet the noise limit requirements of ETSU-R-97 and the Good Practice Guide, published by the Institute of Acoustics, at every residential property.

4.6.7 Archaeology and Cultural Heritage

A desk-based assessment and archaeological walkover was undertaken as part of the EIA. There are no known designated cultural heritage features within the Site and no significant indirect effects likely upon features in the surrounding historic environment from the Development (see **Chapter 7: Archaeology and Cultural Heritage**). As such, cultural heritage features were not a design constraint.

4.6.8 Access

Multiple site access points onto the public road were identified during the design iterations as being needed, in order that the impacts on active peat could be minimised. As a result, ensuring safe use of the public road during access and egress became a key issue, and designing junctions at locations that could achieve the required visibility for all road users was essential. Access considerations are further detailed in **Chapter 13: Traffic and Transport**.

4.6.9 Buildability

The Site is largely on sloping ground, and transporting turbine components around the Site requires having no sharp corners or steep slopes for access tracks. Turbine foundations and crane hardstandings need to be on flat ground or made flat by altering the landform. As well as careful siting and routing of access tracks, cut and fill operations are needed to ensure that these slope criteria are met. To minimise landscape and visual impacts, and the extent of land-take of the Development, the amounts of cut and fill were minimised through careful 3D design.

4.6.10 Summary of Design Criteria

As set out above, the features that influenced design were broadly in order of priority:

- Landscape and related potential effects on recreation and tourism;
- Active peat (direct impacts and indirect impacts via hydrological linkage);
- Rivers designated as Special Areas of Conservation (SACs) – whilst the nearest of these is more than 5 km from the site, the site drains into them, ultimately;
- Peat slide risk;

- Slope (ensuring buildability and minimising cut and fill requirements);
- Visibility splays for access points onto the public highway; and,
- Potential interactions with telecommunications and aviation.

4.7 The Design Iteration Process

The layout of the Development has evolved throughout the EIA process. This iterative approach has allowed the findings of the two-phased pre-application community consultation events, along with the EIA, to guide the evolution of the Development and has allowed the design to be modified to avoid and mitigate against environmental effects where possible.

This was achieved through preliminary assessments of the environmental effects, consideration of the identified spatial constraints combined with consideration of the appearance of the Development from the design viewpoints to take account of landscape and visual considerations. Three design workshops involving the project team were held to inform the design process:

- The first workshop was held after Scoping and pre-design chill, with an overview of onsite constraints and the developable area, based on likely turbine heights and dimensions. This resulted in the layout on which the first round of public consultation was based;
- The second workshop followed receipt of most Scoping responses, the completion of most baseline survey data, phase 2 peat probing, active peat assessment and high-level peat slide risk assessment. This workshop helped inform final design changes based primarily around access tracks, the location of active peat on site, and watercourse buffers; and,
- The third workshop followed a review of the latest design changes, to ensure infrastructure and access tracks were positioned in such a way that environmental effects were avoided, where possible.

It should be noted that the project team were cognisant of the Dalradian Gold Mine grid connection application (LA11/2019/1000/F) at the time of design iterations for the Development. Given the pre-consent status of the Dalradian Gold Mine grid connection application, the optimisation of the Development design was not amended to account for this project.

4.7.1 Layout Evolution

There were 4 principal iterations of the layout of the Development through the design and EIA process. These are set out below, along with the rationale for changes leading to them.

4.7.2 Layout 1 (Scoping Layout)

Layout 1 was initially informed by landownership boundaries. Constraints were then identified from preliminary site surveys, and desk-study information, primarily from Ordnance Survey of Northern Ireland (OSNI) mapping, and included the following parameters:

- Minimum 66.5 m oversail buffer of the Site Boundary;
- Minimum 50 m buffer of watercourses that could be identified on the 1:50,000 OSNI map;
- Minimum 50 m buffer of public roads, which represented the topple height of the turbines plus 10%;
- An exclusion of areas likely to be active peat;
- Minimum 1000 m buffer for residential properties, to minimise potential noise effects and ensure that turbines are located sufficiently far from properties, so as not to appear dominant in views; and,
- Areas were avoided where the topography of the ground represented a slope greater than 20%, which have the potential to give rise to technical constraints for access, and construction on steep slopes.

These constraints were mapped and appropriate turbine technical spacing (5 x 3 rotor diameters between the turbines) was applied to ensure minimum overlap taking into account the predominant south-westerly wind direction. This resulted in a 15 turbine layout presented in Layout 1 (see Figure 4.1). This layout was also used to inform the request for a Scoping Opinion.

For the purposes of Scoping, 180 m turbine tip heights were referred to, as this is consistent with modern deployment of turbines elsewhere across the UK.

4.7.3 Layout 2 (Design Chill Layout)

Layout 2 resulted from the first design workshop and is shown in Figure 4.1. It aimed to avoid or mitigate by design as many of the environmental sensitivities as possible to achieve an acceptable balance between environmental and technical considerations. This considered the first phase of peat probing, ecology surveys, and the landscape and visual assessment design principles. The following changes were made:

- T2 was moved further to the north-northeast to avoid ecological constraints (i.e. bat roost and linear foraging features)
- T10 was relocated further southwest, to avoid hydrologic constraints (i.e. flush areas); and
- T12 was moved further west, further from T14 to avoid areas of active peat.

Layout 2 is shown in Figure 4.1.

This iteration included a revision to the turbine tip height down to 156.5 m. This was in recognition that the Site is on the western edge of the Sperrin's Area of Outstanding Natural Beauty (AONB), responded to the visual relationship of the Development with the surrounding landform and landscape and was informed by pre-application discussions with DfI Planning. This reduced height was set at 156.m instead of 150 m to allow the blade to be at least 20 m above the ground and reduce risks to lower-flying bats.

The most suitable turbine model for a particular location can change with time as a result of developments in wind turbine technology, and, therefore, a final choice of turbine for the Development has not yet been made, although the turbine parameters described in **Chapter 3: Development Description**, would not be exceeded.

4.7.4 Layout 3 (Track Layout)

Layout 3 followed a design workshop that was informed by an analysis of active peat survey results and peat depth probing. Layout 3 included setting out locations of the infrastructure, which was principally the access tracks. An initial access track layout (between Layouts 2 and 3) was used as the starting point, and overlain on the map of active peat, as surveyed. The principal aim was to avoid placing infrastructure on areas of active peat whilst ensuring buildability.

This, alongside adherence to other onsite constraints, resulted in the access track and crane hardstanding layout shown for Layout 3 in Figure 4.1, which achieved the following in particular:

- Avoidance of substantial areas of active peat between T7 and T6, with T7 also being moved further north-east to avoid these areas;
- Initial 3D modelling of the access track network, to improve buildability by setting out maximum track gradients and to map areas of landform cut and fill requirements; and,
- The re-use of the existing access track, as far as possible, in order to reach T16, minimising the increase in footprint of the Development.

4.7.5 Layout 4 (Final Layout)

The Final Layout was discussed during the second design workshop and confirmed during the third design workshop. The most pronounced design changes occurred between Layout 3 and the final layout to ensure effects on active peat, valued habitats, and watercourses, were minimised. This layout included the renumbering of turbines to facilitate construction and operation, previous turbine number is included in parentheses below, wherever a new turbine number is mentioned. The final layout with the revised numbering is shown in Figure 3.1 and Figure 4.1. Where referred to elsewhere in this ES, turbine numbering refers to the final turbine numbers shown in Figure 3.1.

Key changes are summarised as follows:

- T2 (T9) was repositioned c. 100 m west to reduce the slope at its location, in turn reducing the peat slide risk and the amount of cut and fill required for its construction;
- The turbine identified as T2 in Layout 3 was removed to minimise the number and length of watercourse crossings. Removal of T2 was also beneficial from an LVIA perspective, as this was the closest turbine to residential properties;
- The access track from T5 (T16) to T12 (T10) was removed to minimise peat slide risk, cut and fill requirements, and to prevent potential impacts to active peat. T12 (T10) is now accessed from the east near T11 (T5) to avoid this;

- The access track to T8 (T4) was moved further west to maximise separation from the nearby watercourse;
- The track between T8 (T4) and T9 (T1) was also modified, with the track now continuing upslope of the watercourse, then crossing to T9 (T1) via a bridge, to minimise work in proximity to the watercourse;
- Site access point locations were reviewed in detail and adjusted to improve visibility splays and ensure that minimum requirements for safety were met; and,
- The substation and construction compounds were added, along with turning heads for turbine delivery vehicles during the construction phase. These were located outside areas of active peat, outside watercourse buffers, and such that any long-term landscape and visual effects could be mitigated with suitable planting.

The Final Layout was used at Pre-Application Community Consultation event 2. There was limited feedback on the design and layout of the Development at the consultation event.

4.8 Summary

The final Development layout has been informed by a robust design iteration process, achieving a layout which balances the various economic, technical, and environmental constraints, and requirements, whilst achieving a best fit design for the Site, which respects the landform and surrounding area.

Following an initial layout, there were three main design iterations, informed by baseline data, review of visualisations from key design viewpoints, the results of ongoing impact assessment, the results of on-site survey work, input from consultees, wind yield optimisation and taking cognisance of best practice guidance and consultation.

The final Development layout and its scale have been designed to maximise renewable energy generation from the Site, whilst minimising any resulting environmental effects to an acceptable level. The ES is based on the final development layout presented in Figure 3.1 and described in detail in **Chapter 3: Development Description**.

The Netherlands
New Zealand
Norway
Panama
Peru
Poland
Portugal
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Singapore
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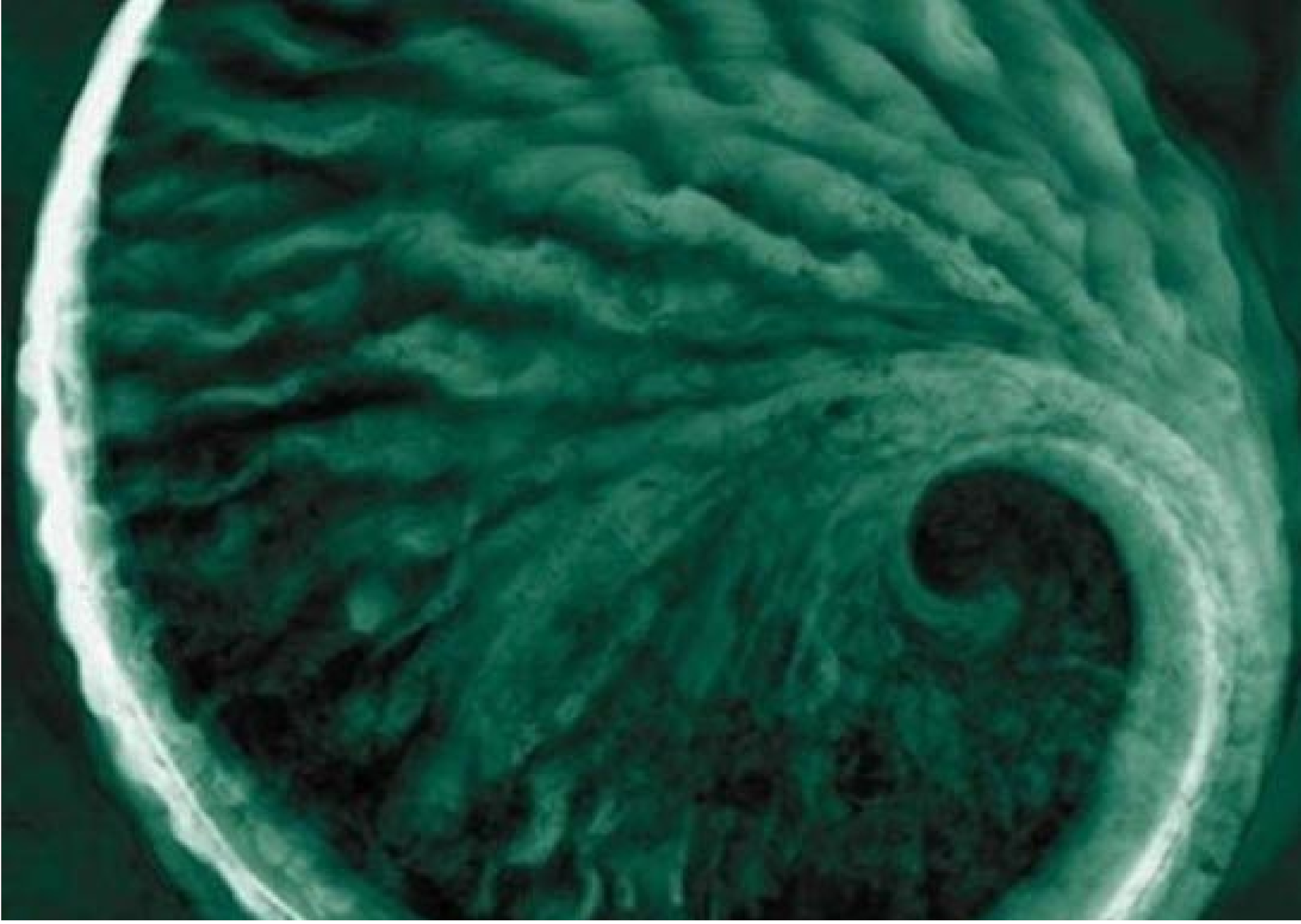

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Environmental Statement – Chapter 5
Policy and Legislative Context

06 September 2023

Project No.: 0696177

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Owenreagh/Craignagapple Wind Farm

Environmental Statement – Chapter 5 Policy and Legislative Context

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CONTENTS

List of Tables

Acronyms and Abbreviations

Name	Description
AHLI	Areas of High Landscape Importance
AONBs	Areas of Outstanding Natural Beauty
BPG	Best Practice Guidance
CTY	Countryside
DAERA	Department of Agriculture and Rural Affairs
DC&SDC	Derry City & Strabane District Council Local
DfI	Department of Infrastructure
DPS	Draft Plan Strategy Stage
DHMP	Draft Habitat Management Plan
GDO	General Development Order
GDP	General Development Principles
GHG	Greenhouse Gases
HE	Historic Environment
HRA	Habitat Regulations Assessment
ICNIRP	International Commission on Non-Ionizing Radiation Protection
EIA	Environmental Impact Assessment

ES	Environmental Statement
ETSU	Energy Technology Support Unit
FLD	Flooding
LDP	Local Development Plan
LVIA	Landscape Visual Impact Assessment
NE	Natural Environment
NI	Northern Ireland
OdCEMP	Outline Decommissioning and Construction Environmental Plan
OPMP	Outline Peat Management
PfG	Programme for Government
PPS	Policy Plan Strategy
RDS	Regional Development Strategy
RED	Renewable Energy Development
SAP	Strabane Area Plan
SCA	Special Countryside Area
SEO	Strategic Environmental Outcome
SFG	Spatial Framework Guidance
SPG	Supplementary Planning Guidance
SPPS	Strategic Policy Planning Statement
TSM	Tourism
WECA	Wind Energy Capacity Area

5 POLICY & LEGISLATIVE CONTEXT

5.1 Introduction

This chapter describes the legislative planning and policy background to the application. The legislative basis for a decision by the Department for Infrastructure Strategic Planning Directorate (DfI Planning), is set out, and an overview of planning policy at a local level and at a regional level is provided. The Planning Statement, submitted alongside the ES, and the technical ES Chapters will assess the Development against the national and local policies outlined below.

5.2 Northern Ireland's Climate Change Act (Northern Ireland) 2022

Northern Ireland's first law to tackle climate change, the 'Climate Change Act (Northern Ireland) 2022[1] (the Climate Change Act), received Royal Assent on 6 June 2022. The Act aims to have Northern Ireland play its part in the global and UK effort to tackle climate change by creating a framework that will establish a pathway to achieving emission reduction targets. This will help to ensure that Northern Ireland develops a greener, low carbon circular economy in which the environment can prosper and be protected.

The Act includes a target for net-zero emissions by 2050 as well as a set of interim targets for 2030 and 2040 for reducing greenhouse gas emissions in Northern Ireland. Part 1, section 15 of the Climate Change Act specifies that "*The Department for the Economy must ensure that at least 80% of electricity consumption is from renewable sources by 2030.*"

5.3 Energy Strategy for Northern Ireland 2022- The Path to Net Zero Energy

In December 2021, the Department for the Economy published the 'Northern Ireland Energy Strategy - The Path to Net Zero'[2] which detailed Northern Ireland's (NI) energy future over the next ten years and set the renewable electricity targets for 2030- identifying that 70% of electrical energy needed to be sourced from renewables by 2030, with flexibility to increase this target.

In June 2022, the Department for the Economy published the 'Electricity Consumption and Renewable Generation in Northern Ireland: Year ending March 2022'[3] , which highlighted that for the 12-month period April 2021 to March 2022, 43.8% of total electricity consumption in Northern Ireland was generated from renewable sources. Of all renewable electricity generated within Northern Ireland over the 12-month period, 83% was generated from wind.

The Northern Ireland Investment Strategy 2011-2021[4] highlights the importance of renewable sources in electricity generation.

5.4 Draft Environment Strategy for Northern Ireland

The draft Environmental Strategy for Northern Ireland[5] is intended to be the overarching government document, setting out Northern Ireland's environmental priorities up until 2050. The draft Strategy identifies six Strategic Environmental Outcomes ("SEOs") for the Environment. These are based around the DAERA core vision of sustainability at the heart of a living, working, active landscape valued by everyone and link to the outcomes from the 'Programme for Government Draft Outcomes Framework' (as consulted upon in 2021), including draft PfG Outcome: *"We live and work sustainably - protecting the environment."*

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[1] Northern Ireland Executive, 2022, The 'Climate Change Act (Northern Ireland) 2022, Available at: https://www.legislation.gov.uk/nia/2022/31/contents/enacted

[2] Department of the Economy (2021) Northern Ireland Energy Strategy- The Path to Net Zero. Available at: https://www.economy-ni.gov.uk/publications/energy-strategy-path-net-zero-energy

[3] Department of the Economy (2021) Electricity Consumption & Renewable Energy Generation in NI: Year Ending March 2022. Available at: https://www.economy-ni.gov.uk/news/electricity-consumption-and-renewable-generation-northern-ireland-year-ending-march-2022

[4] Northern Ireland Executive, 2011, Invest Strategy for Northern Ireland 2011-2021, Available at: https://www.infrastructure-ni.gov.uk/sites/default/files/publications/drd/investment-strategy-for-northern-ireland-2011-2021.pdf

[5] Department of Agriculture, Environment, and Rural Affairs (June 2022), Draft Environment Strategy for Northern Ireland. Available at: https://www.daera-ni.gov.uk/sites/default/files/consultations/daera/Draft%20Environment%20Strategy.PDF

Under each SEO, there are sets of proposals to improve the NI environment. Under SEO 4 '*Sustainable Production & Consumption on Land and at Sea'* the draft Strategy deals with Energy. The future vision/ outcome is identified as follows:

"The Energy Strategy will lead to 'net zero carbon and affordable energy'. It will do this by following five principles:

- Placing you at the heart of our energy future;
- Grow the green economy;
- Do more with less;
- Replace fossil fuels with renewable energy; and,
- Create a flexible, resilient and integrated energy system."

Under SEO 6 '*Fair contribution to UK net zero greenhouse gas emissions and improved climate resilience and adaptability'* the draft Strategy deals with Climate Change. The future vision/ outcome is identified as follows:

"Enactment of a Northern Ireland Climate Change Bill containing statutory five yearly carbon budgets, interim and long term GHG emissions reduction targets, and duties which complements climate change adaptation requirements under the UK Climate Change Act 2008. [note- this has been actioned]

NI's fair contribution to UK-wide net zero target by 2050.

Reduce unnecessary emissions and review cap on number of carbon allowances in UK ETS.

Transition to a net zero carbon and affordable energy system."

5.5 Northern Ireland Peatland Strategy 2022-2040[6]

The Northern Ireland Peatland Strategy provides the framework for the conservation of the NI intact peatlands and the NI approach to peatland restoration. The goal of the strategy is:

"By 2040, Northern Ireland's peatland habitats are conserved and restored to optimise their Natural Capital Value."

The Strategy identified Strategic Objective 1 as "*Peatlands in Northern Ireland are conserved, restored and appropriately managed, in accordance with the Climate Change Committee recommendations."* Strategic Objective 3 is identified as "*Capacity building and appropriate research are supported to ensure delivery of the Northern Ireland Peatland Strategy.*" Of particular note under Strategic Objective 3 are the stated actions to:

"18. Develop and deliver knowledge transfer and innovation programmes to meet the needs of landowners, organisations and contractors, to build capacity in peatland conservation, restoration and management.

23. Ensure evidence informs the development of peatland restoration and management plans and identify evidence gaps that require further research."

5.6 Planning Legislative Context

Table 5.1 outlines the Northern Ireland planning legislative (primary legislation and subordinate legislation) context for the Development.

[6] Department of Agriculture, Environment, and Rural Affairs (2022), Northern Ireland Peatland Strategy 2022, Available at: https://www.daera-ni.gov.uk/sites/default/files/consultations/daera/NI%20Peatland%20Strategy%20-%20Copy%20for%20EQIA%20Consultation.%20%208-8-2022.%20PDF_0.PDF

Table 5.1. Northern Ireland Planning Legislation Context

Northern Ireland Planning Legislation	
Primary Legislation	
The Planning Act (Northern Ireland) 2011[7]	The Planning Act (NI) 2011 provides the legislative basis for the Northern Ireland planning system including the development management systems, development plan preparation, planning appeals and enforcement and the way in which these functions are delivered.
The Conservation (Natural Habitats, etc) Regulations (Northern Ireland) 1995 (as amended)[8] ("Habitats Regulations")	The Habitat Regulations, among other statutory functions, require Competent Authorities to undertake Habitats Regulations Assessments (HRAs) to assess the impacts of any plan, project or activity that may affect a European Site prior to approvals or other authorisations being granted.
Subordinate Legislation	
The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 (as amended)[9]	The Planning (Environmental Impact Assessment) Regulations (NI) 2017 (the EIA Regulations). The EIA Directive aims to ensure that a planning authority granting planning permission for a development proposal makes its decision with the full knowledge of any likely significant effects on the environment by setting out a procedure known as environmental impact assessment to assess such effects. Reasons for determination and decisions must be provided and shared with the public
The Planning (General Development Procedure) Order 2015 (as amended 2016)[10]	The main purpose of the Planning (General Development Procedure) Order 2015 (as amended 2016) is to transfer the necessary powers required to operate the planning system currently contained within the Planning (General Development) Order 1993 (the 1993 GDO) to the councils. It also introduces some new provisions, namely: ▪ Design and access statements for major applications; ▪ Non-material changes to a previous grant of planning permission; ▪ Publicity of applications for planning permission; and, ▪ Changes to the statutory consultation process.
The Planning (Development Management) Regulations (Northern Ireland) 2015[11]	The Planning (Development Management) Regulations (NI) 2015 sets out the details of key elements of the development management process in relation to the hierarchy of development, pre-application community consultation, predetermination hearings and schemes of delegation while also making a transitional provision.

[7] Northern Ireland Assembly (2011), Planning Act (Northern Ireland) 2011. Available at: https://www.legislation.gov.uk/nia/2011/25/contents.
[8] The Department of Environment (1995), The Conservation (Natural Habitats, etc) Regulations (NI) 1995. Available at https://www.legislation.gov.uk/nisr/1995/380/contents/made
[9] Northern Ireland Assembly (2017), The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017. Available at: https://www.legislation.gov.uk/nisr/2017/83/made
[10] Northern Ireland Assembly (2016), The Planning (General Development Procedure) Order (Northern Ireland) 2015 (as amended). Available at: https://www.legislation.gov.uk/nisr/2015/72/contents/made
[11] Northern Ireland Assembly (2015), The Planning (Development Management) Regulations (Northern Ireland) 2015. Available at: https://www.legislation.gov.uk/nisr/2015/71/contents/made

The Planning (Fees) Regulations (Northern Ireland) 2015 (as amended)[12]	The effect of the Planning (Fees) Regulations (NI) (as amended) is to provide for the charging of a fee for the processing of a planning application.

5.6.1 The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 (as amended)

The Development is classified as 'Schedule 2' development as detailed in the EIA Regulations 2017. See **Chapter 2: EIA Methodology** for further details on The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 (as amended).

5.7 Planning Policy Context – Strabane area plan 1986-2001

Section 45 of the Planning Act 2011[13] states:

"*45.-(1) 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…..*"

In this legislative context, regard must be had to the Strabane Area Plan 1986-2001[14] (SAP 1986-2001). The SAP 1986-2001 is the current statutory Local Development Plan (LDP) for this geographic location for the Council area. The SAP 1986-2001 comprises:

- Part 1- Introduction;
- Part 2- Plan Strategy;
- Part 3- Policy Framework;
- Part 4- Statement of Policies, Proposals and Maps- District Towns;
- Part 5- Statement of Policies, Proposals and Maps- Local Towns;
- Part 6- Statement of Policies, Proposals and Maps- Villages;
- Part 7- Statement of Policies, Proposals and Maps- Hamlets; and,
- Part 8- Policy Statements and Maps- Rural Area.

The Site is located within the 'green built' area, as designated by the SAP 1986-2001 and also within the Sperrin Area of Outstanding Natural Beauty. The SAP 1986-2001 does not contain planning policies regarding renewable energy or more particularly wind farm development. Given the vintage of the LDP, the retained policies have limited significance in material planning terms, as they are superseded by the policy provision of the retained Planning Policy Statements and the Strategic Planning Policy Statement, which post-date the publication of the SAP 1986-2001.

The Council are currently preparing the Derry City & Strabane District Council Local Development Plan 2032 (Council LDP), which when adopted will replace all existing plans for the Council area. The Council LDP is currently at Draft Plan Strategy Stage (LDP-DPS). The LDP-DPS is scheduled for independent public examination later in mid-2023, and may be adopted in later 2023 or early 2024.

Until such time as the Local Development Plan Draft Plan Strategy is adopted, the current Draft Plan Strategy policies should be afforded limited material planning weight in the determination of the planning applications. Further details in respect of the Council LDP- DPS are provided in **Section 5.7.2.**

[12] Northern Ireland Assembly (2019), The Planning (Fees) (Amendment) Regulations (Northern Ireland) 2019. Available at: https://www.legislation.gov.uk/nisr/2019/112/made

[13] Northern Ireland Assembly (2011), Planning Act (Northern Ireland) 2011. Available at: https://www.legislation.gov.uk/nia/2011/25/contents.

[14] Former Department of Environment, Jan 1989, Strabane Area Plan 1986-2001 (hard copy- not available online)

5.8 Material Planning Considerations – Regional Planning Policy & Guidance

5.8.1 Regional Planning Policy & Guidance: Regional Development Strategy for Northern Ireland 2035 (RDS)

The Regional Development Strategy 2035[15] (RDS 2035) strategic guidance actively promotes the shift to a lower carbon economy, the adaptation to climate change and the delivery of a secure and sustainable energy supply. One of the eight key aims of the RDS 2035 is to:

"Take action to reduce our carbon footprint and facilitate adaption to climate change."

The RDS 2035 regional guidance for the economy prioritises a secure energy supply stating:

"RG5: Deliver a sustainable and secure energy supply."

Supplementary guidance within the RDS 2035 seeks to:

- *"Increase the contribution that renewable energy can make to the overall energy mix*
- *Strengthen the grid.*
- *Provide new gas infrastructure.*
- *Work with neighbour's.*
- *Develop "Smart Grid" Initiatives."*

Regional guidance for the environment at policy RG9 prioritises the need to reduce NI's carbon footprint and the adaption of the region to climate change:

"RG9: Reduce our carbon footprint and facilitate mitigation and adaptation to climate change whilst improving air quality."

The RDS 2035 notes that climate change is "*increasingly seen as one of the most serious problems facing the world*" and outlines that "*consideration needs to be given on how to reduce energy consumption and the move to more sustainable methods of energy production*." The RDS 2035 identifies climate change mitigations measures which include those to:

- *"Increase the use of renewable energies;*
- *Utilise local production of heat and/or electricity from low or zero carbon energy sources."*

The RDS 2035 outlines key climate change adaption measures including:

- *"Re-use land, buildings and materials;*
- *Minimise development in areas at risk from flooding from rivers, the sea and surface water run-off;*
- *Protect soils;*
- *Protect and extend the ecosystems and habitats that can reduce or buffer the effects of climate change."*

Strategic Policy SFG6 prioritises the development of a strong north west region in Northern Ireland.

"SFG6: Develop a strong North West."

Section 3.53 states *"Planning for physical development, social infrastructure, physical infrastructure and economic development is central to the development of a strong North West."* While section 3.54 highlights the importance of improving the energy infrastructure across the north-west region, ensuring that it has *"access to reliable, sustainable energy supplies to support economic growth and connectivity and to maximise the North West's significant renewable energy resource."*

Given the rural location of the Development, policy SFG13 is also pertinent.

[15] Department for Regional Development, 2010, The Regional Development Strategy 2035, Available at: https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/regional-development-strategy-2035.pdf

"SFG13: Sustain rural communities living in smaller settlements and the open countryside."

Section 3.98 states:

"The distinctive settlement pattern of main and small towns, villages and dwellings in the open countryside is unique within these islands. Many people working on the land are conscious of continuing a cultural tradition. They have a strong interest in sustaining that tradition, the land itself and the living that it provides. It is important that development is sensitive to these issues. The rural community is the custodian of our exceptional natural and built environment. In rural areas, the aim is to sustain the overall strength of the rural community living in small towns, villages, small rural settlements and the open countryside."

5.8.2 Regional Planning Policy & Guidance: Strategic Planning Policy Statement for Northern Ireland

The Strategic Planning Policy Statement[16] (SPPS) is the regional planning policy document for Northern Ireland. It contains a suite of planning policy and is a material planning consideration in the assessment of all planning applications in NI.

Section 2.1 of the SPPS outlines that the planning system should positively and proactively facilitate development in Northern Ireland, as detailed below.

"The objective of the planning system, consistent with Part 1, Section 1 of the Planning Act (Northern Ireland) 2011 (hereafter referred to as the 2011 Act), is to secure the orderly and consistent development of land whilst furthering sustainable development and improving well-being. This means the planning system should positively and proactively facilitate development that contributes to a more socially economically and environmentally sustainable Northern Ireland. Planning authorities should therefore simultaneously pursue social and economic priorities alongside the careful management of our built and natural environments for the overall benefit of our society."

Section 2.3 notes that *"the planning system operates in the public interest of local communities and the region as a whole, and encompasses the present as well as future needs of society. It does not exist to protect the private interests of one person against the activities of another, although private interests may coincide with the public interest in some cases. It can be difficult to distinguish between public and private interests, but this may be necessary on occasion."*

Section 3.3 of the SPPS states that "*planning authorities should deliver on all three pillars of sustainable development in formulating policies and plans."* In terms of the environment, this is stated as:

"Protecting and enhancing the built and natural environment (including our heritage assets, landscape and seascape character); seeking to ensure the planning contributes to a reduction in energy and water usage, helping to reduce greenhouse gas emissions by continuing to support growth in renewable energy sources……"

Furthermore, section 3.4 states:

"The SPPS does not seek to promote any one of the three pillars of sustainable development over the other. In practice, the relevance of, and weight to be given to social, economic and environmental considerations is a matter of planning judgement in any given case. Therefore, in summary, furthering sustainable development means balancing social, economic and environmental objectives, all of which are considerations in the planning for and management of development."

Section 3.7 further expounds that *"furthering sustainable development also means ensuring the planning system plays its part in supporting the Executive and wider government policy and strategies in efforts to address any existing or potential barriers to sustainable development. This includes strategies, proposals and future investment programmes for key transportation, water and sewerage, telecommunications and energy infrastructure (including the electricity network)."*

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[16] Department of the Environment (2015), The Strategic Planning Policy Statement (SPPS). Available at: https://www.infrastructure-ni.gov.uk/publications/strategic-planning-policy-statement

In terms of the planning application decision making process, section 3.8 provides clear guidance on the policy interpretation of the SPPS.

"Under the SPPS, the guiding principle for planning authorities in determining planning applications is that sustainable development should be permitted, having regard to the development plan and all other material considerations, unless the proposed development will cause demonstrable harm to interests of acknowledged importance. In practice this means that development that accords with an up-to-date development plan should be approved and proposed development that conflicts with an up-to-date development plan should be refused, unless other material considerations indicate otherwise."

Section 3.13 indicates that the planning system should help to mitigate and adapt to climate change by measures which include:

- *"shaping new and existing developments in ways that reduce greenhouse gas emissions and positively build community resilience to problems such as extreme heat or flood risk;*
- *promoting sustainable patterns of development, including the sustainable reuse of historic buildings where appropriate, which reduces the need for motorised transport, encourages active travel, and facilitates travel by public transport in preference to the private car;*
- *avoiding development in areas with increased vulnerability to the effects of climate change, particularly areas at significant risk from flooding, landslip and coastal erosion and highly exposed sites at significant risk from impacts of storms;*
- *considering the energy and heat requirements of new developments when designating land for new residential, commercial and industrial development and making use of opportunities for energy and power sharing, or for decentralised or low carbon sources of heat and power wherever possible;*
- *promoting the use of energy efficient, micro-generating and decentralised renewable energy systems."*

Section 6.214 highlights that NI has significant renewable energy resources and a vibrant renewable energy industry while Section 6.216 states that:

"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. Renewable energy technologies support the wider Northern Ireland economy and also offer new opportunities for additional investment and employment, as well as benefitting our health and well being, and our quality of life."

Section 6.218 outlines that the "*aim of the SPPS in relation to renewables 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."*

Section 6.219 details the regional strategic development objectives for renewable energy which are to:

- *"ensure that the environmental, landscape, visual and amenity impacts associated with or arising from renewable energy development are adequately addressed;*
- *ensure adequate protection of the region's built, natural, and cultural heritage features; and.*
- *facilitate the integration of renewable energy technology into the design, siting and layout of new development and promote greater application of the principles of Passive Solar Design."*

Regarding Local Development Plans and renewable energy, section 6.221 states:

"Councils should set out policies and proposals in their Local Development Plans (LDPs) that support a diverse range of renewable energy development, including the integration of micro-generation and passive solar design. LDPs must take into account the above-mentioned aim and regional strategic objectives, local circumstances, and the wider environmental, economic and social benefits of renewable energy development. Moratoria on applications for renewable energy development whilst LDPs are being prepared or updated are not appropriate."

The pertinent SPPS planning policy is referenced in respect of the relevant chapters in the ES. The Planning Statement submitted as part of this planning application provides an assessment of the Development against the relevant policy provision of the SPPS. Table 5.2 outlines the relevant SPPS planning policy and details which section of the ES and other planning document addresses the subject policy.

Table 5.2. SPPS Policy

SPPS Topic	ES Chapter & Technical Appendix
The Archaeology and Built Heritage section (Para 6.6- 6.27) provides planning policy on the following topics (i) world heritage sites (ii) archaeology (iii) listed buildings (iv) conservation areas (vi) areas of townscape character (vii) non- designated heritage assets (viii) enabling development.	ES **Chapter 7: Archaeology and Cultural Heritage** outlines the detailed assessment of the likely significant effects upon archaeology resultant from the Development. The Planning Statement details the planning policy assessment in respect of the Development including the SPPS archaeology policy.
The Development in the Countryside section (Para 6.61- 6.78) provides planning policy on the following topics; (i) Residential Development and Non-residential development, (ii) Farm diversification, (iii) Agricultural and forestry development, and (iv) The conversion and re-use of existing buildings for non-residential use.	The **Planning Statement** details the planning policy assessment in respect of development in the countryside.
The Flood Risk section (Para 6.99- 6.132) provides planning policy on; (i) Development in River (Fluvial) and Coastal Flood Plans (ii) Development at Surface Water (Pluvial) Flood Risk outside Flood Plains, (iii) Development in Proximity to Reservoirs, (iv) Protection of Flood Defence & Drainage Infrastructure, and (v) Artificial Modification of Watercourses.	ES **Chapter 8: Hydrology and Hydrogeology** outlines the detailed assessment of the likely significant effects upon the hydrology & hydrogeology arising from the Development. ES **Technical Appendix A3.1**- **Outline Decommissioning and Construction Environmental Management Plan (oDCEMP)**, **Technical Appendix A8.4: Watercourse Crossing Inventory** and **Technical Appendix A8.5: Outline Drainage Assessment** provide further details on hydrology, drainage and watercourses infrastructure pertaining to the Development. The **Planning Statement** details the planning policy assessment in respect of the Development including the SPPS flood risk and hydrology planning policy.
The Natural Heritage section (Para 6.168- 6.198) provides planning policy on; (i) international designations, (ii) protected species, (iii) national designations including Areas of Special Scientific Interest, Nature Reserves or National Nature Reserves, Marine Conservation Zones, Areas of Outstanding Natural Beauty (AONBs) and (iv) Local Designations including Local Nature Reserves and Wildlife Refuges and 'Other Habitats, Species or features of National Heritage Importance	**Chapter 10: Ecology** and **Chapter 11: Ornithology** of the ES outline the detailed assessment of the likely significant effects upon ecology, including designated sites, and ornithology arising from the Development. **Chapter 9: Geology and Peat** and **Chapter 8: Hydrology and Hydrogeology** are also material to the SPPS natural heritage policy. The ES chapters are supported by the following technical assessments: ■ Technical Appendix A3.1: oDCEMP; ■ Technical Appendix A3.2: Draft Habitat Management Enhancement Plan (DHMEP); ■ Technical Appendix A3.3: Outline Peat Management Plan (oPMP); ■ Technical Appendix A7.3: Assessment of Indirect Effects for Designated Sites within 5 km;

	■ Technical Appendix A7.4: Assessment of Indirect Effects for Designated Sites between 5 and 15 km; ■ Technical Appendix A8.1: Hydrological Unit Assessment; and, ■ Technical Appendix A8.3: Note on Indirect Effects on Dewatering. The submitted **Draft Habitat Regulations Assessment** reviews the potential impact on designated sites, in line with the Conservation (Natural Habitats, etc) Regulations (NI) 1995. **Chapter 6: Landscape and Visual Impact Assessment** details the assessment of the Development upon the sensitive and distinctive character of the Sperrin AONB. Chapter 6 is supported by the following technical assessments, relevant for this planning policy area: ■ Technical Appendix A6.1: Landscape and Visual Impact Assessment Methodology; and, ■ Technical Appendix A6.3: Assessment of Aviation Lighting. The **Planning Statement** details the planning policy assessment in respect of the Development and the SPPS Natural Heritage planning policy.
The Renewable Energy section (Para 6.214- 6.234) provides planning policy on; (i) siting of renewable energy proposals within designated landscapes which include Areas of Outstanding Natural Beauty and World Heritage sites (ii) (a) impacts upon public safety, human health, or residential amenity (b) visual amenity and landscape character (c) biodiversity, nature conservation or built heritage assets (d) local natural resources, such as air quality, water quality or quantity and (e) public access to the countryside, (iii) Active Peatland, and (iv) Separation distances between windfarm development and occupied properties.	The **ES**, **Design and Access Statement** and **Planning Statement** outline a detailed assessment of the Development in respect of compliance with the SPPS renewable energy planning policy, including LVIA and noise considerations.
Telecommunications and other Utilities (Para 6.235- 6.250) provides planning policy in respect of the (i) impact of new telecommunications/ other utilities impact on visual amenity and on environmentally sensitive features and locations (ii) ICNIRP public exposure to electromagnetic fields (iii) protection of airport public safety zones.	ES **Chapter 15: Other Issues** reviews the likely significant effects upon telecommunications, aviation, shadow flicker, climate and other utilities. The **Planning Statement** outlines an assessment of the Development in respect of the SPPS Telecommunications and Utilities planning policy.
Tourism (Para 6.251- 6.266) provides planning policy for (i) tourism proposals within settlements (ii) tourism proposals in the countryside (iii) protection of tourism assets including built and natural heritage assets and safeguarding from unnecessary and inappropriate development.	ES **Chapter 14: Land-Use, Socio-Economics, Tourism and Recreation** reviews the likely significant effects upon tourism assets in the receiving environment arising from the Development. The **Planning Statement** contains a detailed assessment of the Development in respect of the SPPS Tourism planning policy.
Transportation (Para 6.293- 6.305) provides planning policy in respect of the requirements for planning applications and associated Department's	ES **Chapter 13: Traffic and Transport** reviews the likely significant effects of the Development on the receiving transport and traffic

published guidance namely the requirement for a Transport Assessment and inclusion of mitigation measures, where appropriate.	environment, including suggested mitigation measures, as appropriate. **Technical Appendix A13.1 Abnormal Route Assessment**, **Technical Appendix A13.2: Traffic Count Data** and **Technical Appendix A13.4: Access Junction and Visibility Splay Assessment** provide further details in respect of transport and traffic considerations. The **Planning Statement** contains a detailed assessment of the Development in respect of the SPPS Transportation planning policy.

5.8.3 *Regional Planning Policy & Guidance: Northern Ireland Planning Policy Statements (PPSs)*

The suite of existing planning policy statements are material planning considerations in the determination of planning applications. There is currently a transitional period in planning policy terms that will operate until such time as the Local Development Plan ‘Plan Strategy’ for the Council has been adopted, in the context of the provisions of The Planning Act (NI) t 2011. During the transitional period planning authorities will apply existing retained policy (including PPSs) together with the SPPS. Relevant supplementary and best practice guidance will also continue to apply. Where a Council adopts its Plan Strategy, existing policy retained under the transitional arrangements shall cease to have effect in the district of that council and shall not be material from that date, whether the planning application has been received before or after that date. The SAP 1986-2001 predates the enacting of the Planning Act (NI) 2011 and therefore the transitional provisions outlined by the SPPS apply until the updated Council LDP Plan Strategy is adopted.

Any conflict between the SPPS and any retained policy (PPSs) must be resolved in 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 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 afforded to the retained policy. PPS 18 Renewable Energy (PPS18) and its associated best practice guidance (BPG) and supplementary planning guidance (SPG) are retained as regional planning policy.

Policy RE1 of PPS 18 and the SPPS differ in how they describe the weight that should be attached to the renewable energy project’s wider environmental, economic and social benefits. The SPPS states that these are material considerations that will be given appropriate weight in determining whether planning permission should be granted whereas Policy RE1 states that they should be accorded significant weight. The policy provision of the SPPS should be accorded greater weight in the determination of individual wind energy planning applications.

Table 5.3 provides an overview of the Planning Policy Statements, their respective policy provision and details which section of the ES and other planning document addresses the subject policy.

Table 5.3. Planning Policy Statements

Planning Policy Statement & Associated Planning Policy	ES Chapter & Technical Appendix

Planning Policy Statement 2 - Natural Heritage[17] Policy NH1 – European and Ramsar Sites – International Policy Policy NH2 – Species Protected by Law Policy NH3 – Sites of Nature Conservation Importance - National Policy NH4 – Sites of Nature Conservation Importance - Local Policy NH5 – Habitats, Species or Features of Natural Heritage Importance Policy NH6 – Areas of Outstanding Natural Beauty	ES **Chapter 10: Ecology** and **Chapter 11: Ornithology** outline the detailed assessment of the likely significant effects upon ecology, including designated sites, and ornithology arising from the Development. **Chapter 9: Geology and Peat** and **Chapter 8: Hydrology and Hydrogeology** are also material to the PPS natural heritage policy. The ES chapters are supported by the following technical appendices: ■ Technical Appendix A3.1: oDCEMP; ■ Technical Appendix A3.2: Draft Habitat Management Enhancement Plan (DHMEP); ■ Technical Appendix A3.3: Outline Peat Management Plan (oPMP); ■ Technical Appendix A7.3: Assessment of Indirect Effects for Designated Sites within 5 km; ■ Technical Appendix A7.4: Assessment of Indirect Effects for Designated Sites between 5 and 15 km; ■ Technical Appendix A8.1: Hydrological Unit Assessment; and, ■ Technical Appendix A8.3: Note on Indirect Effects on Dewatering. The submitted **Draft Habitat Regulations Assessment** reviews the potentialeffect on designated sites, in line with the Conservation (Natural Habitats, etc) Regulations (NI) 1995. **Chapter 6: Landscape and Visual Impact Assessment** details the assessment of the Development upon the sensitive and distinctive character of the Sperrin AONB. Chapter 6 is supported by the following technical assessments, relevant for Policy NH6. ■ Technical Appendix A6.1: Landscape and Visual Impact Assessment Methodology; and ■ Technical Appendix A6.3: Assessment of Aviation Lighting. The **Planning Statement** details the planning policy assessment in respect of the Development and PPS 2.
Planning Policy Statement 3 - Access, Movement and Parking (PPS3, revised 2006)[18] Policy AMP 1 - Creating an Accessible Environment Policy AMP 2 - Access to Public Roads Policy AMP 6 - Transport Assessment Policy AMP 7 - Car Parking and Servicing Arrangements Policy AMP 9 - Design of Car Parking	**Chapter 13: Traffic and Transport** reviews the likely significant effects of the Development on the receiving transport and traffic environment, including suggested mitigation measures, as appropriate. **Technical Appendix A13.1 Abnormal Route Assessment**, **Technical Appendix A13.2: Traffic Count Data** and **Technical Appendix A13.4: Access Junction and Visibility Splay Assessment** provide further details in respect of transport and traffic considerations. The **Planning Statement** contains a detailed assessment of the Development in respect of PPS 3.

17 Department of the Environment (2013) Planning Policy Statement 2 Natural Heritage. Available at: https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/PPS02%20Natural%20Heritage.pdf

18 Department of the Environment (2005), Planning Policy Statement 3 - Access, Movement and Parking. Available at: https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/PPS03%20Clarification%20amp3.pd_.pdf

Planning Policy Statement 6 - Planning, Archaeology & the Built Heritage[19] Policy BH1- The Preservation of Archaeological remains of Regional Importance Policy BH2 - The Protection of Archaeological Remains of Local Importance and their Settings Policy BH3 - Archaeological Assessment & Evaluation Policy BH 4 - Archaeological Mitigation Policy BH 11 - Development affecting the Setting of a Listed Building	ES **Chapter 7: Archaeology and Cultural Heritage** outlines the detailed assessment of the likely significant effects upon archaeology resultant from the Development. The **Planning Statement** details the planning policy assessment in respect of the Development including PPS 6.
Planning Policy Statement No.10 - Telecommunications[20] Policy Tel 2 - Development and Interference with Television Broadcasting Services	ES **Chapter 15: Other Issues** reviews the likely significant effects upon telecommunications and other utilities, including the existing television broadcasting services. We note this policy is no longer a material planning consideration.
Planning Policy Statement 13 - Transportation and Land Use[21] General Principle 5 - Developers should bear the cost of transport infrastructure necessitated by their development.	ES **Chapter 13: Traffic and Transport** reviews the likely significant effects of the Development on the receiving transport and traffic environment, including suggested mitigation measures, as appropriate. **Technical Appendix A13.1 Abnormal Route Assessment**, **Technical Appendix A13.2: Traffic Count Data** and **Technical Appendix A13.4: Access Junction and Visibility Splay Assessment** provide further details in respect of transport and traffic considerations, including potential mitigation measures (e.g. road widening requirements, passing bay requirements) necessitated by the Development.
Planning Policy Statement No.15- Planning and Flood Risk (Revised) [22] Policy FLD1- Development in Fluvial (River) and Coastal Flood Plains Policy FLD3- Development and Surface Water (Pluvial) Flood Risk Outside Flood Plains Policy FLD4- Artificial Modification of Watercourses	ES **Chapter 8: Hydrology and Hydrogeology** outlines the detailed assessment of the likely significant effects upon the hydrology & hydrogeology arising from the Development. **Technical Appendix A3.1: oDCEMP**, **Technical Appendix A8.4: Watercourse Crossing Inventory** and **Technical Appendix A8.5: Outline Drainage Assessment** provide further details on hydrology, drainage and watercourses infrastructure pertaining to the Development. The **Planning Statement** details the planning policy assessment in respect of PPS15.

[19] Department of the Environment (1999) Planning Policy Statement 6 - Planning, Archaeology & the Built Heritage. Available at: https://www.infrastructure-ni.gov.uk/publications/retained-planning-policy

[20] Department of the Environment (2002), Planning Policy Statement No.10 – Telecommunications. Available at: https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/PPS10%20Telecommunications.pdf

[21] Department for Regional Development (2005), Planning Policy Statement 13 - Transportation and Land Use. Available at: https://www.infrastructureni.gov.uk/sites/default/files/publications/infrastructure/PPS13%20Transportation%20and%20Land%20Use.pdf

[22] Department of the Environment (2014) Planning Policy Statement 15 Planning & Flood Risk. Available at: https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/PPS15%20Planning%20and%20Flood%20Risk.pdf

Planning Policy Statement No.16 – Tourism[23] Policy TSM 8 - Safeguarding of Tourism Assets	ES **Chapter 14: Land-Use, Socio-Economics, Tourism and Recreation** reviews the likely significant effects upon tourism assets in the receiving environment arising from the Development. The **Planning Statement** contains a detailed assessment of the Development in respect of PPS16.
Planning Policy Statement No.18- Renewable Energy including PPS 18, Best Practice Guidance (BPG) and Supplementary Planning Guidance (SPG)[24] Policy RE1 - Renewable Energy PPS 18 BPGs outline the use of ETSU-R-97 for noise assessments for windfarm development and guidelines for shadow flicker assessment.	The **ES**, **Design and Access Statement** and **Planning Statement** outline a detailed assessment of the Development in respect of compliance with the PPS 18- Policy RE1. ES **Chapter 12: Noise** reviews the potential noise effects arising from the Development, and utilises the ETSU-R-97 guidelines. ES **Technical Appendix 15.1**: **Shadow Flicker Assessment** details the shadow flicker assessment for the Development.
Planning Policy Statement No.21 - Sustainable Development in the Countryside[25] Policy CTY 1 - Development in the Countryside Policy CTY 13 - Integration & Design of Buildings in the Countryside. Policy CTY 14- Rural Character	The **Planning Statement** details the planning policy assessment in respect of development in the countryside and the policy provisions of PPS 21.

5.8.4 Regional Planning Policy & Guidance – Other Considerations

PPS 18 is supported by a supplementary planning guidance document entitled 'Supplementary Planning Guidance - Wind Energy Development in NI's Landscapes' (SPG). The SPG provides broad, strategic guidance in relation to the visual and landscape impacts of wind energy development. The SPG document includes general guidance on siting and design within Northern Ireland's landscapes and advice on the landscape assessment of proposed developments. The SPG is a guidance document intended to supplement planning policy (PPS18 & the SPPS). ES **Chapter 6: Landscape and Visual Impact Assessment** addresses the guidance contained in the SPG.

PPS18 is also supported by a best practice guidance document entitled 'PPS 18 - Best Practice Guidance' (BPG). Section 1.0 of the BPG provides guidance on wind energy development. The BPG is a guidance document which is supplementary to planning policy.

[23] Department of the Environment (2009) Planning Policy Statement 16: Tourism. Available at: https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/PPS16%20Tourism.pdf

[24] 5 Department of the Environment (2009), Planning Policy Statement 18 'Renewable Energy'. Available at: https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/PPS18%20Renewable%20Energy.pdf

[25] Department of the Environment (2010), Planning Policy Statement 21 Sustainable Development in the Countryside. Available at: https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/PPS21%20Sustainable%20Development%20in%20the%20Countryside.pdf

5.9 Material Planning Considerations – Emerging Planning Policy (Regional and Local)

5.9.1 Strategic Planning Policy Review for Renewable & Low Carbon Energy

The DfI planning policy review for renewable and low carbon energy is ongoing. At this juncture (April 2023), the updated draft policy has been published and is currently subject to public consultation, which is due to run until June 2023. Therefore, the draft policy should be afforded limited material planning weight.

The draft consultation document notes that "*The aim of the SPPS is to maximise sustainable renewable and low carbon energy from a wide range of technologies, at various scales, in appropriate locations within the built and natural environment, without compromising other environmental assets of acknowledged importance. Full account should be taken of the target to generate 80% of electricity consumption from renewable sources by 2030, as well as prevailing environmental legislation and relevant strategies which will support Northern Ireland's Climate Action Plan."*

In terms of planning policy, the draft consultation document introduces a number of new policy directions, which are outlined below:

*"1.19. Whilst advancements and changes in technology may mean schemes are not like for like, life extension and re-powering of existing development has the potential to continue to maintain or enhance installed renewable energy generation, where appropriate**. Therefore, a presumption in favour of proposals to re-power, expand and extend the life of existing solar and wind farms applies unless the impacts identified (including cumulative impacts) are unacceptable and cannot be mitigated**. Approvals for renewable and low carbon energy development proposals may be time-limited. However, areas identified as appropriate for wind farms are expected to be suitable for use in perpetuity."*

"1.26 ……….. Proposals for renewable and low carbon energy must, therefore, be rigorously assessed for their environmental impacts (covering installation, operation and decommissioning stages, as appropriate) and comply with relevant environmental legislation and policy. Active peatland, for example, is of particular importance to Northern Ireland for its biodiversity, water and carbon storage qualities. Degraded peatlands can also have natural heritage and carbon storage value and their protection and restoration potential can, therefore, be a material consideration in the determination of planning applications on a case by case basis."

5.9.2 Derry City & Strabane District Council Local Development Plan 2032 – Draft Plan Strategy[26]

At the time of preparation of this ES (Q1 2023), the Council are in the process of preparing their Local Development Plan for the Council Area – the Derry City & Strabane District Council Local Development Plan 2032 (DC&SDC LDP). The LDP is currently at Draft Plan Strategy (LDP DPS) stage. The Council had scheduled that the LDP DPS would be at Independent Examination during Q4 2022/ Q1 2023, however the schedule has been amended and it is now anticipated that the Independent Examination will take place in mid-2023. This has not been formally advertised. Therefore, the timeframe for the adoption of the Plan Strategy is unclear. At this stage, the LDP DPS should be afforded limited material planning weight in the planning determination process, however this may be subject to change if the LDP PS is adopted while the application is being determined by DfI Planning. Therefore, relevant policies from the DC&SDC DPS are detailed in Table 5.4.

Table 5.4. DC&SDC LDP DPS Policy

DC&SDC LDP DPS Policy	ES Chapter & Technical Appendix
General Development Principles	The **ES**, **Design and Access Statement** and **Planning Statement** outline a detailed assessment of

[26] Derry City & Strabane District Council (2021), Local Development Plan (LDP) 2032. Available at: https://www.derrystrabane.com/Subsites/LDP/Local-Development-Plan

GDP 1 Sustainable Development GDP 2 Climate Change GDP 6 Importance of Ecosystem Services GDP 7 Development Principles: Preserving and Enhancing the Natural Environment GDPOL 1 General Development Management Policy GDP 8 Development Principles: Preserving and Enhancing the Historic Environment	the Development in respect of the LDP DPS general development principles and general development management policies.
Transport and Movement TAM 2 Access to Public Roads TAM 6 Transport Assessments	ES **Chapter 13: Traffic and Transport** reviews the likely significant effects of the Development on the receiving transport and traffic environment, including suggested mitigation measures, as appropriate. **Technical Appendix A13.1: Abnormal Route Assessment**, **Technical Appendix A13.2: Traffic Count Data** and **Technical Appendix A13.4: Access Junction and Visibility Splay Assessment** provide further details in respect of transport and traffic considerations, including potential mitigation measures (e.g. road widening requirements, passing bay requirements) necessitated by the Development.
Tourism Development TOU 1- Safeguarding of Tourism Assets	ES **Chapter 14: Land-Use, Socio-Economics, Tourism and Recreation** reviews the likely significant effects upon tourism assets in the receiving environment arising from the Development. The **Planning Statement** contains a detailed assessment of the Development in respect of TOU 1.
Natural Environment NE 1: Nature Conservation Sites NE 2 Protected Species and their Habitats NE 3 Biodiversity or Features of Natural Heritage Importance NE 4 Development adjacent to Main Rivers and Open Water Bodies NE 5 Development within or affecting the setting of the Sperrin AONB NE 7 Development within Areas of High Landscape Importance (AHLIs)	ES **Chapter 10: Ecology** and **Chapter 11: Ornithology** outline the detailed assessment of the likely significant effects upon ecology, including designated sites, and ornithology arising from the Development**. Chapter 9: Geology and Peat** and **Chapter 8: Hydrology and Hydrogeology** are also material to the LDP DPS natural environment policy. The ES chapters are supported by the following technical appendices: ■ Technical Appendix A3.1: oDCEMP; ■ Technical Appendix A3.2: Draft Habitat Management Enhancement Plan (DHMEP); ■ Technical Appendix A3.3: Outline Peat Management Plan (oPMP); ■ Technical Appendix A7.3: Assessment of Indirect Effects for Designated Sites within 5 km; ■ Technical Appendix A7.4: Assessment of Indirect Effects for Designated Sites between 5 and 15 km; ■ Technical Appendix A8.1: Hydrological Unit Assessment; and, ■ Technical Appendix A8.3: Note on Indirect Effects on Dewatering. The submitted **Draft Habitat Regulations Assessment** reviews the potential effect on designated sites, in line with the Conservation (Natural Habitats, etc) Regulations (NI) 1995. ES **Chapter 6: Landscape and Visual Impact Assessment** addresses the policy requirements of

	Policy NE5 and NE7. The **Planning Statement** contains a detailed assessment of the Development and the natural environment policy.
Historic Environment HE 2 Archaeological Assessment, Evaluation and Mitigation HE 7 Historic Parks, Gardens, Demesnes and their Settings	ES **Chapter 7: Archaeology and Cultural Heritage** outlines the detailed assessment of the likely significant effects upon archaeology resultant from the Development. The **Planning Statement** details the planning policy assessment in respect of the Development and the Historic Environment policy.
Renewable & Low Carbon Energy Development RED 1 Renewable and Low Carbon Energy Development – General Criteria: This policy introduces an initial requirement to accord with LDP landscape designations. ■ Wind Energy Capacity Area (WECA) ■ Special Countryside Area (SCA) ■ Area of High Landscape Importance (AHLI) ■ Area of Outstanding Natural Beauty (AONB) Policy RED 1 has specific policy pertaining to wind energy development.	The **ES, Design and Access Statement** and **Planning Statement** outline a detailed assessment of the Development in respect of Policy RED 1. ES **Chapter 6: Landscape and Visual Impact Assessment** outlines the detailed assessment of the likely significant effects upon the receiving environment, including the Sperrin AONB.
Development and Flooding FLD 2 Protection of Flood Defence and Drainage Infrastructure FLD 3 Development and Surface Water (Pluvial) Flood Risk Outside Flood Plains FLD 4 Artificial Modification of Watercourses	**ES Chapter 8: Hydrology and Hydrogeology** outlines the detailed assessment of the likely significant effects upon the hydrology & hydrogeology arising from the Development. **Technical Appendix A3.1: oDCEMP, Technical Appendix A8.4: Watercourse Crossing Inventory** and **Technical Appendix A8.5: Outline Drainage Assessment** provide further details on hydrology, drainage and watercourses infrastructure pertaining to the Development. The Planning Statement details the planning policy assessment in respect of the DPS Development and Flooding planning policy.

The Netherlands
New Zealand
Norway
Panama
Peru
Poland
Portugal
Puerto Rico
Romania
Singapore
South Africa
South Korea
Spain
Sweden
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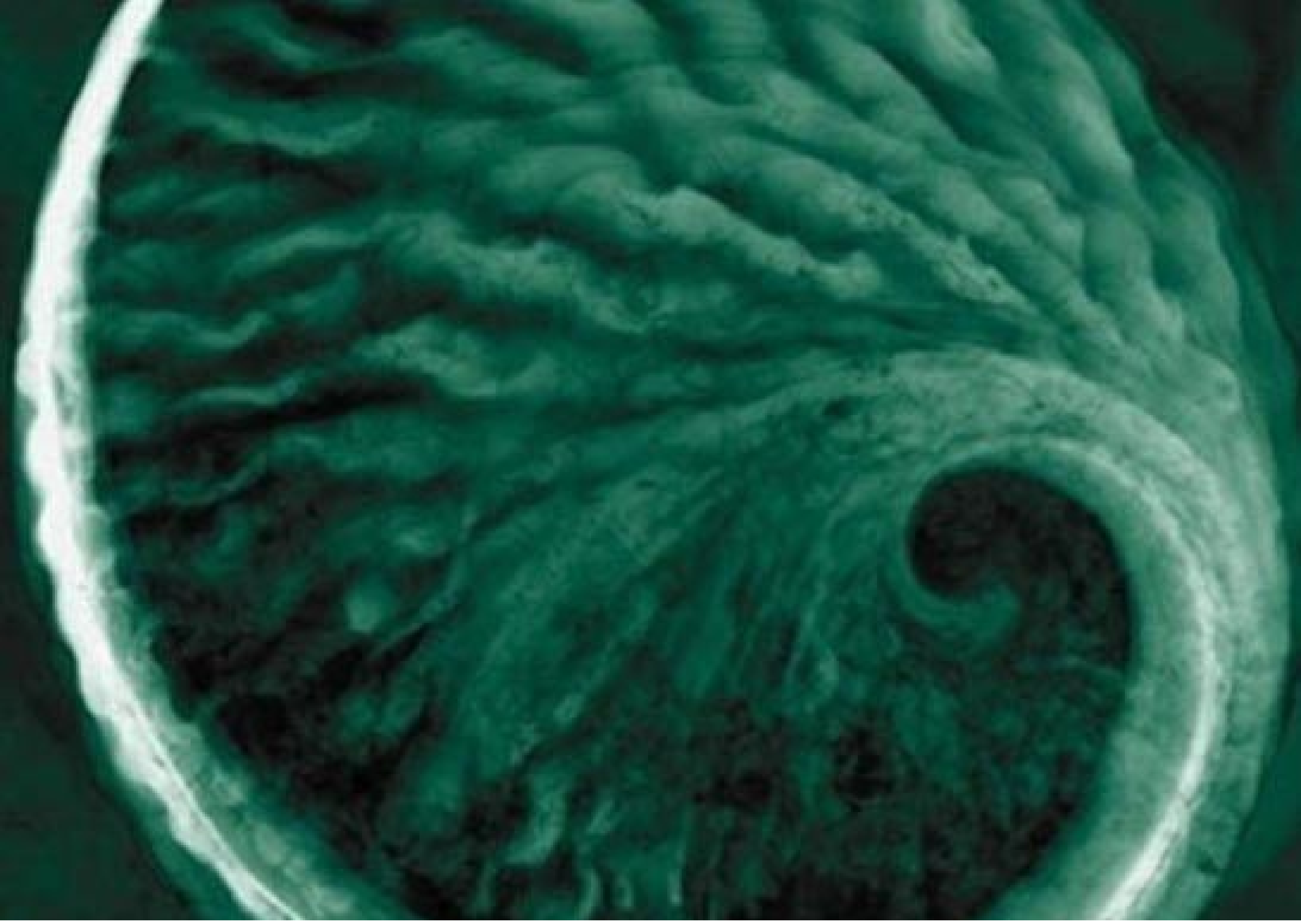

Ørsted

Owenreagh/Craignagapple Wind Farm

Ørsted Onshore Ireland Midco Limited

Environmental Statement – Chapter 6
Landscape and Visual Impact Assessment

07 September 2023

Project No.: 0696177

The business of sustainability

ERM

Signature Page

06 September 2023

Owenreagh/Craignagapple Wind Farm

Environmental Statement – Chapter 6 Landscape and Visual Impact Assessment

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Acronyms and Abbreviations

Name	Description
AoHLI	Area of High Landscape Impact
AoHSV	Area of High Scenic Value
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty

CLVIA	Cumulative Landscape and Visual Impact Assessment
DAERA	Department for Agriculture, Environment and Rural Affairs
DCEMP	Decommission and Construction Environmental Management Plan
DfI	Department for Infrastructure
DoENI	Department of the Environment Northern Ireland
ES	Environmental Statement
EIA	Environmental Impact Assessment
GIS	Geographic Information System
GLVIA3	Guidelines for Landscape and Visual Impact Assessment Third Edition
ICAO	International Civil Aviation Organisation
LCT	Landscape Character Type
LCA	Landscape Character Area
LDP	Local Development Plan
LI	Landscape Institute
LVIA	Landscape and Visual Impact Assessment
NCR	National Cycle Route
NI	Northern Ireland
NILCA	Northern Ireland Landscape Character Assessment
NIEA	Northern Ireland Environment Agency
NSA	National Scenic Area
OSNI	Ordnance Survey Northern Ireland
PVR	Principal Visual Receptor
RoI	Republic of Ireland
RVAA	Residential Visual Amenity Assessment
SLA	Special Landscape Area
SNH	Scottish Natural Heritage
SPG	Supplementary Planning Guidance
WECA	Wind Energy Capacity Area
ZTV	Zone of Theoretical Visibility

6. LANDSCAPE AND VISUAL IMPACT ASSESSMENT

6.1 Introduction

This Chapter of the Environmental Statement (ES) evaluates the effects of the proposed Owenreagh/Craignagapple Wind Farm ('the Development') on the landscape and visual resource. This assessment was undertaken by Optimised Environments Ltd (OPEN).
This Chapter includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Likely Significant Effects and Mitigation;
- Assessment of Likely Significant Physical Effects;
- Assessment of Likely Significant Effects on Landscape Character;
- Assessment of Likely Significant Effects on Landscape Designations;
- Assessment of Likely Significant Effects on Viewpoints;
- Assessment of Likely Significant Effects on Visual Receptors;
- Assessment of Cumulative Effects;
- Summary of Likely Significant Effects;
- Statement of Significance; and,
- Glossary and Acronyms.

This Chapter of the ES is supported by the following Figures provided in **Volume 3**:

- **Volume 3b: Figures 6.1 to 6.25**; and
- **Volume 3c: Visualisations Figures 6.26 to 6.50, Wirelines Figure 6.51 to 6.75**.

This Chapter of the ES is supported by the following Technical Appendices provided in **Volume 4:**

- **Technical Appendix A6.1: Landscape and Visual Impact Assessment Methodology**;
- **Technical Appendix A6.2: Residential Visual Amenity Assessment**; and
- **Technical Appendix A6.3: Assessment of Aviation Lighting**.

In this Chapter, 'Site' refers to the land on which the development is to be built and the 'Development' as the elements which make up the application.

6.2 Legislation, Policy and Guidance

The following guidance, legislation and information sources have been considered in carrying out this assessment:

- Department of the Environment Northern Ireland (2013) Planning Policy Statement 2 Natural Heritage [Online] Available at: PPS 2: Natural Heritage (infrastructure-ni.gov.uk) (Accessed on 18/05/2023)[1];
- Department of the Environment (2011). Derry Area Plan [Online] Available at: Derry Area Plan 2011: Adopted Plan (archive-it.org) (Accessed 18/05/2023)[2];
- Department of the Environment (1991). Strabane Area Plan 1986-2001[3]. Not available online;

[1] Department of the Environment Northern Ireland (2013) Planning Policy Statement 2 Natural Heritage [Online] Available at: PPS 2: Natural Heritage (infrastructure-ni.gov.uk) (Accessed on 18/05/2023)
[2] Department of the Environment (2011). Derry Area Plan [Online] Available at: Derry Area Plan 2011: Adopted Plan (archive-it.org) (Accessed 18/05/2023)
[3] Department of the Environment (1991). Strabane Area Plan 1986-2001.

- Department for Regional Development (2012) Regional Development Strategy 2035 [Online] Available at: Regional Development Strategy 2035 (infrastructure-ni.gov.uk) (Accessed 18/05/2023)[4];
- Department of Agriculture, Environment and Rural Affairs (2000) The Northern Ireland Landscape Character Assessment [Online] Available at: Landscape Character of Northern Ireland | Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk) (Accessed 18/05/2023)[5];
- Derry City & Strabane District Council (2019). Local Development Plan Draft Plan Strategy [Online] Available at: DC-SDC_Local-Development-Plan-final-online_1.pdf (derrystrabane.com) (Accessed 18/05/2023)[6];
- Northern Ireland Environment Agency (2010) Wind Energy Development in Northern Ireland's Landscapes [Online] Available at: Northern Ireland Environment Agency (infrastructure-ni.gov.uk) (Accessed 18/05/2023)[7];
- Department of the Environment (2009) Planning Policy Statement 18: Renewable Energy [Online] Available at: Planning Policy Statement 18 'Renewable Energy' (infrastructure-ni.gov.uk) (Accessed 18/05/2023)[8];
- Landscape Institute and Institute of Environmental Management & Assessment (2013) Guidelines for Landscape and Visual Impact Assessment: Third Edition (GLVIA3)[9];
- Scottish Natural Heritage (SNH) (2017) Siting and Designing Wind Farms in the Landscape, version 3a [Online] Available at: Appendix 1 (nature.scot) (Accessed 18/05/2023)[10];
- SNH (2021) Assessing the Cumulative Impact of Onshore Wind Energy Developments [Online] Available at: Guidance - Assessing the cumulative landscape and visual impact of onshore wind energy developments | NatureScot (Accessed 18/05/2023)[11];
- SNH (2017) Visual Representation of Wind Farms: Version 2.2 [Online] Available at: "7 (nature.scot) (Accessed 18/05/2023)[12]; and,
- Landscape Institute (2019) Technical Guidance Note 06/19: Visual representation of development proposals [Online] Available at: TGN-06-19-Visual_Representation (windows.net) (Accessed 18/05/2023)[13].

6.3 Assessment Methodology and Significance Criteria

6.3.1 Scoping Responses and Consultations

Consultation for this ES topic was undertaken with the organisations shown in Table 6.1: Consultation Responses.

[4] Department for Regional Development (2012) Regional Development Strategy 2035 [Online] Available at: Regional Development Strategy 2035 (infrastructure-ni.gov.uk) (Accessed 18/05/2023)

[5] Department of Agriculture, Environment and Rural Affairs (2000) The Northern Ireland Landscape Character Assessment [Online] Available at: Landscape Character of Northern Ireland | Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk) (Accessed 18/05/2023)

[6] Derry City & Strabane District Council (2019). Local Development Plan Draft Plan Strategy [Online] Available at: DC-SDC_Local-Development-Plan-final-online_1.pdf (derrystrabane.com) (Accessed 18/05/2023)

[7] Northern Ireland Environment Agency (2010) Wind Energy Development in Northern Ireland's Landscapes [Online] Available at: Northern Ireland Environment Agency (infrastructure-ni.gov.uk) (Accessed 18/05/2023)

[8] Department of the Environment (2009) Planning Policy Statement 18: Renewable Energy [Online] Available at: Planning Policy Statement 18 'Renewable Energy' (infrastructure-ni.gov.uk) (Accessed 18/05/2023)

[9] Landscape Institute and Institute of Environmental Management & Assessment (2013) Guidelines for Landscape and Visual Impact Assessment: Third Edition (GLVIA3)

[10] Scottish Natural Heritage (SNH) (2017) Siting and Designing Wind Farms in the Landscape, version 3a [Online] Available at: Appendix 1 (nature.scot) (Accessed 18/05/2023)

[11] SNH (2021) Assessing the Cumulative Impact of Onshore Wind Energy Developments [Online] Available at: Guidance - Assessing the cumulative landscape and visual impact of onshore wind energy developments | NatureScot (Accessed 18/05/2023)

[12] SNH (2017) Visual Representation of Wind Farms: Version 2.2 [Online] Available at: "7 (nature.scot) (Accessed 18/05/2023)

[13] Landscape Institute (2019) Technical Guidance Note 06/19: Visual representation of development proposals [Online] Available at: TGN-06-19-Visual_Representation (windows.net) (Accessed 18/05/2023)

Table 6.1: Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Department of Agriculture, Environment and Rural Affairs – Natural Environment Division	Scoping Opinion	Q6.1: Do consultees have any comments on the proposed methodology? The applicant has indicated that they intend to follow the "Guidelines for Landscape and Visual Impact Assessment: Third Edition' (Landscape Institute and IEMA,2013) ('GLVIA3')" and other publications for additional guidance as stated in section 6.3.1. These all seem appropriate for assessing the visual impact of the proposal on the landscape.	Noted. **Technical Appendix A6.1: Landscape and Visual Impact Assessment Methodology** presents the detailed description of the LVIA Methodology while a summarised version is presented in Sections 6.3.5 through 6.3.7.
Department of Agriculture, Environment and Rural Affairs – Natural Environment Division	Scoping Opinion 27th October 2022	Q6.2: Are consultees in agreement with the proposed 30 km Study Area? Yes, we are agreed on the 30km Study Area.	Noted. A 30 km Study Area has been used as the basis of the LVIA and is shown in Figures 6.1 to 6.25. This aligns with guidance presented in the Supplementary Planning Guidance (SPG) which accompanies Planning Policy Statement 18[14], which states "*For turbines of medium or large commercial height we would generally recommend a radius of 20-30 km.*"
Department of Agriculture, Environment and Rural Affairs – Natural Environment Division	Scoping Opinion 27th October 2022	Q6.3: Are consultees in agreement that the assessment of the effects on landscape character receptors should focus on those LCAs which are highlighted as being relevant to the LVIA in Table 6.1? Yes, this would seem appropriate.	Noted. A detailed assessment of these LCAs is presented in Section 6.7.
Department of Agriculture, Environment and Rural Affairs – Natural Environment Division	Scoping Opinion	Q6.4: Are consultees in agreement that the assessment of the effects on landscape designations should focus on the Sperrin Mountains AONB? NED are in agreement that the assessment of the landscape effects of this proposal should be focussed on the Sperrin AONB. To note the official name is "Sperrin AONB" there is no Mountains in the title of the AONB.	Noted. A detailed assessment of the Sperrin AONB is presented in Section 6.8.
Department of Agriculture, Environment and Rural	Scoping Opinion 27th October 2022	Q6.5: Do consultees have any comments or suggestions in relation to the Preliminary Representative Viewpoint Locations shown in Table 6.2 and illustrated on Figure 6.2?	Noted. The applicant has reviewed the representative viewpoints and four additional viewpoints have been added. A detailed assessment of the

[14] Department of the Environment (2009) Planning Policy Statement 18: Renewable Energy [Online] Available at: Planning Policy Statement 18 'Renewable Energy' (infrastructure-ni.gov.uk) (Accessed 18/05/2023).

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Affairs – Natural Environment Division		It is in effect the responsibility of the applicant to make sure that the viewpoints are representative of the impact of the proposal on the landscape. However, we would request that viewpoints should match those used for the previous applications on this site.	representative viewpoints is presented in Section 6.9.
Department of Agriculture, Environment and Rural Affairs – Natural Environment Division	Scoping Opinion 27th October 2022	Q6.6: Do consultees have any comments on the acceptability of the proposed turbine tip height of 180 m? In our opinion the increased blade height and increase in the numbers of turbines, after the decommissioning of Owenreagh I Wind Farm, may create an unacceptable impact on the AONB. The increased blade height from 111m to 180m adds significant height to the development which is of concern as the existing turbines rise above the skyline, this increased height will increase the visual impact of the windfarm in this part of the AONB.	The applicant has reduced the proposed turbine tip height from 180 m to 156.5 m in order to reduce the potential effects on the Sperrin AONB. A detailed assessment of the Sperrin AONB is presented in Section 6.8.
Department of Agriculture, Environment and Rural Affairs – Natural Environment Division	Scoping Opinion 27th October 2022	Q6.7: Do consultees have any comments on the approach to assessing the effects of turbine lighting? The proposed approach to provide visualisations of the possible impact of the turbine lighting is welcomed. The proposed approach does seem to provide some idea of the impact of the lighting in the night time landscape.	Noted. **Technical Appendix A6.3: Assessment of Aviation Lighting** presents the detailed assessment of the effects of the night-time lighting on the proposed turbines.
Department of Agriculture, Environment and Rural Affairs – Natural Environment Division	Scoping Opinion 27th October 2022	Q6.8: Do consultees have any comments or suggestions on the approach to cumulative landscape and visual assessment? It is critical to recognise that wind energy development proposals can create significant cumulative impacts as a result of combined effects. It would be useful to see photomontages that should show how the surrounding established wind farms sit within the views of this proposal. While the map (Figure 6.6 Cumulative Wind Farms) gives an indication of the surrounding wind farms, operational, under construction etc it would be useful to see if there is any substantial cumulative impact on for example the skyline when taken into consideration with this proposal.	Figures 6.26 to 6.50 illustrate the cumulative context in respect of the 25 representative viewpoints, including the operational wind farms in the photomontages and under construction, consented and application stage wind farms in the cumulative wirelines.

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Department for Infrastructure Planning	Pre-application Meeting 16th September 2021	DfI Planning welcomes 30km Study Area, but due to height concerns may request viewpoints outside 30 km.	No further requests have been made regarding viewpoints outside the 30 km Study Area. The applicant has reduced the proposed turbine tip height from 180 m to 156.5 m. Likely significant effects on representative viewpoints are all contained within a 30 km Study Area.
Department for Infrastructure Planning	Pre-application Meeting 16th September 2021	DfI Planning queried why certain LCAs were not being included in the detailed assessment.	The assessment of effects on LCAs focuses on those with potential to be significantly affected. Section 6.4.2 sets out a preliminary assessment explain why some LCAs have been discounted from the detailed assessment.
Department for Infrastructure Planning	Pre-application Meeting 16th September 2021	In respect of the lack of information publicly available on the Sperrin AONB special qualities, assistance was offered by the DfI Planning to supply document reviewing AONB boundaries used at previous PLI.	'Designation of the Sperrin AONB' which is an undated, draft document produced by NIEA / DfI Planning has been sourced.
Department for Infrastructure Planning	Pre-application Meeting 16th September 2021	DfI Planning suggested an additional viewpoint at Aghafad Road and other potential viewpoints in the wider landscape.	Aghafad Road has been included as a viewpoint. Two other distant viewpoints have been added at Bessy Bell and Raphoe.
Department for Infrastructure Planning	Pre-application Meeting 16th September 2021	DfI Planning queried why VP14 only one within large swathes of purple – accepts that impact decreases with distance but need to see evidence of this. DfI Planning noted that using viewpoints previously used is fine but could possibly use a few more.	Viewpoint 14 is located to the south-west of the Development where it is unlikely for significant effects to arise owing to a combination of the separation distance of over 20 km and the closer range influence from other operational wind farms in this area. The effects on Viewpoint 14 are not significant and for the reasons stated, therefore no further viewpoints have been added in this area. Four additional viewpoints have been added to the original list of viewpoints used in the Craignagapple ES (Planning Ref: J/2010/0481/F).
Department for Infrastructure Planning	Pre-application Meeting 16th September 2021	DfI Planning noted they are concerned at the height but don't yet have the level of detail required to make an informed position. Noted that comparative assessment is critical and suggested using visualisations to highlight difference between the schemes.	In response to concerns regarding height, the blade tip height has been reduced from 180 m to 156.5 m. Comparative wirelines with the consented Craignagapple Wind Farm are included on Figures 6.51 to 6.75.

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Department for Infrastructure Planning	Pre-application Meeting 16th September 2021	DfI Planning suggested Aghafad Road for night time assessment. Discussion on turbine lighting assessment, how this is worst case scenario assessment.	Aghafad Road has been used as a night time viewpoint.

6.3.2 *Scope of Assessment*

The key issues for the assessment of potential landscape and visual effects relating to the Development include;

- Temporary effects arising from the decommissioning and construction phase, and final decommissioning phase, such as the presence of materials and plant, the construction of access tracks, foundations and crane pads and the erection of the wind turbines;
- Long term and reversible effects arising from the operational phase such as the presence and movement of the wind turbines and presence of the tracks and substation; and,
- Indirect effects arising from the decommissioning and construction phase and operational phase such as the effects on landscape character and visual amenity owing to visibility of the onshore turbines and other infrastructure.

The Development comprises the decommissioning and removal of the existing turbines and infrastructure from the Owenreagh I and II Wind Farms, erection of 14 new turbines with construction of associated infrastructure, including access tracks and a compound containing the control building and substation, as described in **Chapter 3: Development Description**. The LVIA is based on turbines of up to 156.5 m to tip. A hub height of 88.5 m and a blade diameter of 136 m is shown in the visualisations and evaluated in the assessment, as this is considered to be the likely worst case in relation to landscape and visual effects. The 15 turbines in the operational Owenreagh I and II Wind Farms, which are located to the immediate south of the proposed new infrastructure, are 60 to 66 m to blade tip. The turbines and infrastructure comprising Owenreagh I and II would be decommissioned in tandem with the construction of the proposed new infrastructure.

This assessment covers the decommissioning and construction phase, operational phase and final decommissioning phase of the Development. The effects associated with the decommissioning and construction phase would be temporary in nature. The effects associated with the operational phase are considered to be long term and reversible. The final decommissioning effects would be similar in magnitude to the construction effects.

6.3.3 *Elements Scoped Out of Assessment*

On the basis of the desk based and site survey work undertaken, the professional judgement of the EIA team, experience from other relevant projects, and policy guidance or standards, the following effects have been scoped out of this LVIA, as proposed and agreed through the scoping process:

- Effects on landscape character types lying beyond a 20 km radius of the nearest proposed turbine and also where the influence of the Development on the landscape character types would be limited;
- Effects on national and regional landscape planning designations lying beyond a 20 km radius of the nearest proposed turbine and also where the influence of the Development on the Designations would be limited;
- The cumulative effect of the Development in the context of wind farms that lie beyond a 30 km radius from the nearest proposed turbine;
- The cumulative effect of the Development in the context of scoping stage wind farms (although scoping stage wind farms within a 20 km radius are shown in the cumulative wirelines); and,
- Effects arising from the process of final decommissioning since they are of a similar nature to construction issues, but of a smaller scale and shorter duration. However, the results of

decommissioning (i.e. the removal of the Development) are taken into account in assessing on-going and operational effects where appropriate.

6.3.4 Study Area

An area with a radius of 30 km from the nearest turbine in the Development has been applied as the LVIA Study Area. This aligns with guidance presented in the SPG which accompanies Planning Policy Statement 18[15], which states *"For turbines of medium or large commercial height we would generally recommend a radius of 20-30 km."* A ZTV analysis has been carried out for this area, based on the turbine layout, as has mapping of landscape character, designations and principal visual receptors. This Study Area is shown on Figure 6.1: Study Area in **Volume 3b**.

The Study Area is not intended to provide a boundary beyond which the Development would not be seen, but rather to define the area beyond which it is unlikely to have a significant landscape or visual effect. In reality, a significant effect is very unlikely to occur towards the edges of the Study Area due to a combination of factors such as distance from the Development, which would ensure that the turbines appear as minor features in views and would affect a very limited proportion of the wider views available; and screening by intervening buildings and vegetation.

The cumulative landscape and visual assessment also cover a Study Area of 30 km from the nearest turbine. Due to the contained nature of the Development and its location on a Site where there is an existing influence from the operational Owenreagh I and Owenreagh II wind farms, significant cumulative effects would not arise beyond this 30 km radius and are likely to be substantially more localised. Turbines of tip height 50 m or smaller are not considered, because of their limited influence on landscape and visual receptors compared to larger wind farms.

Known cumulative wind farms within the 30 km Study Area are shown on Figure 6.12: Cumulative Wind Farm Plan. This list has been shared with DfI Planning, who advised that there were content with the cumulative details and provided no further comments or feedback.

6.3.5 Baseline Survey Methodology

6.3.5.1 Desk Study

The assessment is initiated through a desk study of the Site and the 30 km Study Area. This study identifies aspects of the landscape and visual resource that may need to be considered in the landscape and visual assessment, including landscape-related planning designations, landscape character typology, operational and potential cumulative wind farms, and views from settlements and routes.

The desk study also utilises Geographic Information System (GIS) and Resoft WindFarm software to explore the potential visibility of the Development. The resultant ZTV diagrams and wirelines provide an indication of which landscape and visual receptors are likely to be important in the assessment.

6.3.5.2 Field Survey

Field surveys are carried out throughout the 30 km radius Study Area, although the focus is on the areas shown on the ZTV to gain theoretical visibility of the Development. The baseline field survey has four broad stages:

- A preliminary familiarisation around the Study Area in order to visit landscape and visual receptors that have been identified through the desk study and verify their existence and importance. Important features and characteristics that have not become apparent through the desk study are also identified, and particularly sensitive receptors are noted in order to inform the design process;
- A visit onto the proposed Development area at the time of EIA Scoping, in order to establish the potential for wind farm development and identify the most suitable areas for Development in landscape and visual terms, along with any constraints that may restrict the developable area;

15 Department of the Environment (2009) Planning Policy Statement 18: Renewable Energy [Online] Available at: Planning Policy Statement 18 'Renewable Energy' (infrastructure-ni.gov.uk) (Accessed 18/05/2023).

- Further field survey around the Study Area, concurrent with the design process for the Development, to identify those receptors that are likely to be particularly important in the assessment and inform the layout design, possible turbine height, and the extent of the Development; and,
- The identification of representative viewpoints to include in the landscape and visual assessment, including a wide range of landscape and visual receptors, as well as directions and distances from the Development.

6.3.6 Methodology for the Assessment of Effects

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. This section summarises the methodology and guidance used to carry out the LVIA, which is described in full in **Technical Appendix A6.1: Landscape and Visual Impact Assessment Methodology**.

6.3.6.1 Categories of Effects

The LVIA is intended to determine the likely significant effects that the Development would have on the landscape and visual resource. For the purpose of assessment, the potential effects on the landscape and visual resource are grouped into the following five categories; physical effects, effects on landscape character, effects on landscape designations, effects on visual receptors and cumulative effects.

6.3.6.2 Assessment of Effects

The broad principles used in the assessment of significance of the various categories of effects are the same and are described below. The detailed methodology for the assessment of significance does, however, vary, and the specific criteria used are described in **Technical Appendix A6.1: Landscape and Visual Impact Assessment Methodology**.

The objective of the assessment of the Development is to predict the likely significant effects on the landscape and visual resource. The significance of effects is assessed through a combination of two considerations; the sensitivity of the landscape receptor or view and the magnitude of change that would result as a consequence of the addition of the Development.

6.3.6.3 Sensitivity

Sensitivity is an expression of the ability of a landscape or visual receptor to accommodate the Development. Sensitivity is determined through a combination of the value of the receptor and its susceptibility to the Development. The factors that determine these criteria are described in **Technical Appendix A6.1: Landscape and Visual Impact Assessment Methodology**.

Levels of sensitivity - high, medium-high, medium, medium-low and low - are applied in order that the judgement used in the process of assessment is apparent.

6.3.6.4 Magnitude of Change

Magnitude of change is an expression of the extent of the effect on landscape and visual receptors that would result from the introduction of the Development. The magnitude of change is assessed in terms of a number of variables, including the size and scale of the impact and the extent of the affected area. The factors that determine these criteria are described in **Technical Appendix A6.1: Landscape and Visual Impact Assessment Methodology**.

Levels of magnitude of change – high, medium-high, medium, medium-low, low and negligible – are applied in order that the judgement used in the process of assessment is apparent.

6.3.6.5 Assessment of Significance

The significance and level of effects is assessed through a combination of the sensitivity of the landscape or visual receptor and the magnitude of change that would result from the addition of the Development. While this methodology is not reliant on the use of a matrix to determine a significant or not significant effect, a matrix is included in Table 6.2 below to illustrate how combinations of sensitivity and magnitude of change ratings can give rise to significant effects and the level of those effects in terms of major, moderate or minor. The matrix also gives an understanding of the threshold at which significant effects may arise, where a moderate level of effect is assessed.

Table 6.2: Assessment of Significance Matrix

Magnitude: Sensitivity:	High	Medium-High	Medium	Medium-Low	Low	Negligible/ None
High	Significant (Major)	Significant (Major)	Significant (Major / moderate)	Significant or Not Significant (Moderate)	Not Significant (Moderate / minor)	Not Significant (Minor)
Medium-High	Significant (Major)	Significant (Major / moderate)	Significant or Not Significant (Moderate)	Significant or Not Significant (Moderate)	Not Significant (Moderate / minor)	Not Significant (Minor)
Medium	Significant (Major / moderate)	Significant or Not Significant (Moderate)	Significant or Not Significant (Moderate)	Not Significant (Moderate / minor)	Not Significant (Minor)	Not Significant (Minor)
Medium-Low	Significant or Not Significant (Moderate)	Significant or Not Significant (Moderate)	Not Significant (Moderate / minor)	Not Significant (Minor)	Not Significant (Minor)	Not Significant (Negligible)
Low	Significant or Not Significant (Moderate)	Not Significant (Moderate / minor)	Not Significant (Minor)	Not Significant (Minor)	Not Significant (Negligible)	Not Significant (Negligible)

Effects within the dark grey boxes in the matrix are considered to be significant with either a Major or Major / Moderate level of effect. Effects within the light grey boxes may be significant or not significant depending on the specific relevant factors that arise at a particular landscape or visual receptor and here the level of effect is Moderate. Effects within the white boxes are considered to be not significant at either a Moderate / Minor, Minor or Negligible level. In accordance with GLVIA3, experienced professional judgement is applied to the assessment of all effects and reasoned justification is presented in respect of the findings of each case.

A significant effect occurs where the Development would provide a defining influence on a landscape element, landscape character receptor or view, albeit that it may be one of a number of defining characteristics. A not significant effect occurs where the effect of the Development is not material, and the baseline characteristics of the landscape element, landscape character receptor, view or visual receptor continue to provide the definitive influence. In this instance, the Development may have an influence, but this influence would not be definitive.

6.3.6.6 Cumulative Assessment

Supplementary Planning Guidance[16] issued by Northern Ireland Environment Agency in relation to wind energy development stresses the importance of considering the cumulative effects of wind farms. This document refers to guidance issued by SNH ‘Guidance: Cumulative Effect of Wind Farms’ for further information on assessing cumulative impacts. This SNH guidance has been superseded by NatureScot’s ‘Guidance – Assessing the cumulative landscape and visual impact of onshore wind

[16] Northern Ireland Environment Agency (2010). Wind Energy Development in Northern Ireland’s Landscapes: Supplementary Planning Guidance to Accompany Planning Policy Statement 18 ‘Renewable Energy’.

energy development'[17], and this document therefore provides the basis for the methodology for the cumulative assessment. It states;

"The purpose of a Cumulative Landscape and Visual Impact Assessment (CLVIA) is to describe, visually represent and assess the ways in which a proposed wind farm would have additional impacts when considered with other consented or proposed wind farms. It should identify the significant cumulative impacts arising from the proposed wind farm."

The addition of the Development to the operational and under construction wind farm context is assessed in cumulative terms within the main assessment. This includes the assessment of the effects of the Development in the context of the operational wind farms, with Carrickatane, Slieve Kirk and Eglish Mountain located within a 10 km radius of the Development and Curryfree and Bessy Bell I and II located within a 20 km radius, as shown on Figure 6.12.

The cumulative section of the LVIA, presented in Section 6.9.19, assesses the effects arising from the addition of the Development to a context including two further scenarios of wind farm development, as follows:

- Consented scenario – operational and under construction wind farms plus consented wind farms; and,
- Application scenario – operational, under construction and consented wind farms plus application stage wind farms.

Baseline operational and under construction cumulative wind farms are taken into consideration in both the assessment of the Development itself and the cumulative assessment, while consented and application-stage wind farms are considered only in the cumulative assessment.

The aim of the Cumulative Landscape and Visual Impact Assessment (CLVIA) is to focus on, and determine, the likely significant cumulative landscape and visual effects. Significant cumulative landscape and visual effects are likely to arise where wind farm developments become a prevailing landscape and visual characteristic as a result of the additional effects of the Development, albeit that they may become one of a number of prevailing characteristics.

6.3.6.7 Nature of Effects

The 'nature of effects' relates to whether the effects of the Development are positive/beneficial or negative/adverse. Guidance provided in GLVIA3[18] states that "thought must be given to whether the likely significant landscape and visual effects are judged to be positive (beneficial) or negative (adverse) in their consequences for landscape or for views and visual amenity" but does not provide an indication as to how that may be established in practice. The nature of effect is, therefore, one that requires interpretation and reasoned professional opinion.

In this assessment, beneficial, neutral and adverse effects are defined as follows:

- Beneficial effects contribute to the landscape and visual resource through the enhancement of desirable characteristics or the introduction of new, beneficial attributes. The removal of undesirable existing elements or characteristics can also be beneficial, as can their replacement with more appropriate components;
- Neutral effects occur where the Development neither contributes to nor detracts from the landscape and visual resource and is accommodated with neither beneficial nor adverse effects, or where the effects are so limited that the change is hardly noticeable. A change to the landscape and visual resource is not considered to be adverse simply because it constitutes an alteration to the existing situation; and,
- Adverse effects are those that detract from or weaken the landscape and visual resource through the introduction of elements that contrast, in a detrimental way, with the existing characteristics of the landscape and visual resource, or through the removal of elements that are key in its characterisation.

[17] NatureScot (2021). Guidance – Assessing the cumulative landscape and visual impact of onshore wind energy development.

[18] Landscape Institute and Institute of Environmental Management & Assessment (2013) Guidelines for Landscape and Visual Impact Assessment: Third Edition (GLVIA3).

6.3.6.8 Duration and Reversibility of Effects

The effects of the Development are of variable duration and are assessed as short-term or long-term and reversible. The decommissioning and construction phase would last approximately 12 months and would be considered short term. It would include those effects associated with the groundworks, construction of the compounds, control building, substation, access tracks, crane pads and turbine foundations, as well as the erection of the turbines. The tall cranes would be apparent intermittently and over a shorter duration.

The application is for a 40 year period of consent for the Development and following this period the Development will either be decommissioned, or a new application made for repowering the Development. The turbines, site access tracks, control building and substation would be apparent during this 40 year period, and these effects are considered to be long-term and reversible.

The reversibility of effects is variable. The most apparent effects on the landscape and visual resource, which arise from the presence and movement of the turbines, are reversible as the turbines would be removed on final decommissioning. The effects of the tall cranes and heavy machinery used during the decommissioning and construction phase and final decommissioning phase are also reversible. Access tracks will remain after final decommissioning. Turbine foundations and underground cabling would be left in-situ at more than 0.5 m below ground with no residual landscape and visual effects.

In order to avoid repetition, the duration and reversibility of effects are not reiterated throughout the assessment.

6.3.6.9 Graphic Production

The written LVIA is accompanied by a set of graphics contained in **Volume 3b** and **Volume 3c**. Reference is made throughout the written text to these graphics, as they are an integral part of the overall assessment and of importance in illustrating specific matters. They should be viewed in accompaniment to the written text.

The graphics can be divided into two categories; maps, presented in **Volume 3b**, and visualisations, presented in **Volume 3c**. The maps are based on the 30 km Study Area around the Development and present data of relevance to the assessment, such as the location and extent of landscape designations and representative viewpoints. ZTV maps are also included. These digitally calculate the extent and level of theoretical visibility across a given area, using Ordnance Survey Northern Ireland 10m digital terrain model (OSNI 10m DTM) mapping as the basis for the calculations. As this terrain model is based only on the ‘bare earth’, it does not take account of potential screening by vegetation or buildings, and this is why it is referred to as theoretical and not actual visibility.

The visualisations are based on the 25 viewpoint locations which are representative of the visual amenity of visual receptors in the area surrounding the Development. For each viewpoint there is baseline photography, and wirelines of the Development showing the ‘bare earth’ landform for the same extent as shown in the photography. In accordance with SNH’s visualisation guidance[19], all of the viewpoints also have accompanying photomontages. These use the baseline photography and add onto this a computer-generated model of the Development. More detailed information on graphic production is included in the Assessment Methodology in **Technical Appendix A6.1: Landscape and Visual Impact Assessment Methodology**.

6.3.7 Night-time Assessment

The nature of the daytime and night-time visual effects arising from wind farms differs considerably, as during daylight hours visibility of the large-scale moving turbines gives rise to effects that are very different to the pinpoint effects of lighting at night. As a result, the assessment of sensitivity and magnitude of change for night-time effects is carried out using different criteria/definitions than those for daytime views. These are described in **Technical Appendix A6.3: Assessment of Aviation Lighting**.

The visual assessment of turbine lighting is intended to determine the likely effects that the Development would have on the visual resource i.e. it is an assessment of the effects of visible aviation lighting on views experienced by people at night.

[19] SNH (2017) Visual Representation of Wind Farms: Version 2.2 [Online] Available at: “7 (nature.scot) (Accessed 18/05/2023)

The assessment of turbine lighting in this Appendix does not consider effects of aviation lighting on landscape character (i.e. landscape effects). For visible medium intensity steady or fixed red aviation warning lights, ICAO indicates a requirement for no lighting to be switched on until 'night' has been reached, as measured at 50 cd/m2 or darker. This is helpful as it does not require them to be on during 'twilight', when landscape character may be clearly discerned. It is considered that visible aviation lighting would therefore not affect the perception of landscape character, which is not readily perceived at night in darkness, particularly in rural areas. The assessment of visible lighting is solely a visual effect. While aviation lighting would be visible and result in visual effects, as assessed in this Appendix, the effects of aviation lighting on the perception of landscape character are scoped out of this assessment.

6.3.8 Assessment Limitations

Photographs and other graphic material such as wirelines and photomontages used in the assessment are for illustrative purposes only and, whilst useful tools in the assessment, are not considered to be completely representative of what would be apparent to the human eye. The assessment itself is carried out from observations in the field and therefore may include elements that are not visible in the photographs.

6.3.8.1 Zone of Theoretical Visibility (ZTV)

There are limitations in the theoretical production of ZTVs, and these should be borne in mind in their consideration and use:

- OSNI 10m DTM has been used to generate the ZTVs within the Study Area. The analysis is based on visibility at points on a 5 m grid and does not take into account local, small-scale landform changes in analysing theoretical visibility.
- The ZTVs illustrate the ‘bare ground’ situation, and do not take into account the screening effects of vegetation, buildings, or other local features that may prevent or reduce visibility;
- The ZTVs do not indicate the reduction in visibility that occurs with increased distance from the Development. The nature of what is visible from 3 km away would differ markedly from what is visible from 10 km away, although both are indicated on the ZTVs as having the same level of visibility; and
- It is important to remember that there is a wide range of variation within the visibility shown on the ZTV. For example, an area shown on the blade tip ZTV as having visibility of all of the turbines may gain views of the smallest extremity of blade tips, or of full turbines. This can make a considerable difference in the effects of the Development on that area.

These limitations mean that while the ZTVs are used as a starting point in the assessment, providing an indication of where the Development would theoretically be visible, the information drawn from the ZTVs is not completely relied upon to accurately represent visibility of the Development. As the ZTVs illustrate theoretical visibility which is always greater than actual visibility owing to the screening effects of settlement and forestry, they represent a worst-case scenario in terms of visibility.

6.3.8.2 Visualisations

The LVIA includes a Horizontal Angle ZTV to show the horizontal field of view (in degrees) that may be affected by views of the wind turbines, shown in Figure 6.7. This illustrates the extent of the view that would be occupied by the proposed turbines and is expressed in bands, for example 5 to 10 degrees or 10 to 20 degrees and this measure indicates the proportion of the full 360-degree view that would be affected.

Visualisations

Limitations associated with the visualisations are set out in full in **Technical Appendix A6.1: Landscape and Visual Impact Assessment Methodology** and summarised here.

The visualisations are based on theoretical visibility from 1.5 metres above ground level. There are limitations in these theoretical productions, and these should be borne in mind in the consideration and use of the wireline images. Firstly, the wireline illustrates the ‘bare ground’ situation, not taking into account the screening effects of vegetation, buildings, or other local features that may prevent or reduce visibility. Secondly, the wireline is based on OS NI10m DTM, so there may be local, small-scale landform variations that are not reflected in the wireline but may alter the actual visibility of the Development, either by screening theoretical visibility or revealing parts of the Development that are not theoretically visible. Thirdly planning conditions are likely to allow the locations of the turbines to be horizontally micro-sited to a small degree and the levels of the turbine bases have not yet been established in detail as this would be determined through site investigations and engineering design. Also, to note that micro-siting will not alter the findings of this assessment because the changes in turbine location would be minimal and the effects relate more to the number, size and general extents of the proposed turbines. Both of these factors may alter the base and, therefore, the tip heights of the turbines above ground level from those that are assumed in the assessment and shown on figures. Such variation may also affect ZTVs.

Where descriptions within the assessment identify the numbers of turbines visible this refers to the theoretical illustrations generated and therefore the reality may differ to a degree from these impressions, for example, in reality fewer turbines may be visible but not more. These factors are unlikely to make a material difference to the outcome of the assessment and the ZTV represent the worst-case scenario in respect of visibility.

6.3.8.3 Material Limitations on the LVIA

Not all areas of the Study Area are publicly accessible, and this has limited the specific assessment of views from residential and other properties, for example. Notwithstanding these limitations, the assessors consider that there is sufficient information available, from publicly accessible viewpoints, to form a competent assessment of the likely landscape and visual amenity effects.

6.3.9 Embedded Mitigation

Embedded mitigation, relevant to the LVIA, relates to site selection and the iterative design of the layout. The Development would be located in the western part of the Sperrin Mountains where wind farm development is an existing feature and where Craignagapple Wind Farm (application reference J/2010/0481/F) was approved on 17th January 2018 within the same planning policy context as this LVIA. The location has been largely determined by the suitability of this upland area for the production of wind energy, its separation from the main centres of population and its location on the edge of the AONB where a wind farm influence already exists.

There is very limited opportunity to mitigate landscape and visual effects outwith standard mitigation measures undertaken in the iterative design process described in **Chapter 4: Site Selection and Design**. There is, therefore, no additional mitigation to be considered in the LVIA.

Residual effects are those effects which remain after mitigation. The residual effects that the Development would have on landscape and visual receptors are assessed in Sections 6.5, 6.6, 6.7, and 6.8. These are categorised into physical effects, effects on landscape character, effects on landscape designations, effects on views, effects on visual receptors and cumulative effects. These are considered at the three main stages of the project, namely, decommissioning and construction, operation and maintenance, and final decommissioning.

6.4 Baseline Conditions

The baseline section of the LVIA records the existing conditions of the Study Area. Establishing a baseline helps to gain an understanding of what makes the landscape distinctive and what its important components or characteristics are. The baseline is instrumental in the identification of the landscape and visual receptors that are included in the assessment. This section is presented under the following headings:

- The Site;
- Landscape Character;
- Landscape Planning Designations;
- Representative Viewpoints;
- Principal Visual Receptors;
- Trends and Projected Future Baseline; and,
- Cumulative Wind Farm Developments.

6.4.1 The Site

The Site is the land on which the Development is to take place, as shown in Figure 3.1.
The Site is located across the northern side of Owenreagh Hill (~400 m AOD) in the western foothills of the Sperrin Mountains. It lies approximately 7.5 km east of the town of Strabane in Strabane District, County Tyrone. The Site is characterised by the presence of operational Owenreagh I and Owenreagh II Wind Farms, with 15 turbines occupying the southern part of the Site, across the summit of Owenreagh Hill and extending along the eastern ridgeline.

Owenreagh Hill forms one of the outlying hills to the west of the main ridge of the Sperrin Mountains. It is typical of the local landscape character, with its relatively steep sloping sides and rounded elevated summit and ridgeline. The hill slopes are incised by the gullies of a number of fast-flowing streams, with Owenreagh Burn flowing north-west to join with Glenmornan River to the north, and Douglas Burn flowing south-west to join the Mourne River to the south. The land cover is predominantly open moorland used as rough pasture for sheep and cattle farming with a block of coniferous forestry across the western flank and other small blocks across hill slopes in the wider landscape. The openness of Owenreagh Hill means that views extend out in all directions and that it is also readily visible in views from the surrounding valleys and glens.

While there is no settlement across the upper slopes of Owenreagh Hill, the surrounding rural landscape presents a pattern of dispersed settlement with scattered farmsteads and other rural properties, as well as linear hamlets and villages set along minor roads. There is a dense network of minor roads making much of the rural area accessible and reducing any sense of remoteness. The more notable B roads that surround the Site include the B536 to the south, and the B48 to the east. The A5 is the main road that accesses this area, which follows the succession of the Strule River, Mourne River and River Foyle as they wrap around the south and west of the Sperrin Mountains.

6.4.2 Landscape Character

6.4.2.1 Overview of Landscape Character

The central and eastern parts of the Study Area lie within Northern Ireland (NI), while the western part lies within the Republic of Ireland (RoI). Landscape Character Areas (LCAs) are defined in all parts of the Study Area, through the detailed assessments presented in the relevant Landscape Character Assessments.

In NI, Policy RG11 of the Regional Development Strategy[20] notes the importance of landscape character in planning:

"Landscape character is what makes an area unique. It is defined as "a distinct, recognisable and consistent pattern of elements, be it natural (soil, landform) and/or human (for example settlement and development) in the landscape that makes one landscape different from another, rather than better or worse". We can only make informed and responsible decisions on the management and planning of sustainable future landscapes if we pay proper regard to their existing character. By understanding how places differ we can ensure that future development is well situated, sensitive to its location, and contributes to environmental, social and economic objectives. The Northern Ireland Landscape Character Assessment 2000 provides valuable guidance on local landscape character and scenic quality."

All the NI landscape is classified and published in 'The Northern Ireland Landscape Character Assessment' (NILCA) 2000[21].

Landscape character information is based on the landscape character areas (LCAs) that are described in the Supplementary Planning Guidance 5 (SPG5) document entitled 'Wind Energy Development in Northern Ireland's Landscapes'[22]. This 2010 report in turn draws from the LCAs that

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[20] Department for Regional Development (2012) Regional Development Strategy 2035 [Online] Available at: Regional Development Strategy 2035 (infrastructure-ni.gov.uk) (Accessed 18/05/2023)

[21] Department of Agriculture, Environment and Rural Affairs (2000) The Northern Ireland Landscape Character Assessment [Online] Available at: Landscape Character of Northern Ireland | Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk) (Accessed 18/05/2023)

[22] Northern Ireland Environment Agency (2010) Wind Energy Development in Northern Ireland's Landscapes [Online] Available at: Northern Ireland Environment Agency (infrastructure-ni.gov.uk) (Accessed 18/05/2023)

were originally identified in 'NILCA'. The NI landscape was subdivided into 130 different landscape character areas, each classified in respect of its distinctive character.

The LCAs that cover the Study Area are shown on Figure 6.2, and in relation to the ZTV on Figure 6.8. Of the 130 LCAs which occur across NI, 23 occur either wholly or partly across the central and eastern part of the Study Area. In respect of RoI, the Landscape Character Assessment of County Donegal (2016)[23] identifies 44 LCAs, of which 14 occur either wholly or partly across the western part of the Study Area. The LCAs are used as the basis of the assessment of effects on landscape character presented in section 6.7, with all relevant LCAs being assessed in detail in respect of the likely effects of the Development. The NILCA and Landscape Character Assessment of County Donegal provide baseline descriptions of the key characteristics of each LCA and this information is referenced in the assessment and supplemented with observations made during site work.

The most notable landscape feature of the Study Area is the Sperrin Mountains LCA 29, which forms a well-defined, west-east band of hills extending from the centre of the Study Area to its eastern edge. The Development is located in the western part of this LCA, where the hills are slightly lower and wind farm development already exists in the form of the operational Owenreagh I and II Wind Farms. Although the consent has lapsed, there is also the proposed Craignagapple Wind Farm, comprising six turbines at 111 m to blade tip height on this Site. In response to a request from statutory consultees, this is addressed within a comparative assessment with the Development in respect of the assessment of representative viewpoints in Section 6.9.

While NILCA and Landscape Character Assessment of County Donegal provide descriptions of the LCAs, SPG5 goes a step further by providing strategic guidance on the relative sensitivity and capacity of each LCA to accommodate wind farm development. This means that only the entry in respect of Sperrin Mountains LCA is relevant to this assessment, as the Development would only be located in this LCA. The Key Landscape and Visual Characteristics and Values are identified in SPG5. In relation to windfarm development the document advises that the overall sensitivity is "high" and provides the following advice:

"Owenreagh, in the west of this LCA, is the specific area in this LCA that is most suited to wind energy development. Consideration could be given to siting turbines on hill flanks where they might be seen against a backdrop of land.

Care should be taken to avoid adverse impacts on skylines, views and the visual amenity, recreational value and wild character of this LCA. Open exposed slopes and ridgelines should be respected as should natural and cultural heritage landscape interests. Care should be taken to ensure that wind energy developments do not dominate and flatten this topographically complex landscape.

At the time of assessment there was one existing wind farm at Owenreagh Hill and further consented turbines (16 turbines in all, 60-66m high). Other operational and consented sites in adjacent LCAs were at Bessy Bell (total 16 turbines) 15km to the south; and there are three consented wind farms within 18 to 25km to the west in County Donegal. Hence there are growing cumulative/transboundary impacts in this LCA."

To the north of the Sperrin Mountains LCA and located in close proximity to the northern boundary of the Development, lies the Sperrin Foothills LCA. This LCA is characterised by rounded foothills to the north of the main Sperrin range. The landcover is diverse, including rolling agricultural land, steep wooded valleys and moorland on the tops of the rounded hills. In terms of overall sensitivity this is rated as high, in respect of which the SPG5 makes the following statement:

"Theoretically the simple, convex forms of some of the hills in this LCA are suited to wind energy development, and the widespread tree cover could provide screening. However the relatively small size of the hills, the intimate character of the adjoining valleys, the small scale field patterns on the hill slopes, and the many sudden, short range views tend to increase landscape sensitivity to wind energy development.

A further constraint is the fact that the LCA forms a foreground to some of the most important views of the Sperrins: hence any wind energy development on this northern fringe of the Sperrins could

[23] Donegal County Council (May 2016) Landscape Character Assessment of County Donegal [Online] Available at: Donegal County Council (Accessed 18/05/2023)

have widespread and significant impacts on landscape character and visual amenity. The north-eastern and north-western fringes of the LCA might be of slightly lower sensitivity."

6.4.2.2 Landscape Character Areas to be included in the detailed assessment

Table 6.3 below presents the preliminary assessment of all of the LCAs that are found in the 30 km radius Study Area and indicates which of them are considered to have potential to undergo a significant effect or significant cumulative effect as a result of the Development, and which of them do not require further detailed assessment. Nine of the 15 LCAs that do have potential to undergo a significant effect, or significant cumulative effect, as a result of the Development, are shaded grey in the table, listed below and assessed in detail in Section 6.7 of this Chapter:

- LCA 20: Derg Valley;
- LCA 24: South Sperrins;
- LCA 26: Bessy Bell and Gortin LCA;
- LCA 27: Foyle Valley LCA;
- LCA 28: Glenelly Valley
- LCA 29: Sperrin Mountains;
- LCA 30: Sperrin Foothills;
- LCA 31: Burngibbagh and Drumahoe; and,
- LCA 13: Foyle Valley (RoI).

This list of LCAs has been agreed with DfI Planning through the scoping process and pre-application meetings. While a request to include more LCAs in the southern part of the Study Area was suggested by DfI Planning, the existing presence and influence of operational wind farms in this area ensures that the development would not give rise to significant effects on the landscape character of these LCAs. This is because the magnitude of change or the degree of change that an additional wind farm gives rise to in a context where wind farms already have a notable influence is notably less than if a wind farm is introduced into a context where there is no such influence.

Table 6.3: Preliminary Assessment of Landscape Character

Receptor Name LCA / LCA	Nearest turbine approx. (km)	Subject to theoretical visibility?	Need to assess effects further within LVIA?
LCA 14: Lough Bradan	12 km	Yes	No, owing to the following reasons: ▪ Separation distance of 22 km+ means the Development would appear distant range and small scale; ▪ ZTV shows patches of theoretical visibility across northern boundary of LCA beyond 22 km; and, ▪ Other closer range operational wind farms already have an influence on this LCA.
LCA 19: Killeter Uplands	18 km	Yes	No, owing to the following reasons: ▪ Separation distance of 18 km+ means the Development would appear distant range and small scale; ▪ ZTV shows patches of theoretical visibility across north and east facing slopes of LCA beyond 18 km; and, ▪ Other closer range operational wind farms already have an influence on this LCA.

Receptor Name LCA / LCA	Nearest turbine approx. (km)	Subject to theoretical visibility?	Need to assess effects further within LVIA?
LCA 20: Derg Valley	9 km	Yes	Yes, owing to the following reasons: ▪ Separation distance of 9 km+ means the Development would appear middle range and medium scale; ▪ ZTV shows almost continuous theoretical visibility across large parts of the LCA; and, ▪ Parts of this valley landscape align towards the Site, thus forming an association.
LCA 21: Fairy Water Valley	19 km	Yes	No, owing to the following reasons: ▪ Separation distance of 19 km+ means the Development would appear distant range and small scale; ▪ ZTV shows patches of theoretical visibility through the central part of the LCA although actual visibility would be reduced by tree cover; ▪ Other closer range operational wind farms already have an influence on this LCA.
LCA 22: Omagh Farmland	17 km	Yes	No, owing to the following reasons: ▪ Separation distance of 17 km+ means the Development would appear distant range and small scale; ▪ ZTV shows patches of theoretical visibility through the central part of the LCA although actual visibility would be reduced by tree cover; and, ▪ Other closer range operational wind farms already have an influence on this LCA.
LCA 23 Carnowen Valley	21 km	No	No, as there is no theoretical visibility shown on the ZTV.
LCA 24: South Sperrins	7 km	Yes	Yes, owing to the following reasons: ▪ Separation distance of 7 km+ means the Development would appear middle range and medium scale; ▪ ZTV shows middle-level theoretical visibility to occur in the western part with vast majority of LCA remaining unaffected; and, ▪ This LCA has some association with the foothills to the north-west where the Site is located, albeit a stronger association with the higher hills to the north.
LCA 25: Beaghmore Moors and Marsh	18 km	Yes	No, owing to the following reasons: ▪ Separation distance of 18 km+ means the Development would appear distant range and small scale; ▪ ZTV shows very small patches of low-level theoretical visibility across the southern parts of the LCA; and, ▪ Other closer range operational wind farms already have an influence on this LCA.
LCA 26: Bessy Bell and Gortin	8 km	Yes	Yes, owing to the following reasons: ▪ Separation distance of 8 km+ means the Development would appear middle range and medium scale; ▪ ZTV shows high-level theoretical visibility to occur extensively across the northern part of this LCA; and, ▪ This LCA has a close association with the Sperrin Mountains LCA on the opposite side of the Foyle Valley where the Site is located.

Receptor Name LCA / LCA	Nearest turbine approx. (km)	Subject to theoretical visibility?	Need to assess effects further within LVIA?
LCA 27: Foyle Valley	3 km	Yes	Yes, owing to the following reasons: ▪ Separation distance of 3 km+ means the Development would appear close range and large scale; ▪ ZTV shows theoretical visibility to occur intermittently across this LCA; and, ▪ This LCA wraps around the south and west of the Sperrin Mountains LCA where the Site is located.
LCA 28: Glenelly Valley	6 km	Yes	Yes, owing to the following reasons: ▪ Separation distance of 6 km+ means the Development would appear middle range and medium scale; ▪ ZTV shows theoretical visibility to be contained on the north-facing slopes in the south-western part of the LCA; and, ▪ Although this LCA has a closer association with the higher hills to the north, there is still some association with the foothills to the north-west where the Site is located.
LCA 29: Sperrin Mountains	0 km	Yes	Yes, owing to the following reasons: ▪ The location of the Development in this LCA means that there would be direct and indirect effects and that the Development would appear close range and large scale; ▪ ZTV shows variable levels of theoretical visibility to occur mostly across the western part of this LCA; and, ▪ The Development would present the closest wind farm despite other wind farms occurring in the area.
LCA 30: Sperrin Foothills	0.5 km	Yes	Yes, owing to the following reasons: ▪ Separation distance of 0.5 km+ means the Development would appear close range and large scale; ▪ ZTV shows theoretical visibility to occur as large patches across the southern part of this LCA; and, ▪ The Development would bring wind farms closer to this LCA despite other wind farms occurring in the area.
LCA 31: Burngibbagh and Drumahoe	7 km	Yes	Yes, owing to the following reasons: ▪ Separation distance of 7 km+ means the Development would appear middle range and medium scale; ▪ ZTV shows that although the majority of this LCA would remain unaffected there would be a concentration of high level theoretical visibility in the southern part; and, ▪ There is some association between this LCA and the Site, although closer association with the Derry Slopes LCA on the opposite side of the River Foyle.
LCA 32: Derry Slopes	15 km	Yes	No, owing to the following reasons: ▪ Separation distance of 15 km+ means the Development would appear middle range and medium scale; ▪ ZTV shows very patches of theoretical visibility across the southern part of the LCA beyond 15 km; and, ▪ This LCA relates more closely with the Burngibbagh and Drumahoe LCA on the opposite side of the River Foyle.

Receptor Name LCA / LCA	Nearest turbine approx. (km)	Subject to theoretical visibility?	Need to assess effects further within LVIA?
LCA 33: Lough Foyle Alluvial Plain	21 km	No	No, as there is no theoretical visibility shown on the ZTV.
LCA 34: Loughermore Hills	14 km	Yes	No, owing to the following reasons: ▪ Separation distance of 14 km+ means the Development would appear middle range and medium scale; ▪ ZTV shows theoretical visibility to occur mostly as a patch in the centre as well as along the southern part of this LCA; and, ▪ This LCA is separated from the Site by intervening hills which reduce the association between these LCAs.
LCA 37: Roe Basin	20 km	Yes	No, owing to the following reasons: ▪ Separation distance of 20 km+ means the Development would appear distant range and small scale; ▪ ZTV shows very small patches of low-level theoretical visibility along the more distant eastern boundary; and, ▪ Other closer range operational wind farms already have an influence on this LCA.
LCA 40: Upper Moyola Valley	26 km	No	No, as there is no theoretical visibility shown on the ZTV.
LCA 41: Slieve Gallion	28 km	Yes	No, owing to the following reasons: ▪ Separation distance of 28 km+ means the Development would appear distant range and small scale; ▪ ZTV shows very small patches of low-level theoretical visibility to occur; and, ▪ Other closer range operational wind farms already have an influence on this LCA.
LCA 43: Carrickmore Hills	19 km	Yes	No, owing to the following reasons: ▪ Separation distance of 19 km+ means the Development would appear distant range and small scale; ▪ ZTV shows small patches of theoretical visibility to occur in patches across north-west facing slopes; and, ▪ There is no close association between this LCA and the Site of the Development as the landscapes are not close nor are they orientated towards each other.
LCA 7: Lough Foyle Coast (RoI)	29 km	Yes	No, owing to the following reasons: ▪ Separation distance of 29 km+ means the Development would appear distant range and small scale; ▪ ZTV shows that only the southern edge of this LCA lies in the Study Area; and, ▪ There is no close association between this LCA and the Site of the Development, as the landscape are not close nor are they orientated towards each other.

Receptor Name LCA / LCA	Nearest turbine approx. (km)	Subject to theoretical visibility?	Need to assess effects further within LVIA?
LCA 8: Buncrana Coast (RoI)	28 km	No	No, as there is no theoretical visibility shown on the ZTV.
LCA 9: Scalp Mountains (RoI)	28 km	Yes	No, owing to the following reasons: ▪ Separation distance of 28 km+ means the Development would appear distant range and small scale; ▪ ZTV shows that only the southern edge of this LCA lies in the Study Area; and, ▪ There is no close association between this LCA and the Site of the Development, as the landscape are not close nor are they orientated towards each other.
LCA 10: South Inishowen Farmland (RoI)	24 km	Yes	No, owing to the following reasons: ▪ Separation distance of 24 km+ means the Development would appear distant range and small scale; ▪ ZTV shows small patches of theoretical visibility across eastern parts with the remainder of the LCA largely unaffected; and, ▪ There is no close association between this LCA and the Site of the Development, as the landscape are not close nor are they orientated towards each other.
LCA 11: Grianin Slopes and Lowland (RoI)	17 km	Yes	No, owing to the following reasons: ▪ Separation distance of 17 km+ means the Development would appear distant range and small scale; ▪ ZTV shows patches of theoretical visibility across southern and central parts of the LCA; and, ▪ There is no close association between this LCA and the Site of the Development, as the landscape are not close nor are they orientated towards each other.
LCA 12: Lough Swouldy Slopes (RoI)	12 km	Yes	No, owing to the following reasons: ▪ Separation distance of 12 km+ means the Development would appear middle range and medium scale; ▪ ZTV shows patches of theoretical visibility on east facing hill slopes with remainder of LCA unaffected; and, ▪ There is no close association between this LCA and the Site of the Development, as the landscape are not close nor are they orientated towards each other.
LCA 13: Foyle Valley (RoI)	7 km	Yes	Yes, owing to the following reasons; ▪ Separation distance of 7 km+ means the Development would appear middle range and medium scale; ▪ ZTV shows theoretical visibility to occur almost continuously across much of this LCA; and, ▪ The Development would bring wind farms closer to this LCA despite other wind farms occurring in the area.
LCA 14: Finn Valley (RoI)	12 km	Yes	No, owing to the following reasons: ▪ Separation distance of 12 km+ means the Development would appear middle range and medium scale;

Receptor Name LCA / LCA	Nearest turbine approx. (km)	Subject to theoretical visibility?	Need to assess effects further within LVIA?
			▪ ZTV shows patches of theoretical visibility across southern valley side and more patchily across northern valley side of LCA; and, ▪ There is no close association between this LCA and the Site of the Development, as the landscape are not close nor orientated towards each other.
LCA 15: Letterkenny Estuary and Farmland (RoI)	20 km	Yes	No, owing to the following reasons: ▪ Separation distance of 20 km+ means the Development would appear distant range and small scale; ▪ ZTV shows patches of theoretical visibility across central parts of LCA; and, ▪ There is no close association between this LCA and the Site of the Development, as the landscape are not close nor orientated towards each other.
LCA 16: Cark Mountain and Upland (RoI)	22 km	Yes	No, owing to the following reasons: ▪ Separation distance of 22 km+ means the Development would appear distant range and small scale; ▪ ZTV shows patches of theoretical visibility across eastern facing slopes in eastern and southern part of LCA; and, ▪ There is no close association between this LCA and the Site of the Development, as the landscape are not close nor orientated towards each other.
LCA 18: Lough Fern (RoI)	29 km	Yes	No, owing to the following reasons: ▪ Separation distance of 29 km+ means the Development would appear distant range and small scale; ▪ ZTV shows small patches of theoretical visibility on furthest western edge with majority of LCA unaffected; and, ▪ There is no close association between this LCA and the Site of the Development, as the landscape are not close nor orientated towards each other.
LCA 19: Rathmelton Swouldy Coast (RoI)	26 km	Yes	No, owing to the following reasons: ▪ Separation distance of 26 km+ means the Development would appear distant range and small scale; ▪ ZTV shows patches of mixed level theoretical visibility across the LCA; and, ▪ There is no close association between this LCA and the Site of the Development, as the landscape are not close nor orientated towards each other.
LCA 40: Cashelnavern Border and Uplands (RoI)	18 km	Yes	No, owing to the following reasons: ▪ Separation distance of 18 km+ means the Development would appear distant range and small scale; ▪ ZTV shows small patches of theoretical visibility along northern edge with majority of LCA unaffected; and, ▪ There is no close association between this LCA and the Site of the Development, as the landscape are not close nor orientated towards each other.

Receptor Name LCA / LCA	Nearest turbine approx. (km)	Subject to theoretical visibility?	Need to assess effects further within LVIA?
LCA 43: Pettigo and Drumlins (RoI)	30 km	Yes	No, owing to the following reasons: ▪ Separation distance of 30 km+ means the Development would appear middle range and medium scale; ▪ ZTV shows very small patches of theoretical visibility along northern edge with vast majority of LCA unaffected; and, ▪ There is no close association between this LCA and the Site of the Development, as the landscape are not close nor orientated towards each other.

6.4.3 Landscape Planning Designations

There are three ways in which landscape planning designations are relevant to the LVIA:

- The presence of a designation can give an indication of a recognised value that may increase the sensitivity of a landscape character receptor, viewpoint or visual receptor, and may therefore affect the significance of the effect on that receptor;
- The presence of a relevant designation can lead to the selection of a representative viewpoint within the designated area, as the viewpoint would provide a representative outlook from that area; and,
- Designated areas may be included as landscape character receptors so that the effects of the Development on these features of the landscape that have been accorded particular value can be specifically assessed.

The Landscape Designations which occur in the Study Area include Areas of Outstanding Natural Beauty (AONBs) and Registered Gardens. The Site lies in the Sperrin AONB. The landscape designations which occur in the Study Area are shown in conjunction with the Development ZTV on Figure 6.9 and described below.

6.4.3.1 Areas of Outstanding Natural Beauty

The central and eastern part of the Study Area is covered by the Sperrin AONB. Designated in 2008 under the Nature Conservation and Amenity Lands (NI) Order 1985[24] and lying in the heart of Northern Ireland, the Sperrin AONB encompasses an extensive upland area, stretching from the Strule Valley in the west to the Lough Neagh lowlands in the east. This area presents a vast expanse of upland moorland, divided by narrow glens and deep valleys. The area is rich in historic and archaeological heritage.

The Development lies within the western part of the AONB, and this designation also covers the immediate landscape setting (up to 2 km from the nearest turbine), the local landscape setting (between 2 km and 5 km from the nearest turbine), parts of the landscape setting (between 5 km and 15 km from the nearest turbine), and the broad landscape context (between 15 km and 30 km from the nearest turbine) to the east of the Development.

The AONB designation aims to protect and enhance the landscape quality of the area as well as to promote enjoyment of the landscape by the public. Whilst views from these locations would be of heightened sensitivity, wind farm development has not been prohibited from occurring within AONBs

[24] United Kingdom Government (1985) The Nature Conservation and Amenity Lands (Northern Ireland) Order 1985 [Online] Available at: Legislation UK Government | NI Statutory Instruments (Accessed on 28/12/2022)

in NI. Paragraph 6.2.2.3 of SPPS[25] outlines the approach for development located within AONBs, stating that a cautious approach should be taken for renewable energy developments in these locations.

In respect of the Sperrin AONB, the wind farms comprise Operational Owenreagh I Wind Farm, Operational Owenreagh II Wind Farm and Consented Craignagapple Wind Farm. These wind farm developments are all located within broadly the same area as the Site.

AONBs were designated by the Department of the Environment for Northern Ireland (DoENI), which was replaced in 2015 by the Department of Agriculture, Environment and Rural Affairs (DAERA) and are of national importance. The policy context for AONBs is described in 'Planning Policy Statement 2 Natural Heritage'[26], which states that AONBs are designated *"primarily for their high landscape quality, wildlife importance and rich cultural and architectural heritage."* Policy NH 6 is specifically worded for AONBs, and states that:

"Planning permission for new development within an Area of Outstanding Natural Beauty will only be granted where it is of an appropriate design, size and scale for the locality and all the following criteria are met:

a) the siting and scale of the proposal is sympathetic to the special character of the Area of Outstanding Natural Beauty 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; and

c) the proposal respects:

- *local architectural styles and patterns*;
- *traditional boundary details, by retaining features such as hedges, walls, trees and gates;*
- *and local materials, design and colour."*

Explanatory text for this policy goes on to say the following:

"This policy requires development proposals in Areas of Outstanding Natural Beauty (AONB) to be sensitive to the distinctive special character of the area and the quality of their landscape, heritage and wildlife. 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."

In the Derry City and Strabane District Council's emerging LDP Draft Plan Strategy[27], 'Policy NE 5 Development within or affecting the setting of the Sperrin AONB' is consistent with Policy NH 6 presented above.

A detailed assessment of the effects of the Development on the special landscape qualities of the Sperrin AONB is presented in Section 6.8 of this LVIA. As there are no official policy documents detailing the reasons for which the Sperrin AONB has been designated, the assessment takes account of information included within the documents entitled 'Designation of the Sperrin AONB'[28] and 'North Derry and Sperrin AONB Boundary Review: Final Report'[29] which are not publicly available.

6.4.3.2 Registered Parks, Gardens and Demesnes

[25] Department of the Environment Northern Ireland (2015) Strategic Planning Policy Statement – Planning for Sustainable Development [Online] Available at: Strategic Planning Policy Statement (infrastructure-ni.gov.uk) (Accessed on 28/12/2022)

[26] Department of the Environment Northern Ireland (2013) Planning Policy Statement 2 Natural Heritage [Online] Available at: PPS 2: Natural Heritage (infrastructure-ni.gov.uk) (Accessed on 18/05/2023)

[27] Derry City and Strabane District Council (December 2019). Derry City & Strabane District Council Local Development Plan (LDP) 2032

[28] Northern Ireland Environment Agency and Department for Infrastructure (undated) Designation of the Sperrin AONB.

[29] Julie Martin Associates, on behalf of Environment and Heritage Service, Department of the Environment for Northern Ireland (2005). North Derry and Sperrin AONB Boundary Review: Final Report.

Figure 6.3 shows Historic Parks and Gardens in relation to the Development ZTV. This shows that the closest Registered Garden to the Development turbines is Holy Hill House at approximately 3 km to the north-west, with Moyle House, Beltrim Castle and Barons Court all lying at or beyond 10 km to the south.

The effects on those Registered Gardens contained in the Register of Parks, Gardens and Demesnes of Special Historic Interest are considered within the Cultural Heritage Chapter of the ES.

6.4.3.3 Areas of High Scenic Value

Areas of High Scenic Value (AoHSV) are the local landscape designation presented in the extant Derry Area Local Plan[30]. There are three AoHSVs within 20 km of the Development, covering both banks of the Foyle north of Derry, both banks of the Foyle south of Derry and Faughan Valley south-east of Drumahoe to Burntollet Bridge. Visibility across these is limited in nature, particularly from the designations along the Foyle north of Derry and the Faughan Valley. The designations which cover the banks of the Foyle south of Derry have some theoretical visibility, as shown on Figure 6.3. However, as the ZTV indicates, views from these areas would mainly be restricted to only a proportion of the turbines within the Development. Views of all turbines would be restricted to an area on the western bank. The Derry Area Local Plan (2011)[31] identifies these areas as AoHSV as a result of the following factors:

- "the contribution they make to the setting of the City;
- their relatively unspoilt nature and their relationship with the Rivers Foyle and Faughan in providing an attractive setting for the enjoyment of the rivers;
- their proximity to the urban area and their contribution in providing a high quality environmental image along the major approach roads to the City; and,
- their intrinsic landscape quality based on the inter-relationship between river, riverbank, large country houses, many of considerable historic character set in mature parkland/woodland and well maintained agricultural land uses."

The Local Plan provides guidance on the types of development that will be acceptable within the AoHSV and stresses their importance in providing a setting to the City of Derry. Development outwith the boundaries of the AoHSV is considered to have limited potential to influence the reasons for which these areas have been designated. At a distance of more than 15 km, and with limited theoretical visibility as shown on Figure 6.3, the Development is unlikely to result in significant effects on the AoHSV, and these designations are not considered further within the assessment.

In the Derry City and Strabane District Council's emerging LDP Draft Plan Strategy[32], 'Policy NE 7 Area of High Landscape Importance' (AoHLI) will replace the AoHSV and although also a regional level landscape designation the AoHLI will extend to cover the southern half of the Sperrin AONB.

6.4.3.4 Other Landscape Related Designations

The Derry City and Strabane District Council's emerging LDP Draft Plan Strategy[33] includes Policy RED1 / Designation WECA 1Wind Energy Capacity Area and Policy NE6 Special Countryside Area. The location and extent of these areas is shown in Appendix 1 of the LDP Draft Pan Strategy and show that the Development would be located outwith these areas.

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[30] Department of the Environment (2011). Derry Area Local Plan.

[31] Department of the Environment (2000) Derry Area Local Plan.

[32] Derry City and Strabane District Council (December 2019). Derry City & Strabane District Council Local Development Plan (LDP) 2032

[33] Derry City and Strabane District Council (December 2019). Derry City & Strabane District Council Local Development Plan (LDP) 2032

6.4.4 Representative Viewpoints

The LVIA presents an assessment of the likely significant visual effects of the Development through consideration of the specific visual effects at a selection of representative viewpoints and by considering the wider effects on visual amenity with reference to principal visual receptors. Representative viewpoints and principal visual receptors are shown in conjunction with the Development ZTV on Figures 6.5 and 6.10 respectively.

Visualisations and figures have been produced to NatureScot's standards as set out in 'Visual Representation of Wind Farms: Version 2.2' (February 2017)[34]. In the absence of the equivalent statutory bodies producing such guidance in Northern Ireland, England or Wales, this guidance is used in the production of wind farm visualisations in all parts of the UK. Photomontages have been prepared for all 25 of the representative viewpoints. These are presented in Figures 6.26 to 6.50.

The list of representative viewpoints is shown in Table 6.4 below, along with the visual receptors they represent and the landscape designations in which they occur. The locations of the viewpoints are shown in conjunction with the blade tip ZTV on Figure 6.5 and the hub height ZTV on Figure 6.6. A detailed assessment for each of these is presented in Section 6.9.

The selection has been based on the viewpoints previously included in the LVIAs for the Operational Owenreagh II and Consented Craignagapple wind farms. Additional viewpoints suggested by DfI Planning have been included, along with additional viewpoints identified by the LVIA assessors to ensure a robust assessment. This list has been verified through fieldwork, with the assessment of effects carried out in the field.

The assessment of likely significant visual effects is informed by a series of 25 viewpoints. The viewpoint assessment is used to inform and illustrate the assessment of effects on landscape character as well as the assessment of effects on views and principal visual receptors and are, therefore, selected to represent visibility from landscape character types, landscape planning designations and principal visual receptors around the Study Area. These include points of specific importance such as recognised viewpoints, designated landscapes, settled areas, important routes and attractions. A variety of landscape character types and locations from different directions and distances have also been represented. Viewpoints for the landscape and visual assessment have been discussed and agreed in consultation with DfI Planning.

It should be noted that while the majority of the viewpoints are chosen to represent receptors that have potential to undergo a significant effect, this is not always the case, and some viewpoints that are included demonstrate a lower level of visibility from certain locations. The process of identifying viewpoints involves extensive investigation to ensure that the final viewpoints are representative of levels of visibility around the Study Area, and that they clearly illustrate the predicted visibility of the Development.

Table 6.4: Representative Viewpoints

ID	Viewpoint name	Irish National Grid (ING) ref. (Preliminary)		Dist. nearest turbine (km)	Receptors represented / Landscape Designations
1	Koram Road, Ligfordrum.	241107	394617	2.0	Residents / Road-users
2	Koram Road, north of Ligfordrum.	241125	394944	1.7	Residents / Road-users
3	Napple Road, Ballykeery Bridge.	245447	395797	1.6	Road-users
4	Moor Lough picnic area.	244549	398304	1.4	Visitors / Anglers

34 SNH (2017) Visual Representation of Wind Farms: Version 2.2 [Online] Available at: "7 (nature.scot) (Accessed 18/05/2023)

5	Holyhill Road, Holly Hill	238182	398497	3.8	Residents / Road-users
6	President Wilson's House	236975	396182	4.7	Residents / Visitors
7	Strathmourne Road, Strabane	233962	395609	7.8	Road-users / Workers
8	Victoria Bridge	235402	390038	9.0	Residents / Road-users
9	Harry Avery's Castle, Newtownstewart	239162	385220	11.4	Visitors
10	Slievebeg Road, Slievebeg	248699	389186	8.6	Residents / Road-users
11	B48 Ballynamallaght	247722	400121	4.9	Residents / Road-users
12	B48 Dunnamanagh	244523	402532	5.5	Residents / Road-users
13	Lenamore picnic site, above Gortin	250717	384119	13.9	Visitors
14	Ulster Way at Bolaght Mountain above Castlederg	227297	377865	23.6	Walkers
15	Foreglen Road, Killaloo	252323	409407	14.9	Residents / Road-users
16	A5, Strule River Valley	241801	381839	14.2	Residents / Road-users
17	Bells Park Road, Glebe	232255	393158	10.0	Residents / Road-users
18	Mullaghclogha, Sperrin Mountains	255704	395693	11.5	Walkers
19	Ballindrait	230599	399953	11.5	Residents / Road-users
20	Meendamph Road, Crockrour Hill	245967	395259	2.3	Residents / Road-users
21	Glenmornan	241057	399689	2.7	Residents / Road-users
22	Aghafad Road	249070	399844	5.8	Residents / Road-users
23	Bessy Bell	239053	382091	14.5	Walkers
24	Silverhill Road	239951	397271	1.8	Road-users
25	Raphoe	226656	403175	16.3	Residents / Road-users

6.4.5 Principal Visual Receptors

A number of visual receptors such as settlements and travel routes are considered in the assessment as views from them may be affected by the Development. It is not possible to consider every potential visual receptor in the Study Area due to the extent of ground that it covers and the assessment, therefore, concentrates on the key visual receptors that may gain visibility of the Development such as settlements and routes. Principal visual receptors are shown on Figure 6.4 and in conjunction with the blade tip ZTV on figure 6.10.

6.4.5.1 General Visibility

The ZTVs of the Development shown on Figures 6.5 to 6.11 shows a general pattern in which theoretical visibility would be concentrated in the first 10 km and then occurring more patchily beyond this. The location of the Development on the northern side of Owenreagh Hill leads to a concentration of higher-level visibility across the Sperrin Foothills to the north and north-east, and the Foyle Valley to the north-west. Visibility is shown to be mostly continuous with the exception of where valleys and north-facing slopes occur. Further north, large patches of visibility occur across the south-facing slopes of the Loughermore Hills to the north-east and Derry Slopes to the north-west, albeit at distances of beyond 15 km.

To the south of Owenreagh Hill, while theoretical visibility is shown to be also largely continuous, the levels are variable with only smaller patches from where all 14 turbines would be visible. This demonstrates the screening effect of the ridgeline and intervening hills which would reduce the extent to which the Development would be visible. While visibility across the Foyle Valley is shown to be fairly widespread to the west, it would only occur on the western valley side and not the eastern valley side which would be screened by the intervening hills. In the upland area of Bessy Bell and Gortin, beyond 10 km to the south, high levels of visibility would occur, while across the Derg Valley to the south-west, again partial screening would mean that the full extents would not be visible. Patchier visibility extends on across this south-western part of the Study Area, out to the 30 km radius.
To the east of Owenreagh Hill, the increase in height of the Sperrin Mountains means that visibility is screened from most of the eastern part of the Study Area. Theoretical visibility is, however, most notably shown across the west-facing slopes on the closest parts of the Sperrin Mountains and along the north-facing slopes on the southern side of Glenelly Valley as well as more distant elevated summits.

To the west of the Development, the ZTV shows visibility extending across the border between NI and RoI, with high level visibility occurring over the western valley slopes to the Foyle Valley and into the upland landscape beyond. High level visibility is also shown to extend patchily along the northern valley side and more continuously along the southern side of the Finn Valley, as it flows west-east to join the River Foyle. Patches of visibility occur across the more elevated east facing uplands further west.

The ZTV indicates that the greatest potential for landscape and visual effects would occur within the first 10 km radius of the Study Area with also sensitive landscape and visual receptors being susceptible in the localised areas showing theoretical visibility beyond this.

6.4.5.2 Settlements and Residents

Settlement within the Study Area is primarily composed of small settlements within valleys. However, there are several larger urban centres. Derry, to the north of the Study Area, forms the largest settlement and only city within the area. There are several towns, including Omagh and Strabane. These larger settlements are more prominent across the northern, western and southern parts of the Study Area. Settlement to the east is smaller in scale as a result of the upland landscape across the Sperrin Mountains, which stretch eastwards from the Site.

With the exception of these larger settlements, settlement largely comprises small towns and villages, as well as isolated rural development, focussed along the valleys which cross the Study Area. Settlement within the area immediately surrounding the Site is most widespread to the north along the valley of the Glenmornan River. In this area, settlement mainly comprises residential properties spread out along the minor roads which traverse this area. The Residential Visual Amenity Assessment (RVAA) presented in **Technical Appendix A6.2: RVAA**, sets out the detailed assessment of the individual properties within a 2 km radius of the nearest Development turbine. Within approximately 10 km, there are small settlements at Glenmornan and Artigarvan to the north-west; Donemana to the north; Ballynamallaght to the north-east; Plumbridge to the south-east; Newtownstewart to the south; Douglas Bridge to the south-west; Sion Mills to the west; and the larger settlement of Strabane to the west. The ZTV on Figure 6.10 indicates that some of these relatively close-range settlements would be affected by visibility and, therefore, require a detailed assessment. Where high levels of visibility are shown to extend to the south, the village of Newtownstewart at a minimum of approximately 11 km appears to have some potential to be influenced by the Development although not significantly affected. Beyond this, further settlements are considered to be too distant and with too many other human influences to require detailed assessment.

Section 6.10 of this Chapter assesses the likely effects resulting from the Development on settlement within the Study Area, making reference to the visual assessment of representative viewpoints presented in Section 6.9.

6.4.5.3 Road and Railway Routes

Access routes throughout the Study Area are largely concentrated through the lower-lying valleys. A number of A roads within NI and National Primary Roads within ROI form the main transport corridors through the Study Area. The A5 passes from north to south through the centre of the Study Area and links Derry with Omagh, passing through Strabane to the west within approximately 8 km of the Development.

The A6 and the A2 pass through valleys to the south and north of the Sperrin Mountains, linking Derry with north-eastern parts of the Study Area in a generally east-west orientation. The A6 passes within approximately 15 km of the Development near Claudy. The N14 and N15 link Strabane with parts of the Study Area within RoI to the north-west and west respectively and pass within approximately 8.5 km of the Development. The A32 crosses from the south of the Study Area to Omagh, and the A505 continues to the north-east of Omagh towards Cookstown, beyond the edge of the Study Area. This route passes within approximately 21 km of the Development near Mountfield.

Within 10 km of the Study Area there is a network of minor roads which pass through the valleys between upland areas. To the east of the Development the presence of the Sperrin Mountains generally limits vehicular access. The areas to the south and west of the Development are generally more accessible via road.

The ZTV on Figure 6.10 shows theoretical visibility along the roads to be predominantly low in levels and limited in extents. This reflects the low-lying location of most roads, which typically follow the courses of the local river valleys.

The railway line between Belfast and Derry passes through northern and eastern parts of the Study Area, within approximately 18 km. However, theoretical visibility of the Development from this route is extremely limited and it is not considered further.

Routes which are considered to have the potential to be significantly affected are assessed in detail in Section 6.10 of this Chapter, making reference to the visual assessment of representative viewpoints presented in Section 6.9.

6.4.5.4 Walking and Cycling Routes

The most important long distance walking route in the area is the Ulster Way. The 636-mile circular route essentially encircles Northern Ireland, crossing briefly into RoI in several places. It passes to the east and south of the Sperrin Mountains, coming within approximately 10 km of the Site, near Gortin. The ZTV shows limited theoretical visibility to occur in sections of the Ulster Way to the east and south of Gortin; to the south of Newtownstewart; and to the north-west of Drumquin. At a minimum of approximately 10 km, and with limited theoretical visibility occurring across short discrete sections of the route, the Ulster Way is not considered to be of relevance to the assessment, especially as some sections of the route which would experience theoretical visibility have existing visibility of operational wind farms in closer proximity than the Development. Viewpoint 13 is representative of the views of walkers on the Ulster Way. The route as a whole is not included in the detailed assessment of principal visual receptors, as only short sections would be affected, which already experience views of existing wind farms.

National Cycle Route 92 passes broadly north to south and is made up of two sections of route. A small section passes along a traffic-free route along the Foyle through Derry, while the main section passes between Ballinamallard in the south, through Omagh, and finally to Lifford, beyond Strabane. To the south of the Development, it forms a circular route, which passes through Gortin, Plumbridge and Newtownstewart, passing within approximately 5 km of the Site. The extent of theoretical visibility of the Development along this route is shown on the ZTV on Figure 6.10. Sections to the south of the Development within 10 km have the potential to be significantly affected by the Development.

NCR92 is the only walking or cycling route considered to have potential to be significantly affected by the Development and is therefore assessed in detail in Section 6.10 of this Chapter.

6.4.6 Trends and Projected Future Baseline

In terms of Climate Change, the Sixth Assessment Report produced by the International Panel for Climate Change makes the following headline statements;

"A. The Current State of the Climate
A.1 It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred.
A.2 The scale of recent changes across the climate system as a whole and the present state of many aspects of the climate system are unprecedented over many centuries to many thousands of years.
A.3 Human-induced climate change is already affecting many weather and climate extremes in every region across the globe. Evidence of observed changes in extremes such as heatwaves, heavy precipitation, droughts, and tropical cyclones, and, in particular, their attribution to human influence, has strengthened since the Fifth Assessment Report (AR5)."

The key features of climate change in respect of the Northern Irish climate are generally warmer and wetter conditions. As well as an increase in rainfall, there would also be a greater risk of flooding with more frequent occurrence of heavy downpours over short periods of time. As settlement and roads are typically located along the valley floors of the Study Area, this means these areas are most susceptible to flooding. Farmland would also be increasingly at risk, especially where run-off from adjacent hillsides washes onto lower-lying areas or where rivers or loughs spread into farmed floodplains. Warmer conditions are also giving rise to the spread of pests and diseases, which are not only endangering forestry and other tree species, but also the wildlife dependent on tree cover for their survival.

Other changes occurring in the Study Area are the increase in wind farm developments and the felling and replanting of coniferous forestry, which has become mature. Figure 6.12 shows the extent of operational, under construction and consented wind farm developments, as well as those at application stage and in scoping. The approach of the assessment to cumulative effects is outlined below and a more detailed assessment is contained in 'Assessment of Cumulative Effects' Section 6.9.19. It must be noted that wind farm consents are often time-limited and that in the absence of applications for repowering of wind farms, decommissioning would be the default.

Existing settlements at close range are relatively small and their growth has typically occurred incrementally. The emerging Derry & Strabane Local Development Plan[35] highlights that future growth would predominantly take place in Derry and Strabane. The majority of developments in the rural area comprise individual properties or small clusters of properties, which although unlikely to grow substantially, continue to erode the extent of undeveloped countryside.

6.4.7 Cumulative Wind Farm Developments

Both NatureScot and GLVIA3 advise in their guidance that the assessment of the cumulative effects associated with the Development should encompass the effects of the proposal in conjunction with existing, under construction, consented and application stage wind farms awaiting determination. Schemes that are at the pre-planning or scoping stage are generally not considered in the assessment of cumulative effects because firm information on which to base the assessment is not available. The list of proposals presented in NatureScot guidance (2021, p4) is as follows:

- *"existing development, either built or under construction;*
- *approved development, awaiting implementation; and*
- *proposals awaiting determination within the planning process with design information in the public domain. Proposals and design information may be deemed to be in the public domain once an application has been lodged, and the decision-making authority has formally registered the application."*

The developments to be included within the CLVIA are set out in Table 6.5 below. As stated in NatureScot guidance (2021, p5);

[35] Strabane District Council (Dec 2019) Local

"The key principle for all impact assessments is to focus on the likely significant impacts and those which are likely to influence the outcome of the consenting process".

The cumulative situation changes frequently as applications are made or withdrawn, and the layouts of submitted wind farm applications are changed. It is, therefore, necessary to agree on a cut-off date when the sites and layouts to be included are fixed. This has been set at 31st January 2023. Any changes in the cumulative situation after this date are not incorporated in the assessment.
The size of the cumulative wind farms is also of relevance to the CLVIA, in terms of the number and size of the turbines. In respect of the cumulative context, the strongest influences would arise from those wind farms in close proximity to the Development. The larger the development, generally the higher the likelihood of a significant cumulative effect. Turbines of less than 50 m are not included within the assessment as they have a limited influence as part of the cumulative context.

A total of 60 wind farm sites lie within a 30 km radius of the Development and these are listed in Table 6.5 below. Sites that lie outwith a 30 km radius of the Development have been discounted due to their distance from the Development which ensures that either one or both would be seen from a considerable distance away and, therefore, would have a very limited effect.

Table 6.5 shows the separation distance of the cumulative wind farms or single turbines from the Development, turbine height and number. These are often the key reasons for excluding sites within the cumulative context as they are considered to not have the potential to contribute to the Development having a significant cumulative effect.

Table 6.5: Cumulative wind energy development within a 30 km radius

Name / Status	Status	Number of turbines	Blade tip height	Distance in km
Altahullion I	Operational	20	80	23.5
Altahullion II	Operational	9	80	23.6
Glenconway	Operational	20	115	23.2
Monnaboy	Operational	4	121	22.3
Bessy Bell I	Operational	10	59.75	14.9
Castlecraig	Operational	10	127	25.4
Church Hill	Operational	8	100	29.4
Seegronan	Operational	6	110	29.2
Slieveglass	Operational	3	99.5	23.5
Tappaghan Mountain	Operational	13	88	30.3
Thornog	Operational	4	99.5	30.2
Tappaghan Mountain Extension	Operational	6	100	30.9
Lough Hill Resubmission	Operational	7	80	26.3
Bin Mountain	Operational	6	90.25	25.6
Bessy Bell II	Operational	6	96	14.6
Eglish Mountain	Operational	6	107	9.9
Curryfree	Operational	6	100	11.8

Name / Status	Status	Number of turbines	Blade tip height	Distance in km
Slieve Kirk	Operational	12	106.2	10.7
Carrickatane	Operational	9	110	10.0
Drumcraig Road (19)	Operational	1	54	11.7
Clondermot	Operational	1	110	16.4
Trench Road (51)	Operational	1	53	16.1
Meenagrauv	Operational	4	75	29.9
Pollnalaght	Operational	12	125	25.3
Crockdun	Operational	5	100	25.2
Rushall Road (62)	Operational	1	63.5	13.9
Lislafferty Road (20)	Operational	1	68.5	13.9
Lislafferty Road II (20)	Operational	1	68.5	13.9
Peacock Road	Operational	1	59.5	11.7
Meenanilta	Operational	6	75	30.3
Ballykeery Road	Operational	1	57.5	1.6
Ballylaw Road	Operational	1	67	5.7
Clunahill	Under Construction	6	100	27.4
Ballyhanedin	Consented	8	126	19.8
Barr Cregg	Consented	7	125	17.6
Dooish	Consented	10	120.5	28.8
Gronan	Consented	4	125	30.3
Pigeon Top	Consented	9	126	25.7
Bessy Bell II Extn.	Consented	4	115	15.4
Erganagh Road (29)	Consented	1	81	17.2
Ligford Rd	Consented	1	55	4.8
Greenville Road (40)	Consented	1	68.5	13.7
Cavan Road (68)	Appeal	1	59.5	21.2
Cavan Road (66)	Appeal	1	62	21.2
Altgolan	Application	5	149.99	29.2
Binnawooda	Application	15	109.5	24.6
Thornog Extension	Application	4	99.5	31.3
Magheramore	Application	6	149.9	25.5

Name / Status	Status	Number of turbines	Blade tip height	Distance in km
Ballylaw Road (5)	Application	1	67	5.7
Dunnyboe Road (165)	Application	1	76.5	3.4
Curlyhill Road	Application	1	66.5	4.2
Castlewarren Road (90)	Application	1	59.5	10.4
Aghalougher Rd (28)	Application	1	86	28.3
Concess Road (35)	Application	1	70.5	11.2
Botera Road (81)	Application	1	54.5	24.7
Ballykeery Road	Application	1	85	1.5

All operational and under construction sites are included in the baseline assessment as they form a part of the baseline situation. Their presence has the potential to influence the assessment of effects on landscape character and the assessment of effects on views. The cumulative assessment of the operational and under construction sites, as well as the consented and application sites, is presented in the 'Assessment of cumulative effects' in Section 6.9.19. This assessment differs from that contained in the 'Assessment of effects on landscape character' and 'Assessment of effects on views' in that it focuses specifically on the cumulative effect of the Development in association with all other cumulative sites and assesses the detailed relationship between them.

6.5 Potential Effects and Mitigation

6.5.1 Potential LVIA Effects

Potential effects are those which could result from the construction, operation and decommissioning of a wind farm, according to the development, site and receptor characteristics and their interactions. Table 6.6 describes typical landscape and visual effects that can occur from a wind farm, their inclusion does not imply that they would occur, or be significant in the case of the Development. A variety of landscape and visual mitigation measures have been incorporated through the iterative design of the Development in order to prevent, reduce or offset potential landscape and visual effects. These are described in the section on mitigation below. The residual effects of the Development – those effects remaining after mitigation that would materialise when the Development is under decommissioning and construction, operation or final decommissioning, are assessed in the 'Assessment of effects on landscape character' and 'Assessment of effects on views' in Sections 6.7 and 6.8.

Table 6.6: Typical landscape and visual effects of wind farm development

Activity	Specific Element	Potential Effects	Potential Sensitive Receptors
Initial Decommissioning / Construction	Construction plant, temporary construction facilities, , construction cranes, access track construction, turbine removal, turbine construction	Temporary physical effects on landscape fabric Temporary effects on landscape character Temporary effects on views Temporary cumulative effects	Physical landscape features e.g. trees and ground cover Landscape character receptors – landscape character types, and designated landscapes

Operation	Turbines, access tracks, substation, site office, transformers	Long term effects on landscape character Long term effects on views Long term cumulative effects with other wind farms	Views – experienced by different receptors e.g. residents, road users, walkers
Final Decommissioning	Construction plant, cranes, turbine removal	Temporary physical effects on landscape fabric Temporary effects on landscape character Temporary effects on views	

The effects of the Development on the landscape and visual resource would arise principally from the decommissioning and construction, operation and final decommissioning of the turbines, control building, substation and access tracks. The temporary construction facilities, such as cranes, construction vehicles, construction compounds, laydown areas and delivery vehicles required during the construction would also have effects on the landscape and visual resource. It is anticipated that decommissioning and construction phase of the Development would take approximately 12 months; the decommissioning and construction effects identified are therefore predicted to occur during this period and end at the start of the operational stage. While the majority of the effects during the decommissioning and construction phase would relate to the tall cranes, it is anticipated that two months would be the maximum period during which the cranes would be active, making this an especially short-term effect. A Decommissioning and Construction Environmental Management Plan (DCEMP) would be prepared that would further detail the mitigation measures to be implemented during the decommissioning and construction phase.

6.5.2 Mitigation

This section describes the landscape and visual mitigation measures which have been incorporated through the iterative design of the Development in order to prevent, reduce or offset potentially negative landscape and visual effects caused by the decommissioning and construction, operation and final decommissioning of the Development. It should be read in conjunction with the full project description and the rationale for site selection and scheme design in **Chapter 3: Development Description**, and **Chapter 4: Site Selection and Design**.

6.5.2.1 Site Selection

The Site lies within the Sperrin Mountains LCA which is characterised by a well-defined, west-east band of hills extending from the centre of the Study Area to its eastern edge. The Development is located in the western part of this LCA, where the hills are slightly lower and wind farm development already exists in the form of Operational Owenreagh I Wind Farm and Operational Owenreagh II Wind Farm. The suitability of the Site for wind farm development relates principally to the landscape character of the Site, and this has been realised through the location of the existing wind farm development at the Site. The existing influence from these operational wind farm developments has established wind farm development as a baseline feature of this landscape.

The Development would be located within the Sperrin AONB and would, therefore, have a direct effect on this designated landscape. However, the Site is located at the north-western edge of the AONB, within the foothills of the Sperrin Mountains, and the focus of the AONB is the higher hills to the east of the Study Area. The position of the western part of the Development (T1 to T5) to the west of Owenreagh Hill would reduce its influence on the AONB by partially screening some of the turbines beyond the ridge formed by the hill in views from the east. As shown on Figure 6.9, visibility of the Development would be primarily focussed within 10 km and would be limited from the majority of the AONB. The principle of wind farm development within the AONB has been accepted previously, both at the Site itself and at Eglish Mountain Wind Farm, which is also located on the north-western boundary of the AONB, to the north of the Development. The AONB is also indirectly influenced by visibility of wind farms within the wider landscape. The likely effects on the AONB are described in Section 6.8.

General visibility is described in detail in Section 6.4.1 highlighting the relatively contained pattern of visibility that would arise across the Study Area, with patchy visibility occurring to the north, west and south but limited to the east. This contained pattern relates largely to the screening effect of surrounding uplands, most notably the Sperrin Mountains to the east of the Site which would notably reduce the extent of visibility across the eastern half of the Study Area. Furthermore, the Cumulative ZTVs on Figures 6.13 to 6.22 show that the extent to which the Development would be visible broadly replicates the existing extent to which the consented Owenreagh I and II Wind Farms are already visible and to a lesser extent the extent to which the Consented Craignagapple Wind Farm would be visible. This means that in those locations where visibility of the Development would arise, it would seldom appear as a new feature owing to existing visibility of the operational developments, albeit with the proposed turbines notably larger than the operational turbines.

The visibility of the Development from visual receptors within the wider area, including roads, settlements and core paths, is limited to localised areas and short sections of routes. The potential effects of the Development on visual receptors are assessed in Sections 6.9 and 6.10.

6.5.2.2 Layout design

The design of the wind farm layout is a vital part of the EIA process as it is the stage where the most notable contribution can be made to mitigate potential landscape and visual effects. This helps to create a wind farm which is appropriate for the existing landscape character and visual features of an area. The iterative design process allows the effects of different wind farm layouts to be assessed then modified to prevent, reduce or offset effects. The residual effects reported in the following sections, therefore, include considerable embedded mitigation in the form of design refinement and consideration against landscape and visual objectives, for example, arranging turbines with respect to landform features, particular consideration of a view of the wind farm from a highly valued landscape, or ensuring the arrangement of turbines is aesthetically balanced from sensitive viewpoints.

In order to minimise negative effects on landscape character and visual amenity, a number of design principles were considered. Insofar as was possible, given the other technical and environmental constraints on the Site, these principles sought to reduce significant effects through alterations to layout, design and siting, management practices and mitigation. The design objectives are based upon the characteristics of the existing landscape and visual environment, described in Section 6.4 Baseline Conditions above, and are set out as follows:

- To create a visually legible design, insofar as was possible on a site, which is constrained by other environmental and technical issues, and create a simple, positive layout, viewed consistently from different positions;
- To minimise the effects of the Development on the sensitive and close-range Sperrin Mountains;
- To ensure that the Development in views from the Sperrin Mountains appears a compact and well-defined group in which the turbines relate well to the landform and each other;
- To group turbines to create a balanced and coherent image, avoiding where possible excessive ‘stacking’ or overlapping of turbine rotors in lines, favouring an irregular cluster, that reflects the nature of the undulating landscape; and,
- To group the infrastructure in order to limit the number of areas affected.

The iterative design process has refined the original layout to help mitigate the potential effects of the Development on the landscape and visual receptors. The key considerations have been the likely significant effects on the close-range Sperrin Mountains, including the Sperrin AONB, and views from the surrounding valleys, but also taking into account other sensitive receptors using wirelines from key viewpoints to inform the process. Concerns regarding the height of the proposed turbines has led to a reduction in proposed blade tip height from 180 m to 156.5 m, with the motivation for this decrease being to reduce landscape and visual effects on nearby sensitive receptors.

Environmental constraints, relating to areas with special sensitivities in respect of cultural heritage assets, ornithology, hydrology and peat, as well as constraints of gradient, have also been important considerations in the iterative process and these have had a notable influence on the final design.

6.5.3 Residual Effects

The residual effects are those which remain after mitigation. The residual effects that the Development would have on the landscape and visual resource are assessed in the sections presented below. These are categorised into physical effects, effects on landscape character, effects on landscape designations, effects on views and effects on principal visual receptors, as described previously. Cumulative effects are assessed in the 'Assessment of cumulative effects' later in this chapter at Section 6.9.19.

6.6 Assessment of Physical Effects

6.6.1 Introduction

The first category of effects covered in the assessment is physical effects, which are direct effects on the fabric of the Site, such as the removal of ground cover vegetation. Physical effects are found only where existing landscape elements may be removed, replaced or altered by the Development. This category of effects is made up of landscape elements and, in this case, there is only one element involved; rough grass moorland. It is important to note that the assessment of effects on landscape elements presented in the LVIA Chapter is separate from the assessment of effects on National Vegetation Classification (NVC) presented in **Chapter 10: Ecology** and **Technical Appendix A10.3: NVC Assessment**, as the LVIA Chapter is assessing rough grass moorland as a component of the landscape while the Ecology Chapter is assessing rough grass moorland as an ecological element. The methodology for the assessment of physical effects is described in full in **Technical Appendix A6.1: Landscape and Visual Impact Assessment Methodology**.

6.6.2 Rough Grass Moorland

Baseline

Livestock farming is by far the predominant land use across the Study Area and characterises much of the Northern Irish landscape. Farms are typically small to medium in scale with small to medium sized fields, enclosed by post and wire fencing or drystone dykes, and containing mostly improved or semi-improved pasture. The Development infrastructure is located across Owenreagh Hill which is used to farm sheep and cows. The land cover comprises mostly rough grass moorland with some areas of semi-improved pasture. While definition of fields is formed by post and wire fencing across the middle and lower slopes, Owenreagh Hill generally appears as an open expanse of moorland with some semi-improved grasslands also. There are few hedgerow boundaries or trees on the Site and no other areas of natural vegetation.

Rough grass moorland is the predominant landcover across the Site. It comprises mostly rough grasses, which grow from soil that tends to be peat based and often waterlogged, albeit with drier upper slopes and summits. This type of landcover is typical throughout much of Northern Ireland. It contributes to the open and exposed parts of the upland landscape and provides contrast from improved pasture in the valley landscapes. While ecological diversity occurs within the rough grass moorland at a detailed scale, the general appearance is of a homogenous landcover.

Sensitivity

In an agricultural area with extensive improved pasture, the rough grass moorlands contribute to the more open and less modified character of the landscape. While it is a relatively abundant landscape element that is not rare or recognised for its value, within the diversity at the detailed scale there are landscape elements within it which are of greater value owing to the importance of the flora and fauna. The value of the rough grass moorland is medium.

The susceptibility of the rough grass moorland to the effects of the Development is medium-low as it occurs in abundance across the uplands of the Sperrins. Furthermore, the rough grass species are sufficiently invasive to enable them to re-colonise disturbed areas and can re-establish in relatively short periods of time.

The combination of these factors results in a **medium** sensitivity being attributed to the rough grass moorland on the Site.

Magnitude of Change

Changes to the rough grass moorland landscape element would result as a consequence of the removal of soil and vegetation from the routes of the access tracks, in the areas of the temporary construction compound and the longer-term sub-station, control buildings, crane pads and turbine foundations.

There will also be the reinstatement of rough grass moorland in those areas where the Owenreagh I and II turbines would be removed. In those locations where the areas of the turbine and transformer bases will not form part of the new crane hardstanding and laydown areas, they will be cut to 1 m below the surface and backfilled with suitable topsoil. Those areas of hardstanding and access track which are being reused will be retained, whilst unaffected areas of hardstanding and access track that have already naturally regenerated will either be left in situ or removed and reinstated.

The magnitude of change on the rough grass moorland element would be **medium-low** as the Development would result in both the removal and reinstatement of relatively small areas, which constitute a small proportion of this extensive landscape element. This rating has also taken into account the relative ease with which this vegetation type can re-colonise. The location of the turbines, tracks and other associated infrastructure have been carefully located to avoid the more sensitive habitats within this landscape element.

Significance of Effect

The physical effect of the Development on the rough grassland would be **moderate / minor** and **not significant**. This is primarily due to the medium sensitivity of the landscape element, the limited proportion of the landscape element that would be affected, and the high potential for the physical mitigation of any direct effects through reinstatement of the rough grass moorland ground cover. Although the effect would be not significant, the nature of the effect would be adverse.

6.6.3 Summary of Physical Effects

The principal physical effects that the Development would have on the landscape fabric of the Site are the removal of relatively small areas of rough grass moorland. These effects have been assessed as not significant largely owing to the extensive nature of this landcover type and the relative ease with which reinstatement can take place both post-construction, in respect of the temporary infrastructure, and post-decommissioning.

6.7 Assessment of Effects on Landscape Character Receptors

6.7.1 Introduction

Landscape character is the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape and relates to the way in which this pattern is perceived. Effects on landscape character are manifested both at the location of the Development, where the pattern of elements that characterise the landscape will be directly altered by the removal of Owenreagh I and II wind farms and the addition of the Development to the landscape; and off-site, around the Study Area, where visibility of the new components of the Development may alter the way in which this pattern of elements is perceived. For example, if the proposed Development turbines are visible from LCA 24: South Sperrins, the perceived experience of this area may be altered as the visibility of the wind farm introduces new external influences and characteristics, despite its physical location in a different, geographically separate, LCT.

Landscape character receptors fall into two groups:

- LCTs/LCAs; and,
- Designated areas.

The assessment of effects on these receptors is described in the following sections of this chapter. The detailed methodology for the assessment of effects on landscape character is described in **Technical Appendix A6.1: Landscape and Visual Impact Assessment Methodology**.

It should be noted that levels of magnitude of change on landscape character receptors are generally found to be lower than the magnitude of change on viewpoints that lie within these receptors. This means, for example, that if a viewpoint is assessed to undergo a medium-high magnitude of change it does not necessarily follow that the landscape character receptor within which it lies would also undergo a medium-high magnitude of change but may undergo a medium magnitude of change instead.

This is because the effects on viewpoints are assessed within the context of a specific outlook towards the Site and are usually specifically selected to gain a direct view over the Development. The Development is therefore the principal consideration in the viewpoint assessment, and influences that lie in other areas of the view are of lesser relevance to the assessment. The landscape character of a receptor is not, however, determined so specifically by the outlook over the Development, and there are many other considerations, both visual and perceptual, that combine to give an area its landscape character. This means that the degree of influence of the Development on landscape character may be lower than its influence on a specific view. Viewpoints are referred to in this assessment as they do give a useful indication of the appearance of the Development from the landscape receptors, but the level of magnitude of change may vary between the viewpoint assessment and the landscape character assessment.

This is particularly true of areas that lie slightly further away from the Site. In the immediate vicinity of the Site, typically up to around 2 to 3 km away – the magnitude of change on viewpoints and landscape character is likely to be similar, but beyond this, the magnitude of change on landscape character is found to often diminish more rapidly as the influence of the turbines is subsumed in the many other influences on landscape character.

6.7.2 Assessment of Effects on LCAs

The LCAs that cover the 30 km Study Area are shown in conjunction with the ZTV on Figure 6.8. Through the scoping process, no objection was raised by statutory consultees to the proposed approach to scope out LCAs beyond a 20 km radius of the Development. Section 6.4.2 presents a further review of those LCAs within the 20 km radius. This has found that the following LCAs have the potential to undergo significant effects and, therefore, require a detailed assessment in the LVIA.

- LCA 20: Derg Valley;
- LCA 24: South Sperrins;
- LCA 26: Bessy Bell and Gortin LCA;
- LCA 27: Foyle Valley LCA;
- LCA 28: Glenelly Valley
- LCA 29: Sperrin Mountains;
- LCA 30: Sperrin Foothills;
- LCA 31: Burngibbagh and Drumahoe; and,
- LCA 13: Foyle Valley (RoI).

The effect on each of these nine LCAs is assessed below. The LCAs that cover the remainder of the Study Area were found through the review process in Section 6.4.2, to not have the potential to be significantly affected and have, therefore, not been assessed in any further detail.

6.7.3 LCA 20 Derg Valley

Baseline

The following baseline description is an extract from the ‘Northern Ireland Landscape Character Assessment 2000’.

- *“Gently rolling pastures on lower valley slopes and river floodplain.*
- *Meandering river is sometimes enclosed by low embankments.*
- *Extensive patches of peaty marsh and scrubby fen woodland at confluences with minor streams.*

- *Areas with small, poorly-drained fields are often juxtaposed against larger, rolling pastures; fields enclosed by both stone walls and hedgerows.*
- *Large pastures near river have open character but there are numerous hedgerow trees and small woodlands on adjacent hills.*
- *Straight, embanked roads and stone bridges on floodplain, winding, narrow lanes on lower valley slopes.*
- *Farms and cottages scattered along roads; larger settlements concentrated at principal bridge crossing points."*

This LCA sits within the south-west quadrant of the Study Area, at a range of approximately 10 and 30 km from the Development. The LCA is centred around the River Derg, which flows from Lough Derg, in the afforested uplands to the south-west, to join with the River Foyle to the north-east. While the south-western section of the river is enclosed by low hills, the north-eastern section is more open, albeit with intermittent low hills in the wider surrounds. This LCA is characterised by agricultural land-uses, with fields of pasture set across the rolling landform with some enclosure afforded by hedgerows and trees. Farmsteads and other rural properties occur intermittently across this rural area, accessed by the fine network of minor roads that cover much of this landscape.

There are no large-scale developments in this LCA, and settlement and roads are typically rural in character and small in scale. There is, however, influence from the town of Castlederg in the centre of the LCA and the 'B' roads that pass in and out of it. There is also an influence from operational wind farms which occupy the southern boundary of the LCA, including Church Hill, Seegronan, Bin Mountain and Lough Hill Resubmission, as well as smaller scale turbines in the LCA itself.

Sensitivity

The value of this LCA is medium as it is not covered by any landscape planning designations which would otherwise denote a special scenic value.

The susceptibility of this LCA to the effects of the Development is medium. This LCA is largely undeveloped and predominantly rural in character, although heavily modified by the land-use practices of farming, with also an influence from settlement and roads. There is also an existing influence from a cluster of wind farms along the southern boundary of the LCA which make this type of development an established part of the baseline character. The effects of the Development on the character of the LCA would be indirect and would be associated with the western end of the Sperrin Mountains where wind farm development is already evident, albeit from the smaller scale Owenreagh I and II turbines at a minimum distance of approximately 10 km.

The combination of the medium value of the LCA with its medium susceptibility to the Development, gives rise to an overall **medium** sensitivity.

Magnitude of change

The ZTV on Figure 6.8 shows theoretical visibility occurring as large patches across the north-eastern part of this LCA, which is closest to the Development, and across the southern side of the Derg Valley, with theoretical visibility across the northern side much more limited in extent. Typically, 9 to 12 of the turbines would be visible from this LCA with those on the north-eastern side of the Development screened by intervening Owenreagh Hill. They would be seen from a minimum of approximately 10 km extending out to 30 km.

During the decommissioning and construction phase, the magnitude of change would be **medium-low**. The minimum separation distance of 10 km combined with the extent of intervening landform would mean that ground level construction works would not have a notable influence on this LCA. While the presence and activity of the cranes and the removal of the existing turbines and emergence of the proposed turbines would have an influence on this LCA, this would be moderated by their separation distance of over 10 km, their location on the same hill as the operational Owenreagh I and II wind farms, and the stronger influence from the closer range hills to the south-east of the Derg Valley.

During the operational phase, the magnitude of change would be **medium-low**. The Development would have an influence on this LCA, owing to the location of the proposed turbines in the north-easterly sector of the wider landscape, with which the valley aligns, such that there is some degree of association. Despite the baseline influence of Owenreagh I and II in this location, the proposed turbines would appear larger and form a more readily visible feature.

The Development would not, however, become the defining feature in the characterisation of this valley landscape owing to the separation distance of the development at a minimum of approximately 10 km, its location in, and association with, this distinct upland landscape on the western end of the Sperrins, the stronger influence from the immediate valley landscape and surrounding closer range hills, and the stronger influence from the closer range single turbines in this LCA and wind farms around its edges.

Significance of effect

The effect of the Development on the landscape character of the LCA 20 Derg Valley would be **moderate / minor** and **not significant** during both the decommissioning and construction and operational phases. The Development would not redefine the landscape character of this LCA owing principally to its separation distance from this LCA, the greater influence from the immediate and surrounding landscapes, and the existing influence from the closer range operational wind farms to the south-east.

6.7.4 LCA 24: South Sperrins

Baseline

The following baseline description is an extract from the 'Northern Ireland Landscape Character Assessment 2000'.

- *"Broad rounded ridges with deep, branching gullies and fast-flowing upland streams.*
- *Meandering rivers are a focus for views - the narrow floodplain is often subdivided by irregular mounds of glacial till.*
- *Patches of peaty marsh in low-lying areas between ridges of moraine and valley sides.*
- *Marginal farmland, with scrub, rushes and moorland vegetation on upper slopes of stream valleys.*
- *Hedgerows and stone walls on lower slopes follow historic townland boundaries and emphasise the undulating landform.*
- *Narrow lanes along margins of river floodplains - stone bridges at crossing points are local landscape features."*

This LCA sits within the south-east quadrant of the Study Area, at a range of approximately 8 and 29 km from the Development. The South Sperrins LCA extends from Slievemore (367 m AOD) to the south of Plumbridge, in the west, to Slieveavaddy (486 m AOD) to the west of Draperstown in the west. It lies wholly within the Sperrin AONB, forming a band of hills across the south-western part of the AONB. The South Sperrins LCA is separated from the Sperrin Mountains to the north by the intervening Glenelly Valley LCA which forms a predominantly east to west alignment. The South Sperrins LCA follows this east to west alignment by forming a narrow band of hills in the western part of the LCA, defined by Glenelly Valley to the north and the Owenkillew Valley to the south, which broaden and increase in height in the eastern part of the LCA.

The hills are broad and rounded, with rough pasture used for hill sheep farming across the upper slopes and improved pasture across the middle and lower slopes. There are also blocks of commercial forestry across the hill slopes of the Glenlark Valley and other hill slopes to the east. There are farmsteads and rural properties dispersed around the margins and along the valleys within the LCA, but no settlement in the hillier parts. Minor roads are also typically concentrated in the lower-lying parts with one crossing the hills through the centre of the LCA. There are no wind farms in this LCA and no large-scale developments, although the landscape has been modified by commercial forestry and farming and settlement is widely evident.

Sensitivity

The value of this LCA is high owing to its location within the Sperrin AONB which marks the national scenic value of this landscape.

The susceptibility of this LCA to the effects of the Development is medium. This LCA is largely undeveloped and predominantly rural in character, although heavily modified by the land-use practices of farming, with also an influence from settlement and roads. There is also an existing influence from a cluster of wind farms along the south-eastern and southern boundary of the LCA which make this type of development an established part of the baseline character. The effects of the Development on the character of the LCA would be indirect and would be associated with the western end of the Sperrin Mountains where wind farm development is already evident, albeit from the smaller scale Owenreagh I and II turbines at a minimum distance of approximately 7 km.

The combination of the high value with the medium susceptibility gives rise to an overall **medium-high** sensitivity.

Magnitude of change

The ZTV on Figure 6.8 shows that the Development would not be visible across a substantial part of this LCA, with visibility occurring only across the western edge of the LCA and then as very small patches on select summits or north-west facing slopes across the LCA. The Development would be visible from the western edge of the LCA between a range of approximately 7 and 13 km.

Across the majority of the LCA there would be **no change** during both the decommissioning and construction phase and the operational phase, as there would be no visibility.

During the decommissioning and construction phase, the magnitude of change would be **medium-low** or **low** where visibility occurs. While some of the ground level construction works would be screened by intervening landform, some visibility may occur from parts of the LCA from where the exposed ridgeline would be visible. The key feature during the decommissioning and construction phase would, however, be the use of tall cranes and the removal of the existing turbines and emergence of the proposed turbines. This effect would be moderated by the separation distance between the Development and the LCA, the relatively small proportion of the wider landscape context that would be affected, and the greater influence from the wider landscape context.

The only parts of the South Sperrin LCA that would be affected by the Development would be the western edge and very small patches on select summits or north-west facing slopes, where the magnitude of change during the operational phase would be **medium-low** or **low**. From the closest parts, the full Development would not be visible owing to the screening effect of the intervening landform, although in those parts beyond 10 km fuller visibility would occur. The proposed turbines would appear notably larger than the existing turbines and would form a prominent feature in the lower hills to the north-west of the LCA. The magnitude of change would, however, be moderated by the much wider landscape influence, whereby there is a close association between the western end of these hills and the convergence of the River Glenelly and River Owenkillew, as well as a close association with the higher Sperrin Mountains to the north and north-east and the baseline influence from Owenreagh I and II in the same location as the Development.

Significance of Effect

There would be no change and, therefore, no effect across most of the South Sperrins LCA owing to there being no visibility of the Development. In those localised parts where visibility does arise, the effect would be **not significant** at a **moderate** or **moderate / minor** level owing to the limited levels of visibility, the wider landscape influences on this LCA and the baseline influence of Owenreagh I and II in the same location as the Development.

6.7.5 LCA 26 Bessy Bell and Gortin

Baseline

The following baseline description is an extract from the ‘Northern Ireland Landscape Character Assessment 2000’.

- *“Scenic, accessible landscape on the western fringes of the Sperrins; steep mountain of Mullaghcarn to east and rounded moorland summit of Bessy Bell to west.*
- *River Strule flows within incised, wooded valley, with roads following river course on terraces alongside.*
- *Diverse landscape pattern, with a transition from steep, wooded river banks to farmland to open moor within relatively short distances.*
- *Hedgerows enclose all fields, becoming gappy, with wire fencing on higher land; stone walls in areas of higher land close to the Sperrins.*

- *Relatively dense tree cover, with numerous hedgerow trees and small copses; landscape becomes more open on elevated slopes.*
- *Long scenic views from mountain slopes and along valley."*

This LCA sits within the southern quadrant of the Study Area, at a range of approximately 8 and 22 km from the Development. The LCA is defined by the upland hills of Bessy Bell (420 m AOD) in the west and Mullaghcarn (542 m AOD) in the east. These hills are separated by the relatively narrow valley of the River Strule, which flows from south to north to join with the River Foyle at Newtownstewart. This adds to the diversity of this LCA, with marked transitions from wooded river valleys, through farmed valley slopes to open moorland hills.

Agriculture is the predominant land-use across this LCA, with fields of pasture through the valleys and across the hill slopes, and rough grazing across the moors and hills. There are also forestry blocks across the western flanks of Bessy Bell and Mullaghcarn, adding to the modified state of the landscape. Barons Court is a designed landscape to the west of Bessy Bell which comprises a mix of coniferous and deciduous woodlands around a series of loughs.

In contrast to the rural character of much of this LCA, the routing of the A5 through the Strule Valley, along with the location of Newtonstewart and Gortin on the norther edge of the LCA, presents more of an urban influence. There is also an influence from operational wind farms which are located in this LCA; namely Bessy Bell I and Bessy Bell II with a consented Bessy Bell II Extension set to join the cluster.

Sensitivity

The value of this LCA is medium-high to the west of the Strule Valley and high to the east, reflecting the fact that the Sperrin AONB extends to cover the eastern part of this LCA but not the western part. Although the western part of the LCA is not covered by any landscape planning designations, which would otherwise denote a special scenic value, Barons Court is designated under the title 'Historic Parks and Gardens'.

The susceptibility of this LCA to the effects of the Development is medium. The key factor in this assessment is the baseline influence from the Bessy Bell wind farms, which are located in this LCA, and which mean that by comparison the Development would form a familiar type of development with an influence from a more distant range. This LCA has also been modified by agricultural and forestry practices, such that there are few natural areas. The influence of the Development on the character of the LCA would be indirect and would be associated with the western end of the Sperrin Mountains where wind farm development is already evident in Owenreagh I and Owenreagh II, albeit at a minimum distance of approximately 10 km.

The combination of the high or medium-high value of the LCA with its medium susceptibility to the Development, gives rise to an overall **medium-high** sensitivity in the eastern part and **medium** sensitivity in the western part.

Magnitude of change

The ZTV on Figure 6.8 shows theoretical visibility occurring fairly extensively across the western part of the LCA at minimum distances of approximately 11 to 19 km, and typically comprising higher levels of visibility across the expansive north-facing slopes. The ZTV also shows theoretical visibility across the eastern part of the LCA, although much more contained along the northern and north-eastern edge with numbers of turbines visible increasing from the north to the south from a minimum distance of approximately 8 km to 14 km. There is also a band of high-level visibility along the ridgeline that extends from the high point of Mullaghcarn (539 m AOD).

During the decommissioning and construction phase, the magnitude of change would be **medium-low** or **low** in those parts of the LCA where visibility would arise. There would be **no change** in those parts of the LCA where there would be no visibility. Despite the elevated nature of much of the LCA, the ridge of Owenreagh Hill would intervene to screen visibility of most of the ground level construction works, with the exception of those along and close to the ridgeline. The presence and activity of the construction cranes and the removal of the existing turbines and construction of proposed turbines would be visible above the ridge and would have an influence on this LCA. This effect would, however be moderated by the minimum separation distance of 8 km, their location in the same area as the decommissioned Owenreagh I and II wind farms, their relatively small numbers and contained extents amidst a much wider landscape context and the closer range influence from operational Bessy Bell I and II wind farms in the western part of this LCA.

During the operational phase, the magnitude of change would be **medium-low** or **low** in those parts of the LCA where visibility would arise. There would be **no change** in those parts of the LCA where there would be no visibility. Those factors which add to the magnitude of change include the orientation of the extensive north-facing slopes of this LCA, broadly towards the north where the Site is located, and the larger scale of the proposed turbines which would make them a more readily visible feature compared to the existing Owenreagh I and II turbines. While the proposed turbines would be noticeably larger, this change would not be of a sufficient magnitude for the Development to redefine the landscape character of this LCA.

Those factors which reduce the magnitude of change, include the minimum separation distance of 8 km to the eastern part where low levels of visibility occur, and 11 km to the western part where higher levels of visibility occur, as well as the influence of operational Bessy Bell I and II wind farms, which are located in the western part of this LCA and which means there is already an established and closer range influence from wind farm development on this LCA.

Significance of effect

The effect of the Development on the landscape character of LCA26 Bessy Bell and Gortin would be **moderate** or **moderate / minor** and **not significant** during the decommissioning and construction phase and operational phase. The Development would not redefine the landscape character of this LCA owing principally to its separation from the Development and the existing influence from the operational Bessy bell I and II in this LCA.

6.7.6 LCA 27 Foyle Valley

Baseline

The following baseline description is an extract from the ‘Northern Ireland Landscape Character Assessment 2000’.

- *“Broad, accessible valley on the western slopes of the Sperrins*
- *Farmland has strong, geometric field pattern, which continues onto the slopes of the adjacent higher land*
- *Sperrins to the east, with scenic, steep, wooded tributary glens*
- *Deeply incised river channel, with wooded banks and river terraces between Victoria Bridge and Newtownstewart*
- *Roads follow terraces on outer edge of valley floor or on lower valley slopes*
- *Attractive stone bridges.”*

This is a narrow but extensive LCA, wrapping around the southern and western sides of the western end of the Sperrin Mountains where the Development would be located. The LCA then extends northwards to join with Lough Foyle. The LCA sits at a range of approximately 3.5 and 22 km from the Development, with the closest part occurring around the settlement of Artigarvan to the north-west. The eastern extent of the LCA occurs where the narrow mountain valleys of Glenelly River and Owenkillew River converge into a broader farmed valley, just south-west of the village of Plumbridge. The Owenkillew River becomes the Strule River to the north-west of Newtonstewart and then the Mourne River around Victoria Bridge. It is only to the north of Strabane, beyond the confluence with the River Finn, that the water course is named the River Foyle although the LCA is named the River Foyle LCA.

The LCA is defined by the successive water courses and the valley floors and valley sides which enclose them, with the Sperrin Mountains forming a notable backdrop within the wider setting to the north of the upper course. Agriculture is the predominant land-use across this LCA, with fields of pasture set within the valleys and extending onto the hill slopes. Although there are no commercial forestry blocks, there is some enclosure from deciduous and coniferous tree cover within the valley. The accessible nature of the valley has made it a suitable location for development, with the A5 following the valley from Newtownstewart to Londonderry and intermittent towns and villages established along its course. While there are no wind farm developments located in this LCA, they are intermittently visible in the surrounding upland areas, including Owenreagh I and II in the western end of the Sperrin Mountains, the cluster to the south around Bessy Bell, and the cluster to the north of the Sperrin Mountains.

Sensitivity

The value of the LCA is high across the eastern part between Plumbridge and Victoria Bridge, reflecting the fact that the Sperrin AONB extends to cover the eastern part of this LCA but not the western or northern parts. The western and northern parts of the LCA are not covered by any landscape planning designations, which would otherwise denote a special scenic value, and therefore their value is rated as medium.

The susceptibility of the LCA to the effects of the Development is medium. This reflects the baseline influence from the roads and settlements that occur throughout this LCA, as well as the modified state of the landscape owing to the extents of farming practices. There is also a baseline influence from operational wind farm developments located in the surrounding hills. The influence of the Development on the character of the LCA would be indirect and would be associated with the western end of the Sperrin Mountains where wind farm development is already evident, at a minimum distance of approximately 3.5 km from the closest parts of the LCA to the north-west.

The high and medium value combined with the medium susceptibility, gives rise to a **medium-high** sensitivity in the eastern part, and a **medium** sensitivity in the western and northern parts.

Magnitude of change

The ZTV on Figure 6.8 shows a variable pattern of theoretical visibility, reflecting the variable orientation of this LCA as it wraps around from the south through the west to the north-west of the Site. To the south and west, the ZTV shows visibility to be fragmented with typically lower levels. This is on account of the screening effect of Owenreagh Hill which prevents all 14 of the turbines from being visible as well as the screening effect of the valley landform which means visibility is typically limited on the northern or eastern sides, and more concentrated on the southern and western sides. Theoretical visibility occurs across the south and west of this LCA within a minimum range of 7 to 13 km.

To the north-west of the proposed turbines, the landform is typically less hilly and lower lying, and this has the effect of visibility of all 14 turbines extending across this area. The closest range patch of theoretical visibility occurs across the rural area to the north-east of Strabane, within a minimum range of 3 to 5 km. Visibility then becomes more fragmented in the enclosed part of the valley before resuming as a more continuous band across the west facing slopes, within a minimum range of 7 to 14 km.

During the decommissioning and construction phase, the magnitude of change would be **medium** in the close range patch to the north-west of the Development at a minimum range of 3 to 5 km. The relatively close range of this area combined with the general openness of the landscape on the north-west side of the Development, means that while ground level works, such as construction of tracks, foundations and crane pads would have an influence, it would be the larger scale elements of the cranes, the removal of existing turbines and the addition of the proposed turbines that would form a defining feature, even despite the baseline influence of decommissioned Owenreagh I and II in this area. In those parts of the LCA to the west and south, ground level decommissioning and construction works would be screened by the intervening landform such that it would mainly be the cranes and emerging turbines that would have an influence on landscape character. At a minimum distance of 7 to 14 km, the magnitude of change would be **medium-low** reducing to **low**. The cranes and emerging turbines would be seen to occupy a relatively small proportion of a much wider landscape context and the LCA would continue to be defined by the key characteristics of the valley landscape, namely the enclosing landform and the agricultural land uses.

During the operational phase, the magnitude of change would be **medium-high** in the close range patch to the north-west of the Development at a minimum range of 3 to 5 km. The minimum separation distance of 3 km combined with the general openness of the landscape on the north-west side of the Development and the relatively large scale of the 14 proposed turbines seen from this range would mean they form a defining feature on this closest eastern edge of the LCA. In those parts of the LCA to the west and south, where a smaller proportion of the 14 proposed turbines would be visible and seen from the greater minimum distance of 7 to 14 km, the magnitude of change would be **medium** reducing to **medium-low**. The proposed turbines would be seen to occupy a relatively small proportion of a much wider landscape context and the LCA would continue to be defined by the key characteristics of the valley landscape, namely the enclosing landform and the agricultural land uses.

Significance of effect

The effect of the Development on the landscape character of LCA27 Foyle Valley would be **moderate** and **significant** in the localised patch to the north-west of the turbines and **moderate / minor** and **not significant** across all remaining parts, during both the decommissioning and construction phase and the operational phase. The Development would not redefine the landscape character of this LCA owing principally to its separation distance from this LCA, the relatively weak association between this LCA and the LCA in which the Development would be located, and the existing influence from the operational Owenreagh I and II Wind Farms in this southerly sector.

6.7.7 LCA 28 Glenelly Valley

Baseline

The following baseline description is an extract from the 'Northern Ireland Landscape Character Assessment 2000'.

- *"Scenic narrow mountain valley, with steep marginal farmland on the fringes of upland moors.*
- *The meandering river is a visual focus on a narrow floodplain which is often subdivided by irregular mounds of glacial till.*
- *Hedgerows and stone walls form a well-connected network, following the historic townland boundaries and emphasising the undulating landform.*
- *Open fields predominate, although tree cover increases in steeper areas and towards the foot of the slopes.*
- *Small 'clachans', churches, stone bridges and traditional stone farmsteads are attractive features, linked by steep, narrow roads.*
- *Numerous ancient historic sites."*

This LCA is located to the immediate south of the Sperrin Mountains and follows their broad east to west alignment. The LCA is focused on the Glenelly River and extends from Mullaghsallagh in the east to Plumbridge in the west, where the narrow valley opens out into a broader valley and the River Glenelly converges with the Owenkillew River. The western end of the LCA comes within a minimum distance of 6 km from the Development. The southern side of the narrow valley is enclosed by the Southern Sperrins which in this section range between ~350 and 440 m AOD, while the Sperrin Mountains to the north range between ~520 and 680 m AOD.

The narrow valley is occupied with small fields of pasture which extend onto the steep hill slopes as improved or rough pasture. There is also a pattern of dispersed settlement, with a nucleated settlement at Glenelly and roads either side of the valley, although often traversing the lower slopes so as to be set above the floodplain. Occasional tree cover and forest blocks occur, although open moorland on the middle to upper slopes is the predominant land cover. There are no wind farms located in this LCA and visibility of such developments on surrounding hills is largely precluded by the tight enclosure of the steep valley sides. There is, however, visibility of operational Owenreagh I and II from the middle valley slopes in the western end of this LCA.

Sensitivity

The value of the LCA is high, reflecting the fact that it is covered by the landscape designation of the Sperrin AONB, which denotes the national scenic value of the hills and valleys in this area.

The susceptibility of the LCA to the effects of the Development is medium. This LCA has a strongly introverted nature relating to the strong enclosure formed by the steep valley sides, which means that influences on landscape character are typically derived from the immediate surroundings with limited association with the wider landscape. While this LCA is also strongly rural, there is an influence from the roads, settlement and farming located throughout this valley, which along with patchy visibility of operational wind farms, moderates its susceptibility to the Development.

The high value of the LCA, combined with the medium susceptibility, gives rise to an overall **medium-high** sensitivity.

Magnitude of change

The ZTV on Figure 6.8 shows there to be no theoretical visibility across most of this LCA owing to the enclosed landform of the valley. The ZTV shows a long band of visibility occurring on the southern side of the valley in the western half of the LCA from a minimum of approximately 8 km out to 18 km. this bands extends from the middle to the upper slopes with levels of visibility increasing with elevation. There are also some very small patches of high level visibility on high points on the northern side of the valley.

Across the majority of the LCA there would be **no change** during both the decommissioning and construction phase and operational phase, as there would be no visibility.

During the decommissioning and construction phase, the magnitude of change would be **medium-low** or **low** across the southern and western part of the LCA where theoretical visibility arises. The contained nature of much of the LCA, means the ground level construction works, such as the construction of access tracks, crane pads and turbine foundations, would be limited owing to the screening effect of the intervening landform. The presence and activity of the construction cranes, removal of existing turbines and addition of proposed turbines would have more of an influence owing to their large scale and vertical form, although also partly screened by the intervening landform. The limited visibility of the cranes and turbines, combined with their minimum separation distance of 8 km would reduce their influence on this LCA.

During the operational phase, the magnitude of change would be **medium-low** or **low** across the southern and western part of the LCA where theoretical visibility arises. Those factors which add to the magnitude of change include the larger scale of the proposed turbines compared to the existing Owenreagh I and II turbines they would replace, which would make them a more prominent feature and their scale relative to the scale of the relatively modest landform. Those factors which reduce the magnitude of change include the minimum separation distance of 8 km, the existing presence of Owenreagh I and II wind farms on this Site, the relatively contained nature of this valley landscape and its closer association with the higher Sperrin Mountains that the valley faces to the north, than smaller Owenreagh Hill at an oblique angle to the north-west.

Significance of effect

There would be no change and, therefore, **no effect** across most of the Glenelley Valley LCA owing to there being no visibility of the Development. In those localised parts where visibility does arise, the effect would be **not significant** at a **moderate** or **moderate / minor** level owing to the limited levels of visibility, the closer association of this valley with the Sperrin Mountains to the north and the baseline influence of Owenreagh I and II in the same location as the Development.

6.7.8 LCA 29 Sperrin Mountains

Baseline

The Development lies within the Sperrin Mountains LCA. Strategic guidance on the siting of wind farms in this LCA is presented in SPG5 'Wind Energy Development in Northern Ireland's Landscapes'[36] and summarised in section 6.4.2. This assessment focuses on the change that the Development will give rise to in respect of the baseline description and this is presented below. The following baseline description is an extract from the 'Northern Ireland Landscape Character Assessment 2000'.

- *"Broad, rounded ridges with rocky outcrops leading to steep, pointed summits.*
- *Deep, branching gullies and open, fast-flowing moorland streams.*
- *Carpet of open moorland pasture and heather with extensive bog and areas of damp grassland on flatter land and lower slopes.*
- *Earthbanks and stone walls follow historic townland boundaries on lower slopes; some pastures are derelict and infested by scrub and rushes.*
- *Winding moorland roads and straight tracks leading across contours.*

[36] Northern Ireland Environment Agency (2010) Wind Energy Development in Northern Ireland's Landscapes [Online] Available at: Northern Ireland Environment Agency (infrastructure-ni.gov.uk) (Accessed 18/05/2023)

- *Broadleaf woodland concentrated within lower valleys; some conifer woodland on mountain slopes.*
- *Isolated barns on upper slopes; clachans and farmsteads in valleys."*

The Development would be located in this LCA which occupies the central part of the Study Area from where it extends east. The Sperrin Mountains is one of the largest LCAs in NI, covering a broad upland area extending from Strabane in the west to Moneyneany in the east. The hills follow a strong east to west alignment, bounded by the narrow Glenelly Valley LCA to the south and the broader expanse of the Sperrin Foothills LCA to the north, with the Foyle Valley LCA wrapping around the south-western and western end of the Sperrin Mountains LCA. The higher hills occur in the east of the LCA, with Sawel Mountain at 678m AOD and Dart Mountain at 619m AOD, forming the two highest points. These hills are typically conical shaped to collectively form a distinctive skyline. In contrast, the hills in the west of the LCA are notably lower and more rounded with Balix Hill at 403m AOD and Owenreagh at ~390m AOD forming the two highest points.

The central and western parts of the Sperrin Mountains LCA are largely undeveloped. 'B' roads are routed around the periphery of this upland range with minor roads crossing intermittently north to south over the passes between the high tops. Settlement is limited to dispersed farmsteads and other rural properties, with some small, consolidated settlements around the periphery. The B48 also crosses the hills in a north-south alignment, connecting Ballynamallaght with Plumbridge and marking the transition from the higher hills to the east and the lower hills to the west, and there is a greater extent of development to the west, in the form of a more extensive road network and increased occurrence of settlement. Land-use also changes from a predominance of rough grazing on upland moorland, to fields of improved pasture with semi-improved pasture extending across hill slopes. The LCA as a whole is largely open in character, with only small forest blocks occurring very intermittently. While there are no wind farm developments in the central and eastern parts of the LCA, there are the operational Owenreagh I and II Wind Farms present in the western part, establishing wind farm development as a baseline feature of this LCA.

Sensitivity

The value of the LCA is high, reflecting the fact that it is covered by the landscape designation of the Sperrin AONB, which denotes a national scenic value.

The susceptibility of the LCA to the effects of the Development is medium. The Development is located in this LCA, which would typically raise the susceptibility as there would be direct, as well as indirect effects. The fact that it would be located on the same hill as the operational Owenreagh I and II would, however, moderate the susceptibility as there is an existing influence from the same type of development, albeit of a smaller scale.

The high value of the LCA, combined with the medium susceptibility, gives rise to an overall **medium-high** sensitivity.

Magnitude of change

The Development is located in the western end of this LCA, set close to the northern boundary with the Sperrin Foothills LCA. As a result, the ZTV on Figure 6.8 shows continuous theoretical visibility across much of this western end of the LCA, albeit with variable numbers of turbines visible. The highest levels of visibility occur along the northern edge of the LCA and extending into the valley to the immediate east. To the south of the Development, the levels of visibility reduce as Owenreagh Hill creates a screening effect, such that only 1 to 4 or 5 to 8 turbines would typically be visible and 9 to 11 and 12 to 14 turbines only visible from localised patches on higher facing slopes. While the main part of the LCA extends much further east beyond the B48, the ZTV shows that theoretical visibility in this direction is limited, partly owing to the screening effect of Balix Hill (408 m AOD) and Crockrour (366 m AOD) on the western side of the B48. Theoretical visibility across the main part of the LCA, therefore, comprises localised patches occurring across elevated west-facing slopes beyond a range of approximately 5 km

During the decommissioning and construction phase, the magnitude of change would be **medium-high** across the Site and out across the LCA to approximately 4.5 km to the west, 4.0 km to the east and 2.0 km to the south. This rating is prevented from being high by the baseline influence from Owenreagh I and II on the same Site. Across the Site and to the west and east, while ground level works including the construction of access tracks, foundations and crane pads, would be apparent, it would be the use of tall cranes, the removal of the existing turbines and the emergence of the proposed turbines that would form the main influence on landscape character. This influence would also occur across the area to the south albeit with a smaller number of proposed turbines and not all of the ground level construction works being visible, such that the magnitude of change would reduce to **medium-low** and **low** further south where visibility is limited and the separation distance is greater. Beyond the ridgeline formed by Balix Hill and Crockrour to the east and south-east, there is a band of no visibility, where there would be **no change**, and beyond this where patchy visibility occurs on more elevated west-facing slopes beyond approximately 5.0 km, the effect during the decommissioning and construction phase would be **medium-low** reflecting the greater separation distance as well as the baseline influence from Owenreagh I and II. Further east, beyond approximately 7 km, visibility becomes more distant and more limited such that the magnitude of change would be **low** and there would be large areas where there would be **no change**.

During the operational phase, the magnitude of change would be **medium-high** across the Site and out across the LCA to approximately 4.5 km to the west, 4.0 km to the east and 2.0 km to the south. This rating is prevented from being high by the baseline influence from Owenreagh I and II on the same Site. Across the Site and to the west and east, the presence and movement of the 14 proposed turbines would form a new defining feature in this western end of the LCA, despite the baseline influence from Owenreagh I and II. Although from the south, a smaller number of proposed turbines would be seen set behind intervening landform, the close proximity means there would still be a **medium** magnitude of change out to approximately 3 km, reducing to **medium-low** out to the southern boundary of the LCA at approximately 6 or 7 km. From here, the Development would occupy a relatively contained extent amidst a much wider landscape context in which the higher hills in this area and to the east would remain the defining feature. Out to approximately 5 km to the south-east, the higher levels of visibility along the more elevated west-facing hill slopes would give rise to a **medium** magnitude of change, while further east this would reduce to **medium-low** or **low**.

Significance of effect

The effect of the Development on the landscape character of the LCA29 Sperrin Mountains would be **major / moderate** and **significant** during the decommissioning and construction phase and the operational phase across the western part out to approximately 4.5 km to the west, 4.0 km to the east, 5.0 km to the south-east and 3.0 km to the south, and **not significant** across all remaining parts of the LCA. The Development would redefine the landscape character of the western part of this LCA owing to the location of the Development close to the boundary of the western part of the LCA. The Development would not redefine the landscape character of the remaining parts of the LCA owing to the greater separation distance and greater influence from the more dramatic hills to the east.

6.7.9 LCA 30 Sperrin Foothills

Baseline

The following baseline description is an extract from the ‘Northern Ireland Landscape Character Assessment 2000’.

- *“Varied landform; typically rounded, dome-shaped hills and deeply dissected valleys, with a complex, undulating landform.*
- *Steep winding valleys, with waterfalls and dense woodland beside river.*
- *Diverse landscape pattern with transition from steep wooded valley sides to brown moorland summits or extensive moss within short distances.*
- *Hedgerows enclose all fields, becoming gappy with wire fencing on higher land; stone walls in areas of higher land close to the Sperrins.*
- *Relatively dense tree cover with numerous hedgerow trees and small copses; landscape becomes more open on elevated slopes.*
- *Dense network of roads and small settlements, with pressures for more development.”*

The Sperrin Foothills LCA lies to the immediate north of the Sperrin Mountains LCA and to the immediate north of the Development, extending north-east from a range of 0 to 26 km. It covers a fairly extensive area and comprises a complex pattern of low hills and valleys. The low hills range in height between 200 and 300 m with a high point of 370 m AOD at Slievekirk in the west of the LCA. Despite the presence of these hills, this LCA is extensively farmed and settled. Livestock grazing is the principal land-use, with fields of improved pasture in the valleys and rough grazing on the upland moorland. There are also small blocks of commercial forestry on some of the lower hill slopes, woodland through the narrow river valleys and extensive hedgerow planting along field boundaries, all of which add a sense of enclosure and reduce the association with the wider upland landscape.

The A6 is the only main road in this LCA, passing alongside the northern boundary on the north side of the foothills. There is also an extensive network of 'B' roads and minor roads, providing access to a dispersed pattern of settlement and although roads and settlement are mostly concentrated in the valleys, they do also extend into the upland areas. There is a cluster of operational wind farms which sit centrally within this LCA and include Eglish Mountain, Slieve Kirk, Currytree and Carricktane. These developments establish wind farms as a baseline feature of this LCA.

Sensitivity

The value of this LCA is high as it mostly covered by the Sperrin AONB, with the exception of the north-west and north-east corners. The AONB denotes the national importance of this landscape.

The susceptibility of the LCA to the Development is medium. The location of the Development to the immediate south of this LCA raises the susceptibility as this would give rise to close-range indirect effects on landscape character. The susceptibility is, however, prevented from being rated high owing to the existing presence and influence of the operational Owenreagh I and II wind farms where the Development would be located, as well as the presence and influence of other operational wind farms in this LCA, which establish this type of development as an integral part of the baseline character.

The combination of the high value, with the medium susceptibility, gives rise to an overall **medium-high** sensitivity.

Magnitude of change

The southern boundary of the Sperrin Foothills LCA joins with the northern boundary of the Sperrin Mountains LCA, close to the location of the Development such that it would form a close-range influence on this southern part of the LCA. The ZTV on Figure 6.8 reflects this by showing almost continuous visibility to approximately 5 to 6 km to the north and north-east, albeit with narrow bands of no visibility following the river courses. A series of river valleys with a predominant east to west orientation occur to the north of Dunnamannagh and here visibility is limited, especially across the north and north-east facing slopes. Visibility then resumes at approximately 8 km where the landform rises from the valley and the slopes are predominantly orientated south towards the Development. Visibility at this range is patchier in extents and then becomes increasingly limited beyond 12 to 13 km.

During the decommissioning and construction phase, the magnitude of change would be **medium-high** across the southern part of the LCA, reducing to **medium** out to approximately 5 km. This rating is prevented from being high by the baseline influence from Owenreagh I and II. Across this southern part of the LCA, while ground level works, including the construction of access tracks, foundations and crane pads, would be apparent, it would be the use of tall cranes, the removal of the existing turbines and the emergence of the proposed turbines that would form the main influence on landscape character. Beyond approximately 5 km, this influence would reduce as the separation distance increases and the baseline influence of the operational wind farms to the north increases. These occur within this LCA and include Eglish Mountain, Slievekirk and Extension, Curryfree and Carrickatane wind farms. Here, the magnitude of change would be **medium-low**. Beyond approximately 7 km, the magnitude of change would reduce to **low** where visibility occurs and **no change** where there is no visibility. The operational wind farms would comparatively have a much stronger influence and the separation distance of more than 7 km would reduce the influence of the cranes and emerging turbines.

During the operational phase, the magnitude of change would be **medium-high** across the southern part of the LCA, reducing to **medium** out to approximately 5 km. This rating is prevented from being high by the baseline influence from Owenreagh I and II on the same Site. Across this southern part of the LCA, the larger size of these turbines relative to the existing Owenreagh I and II turbines means that they would make a notable change to the landscape character of the adjacent foothills, despite the baseline influence from this type of development. Beyond approximately 5 km, the increased separation distance would mean that the Development would form a relatively well contained extent within a much wider landscape context, in which there is already an influence from operational wind farm developments in this LCA to the north and north-east. Here, the magnitude of change would be

medium-low. Beyond approximately 7 km, the magnitude of change would reduce to **low** where visibility occurs and **no change** where there is no visibility. The operational wind farms would comparatively have a much stronger influence and the separation distance of more than 7 km would reduce the influence of the cranes and emerging turbines.

Significance of effect

The effect of the Development on the landscape character of the Sperrin Foothills LCA would be **major / moderate** or **moderate** and **significant** during the decommissioning and construction phase and operational phase across the southern part of the LCA out to approximately 5 km and **not significant** across the remainder of the LCA. The Development would redefine the landscape character of the southern part of this LCA owing to the location of the Development close to the southern boundary of the LCA. The Development would not redefine the landscape character of the remaining parts of the LCA owing to the closer range influence from the existing operational wind farms in this LCA

6.7.10 LCA 31: Burngibbagh and Drumahoe

Baseline

The following baseline description is an extract from the 'Northern Ireland Landscape Character Assessment 2000':

- *"Linear valley system with a strong NE-SW alignment.*
- *Valley has a flat floor and is enclosed by broad, rounded ridges.*
- *Hedgerows enclosing pastures form a strong, geometric pattern on the valley sides, with small areas of open moorland capping some summits.*
- *Pylons lines are a dominant landscape element, particularly to the north.*
- *Built development concentrated in centre of valley, near Drumahoe."*

This LCA covers the river valley of Burngibbagh in the south and the valley of the River Faughan in the north. It is set to the north of the Development at a range of approximately 8 to 24 km. The Burngibbagh converges with the River Flaughan in the town of Drumahoe, in the centre of the LCA, and then from there flows north towards Lough Foyle. The LCA follows the south-west to north-east alignment of the river valleys and runs parallel to the Foyle Valley LCA to the west. To the east lies the Sperrin Foothills LCA, defined by the upland landform, while to the north lies the Lough Foyle Alluvial Plain LCA defined by its low-lying and flat landform.

The predominant land-use in this LCA is agriculture, with an extensive pattern of fields of pasture covering the valley floor and extending onto the enclosing hill sides. There is also a network of minor roads, mostly following the south-west to north-east alignment of the river valley, and with farmsteads and other rural properties accessed from these roads. While the town of Drumahoe, along with the south-eastern fringes of Londonderry and the A6, add an urban character to this LCA, the defining feature is the double row of overhead electricity transmission lines which run thought the length of this valley to converge at the power stations on the riverside. While there are no wind farms in this LCA, operational Carricktane and Curryfree lie close to the south-eastern boundary.

Sensitivity

The value of this LCA is medium as it is not covered by any national or local landscape designations which would otherwise denote a special landscape value.

The susceptibility of the LCA to the Development is medium. This LCA is largely enclosed by the valley landform, such that much of the influence on its character comes from the immediate, rather than more distant landscapes. This means that the influence of Owenreagh Hill and associated developments have a limited influence on this LCA. Furthermore, the presence and influence of the double row of overhead electricity transmission lines in this LCA establishes a baseline character in which large scale structures are a defining feature and this moderates the susceptibility of this LCA to large scale structures in other LCAs.

The combination of the medium value, with the medium susceptibility, gives rise to an overall **medium** sensitivity.

Magnitude of change

The ZTV on Figure 6.8 shows theoretical visibility to occur only in the southern part of the LCA where the south-facing slopes of Carrickatane occur. The remainder of the LCA would remain unaffected, with the exception of a small and localised patch across the high point in the centre of the LCA. The ZTV shows theoretical visibility of 11 to 13 turbines occurring at a range of approximately 8 to 12 km to the closest proposed turbine.

During the decommissioning and construction phase, the magnitude of change would be **medium-low** across the closer south-facing slopes in the southern part of the LCA and **low** or with **no change** across all remaining parts. Despite the elevated nature of these slopes and their general orientation towards the Development, the key factor which limits the effect is the location of operational Carrickatane Wind Farm in this southern part of the LCA and operational Curryfree Wind Farm to the immediate north. This existing influence combined with the separation distance of more than 8 km, would ensure that the most influential parts of the construction works, namely the presence of the cranes, removal of the existing turbines and the emergence of the proposed turbines, would not redefine the character of this LCA.

During the operational phase, the magnitude of change would be **medium-low** across the closer south-facing slopes in the southern part of the LCA and **low** or with **no change** across all remaining parts. As described in respect of the construction phase, the influence of the proposed turbines would be moderated by the closer range presence of the operational Carrickatane and Curryfree turbines, which by comparison would reduce the perceived scale of the proposed turbines. The effect would also be moderated by the baseline influence of Owenreagh I and Owenreagh II on this Site, although the larger scale of the turbines would make them a more prominent feature seen set within this medium to small scale landscape.

Significance of effect

The effect of the Development on the landscape character of LCA 32: Burngibbagh and Drumahoe would be **moderate / minor** and **not significant** or **no change** where there would be no visibility, during both the decommissioning and construction phase and the operational phase. The Development would not redefine the landscape character of this LCA owing principally to its separation distance from this LCA and the existing influence from the operational wind farms in the southern part of the LCA from where the Development is also visible.

6.7.11 LCA 13: Foyle Valley (RoI)

Baseline

The following baseline description is an extract from the ‘County Donegal Landscape Character Assessment 2016’:

- *“Undulating rural agricultural landscape with underlying schist geology in the north and Quartzite in the south that consists of one half of a large broad river valley that slopes gently towards the Foyle, the other half being in Northern Ireland.*
- *Interesting convergence of the rivers Finn, Mourne, Deele, Swilly Burn, and Foyle in the east of this LCA that flow north as the River Foyle into Lough Foyle; mirrored on the east bank of the River Foyle in Northern Ireland.*
- *There is an alluvial plain in the middle of the River Foyle that has formed a long flat island extending from Lifford north towards Porthall within the jurisdiction of Ireland*
- *The landscape is physically shared with Northern Ireland to the east of this LCA; the River Foyle defines the border with Northern Ireland and the 2 jurisdictions share its catchment.*
- *Regular shaped medium to large, arable and pasture fields bound in hedgerow interspersed with deciduous trees and clumps of trees are characteristic to this ‘plantation landscape’.*
- *The topography of this LCA lends a wide aspect over the surrounding landscape and of particular note are the many wind farms in Northern Ireland that are visually prominent within this landscape.”*

This LCA is located on the western side of the River Foyle to the west and north-west of the Development at a range of approximately 8 to 19 km. Its eastern boundary coincides with the boundary between the RoI on the west and NI on the east. The southern point of the LCA is marked by the village of Clady, from where the boundary follows the River Finn up to Lifford where it joins the River Foyle, with the northern point of the LCA marked by the town of Kildrum, inset 3 km to the west of the River Foyle. The LCA extends westwards such the western boundary passes close to Castlefinn, Cloghfin and Raphoe.

The landform presents a mix of types with the broad slopes of the River Foyle on the eastern side and more upland hills on the western side, and with rivers flowing west to east to join the River Foyle, passing through broad river valleys on the way. The overriding characteristic in all parts of this LCA is the predominance of agricultural land uses with farm fields of pasture covering most of the lowland and upland landscape, albeit with a mix of small woodland blocks and moorland vegetation across the tops of the higher hills. While development in this LCA is typically small scale and rural, there is a small four turbine wind farm on the western boundary and a baseline influence from the operational wind farms on the opposite side of the River Foyle.

Sensitivity

The value of this LCA is medium as it is not covered by any national or local landscape designations which would otherwise denote a special landscape value.

The susceptibility of the LCA to the Development is medium. A feature of this LCA is the openness of the landscape and while there is some enclosure from the undulations of the uplands and enclosure of the fields, visibility from parts can be fairly wide ranging, including extending eastwards to the landscapes on the opposite side of the River Foyle. The more distant landscapes are, however, seen in the context of the close range landscape, where the undulating landform and pastoral land uses form the defining feature. There are few large scale developments in this LCA, the susceptibility is moderated by the existing influence of Owenreagh I and II on the Site and other closer range wind farms on the eastern side of the River Foyle.

The combination of the medium value, with the medium susceptibility, gives rise to an overall **medium** sensitivity.

Magnitude of change

The ZTV on Figure 6.8 shows a broad extent of high level theoretical visibility to occur to the north of the Deele Valley and extending almost to the northern end of the LCA. While this large patch of visibility is almost continuous, there are patches of no visibility that sit in the western shadows of the hills in this LCA. To the south of the River Deele there is a larger patch of no visibility relating to the screening effect of the intervening hills of Knockavoe (295 m AOD) and Craignagore (220 m AOD). In the southern part of the LCA, although visibility resumes, it is from approximately 8 to 13 km and typically of a lower level with partial screening caused by intervening landform.

During the decommissioning and construction phase, the magnitude of change would be **medium-low** across the central and northern parts of the LCA, **low** in the southern part, and with **no change** across all remaining parts where there would be no visibility. Despite the relatively open nature of this LCA and the limited influence from large scale developments within the LCA, the combination of the separation distance of over 8 km and the existing influence from the operational wind farms at Carrickatane and Curryfree, as well as the slightly more distant and smaller scale Owenreagh I and Owenreagh II, would mean the influence of the decommissioning and construction works on this LCA would be limited. Ground level works would not be readily visible with the exception of the access track construction, and while the tall cranes, removal of existing turbines and addition of proposed turbines would be visible, they would not redefine the character of this LCA.

During the operational phase, the magnitude of change would be **medium-low** across the central and northern parts of the LCA, **low** in the southern part, and with **no change** across all remaining parts where there would be no visibility. While the larger scale of the proposed turbines compared to the original Owenreagh I and Owenreagh II turbines would make it a more apparent feature in the eastern sector, and the wind farm development would appear at variance with this predominantly small scale and rural landscape, it would not form the defining feature of this LCA, owing to a combination of the separation distance from the development at beyond 8 km, the baseline influence from the closer range operational wind farms in northern Ireland and the closer range influence form the rural landscape which characterises this LCA.

Significance of effect

The effect of the Development on the landscape character of LCA 13: Foyle Valley would be **moderate-minor** and **not significant** or **no change** where there is no visibility, during both the decommissioning and construction phase and operational phase. The Development would not redefine the landscape character of this LCA which would continue to be defined by the surrounding rural landscape.

6.8 Assessment of Effects on Landscape Designations

The effects of the Development can vary widely across a landscape planning designation and the distinction where significant and not significant effects may occur within the same designation is of particular importance in the assessment. Where this is the case, the assessment has defined boundaries through the designation which express the differing effects of the Development.

The scoping process involved a preliminary assessment to identify those landscape designations with potential to undergo significant effects as a result of the Development. Statutory consultees have raised no objections to the inclusion of the Sperrin AONB as presented below, which has the potential to be significantly affected, and therefore requires a detailed assessment. The other designated areas within the Study Area were found through the scoping process not to have the potential to be significantly affected and have therefore not been assessed in any further detail.

6.8.1 Assessment of Effects on the Sperrin Area of Outstanding Natural Beauty

Baseline

The following baseline description is taken from the ‘Designation of the Sperrin AONB’ which is an undated draft document produced by NIEA / DfI Planning:

“Lying in the heart of Northern Ireland and stretching from the Strule Valley to Lough Neagh the Sperrin AONB is a glaciated mountainous area of great geological multiplicity. There is also a rich heritage within the AONB due to multiple human processes acting upon the land over a long period.

Counties Derry/Londonderry and Tyrone are dominated by the mountainous summits of the Sperrins which form a distinctive backdrop for views throughout the North West. In Irish, the name Cnoc Sperrin means pointed hills. The Sperrins have broad, rounded profiles rising to knife-like ridges and pointed peaks (LCA 29). The mountains are underlain by some of the oldest rocks in the province and have an ancient timeless quality. At close quarters the simple composition of the upland views draws attention to minor details of landform such as the shadows thrown by jagged gullies, the cones of broken grey and the rocky outcrops.

The steep slopes of the upland ridges are carpeted with closely- cropped grey-green moorland grasses wrinkled with small terraces and crossed by sheep tracks. Straight earth banks of the ancient townland boundaries divide some of the slopes into broad elongated rectangular plots. There are some conifer plantations, but the overriding impression is of an impenetrable empty wilderness, with only occasional isolated barns and narrow, open roads.

To the south of Sawel Mountain (676m), the Glenelly, Owenkillew and Owenreagh rivers flow within a series of liner glens along some of the principal; fault lines in the Sperrins (LCAs 24, 25 and 28). The picturesque, verdant landscape of these valleys is a striking contrast to the wilderness of the expansive, open moorland above. The ancient ladder pattern of pastures on the upper valley slopes dates back to the early Christian period and this is particularly reflected within the long Glenelly valley. The remote clachans, stone bridges, scattered ancient woodlands and steep earth banks suggest a traditional, slower pace of life.

Further west and near Newtownstewart, the long southern ridges of the Sperrins extend southwest to the pointed summit of Mullaghcarn and the outlying twin peaks of Bessy Bell and Mary Gray. Together these summits separated by the deep wooded Strule river valley (LCA 26), form a memorable gateway landscape at the confluence of many different landscape character areas. This is the western entrance to the high Sperrins along the Glenelly valley (LCA 28), but it is also the bridging point between the Foyle / Mourne valley to the north (LCA 27) and the Omagh farmland *basin to the south (LCA 22). To the west, the wide river Derg valley leads on the remote upland moors and forests of west Tyrone (LCA 19 and 20).”*[37]

The document also identifies several ‘forces for change’, indicating that the landscape of the AONB is *“especially vulnerable to wind farms, single wind turbines, telecommunication and infrastructure development and also to smaller incremental development such as poorly sited housing on hill slopes”.* As well as this, the document identifies *“the cumulative visual impact of conifer plantations in certain areas, particularly on the lower hillsides and summits around the edges of the Sperrins”* as a landscape feature which presents *“threats to the visual amenity and landscape character of the AONB.”*

The assessment has considered the effect of the Development on the Sperrin AONB. The Development lies within the AONB, although near its north-western edge. There is no specific reference to the part of the AONB where the Development would be located. The location of the Development in the AONB means that there would be direct effects on the landscape of the AONB, as well as indirect effects resulting from visibility of the Development within surrounding parts of the AONB. The north-western edge of the AONB, where the Site is located, experiences a greater influence from areas outside the AONB than the heart of the Sperrin Mountains, located further east within the AONB. As such, it displays the identified special characteristics to a lesser extent than other parts of the AONB.

There are a number of settlements that lie within the north-western boundary of the AONB including Ballynamallaght, Dunamanagh and Plumbridge, as well as all the smaller intermediate settlements and connecting roads. There are also a number of settlements just outwith the western boundary, including Strabane, Sion Mills and Newtownstewart and operational wind farms outwith the northern boundary including Eglish Mountain, Slievekirk, Curryfree and Carrickatane, as well as Owenreagh I and Owenreagh II wind farms within the boundary. These developments have a notable influence on the AONB, by establishing these human influences as a baseline feature of the landscape character.

Sensitivity

The AONB designation denotes the national importance of this landscape, and it therefore has a **high** value. The fact that the Development would be located on the same hill as the operational Owenreagh I and II would, however, moderate the susceptibility as there is an existing influence from the same type of development, albeit of a smaller scale. Furthermore, the location of the Development on the north-west edge of the AONB means that the identified special characteristics do not have the same influence experienced in the more remote parts in the core of the AONB to the east. The susceptibility of this western part of the AONB to the effects of the Development is **medium-high**.

The **high** value of the LCA, combined with the **medium-high** susceptibility, gives rise to an overall **medium-high** sensitivity.

Magnitude of change

The ZTV on Figure 6.9 shows that the vast majority of the Sperrin AONB would remain unaffected by the Development as there would be no visibility and, therefore, **no change**.

Furthermore, the cumulative ZTV on Figure 6.13 shows that the extent to which the Development would be visible, largely coincides with visibility of operational Owenreagh I and Owenreagh II, such that there would be only small additional areas of new visibility, albeit with the proposed turbines having a greater influence owing to their larger scale compared to the operational turbines.

The Development is located in the north-western part of the AONB. As a result, the ZTV on Figure 6.9 shows continuous theoretical visibility across much of this north-western part of the AONB, albeit with variable numbers of turbines visible. The highest levels of visibility occur out to the north-western edge of the AONB and extending into the valley to the immediate east. To the south of the Development, the levels of visibility reduce as Owenreagh Hill creates a screening effect, such that only 1 to 4 or 5 to 8 turbines would typically be visible and 9 to 11 and 12 to 14 turbines only visible from localised patches on higher facing slopes. While the main part of the AONB extends much further east beyond the B48, the ZTV shows that theoretical visibility in this direction is limited, partly owing to the screening effect of Balix Hill (408 m AOD) and Crockrour (366 m AOD) on the western

[37] Northern Ireland Environment Agency and Department for Infrastructure (undated). Designation of the Sperrin AONB.

side of the B48. Theoretical visibility across the main part of the AONB, therefore, comprises localised patches occurring across elevated west-facing slopes beyond a range of approximately 5 km.

During the decommissioning and construction phase, the magnitude of change would be **medium-high** across the Site and out across the LCA to approximately 5.0 km to the north, 4.5 km to the west, 4.0 km to the east and 2.0 km to the south. This rating is prevented from being high by the baseline influence from Owenreagh I and II turbines on the same site. Across the site and to the north, west and east, while ground level works including the construction of access tracks, foundations and crane pads, would be apparent, it would be the use of tall cranes, the removal of the existing turbines and the emergence of the proposed turbines that would form the main influence on the AONB. This influence would also occur across the area to the south albeit with a smaller number of proposed turbines and not all of the ground level decommissioning and construction works being visible, such that the magnitude of change would reduce to **medium-low** and **low** further south where visibility is limited, and the separation distance is greater. Beyond the ridgeline formed by Balix Hill and Crockrour to the east and south-east, there is a band of no visibility, where there would be **no change**, and beyond this where patchy visibility occurs on more elevated west-facing slopes beyond approximately 5.0 km, the effect during the decommissioning and construction phase would be **medium-low** reflecting the greater separation distance as well as the baseline influence from Owenreagh I and II wind farms. Further east, beyond approximately 7 km, visibility becomes more distant and more limited such that the magnitude of change would be **low** and there would be large areas where there would be **no change**.

During the operational phase, the magnitude of change would be **medium-high** across the Site and out across the AONB to approximately 5.0 km to the north, 4.5 km to the west, 4.0 km to the east and 2.0 km to the south. This rating is prevented from being high by the baseline influence from Owenreagh I and II wind farms on the same site. Across the site and to the north, west and east, the presence and movement of the 14 proposed turbines would form a new defining feature in this north-western end of the AONB, despite the baseline influence from Owenreagh I and II turbines, because of the larger size of the proposed turbines compared to the existing ones.

The **medium-high** magnitude of change would extend to approximately 5 km to the north and north-east, beyond which this influence would reduce as the separation distance increases and the baseline influence of the operational wind farms to the north increases. These occur on the northern edge of the AONB and include Eglish Mountain, Slievekirk and Extension, Curryfree and Carrickatane wind farms. Here, the magnitude of change would be **medium-low**. Beyond approximately 7 km, the magnitude of change would reduce to **low** where visibility occurs and **no change** where there is no visibility.

Although from the south, a smaller number of proposed turbines would be seen set behind intervening landform, the close proximity means there would still be a **medium** magnitude of change out to approximately 3 km, reducing to **medium-low** out to the southern boundary of the LCA at approximately 6 or 7 km. from here, the Development would occupy a relatively contained extent amidst a much wider landscape context in which the higher hills in this area and to the east would remain the defining feature. Out to approximately 5 km to the south-east, the higher levels of visibility along the more elevated west-facing hill slopes would give rise to a **medium** magnitude of change, while further east this would reduce to **medium-low** or **low**.

Significance of effect

The majority of the Sperrin AONB would remain unaffected by the Development owing to no visibility or limited and low-level visibility. While localised effects would occur, these would be contained within the north-western part of the AONB and largely coincide with the area currently influenced by Owenreagh I and II turbines. The larger scale of the proposed turbines would, however, give rise to **major / moderate** or **moderate** and **significant effect**, that would extend to approximately 4.5 km to the west, 5 km to the north, 4 km to the east, 5 km to the south-east and 3 km to the south during the decommissioning and construction phase and operational phase. These localised effects would not affect the overall integrity of the Sperrin AONB owing to the relatively small number of turbines and their contained extent in the north-western part of the AONB where there are much stronger human influences from existing developments and the special qualities of the AONB are expressed to a much lesser extent.

6.9 Assessment of Effects on viewpoints

The assessment of effects on views comprises an evaluation of the effects at each of the representative viewpoints. This is carried out on site, using wirelines and photomontages to inform the assessment.
The viewpoint locations are shown in conjunction with the ZTVs on Figures 6.5 and 6.6. The viewpoints are illustrated on Figures 6.26 to 6.50 and include the following sequence of figures;

- Viewpoint Location Plan within the 30 km Study Area showing the Development in conjunction with other existing and proposed wind farm developments;
- Viewpoint Location Plan including the ZTV;
- Baseline Photograph(s) presented in 90 degree frames;
- Wireline Drawing(s) presented in 90 degree frames showing the Development in conjunction with other existing and proposed wind farm developments;
- Wireline Drawing presented in 53.5 degree frames showing only the Development; and,
- Photomontage presented in 53.5 degree frames showing the Development in conjunction with other existing wind farm developments.

In the wirelines, the Development turbines are shown in red, operational wind farms are shown in black, under construction wind farms are shown in purple, consented wind farms are shown in green, application wind farms are shown in blue and scoping stage wind farms shown in orange.

6.9.1 Viewpoint 1: Koram Road, Ligfordrum (Figure 6.26)

Baseline

The viewpoint is located a minimum of 2.0 km to the south of the Development, on Koram Road, which connects Ligford Road to the south with Holyhill Road to the north. It runs broadly north to south, and to the west of the Site. The road is flanked by Koram Hill to the west and Owenreagh Hill to the east. The viewpoint is situated to the east of the summit of Koram Hill, from where open views occur over lower ground to the east. There are a number of residential properties located along this stretch of Koram Road. The viewpoint is representative of road-users on Koram Road, as well as rural residents in the local area.

To the west, the rising landform of Koram Hill forms an enclosure which contains the extent of the view in this direction. In contrast, to the south-east, views are more open over lower-lying ground along the valley of the Douglas Burn. In the foreground, agricultural land slopes down towards a low point in the middle distance, while more distant hills to the south of the Owenkillew River form the horizon. The landscape in this direction is characterised by moorland landcover and intermittent tree cover.

To the east and north-east, the view is more contained by the landform of Owenreagh Hill, which slopes upwards to form a rounded summit to the north-east. The landcover is predominantly improved pasture in the foreground, with intermittent areas of woodland and evidence of farming infrastructure. The summit of Owenreagh Hill is predominantly moorland, with a block of forestry visible on its western edge. Several turbines within Owenreagh I and II are visible above the horizon to the east, with the blade tips being seen above the lower eastern slopes of Owenreagh Hill.
The hills are viewed from a settled and cultivated landscape, albeit with settlement being typically dispersed in nature and rural in character, and the cultivation comprising mostly permanent pasture.

Sensitivity

The value of the view is medium-high. The viewpoint is an incidental viewpoint, located on an elevated section of Koram Road, and selected to include the fullest extent of the Development and other operational wind farms. The medium-high value relates to the national landscape designation of the Sperrin AONB which covers this area and denotes a special scenic value, despite the absence of any formal viewpoints.

The susceptibility of road-users on this section of Koram Road is medium. The north to south alignment of the road is at an angle to the north-east alignment of views towards the Site, such that road-users experience oblique views towards the Site and views are more likely to be experienced by road users travelling north along Koram Road. Furthermore, road-users would typically be travelling at speeds between 40 and 50 miles per hour (mph) such that their views would be transitory and experienced only over short periods of time. These factors would reduce the potential influence of the Development in the views of road-users on this section of Koram Road.

In contrast, the views of local residents would be of high susceptibility. There is only a small number of farmsteads and other rural properties along Koram Road, and the majority of these are orientated west. However, their views are static and experienced over long periods of time. These factors would increase the potential influence of the Development in the views of residents in this local area. A detailed assessment of the influence of the Development on residential amenity at properties within 2 km is contained in **Technical Appendix A6.2: RVAA**.

The combination of the medium-high value of the view, the high susceptibility of residents and the medium susceptibility of road-users, leads to an overall **high** sensitivity for residents and **medium-high** sensitivity for road users.

Magnitude of change during decommissioning and construction

The magnitude of change on the views of road-users would be **medium-low** during the decommissioning and construction phase, while on the views of residents it would be **medium**. The ground level construction works would be mostly screened by the intervening landform, such that they would have little or no influence on this viewpoint. The higher-level construction works, involving the use of tall cranes, the removal of existing turbines and the addition of the proposed turbines, would, however, form a visible feature that would be experienced by road-users over a short duration and by residents over a long duration. While the removal of existing operational turbines at closer proximity and at a similar elevation above the horizon would moderate the magnitude of change arising during the decommissioning and construction phase of the Development, the close proximity of the emerging turbines and cranes would form the new defining feature.

Magnitude of change during operation

The magnitude of change on the views of road-users would be **medium-low** during the operational phase, while on the views of residents it would be **medium**. The closest proposed turbine would be located a minimum of approximately 2.0 km from the viewpoint. The wireline and photomontage on Figures 6.26e and 6.26f show that the hubs of two turbines, and the blade tips of a further four turbines, would be visible beyond the horizon formed by Owenreagh Hill to the north-east.

The Development would be seen In the same sector of the view as the operational Owenreagh I and II turbines, of which nine are visible to varying degrees. The south-eastern proposed turbines of the Development would overlap with the sector of the view occupied by the operational turbines (which would be removed), while the north-western proposed turbines would increase the horizontal extent of wind farm development to the north. The field of view ultimately occupied by the proposed turbines would be similar to that of the existing turbines. Given their position behind Owenreagh Hill, and the screening of the lower parts of the turbines, including the towers of all visible turbines, the extent to which the turbines would be visible would be limited. The proximity of the turbines to the viewpoint combined with the large scale of the blades and the contrast they present with the scale of the foreground landscape, ensures that they would still form a defining feature in this view, despite the baseline influence from Owenreagh I and II.

Significance of effect

The significance of the effect on residents would be **major / moderate** and **significant** and the effect on road-users would be **moderate** and **significant** during both the decommissioning and construction phase and the operational phase. This finding relates chiefly to the close proximity of the proposed turbines, despite the extent to which they would be screened by the intervening landform and the baseline influence of operational Owenreagh I and II wind farms, which would be removed, in this upland area. The effects would be short-term and reversible during the decommissioning and construction phase, long-term reversible during the operational phase with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.51)

Assessing the Development against a hypothetical baseline scenario in which the consented Craignagapple Wind Farm is present, the magnitude of change would be **medium-low** during both the decommissioning and construction and operational phases. The hub of one turbine and blade tips of another within Craignagapple would be seen above the horizon, contained within the extent occupied by turbines within Owenreagh I and II.

While the Development would extend wind turbines to the north and north-west of the Owenreagh I and II and Craignagapple turbines, the proposed turbines would be seen to a similar extent above the horizon as the two turbines within Craignagapple. The limited visibility of turbines within Craignagapple, and their containment within the field of view occupied by Owenreagh I and II wind farms, means that the overall magnitude of change resulting from the Development would be similar to that experienced in the main assessment during both the decommissioning and construction phase and the operational phase.

When combined with the high to medium-high sensitivity, this would result in a **major / moderate** and **significant** effect on residents and a **moderate** and **significant** effect on road-users during both the decommissioning and construction phase and the operational phase.

6.9.2 Viewpoint 2: Koram Road, north of Ligfordrum (Figure 6.27)

Baseline

The viewpoint is located a minimum of 1.7 km to the south of the Development, on Koram Road, which connects Ligford Road to the south with Holyhill Road to the north. It runs broadly north to south, and to the west of the Site. The road is flanked by Koram Hill to the west and Owenreagh Hill to the east. The viewpoint is situated to the east of the summit of Koram Hill, from where open views occur over lower ground to the east. There is a residential property to the west of this stretch of Koram Road. The viewpoint is representative of road-users on Koram Road, as well as rural residents in the local area.

To the west, the rising landform of Koram Hill forms an enclosure which contains the extent of the view in this direction. Views to the south-east and south are heavily filtered by vegetation from this viewpoint.

In contrast, to the east, views are more open over lower-lying ground along the valley of the Douglas Burn. In the foreground, agricultural land slopes down towards a low point in the middle distance, and there is evidence of infrastructure associated with farm outbuildings. To the east and north-east, the view is contained in the middle distance by the landform of Owenreagh Hill, which slopes upwards to form a rounded summit to the north-east. The landcover is predominantly improved pasture in the foreground, with intermittent areas of woodland and evidence of farming infrastructure. The summit of Owenreagh Hill is predominantly moorland, with a block of forestry visible on its western edge. Several turbines within Owenreagh I and II are visible above the horizon to the east, with the blade tips being seen above the lower eastern slopes of Owenreagh Hill.

Sensitivity

The value of the view is medium-high. The viewpoint is an incidental viewpoint, located on an elevated section of Koram Road, and selected to include the fullest extent of the Development and other operational wind farms. The medium-high value relates to the national landscape designation of the Sperrin AONB which covers this area and denotes a special scenic value, despite the absence of any formal viewpoints.

The susceptibility of road-users on this section of Koram Road is medium. The north to south alignment of the road is at an angle to the north-east alignment of views towards the Site, such that road-users would experience oblique views towards the Site and views are more likely to be experienced by road users travelling north along Koram Road. Furthermore, road-users would typically be travelling at speeds between 40 and 50 mph such that their views would be transitory and experienced only over short periods of time. These factors would reduce the potential influence of the Development in the views of road-users on this section of Koram Road.

In contrast, the views of local residents would be of high susceptibility. There is only one residential property in the vicinity of this viewpoint. However, views from the property are static and experienced over long periods of time and are orientated to the east. These factors would increase the potential prominence of the Development in the views of residents in this local area. A detailed assessment of the influence of the Development on residential amenity at properties within 2 km is contained in **Technical Appendix A6.2: RVAA**.

The combination of the medium-high value of the view, the high susceptibility of residents and the medium susceptibility of road-users, leads to an overall **high** sensitivity for residents and **medium-high** sensitivity for road users.

Magnitude of change during decommissioning and construction

The magnitude of change on the views experienced at this viewpoint would be **medium-low** during the decommissioning and construction phase. The ground level works would be mostly screened by the intervening landform, such that they would have little or no influence on this viewpoint. The higher-level works, involving the use of tall cranes, the removal of the existing turbines and the addition of the proposed turbines, would, however, form a visible feature that would be experienced by road-users over a short duration and by residents over a long duration. While the removal of existing operational turbines at closer proximity and at a similar elevation above the horizon would moderate the magnitude of change arising during the construction of the Development, the close proximity of the emerging turbines and cranes would form the new defining feature.

Magnitude of change during operation

The magnitude of change on the views experienced at this viewpoint would be **medium** during the operational phase. The Development would be located a minimum of approximately 1.7 km from the viewpoint. The wireline and photomontage on Figures 6.27e and 6.27f show that the hub of one turbine, and the blade tips of a further four turbines, would be visible beyond the horizon formed by Owenreagh Hill to the north-east. The majority of the Development would be screened from view by the landform of Owenreagh Hill.

The Development would be seen in the same sector of the view as the operational Owenreagh I and II turbines, of which nine are visible to varying degrees. The south-eastern side of the Development would overlap with the sector of the view occupied by the operational turbines, while the north-western side would increase the horizontal extent of wind farm development to the north. The field of view ultimately occupied by turbines would be slightly greater than the existing. Given their position behind the ridge formed by Owenreagh Hill, and the screening of the lower parts of the turbines, including the towers of all visible turbines, the extent to which the turbines would be visible would be limited. The proximity of the turbines to the viewpoint combined with the large scale of the blades and the contrast they present with the scale of the foreground landscape, ensures that they would still form a defining feature in the view despite the baseline influence from Owenreagh I and II wind farms.

Significance of effect

The significance of the effect on road-users and residents would be **moderate** and **significant** during the decommissioning and construction phase and the operational phase. These findings relate chiefly to the close proximity of the proposed turbines, despite the extent to which they would be screened by the intervening landform and the baseline influence of operational Owenreagh I and II wind farms in this upland area. The effects would be short-term and reversible during the decommissioning and construction phase and long-term and reversible during the operational phase, with all effects being adverse.

Figure 6.52. Craignagapple Comparative Assessment

Assessing the Development against a hypothetical baseline scenario in which the consented Craignagapple Wind Farm is present, the magnitude of change would be **medium-low** during the decommissioning and construction phase and **medium** during the operational phase. The hub and blade tips of one turbine within Craignagapple, and the blade tips of a further turbine, would be seen above the horizon. These turbines extend the horizontal field of view that has been occupied by turbines to the north and south of the extent occupied by Owenreagh I and II.

The Development would extend the view of wind turbines to the north of the Owenreagh I and II (which would be removed) and Craignagapple turbines and would be seen to a greater extent above the horizon than the existing turbines. The limited visibility of turbines within Craignagapple means that the overall magnitude of change resulting from the Development would be similar to that experienced in the main assessment during both the decommissioning and construction and operational phases.

When combined with the high to medium-high sensitivity, this would result in a **moderate** and **significant** effect on road-users during the decommissioning and construction phase and the operational phase and residents during the decommissioning and construction phase. During the operational phase, residents would experience a **major / moderate** and **significant** effect.

6.9.3 Viewpoint 3: Napple Road, Ballykeery Bridge (Figure 6.28)

Baseline

This viewpoint is a minimum of 1.6 km east of the Development, located on Napple Road, a minor road which passes broadly south-east to north-west, and links Meendamph Road with Moorlough Road. The viewpoint is situated close to the point at which Napple Road meets Meendamph Road, to the west of Crockrour Hill. From this point, views are focussed to the north and west. The viewpoint is representative of the views of road-users on Napple Road. The effects of the Development on a property to the north of the viewpoint are considered further in **Technical Appendix A6.2: RVAA**; this viewpoint is not considered to be representative of views from this property.

To the south and east, the land rises up towards Crockrour Hill, and this rising landform encloses views in this direction. To the north the view is longer-range over pastoral land within the valley of the Burndennet River, with intermittent blocks of woodland and forestry. In the distance, hills within the Slievekirk range form the horizon. Turbines within Slieve Kirk, Curryfree and Carrickatane wind farms are visible across these hills, although these are partially obscured by vegetation from parts of this stretch of the road.

To the west, the foreground is formed by the valley between Owenreagh Hill and Crockrour Hill. The landcover is predominantly pastoral land with intermittent blocks of forestry, and there are several rural properties and farmsteads. The eastern flank of Owenreagh Hill forms the horizon to the east, and features moorland landcover. Turbines within the operational Owenreagh I and II wind farms are visible above the horizon in this direction, although all with towers screened.

Sensitivity

The value of the view is medium-high. The viewpoint is an incidental viewpoint, located on an elevated section of Napple Road, and selected to include the fullest extent of the Development and other operational wind farms. The high value relates to the landscape designation of the Sperrin AONB which covers this area and denotes a special scenic value, despite the absence of any formal viewpoints.

The susceptibility of road-users on this section of the Napple Road is medium. The north-west to south-east alignment of this section of the road is at an angle to the western alignment of views towards the Site, such that road-users would experience oblique views towards the Site. Furthermore, road-users would be travelling at speeds between 40 and 60 mph such that their views would be transitory and experienced only over short periods of time. These factors would reduce the potential influence of the Development in the views of road-users on this section of Napple Road.
The combination of the medium-high value of the view and the medium susceptibility of road-users, leads to an overall **medium-high** sensitivity.

Magnitude of change during decommissioning and construction

The magnitude of change on the views of road-users would be **medium-high** during the decommissioning and construction phase. The intervening ridgeline would screen most of the ground level construction works, such that the tall cranes, removal of existing turbines and addition of emerging turbines would be those parts of the decommissioning and construction phase that would be readily visible in the views of road-users on the minor road where the viewpoint is located. These structures would be seen to rise above the ridgeline, albeit with the lower parts of most of the cranes and turbines screened. While these components of the construction would form a close-range and defining feature, the magnitude of change would be moderated by their location behind the ridgeline and the existing influence of operational wind farms across the Site in this sector of the view.

Magnitude of change during operation

The magnitude of change on the views of road-users would be **high** during the operational phase. The Development would be located a minimum distance of approximately 1.6 km from the viewpoint, with 12 of the 14 turbines visible along or behind the ridgeline, as shown in the wireline and photomontage on Figures 6.28d and 6.28e. The horizontal extent of the proposed turbines would largely coincide with the northern operational turbines of the Owenreagh I and II wind farms which would be removed, but also increase the horizontal extent further north. The turbines would be visible to variable degrees, with those towards the north of the Development seen to a greater extent than those to the south due to screening by the ridgeline.

The presence of the operational w”nd f’rms means that the Development would not form a new feature in the view. The proposed turbines would be contained within the same sector of the view as that influenced by existing turbines, albeit extended slightly further north and reduced slightly in its extents to the south. The proposed turbines would, however, appear notably larger in scale than the operational turbines, especially where proposed turbines would be seen to almost their full extent. They would appear at variance with the relatively small scale and rural character of the baseline view and would form the defining feature in the views of road-users on Napple Road and in the local area.

Significance of effect

The effect on road-users on the minor road would be **major** and **significant** during both the decommissioning and construction phase and the operational phase. This finding relates chiefly to the close proximity of the Development to the viewpoint, the variance with the baseline character and the difference in scale between the existing turbines and the turbines of the Development. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase, with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.53)

Assessing the Development under a hypothetical baseline scenario which contains the consented Craignagapple Wind Farm, the magnitude of change would be **medium-high** during the decommissioning and construction phase and the operational phase. The hubs and blade tips of five turbines within Craignagapple would be visible above the horizon, as well as the blade tips of one further turbine. These turbines would increase the influence of existing wind farm development at the Site in comparison to the operational Owenreagh I and II Wind Farms, of which there is more limited visibility at this viewpoint.

The Development would extend the field of view occupied by turbines to the north of the extent occupied by Craignagapple Wind Farm, and several turbines towards the north of the Development would be visible to a greater extent above the horizon and in closer proximity than the Craignagapple turbines. However, the presence of Craignagapple turbines means that the overall magnitude of change resulting from the Development would be slightly reduced in comparison to the main assessment during the operational phase.

When combined with the medium-high sensitivity, this would result in a **major / moderate** and **significant** effect on road-users during both the decommissioning and construction phase and the operational phase.

6.9.4 Viewpoint 4: Moor Lough picnic area (Figure 6.29)

Baseline

This viewpoint is taken from a picnic area along the western shore of Moor Lough at a minimum distance of 1.4 km to the north-east of the closest proposed turbine. Moor Lough is fed by the Glenmornan River which runs into the western edge of the lough. It is located in a relatively flat part of the landscape, to the north of higher ground formed by Owenreagh Hill and Balix Hill, and south of the valley of the Burn Dennett. There is a footpath around the lough and some limited facilities. The viewpoint is representative of the views experienced by recreational visitors to Moor Lough.

Vegetation around the lough largely limits outward views away from the lough from the footpath. However, views are available across the lough to the landscape beyond from certain parts of the footpath where the vegetation is less dense. There are also a number of platforms into the lough around its edges from which views are available across the lough to the opposite shore and beyond. Views to the north are particularly limited due to the lower elevation of the surrounding land in this direction combined with the presence of woodland along the edge of the lough. Views to the west are similarly limited. From the western shore there are longer-distance views towards smoothly rounded moorland hills within the main range of the Sperrin mountains to the east. These are visible in a ridge which passes to the east beyond the closer proximity uplands to the north of Balix Hill.
Views to the south are available from the northern and western shores of the lough. In this direction, the immediate surroundings are formed by pastoral land with areas of woodland and blocks of coniferous forestry. Beyond this there are upland areas which feature moorland landcover. The horizon is formed by Owenreagh Hill to the south-west, at a distance of approximately 3 km. Turbines within Owenreagh I and II are visible upon the skyline, partially screened by forestry. These turbines present an influence on the character of the view from this location, albeit not a defining one.

Sensitivity

The value of the view is high. The viewpoint is covered by the Sperrin AONB which is a formal recognition of the national scenic value of this landscape, and despite the lack of formal viewpoints, informal views of the surrounding hills are a feature of the arrival at this western end of the lough. The susceptibility of recreational visitors is medium-high. Although the view towards the Site is often screened by intervening vegetation, where open views do occur recreational visitors would be susceptible to the effects owing to their moderate pace of movement and heightened expectation to enjoy scenic views. Effects may be experienced over a relatively long duration, particularly by anglers who may use the platforms around the shore from which more open views are available. The susceptibility is prevented from being rated high by the existing presence and influence of the operational Owenreagh I and II wind farms.

The combination of the high value of the view and the medium-high susceptibility of viewers leads to an overall **high** rating sensitivity.

Magnitude of change during decommissioning and construction

The magnitude of change on the views of recreational visitors would be **high** during the decommissioning and construction phase. The ground level works would be mostly screened by the intervening landform. The higher-level works, involving the use of tall cranes, the removal of the operational turbines and the emergence of the proposed turbines, would form a more readily visible feature that would be experienced by recreational visitors over a potentially longer duration. While operational wind turbines are already visible along this ridgeline, the emergence of closer range and larger turbines replacing them would form a defining feature.

Magnitude of change during operation

The magnitude of change on the views of recreational visitors as a result of the Development would be **high** during the operational phase. The proposed turbines would be seen at a minimum of approximately 1.4 km, such that they would appear as relatively close-range and large-scale structures. The wirelines in Figures 6.29c and 6.29d and photomontages in Figures 6.29e and 6.29f show that of the 14 turbines, all would be theoretically visible to some degree. Vegetation around the lough would filter views towards the Development such that from the majority of the path it is unlikely that views would be experienced to the same extent as the theoretical visibility shown on Figure 6.29. The towers of some turbines would be screened by the landform or filtered by vegetation. However, when the turbines are visible, the majority would be seen to almost their full extents. The hubs and blades of 12 turbines would be visible, while the remaining two would be seen as blade tips only. Those factors which would add to the magnitude of change include the relative proximity of the proposed turbines to the viewpoint and their larger scale compared to the existing turbines at the Site. The Development would extend wind farm development across a greater proportion of the skyline in views from this viewpoint than the existing turbines, extending the horizontal extent occupied by turbines to the west. The proposed turbines would form a new focus in views from more open parts of the shore, largely focussed to the northern and western shorelines.

The main factorIch would m"dera'e the magnitude of change include the existing presence and influence of the operational Owenreagh I and II in the same sector of the view and in the same upland landscape. This has established a precedent of wind farm Development in this area and would ensure that the Development would not be seen as a new type of development.

Significance of effect

The effect of the Development on recreational visitors would be **major** and **significant** during the decommissioning and construction phase and the operational phase. This finding relates chiefly to the relatively close proximity between the viewpoint and the Development, and the proportion of the skyline occupied by turbines in views from this recreational viewpoint, despite the existing influence of turbines within Owenreagh I and II. The effects would be short-term and reversible during the decommissioning and construction phase and long-term and reversible during the operational phase, with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.54)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple Wind Farm is present, the magnitude of change would be **medium** during the decommissioning and construction phase and the operational phase. All six of the turbines within Craignagapple would be seen to almost their full extents above the horizon to the south and would bring wind farm development of a larger scale into closer proximity to the viewpoint than the turbines within Owenreagh I and II. This would increase the influence of wind farm development at the Site. Due to their position further north than the turbines within Owenreagh I and II, on the lower northern flank of Owenreagh Hill, it is likely that some ground level infrastructure associated with the Craignagapple turbines would be visible.

The Development would extend "he f'eld of view occupied by turbines to the east and west of the turbines within Craignagapple and would bring wind turbines into closer proximity to the viewpoint than the existing. However, the turbines would be seen to a similar extent above the horizon as those within Craignagapple, and would appear similar in scale, which would slightly reduce the operational magnitude of change in comparison to the main assessment. The likely visibility of ground level infrastructure associated with Craignagapple Wind Farm means that the magnitude of change associated with the ground level construction works of the Development would also be slightly reduced.

When combined with the high sensitivity, this would result in a **major / moderate** and **significant** effect on recreational visitors during both the decommissioning and construction phase and the operational phase.

6.9.5 Viewpoint 5: Holyhill Road, Holly Hill (Figure 6.30)

Baseline

The viewpoint is located a minimum of 3.8 km to the west of the Development, on a section of Holyhill Road to the east of where it meets Towncastle Road. Hollyhill Road is a minor road which passes broadly east to west through the centre of the Study Area and connects Moor Lough in the east with Ballee Road in the north-west. This viewpoint is representative of the views experienced by road users on Holyhill Road, as well as the views experienced by rural residents at properties in the vicinity. This stretch of Holyhill Road is located in a generally flat part of the landscape, although the road slopes gently down to the east from this viewpoint.

Views from this stretch of the road are relatively long-range, particularly to the north and east. To the north, the foreground is formed by agricultural land with a complex pattern of field boundaries and areas of deciduous woodland. There are also rural properties visible set within this agricultural landscape, as well as several small-scale domestic wind turbines. Hills in the Slievekirk range from the horizon at a distance of approximately 10 km. Several wind farms are visible on the skyline in this direction, including Slieve Kirk, Carrickatane and Curryfree wind farms. To the east, Holyhill Road slopes gently down in the foreground, flanked by hedgerows on either side. There are several properties along Hollyhill Road visible in the middle distance, and a similar pattern of agricultural fields beyond. The horizon is formed by a ridge of hills within the main Sperrin range to the east, and to the south-east by the moorland and forested Owenreagh Hill. A number of turbines within Owenreagh I and II wind farms are visible upon the horizon.

To the west, views are more contained by vegetation alongside Holyhill Road. To the south, the hills of Knockavoe and Craignagare form the horizon in the middle distance. These hills also have a complex pattern of agricultural, woodland and moorland land cover.

Sensitivity

The value of the view is medium-high. This viewpoint is located outside the Sperrin AONB, although the view over the surrounding landscape is similar in character to views from within the AONB and presents a rural and relatively scenic setting. There are no formal viewpoints in this area, and the viewpoint is taken from a relatively arbitrary point to allow the fullest extent of visibility of the Development.

The susceptibility of road-users is medium. The view towards the Site would be more readily visible to road users travelling east than travelling west. It would be experienced as a transitory view whilst travelling at speeds of typically 50 to 60 mph. Furthermore, the operational Owenreagh I and II turbines are already visible, establishing this type of development as a feature of the baseline view. The susceptibility of residents is high, although the focus of most views from properties along this stretch of Holyhill Road is orientated north to south rather than to the east towards the Site.
The combination of the medium-high value of the view and the medium or high susceptibility of road-users and residents leads to an overall **medium-high** sensitivity for road users and **high** sensitivity for residents.

Magnitude of change during decommissioning and construction

The magnitude of change experienced at this viewpoint would be **medium-high** during the decommissioning and construction phase. The position of several turbines on the western flank of Owenreagh Hill means that the ground of parts of the Site is exposed in this view, and that the construction of access tracks, crane pads and foundations would be visible across the hill slope between T1 and T2 and on the ridgeline around T5. This infrastructure would appear as a notable human influence in an upland area in which the influence of wind farm development was previously restricted to views of turbines only. Ground level works across eastern parts of the Site would be screened by the ridgeline formed by Owenreagh Hill. The removal of the existing turbines, emergence of the proposed turbines and presence and activity of associated cranes would also form a readily visible feature of the decommissioning and construction phase, and although there is the existing influence from the operational Owenreagh I and II wind farms across these hills, the closer minimum range of 3.8 km and larger scale of the proposed turbines would increase the magnitude of change.

Magnitude of change during operation

The magnitude of change resulting from the Development on views experienced at this location would be **medium-high** during the operational phase. The wireline and photomontage on Figures 6.30d and 6.30e show that all 14 turbines would be visible, with five turbines seen to almost their full extent, set on the western side of Owenreagh Hill in closer proximity to the viewpoint or upon the ridge. The remaining turbines would be set behind the ridge. The hubs of five of these would be visible, while four would be restricted to blade tips only.

Those factors which would add to the magnitude of change include the relative proximity of the proposed turbines to the viewpoint and their larger scale compared to the existing turbines at the Site. The Development would extend wind farm development across a greater proportion of the skyline in views from this viewpoint than the existing turbines, extending the horizontal extent occupied by turbines to the north. The access track and crane pads associated with T1 and T2, would be visible across the hillside, while the crane pad associated with T5 would be visible in the ridgeline, these elements of infrastructure adding to the overall effect. The proposed turbines would also bring wind farm development into closer proximity to the viewpoint than the existing turbines. Road users travelling east would experience direct views towards the Development, although these would be transitory in nature. Residents in the local area would experience views towards the Development which are longer in duration.

Those factors which would moderate the magnitude of change include the existing presence and influence of the operational Owenreagh I and II wind farms in the same sector of the view and in the same upland landscape. This has established a precedent of wind farm Development in this area and would ensure that the Development would not be seen as a new type of development.

Significance of effect

The effect of the Development would be **major** and **significant** for residents and **major / moderate** and **significant** for road-users during the decommissioning and construction phase and the operational phase. This is mainly due to the closer proximity of the turbines within the Development than the existing, as well as the visibility of several turbines to their full extents, although this is moderated by the existing influence of wind farm development on the Site. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase, with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.55)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple Wind Farm is present, the magnitude of change would be **medium** during the decommissioning and construction phase and the operational phase. All six of the turbines within Craignagapple would be visible above the horizon, with three seen to almost their full extents towards the north-east of the Site. These would bring wind farm development of a larger scale closer to the viewpoint than the turbines within Owenreagh I and II and would increase the influence of wind farm development at the Site. Although the full extent of several turbines would be visible, it is likely that ground level infrastructure would be screened by the ridgeline formed by Owenreagh Hill.

The turbines within the Development would be seen to a similar extent above the horizon as those within Craignagapple, and would appear similar in scale, which would slightly reduce the operational magnitude of change in comparison to the main assessment.

Despite these features which may moderate the magnitude of change, the overall magnitude of change associated with the Development is likely to be similar under this hypothetical baseline as in the main assessment. Factors which influence this include the fact that the Development would extend the field of view occupied by turbines to the east and west of the turbines within Craignagapple and would bring wind turbines into closer proximity to the viewpoint than the existing Owenreagh I and II wind farms. Ground level infrastructure associated with the Development would also be seen, where existing development is restricted to views of turbines.

When combined with the high to medium-high sensitivity, this would result in a **major** / **moderate** and **significant** effect for residents and road-users during both the decommissioning and construction phase and the operational phase.

6.9.6 Viewpoint 6: President Wilson's House (Figure 6.31)

Baseline

This viewpoint is located a minimum of 4.7 km to the west of the Development. It is situated adjacent to President Wilson's House, which is a visitor attraction accessed from the B536, to the south-east of Strabane. It is representative of the views experienced by recreational visitors at this location. There are also a number of residential properties located along the same access track from the B536, and the viewpoint is representative of the views experienced by rural residents in this area. The viewpoint is located to the north of the Cavanalee River, which forms a low point in the surrounding landscape. To the north, the land slopes gradually upwards towards the summit of Knockavoe.

To the north, views are framed by vegetation along the track, although there are longer distance views towards the summit of Knockavoe. There is a large mast set on Koram Hill approximately 3.5 km to the south-east of the viewpoint. The land cover is formed by pastoral fields on the lower slopes and moorland on the summit, and there are several rural properties as well as blocks of forestry and hedgerows. To the west, a hedgerow along the track partially filters views, although there are long distance views towards hills beyond Strabane, to the west of the River Finn. The land cover is a complex pattern of agricultural land with field boundaries delineated by hedgerows and woodland. To the south, views are contained in slightly closer proximity by high ground to the west of Meenashesk Hill. A single turbine is visible on the skyline in this direction. The landcover is formed by a similar pattern of agricultural land.

The view east towards the Site is also long-range over a predominantly pastoral landscape. High ground to the south-east is visible beyond the valley formed by the Cavanalee River. The moorland summits of Koram and Owenreagh Hill form the horizon, and turbines within Owenreagh I and II are visible upon the skyline, largely set behind the ridge formed by Owenreagh Hill. These turbines are partially screened by vegetation from the viewpoint itself, although there would be open views towards them from parts of the surrounding landscape. There are also views of a large residential property in the foreground. From President Wilson's House itself surrounding vegetation screens views towards the Site.

Sensitivity

The value of the view is medium-high. While the viewpoint is covered by the Sperrin AONB, which indicates a formal recognition of the national scenic value of this landscape, there is also value attached to the cultural heritage asset of President Wilson's House, there are no formal viewpoints in this area and the view of the Site is partly screened by Koram Hill and Owenreagh Hill, as well as closer range vegetation surrounding President Wilson's House.

The susceptibility of visitors to President Wilson's House is medium-high. Although the view towards the Site is often screened by intervening vegetation, where open views do occur visitors would be susceptible to the effects.

The views of local residents would also be of medium-high susceptibility. The number of residential properties in the area is limited. However, views from these properties are static and experienced over long periods of time. These factors would increase the potential prominence of the Development in the views of residents in this local area.

The combination of the medium-high value of the view and the medium-high susceptibility of viewers leads to an overall **medium-high** rating for sensitivity.

Magnitude of change during decommissioning and construction

The magnitude of change on the views of residents and visitors would be **medium-low** during the decommissioning and construction phase. The intervening ridgeline would screen most of the ground level works, such that the tall cranes, removal of existing turbines and addition of six visible emerging turbines would be those parts of the decommissioning and construction phase that would be readily visible. These structures would be seen to rise above the ridgeline, albeit with the lower parts of most of the cranes and turbines screened. While these components of the construction would form an apparent feature, the magnitude of change would be moderated by their location behind the ridgeline, the baseline influence of operational Owenreagh I and II Wind Farms in this sector of the view, as well as the minimum separation distance of 4.7 km.

Magnitude of change during operation

The magnitude of change on the views of residents and visitors would be **medium-low** during the operational phase. The Development would be located a minimum distance of approximately 4.7 km from the viewpoint, with six of the 14 turbines visible behind the ridgeline formed by Owenreagh Hill as shown on the wireline and photomontage on Figures 6.31c and 6.31d. They would be seen to overlap with the northern operational turbines of the Owenreagh I and II Wind Farms, but also increase the horizontal extent further north. The turbines would be visible to variable degrees, with one visible to almost its full extent, two further turbines visible to hub height and the remaining turbines visible as blade tips beyond the ridgeline.

The presence of the operational wind farms means that the Development would not form a new feature in the view. The turbines would be contained within the same sector of the view as that influenced by existing turbines, albeit extended slightly further north. The larger scale of the turbines within the Development would be apparent, however their similar horizontal extent and position within the same sector of the view as the existing Owenreagh I and II turbines would moderate the magnitude of change. As shown on the horizontal angle ZTV on Figure 6.7, the Development would occupy between 10 and 20 degrees of the 360 degree view available from this viewpoint, such that it would appear well contained. The proposed turbines would be seen to the north-east, while the main focus of views from this location is to the south. Furthermore, views of the Development from President Wilson's House would be screened, and only glimpsed views experienced on the approach.

Significance of effect

The effect of the Development on the views of recreational visitors and residents would be **moderate** and **not significant** during both the decommissioning and construction phase and the operational phase. This would arise through a combination of the limited extent to which the Development would be visible, the separation distance of approximately 4.7 km between the viewpoint and the Development and the existing influence of wind farm development at the Site, albeit smaller in scale. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase, with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.56)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple Wind Farm is present, the magnitude of change would be **medium-low** during the decommissioning and construction phase and the operational phase. The blade tips of five turbines within Craignagapple would be seen above the horizon. This would extend the horizontal field of view to the north of the turbines within Owenreagh I and II. This is unlikely to have an influence on the overall magnitude of change experienced from this viewpoint compared to the main assessment, due to the limited extent to which the Development would be visible despite the visibility of the proposed turbines to a greater extent above the horizon than the turbines within either Owenreagh I and II or Craignagapple.

When combined with the medium-high sensitivity, this would result in a **moderate** and **not significant** effect on recreational visitors during both the decommissioning and construction phase and the operational phase.

6.9.7 Viewpoint 7: Strathmourne Road, Strabane (Figure 6.32)

Baseline

The viewpoint is located a minimum of 7.8 km to the west of the Development. It is situated on Strathmourne Road, on the south-eastern edge of Strabane. The viewpoint is at the entrance to a small industrial estate, although there are areas of residential properties nearby. This viewpoint is considered to be representative of the views of road-users travelling east who would be experiencing views broadly in the direction of the Site. For road users travelling west the Site would be largely to their rear and therefore would not form such a notable feature. The viewpoint is also representative of workers at businesses in the area.

The viewplint is situated on the edge of Dublin Road Industrial Estate, to the east of Melmount Road. To the west, there are views towards a roundabout on Melmount Road. Housing to the west of Melmount Road is largely screened by roadside vegetation, although there are views of a limited number of residential properties to the north-west. To the north and south, outward views are limited by warehouses within the industrial estate, which also frame longer-distance views to the east.

To the east, Strathmourne Road occupies the foreground. Vegetation along the road partially filters views towards the Mourne River and agricultural land which is visible beyond the river in the middle distance. Beyond this, moorland hills including Koram Hill and Owenreagh Hill form the horizon. Several turbines within Owenreagh I and II are visible upon the horizon in this direction, set beyond the ridgeline formed by Owenreagh Hill.

Sensitivity

The value of the view is medium. The viewpoint is an incidental viewpoint, located on the edge of Strabane, and selected to include the fullest extent of the Development. The medium value reflects that this viewpoint is not a formal viewpoint, and the area lies outwith any landscape designations which would otherwise increase the scenic value.

The susceptibility of road-users on this section of Strathmourne Road is medium. The east to west alignment of this short road means that road users travelling east would have direct views towards the Site. Road users are likely to be travelling at 20 to 30 mph, and their views would be transitory and experienced over a short period of time.

The susceptibility of workers at businesses within the industrial estate are also medium. Although they may experience views towards the Site over a longer period of time, workers are considered to have a lower susceptibility than residents owing to their focus being on their work.
The combination of the medium value of the view and the medium susceptibility of viewers leads to an overall medium sensitivity.

Magnitude of change during decommissioning and construction

The magnitude of change on the views of road-users would be **medium** during the decommissioning and construction phase. The ground level works would be screened by the intervening landform. The higher-level works, involving the use of tall cranes, the removal of existing turbines and the emergence of the proposed turbines, would form a more readily visible feature that would be experienced by road-users over a short duration and by workers over a longer duration. While operational wind turbines are already visible along this ridgeline, the Development would introduce slightly closer range and larger turbines, albeit at a minimum distance of 7.8 km.

Magnitude of change during operation

The magnitude of change that road-users and workers would experience would be **medium**. Of the 14 turbines, eight would be visible, seen set behind the ridgeline formed by Owenreagh Hill. The proposed turbines would be seen at a minimum distance of approximately 7.8 km. One turbine would be theoretically visible to almost its full extent, while the towers of the remaining seven turbines would be largely screened, and these would be seen as blades or hubs and blades, as shown on the wireline and photomontage on Figures 6.32c and 6.32d.

Those factors which would add to the magnitude of change include the larger size of the turbines within the Development, and the slightly increased horizontal extent it forms to the north of the existing turbines, which the proposed turbines would replace.

The factors which would limit the magnitude of change include the separation distance, the presence of the operational wind farm and the containment of wind farm development in this same sector of the view. The minimum distance of approximately 8 km means that the proposed turbines would appear as medium-scaled elements within the view and also that they would occupy between 5 to 10 degrees of the full 360 degree view, as shown on the horizontal angle ZTV on Figure 6.7. The existing presence of Owenreagh I and II Wind Farms has established the precedent of wind farm development on the Site, meaning that the Development would not be seen as a new feature in the view.

Significance of effect

The effect of the Development on road-users and workers would be **moderate** and **not significant** during the decommissioning and construction phase and the operational phase. The slightly closer proximity and larger scale of the turbines would be moderated by the minimum separation distance of 7.8 km and the baseline influence of wind farm development on the Site. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase, with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.57)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple Wind Farm is present, the magnitude of change would be **medium-low** during the decommissioning and construction phase and the operational phase. All six of the turbines within Craignagapple would be seen to some extent, with three to the north being visible to at least hub height. This would extend wind farm development to the north of the turbines within Owenreagh I and II, and the scale of the turbines would be appreciably larger.

The Development would slightly extend the field of view occupied by turbines to the north of the turbines within Craignagapple. However, this effect would be reduced when compared with the actual baseline scenario considered in the main assessment, and the Development would broadly be contained within the field of view occupied by turbines. Turbines within the northern part of the Development would be seen to a similar extent above the horizon as those within Craignagapple, and would appear similar in scale, which would slightly reduce the operational magnitude of change in comparison to the main assessment, although those to the south would be seen to a greater extent. These factors would reduce the magnitude of change to **medium-low**.

When combined with the medium sensitivity, this would result in a **moderate / minor** and **not significant** effect on road-users and workers during both the decommissioning and construction phase and the operational phase.

6.9.8 Viewpoint 8: Victoria Bridge (Figure 6.33)

Baseline

This viewpoint is located a minimum of 9.0 km to the south-west of the Development. It is situated on Melmount Road, on the south-eastern settlement edge of Victoria Bridge. The road passes broadly south-east to north-west, following the course of the Mourne River. The viewpoint is representative of the views of residents within the small settlement, as well as road users on Melmount Road. The viewpoint is situated to the south-east of the main settlement and is located adjacent to several industrial buildings which flank Melmount Road to the west.

Melmount Road is visible in the foreground to the west, and industrial buildings on the western side of the road largely occupy the view in this direction. Glimpsed views between these buildings towards gently rising agricultural land are visible from parts of the road. To the north and south Melmount Road occupies much of the view, although again there are longer-distance views towards higher ground in both directions, occupying only a small proportion of the overall view. Residential properties to the east of Melmount Road are also visible.

To the east, there is an area of open rough grassland between Melmount Road and the Mourne River which occupies the foreground. Beyond this, agricultural fields form the landcover upon relatively flat land within the valley, beyond which gently rolling forested and moorland hills form the horizon. Several turbines within Owenreagh I and II wind farms are visible upon the skyline to the east, as is the mast upon Koram Hill.

Sensitivity

The value of the view is medium. The view is not taken from a formal viewpoint nor is this area covered by a landscape planning designation which would otherwise denote a special scenic value. The susceptibility of road-users is medium. The view towards the Site would be oblique for road users travelling in both directions, although more visible when travelling south-east. It would be experienced as a transitory view whilst travelling at speeds of typically 50 to 60 mph. The susceptibility of residents is high, and views towards the Development are static and would be experienced over a long duration. However, the operational Owenreagh I and II turbines are already visible, establishing this type of development as a feature of the baseline view.

The combination of the medium value of the view and the high susceptibility of residents and medium susceptibility of road-users leads to an overall **medium-high** sensitivity for residents and **medium** sensitivity for road-users.

Magnitude of change during decommissioning and construction

The magnitude of change on the views of road-users and residents would be **low** during the decommissioning and construction phase. The intervening ridgeline would screen most of the ground level works, such that the tall cranes, removal of the existing turbines and addition of the emerging turbines would be the components that would be readily visible in the views of road-users and residents in Victoria Bridge. These structures would be seen to rise above the ridgeline, albeit with the lower parts of most of the cranes and turbines screened. While these components of the decommissioning and construction would form an apparent feature, the magnitude of change would be moderated by their location behind the ridgeline and the minimum separation distance of approximately 9.0 km which would mean they would occupy only a small proportion of the wider view.

Magnitude of change during operation

The magnitude of change on the views of road-users and residents would be **low** during the operational phase. The Development would be located a minimum distance of approximately 9.0 km from the viewpoint, with five of the 14 turbines visible along or behind the ridgeline, as shown on the wireline and photomontage on Figure 6.33. The towers of two turbines would be just visible above the horizon, with the remaining turbines being seen as blades or hubs only. Due to their position beyond the ridgeline the larger scale of the turbines in comparison with the existing would be less apparent. They would be seen to occupy a similar extent of the horizon previously occupied by the turbines within Owenreagh I and II wind farms.

Those factors which would add to the magnitude of change include the position of the turbines slightly higher above the horizon than the smaller-scale turbines within Owenreagh I and II wind farms. The factors which would moderate the magnitude of change include the separation distance, the containment of wind farm development in this same sector of the view and the position of the turbines behind the ridgeline of Owenreagh Hill. The minimum distance of 9 km means that the proposed turbines would appear as small-scale elements, with the horizontal angle ZTV on Figure 6.7 showing that they would occupy only 5 to 10 degrees of the 360 degree view. The existing presence of Owenreagh I and II wind farms has established the precedent of wind farm development on the Site, meaning that the Development would not be seen as a new feature in the view.

Significance of effect

The effect of the Development on road users and residents would be **moderate / minor** or **minor** and **not significant** during the decommissioning and construction phase and the operational phase. This finding relates chiefly to the separation distance and the limited extent to which the Development would be visible, as well as the existing influence of the operational wind farms on the baseline view. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase, with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.58)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple Wind Farm is present, the magnitude of change would be **low** during the decommissioning and construction phase and the operational phase. Five turbines within Craignagapple would be seen above the horizon, with two seen at hub height and three as blade tips only. These would extend the horizontal field of view slightly to the north-west of those within Owenreagh I and II Wind Farms and would also be appreciably larger in scale.

The turbines within the Development would be contained within the horizontal extent that would be occupied by the consented turbines, albeit that the most north-westerly Craignagapple turbine has very limited visibility above the horizon. The turbines would also be seen at a similar scale and to a similar extent above the horizon as the south-eastern turbines within Craignagapple. These factors would slightly reduce the magnitude of change in comparison to the main assessment.

When combined with the medium-high or medium sensitivity, this would result in a **moderate / minor** or **minor** and **not significant** effect on road-users and residents during both the decommissioning and construction phase and the operational phase.

6.9.9 Viewpoint 9: Harry Avery's Castle, Newtownstewart (Figure 6.34)

Baseline

This viewpoint is located at Harry Avery's Castle, a minimum of 11.4 km to the south of the Development and situated to the south-west of the village of Newtownstewart. Harry Avery's Castle is a State Care Scheduled Monument under the guardianship of the Northern Ireland Environment Agency. The castle is situated to the west of Oldcastle Road and is positioned on slightly higher ground to the south of the valley formed by the Strule River. To the south the landscape slopes gently up towards Bessy Bell which forms a high point in the surrounding area. The castle itself is a ruin, and the viewpoint is representative of views experienced by visitors to the castle. There is no formal access track to the castle, and access is available through a field gate on Oldcastle Road.

The location of the castle on higher ground above the Strule River means that there are long-distance, panoramic views from this elevated position. Views are particularly open to the north and east, over a patchwork of agricultural land interspersed with residential properties and areas of woodland. In these directions, the horizon is formed at distance by rolling moorland hills within the Sperrins. Turbines within Owenreagh I and II are visible above the horizon to the north, as is the mast on Koram Hill. There is also a number of domestic scale turbines situated throughout the landscape to the north and east. Development within Newtownstewart is visible in the middle distance to the north-east. Views to the south and west are contained in closer proximity by the rising landform.

Sensitivity

The value of the view is medium-high. Although this area is not covered by the Sperrin AONB, and the viewpoint is not a formal viewpoint, it does offer a natural vantage point from which the surrounding landscapes can be appreciated.

The susceptibility of the views of visitors to the castle is medium-high. Given the open nature of views to the north and east, receptors would be more susceptible to development in these directions. Turbines within Owenreagh I and II and a mast on Koram Hill are visible to the north, and the lower-lying landscape to the north has been heavily modified by development including forestry and farming practices, which would moderate the susceptibility of visitors to changes resulting from the Development.

The combination of the medium-high value of the view and the medium-high susceptibility of viewers leads to an overall **medium-high** sensitivity.

Magnitude of change during decommissioning and construction

The magnitude of change on the views of recreational receptors would be **low** during the decommissioning and construction phase. While the ground level construction works would be largely screened by the intervening ridgeline, the tall cranes, removal of the existing turbines and addition of emerging turbines would be visible along it. The emerging turbines would occupy a small proportion of the long-distance, panoramic views available from this location. The minimum separation distance of approximately 11.4 km would moderate the magnitude of change as the emerging turbines would occupy only a small proportion of the wider panoramic view available from this location and they would be seen in a context where other large vertical structures, such as turbines and masts, are an established feature.

Magnitude of change during operation

The magnitude of change on the views of visitors would be **low** during the operational phase. The Development would be located a minimum distance of 11.4 km from the viewpoint, with all of the 14 turbines visible along or behind the ridgeline as shown on the wireline and photomontage on Figure2 6.34f and 6.34g. The towers of four turbines would be visible, with the remaining turbines being seen as blades or hubs only.

Those factors which would add to the magnitude of change include the greater horizontal extent occupied by the Development as compared to the existing turbines within Owenreagh I and II, as well as the larger scale of the turbines.

The factors which would moderate the magnitude of change include the separation distance, the containment of wind farm development in the same sector of the view as the existing turbines, and the position of the turbines behind the ridgeline of Owenreagh Hill. The minimum distance of 11.4 km means that the proposed turbines would appear as relatively small-scale elements within the view and as shown on the horizontal angle ZTV on Figure 6.7, they would occupy between 10 and 20 degrees of the full 360 degree view available from this location. Furthermore, the existing presence of Owenreagh I and II wind farms has established the precedent of wind farm development on the Site, meaning that the Development would not be seen as a new feature in the view.

Significance of effect

The effect of the Development on recreational visitors would be **moderate / minor** and **not significant** during the decommissioning and construction phase and the operational phase. This finding relates chiefly to the existing influence of the operational wind farms on the baseline view, the separation distance of 11.4 km, and the small proportion of the total view occupied by the Development. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase, with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.59)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple Wind Farm is present, the magnitude of change would be **low** during the decommissioning and construction phase and the operational phase. All six of the turbines within Craignagapple would be seen above the horizon, with four seen at hub height and two as blade tips only. These would slightly extend the horizontal field of view to the west of those within Owenreagh I and II wind farm and would also be appreciably larger in scale.

The turbines within the Development would extend the field of view occupied by turbines to the east and west of those within the baseline scenario of Craignagapple and Owenreagh I and II wind farms. They would be seen to a similar extent above the horizon as those within Craignagapple Wind Farm and would also appear similar in scale. These factors would slightly reduce the magnitude of change in comparison to the main assessment.

When combined with the medium-high sensitivity, this would result in a **moderate / minor** and **not significant** effect on visitors during both the decommissioning and construction phase and the operational phase.

6.9.10 Viewpoint 10: Slievebeg Road, Slievebeg (Figure 6.35)

Baseline

This viewpoint is a minimum of 8.6 km to the south-south-east of the Development. It is located on Slievebeg Road which passes north to south along the western edge of an upland area formed by Slievemore, Craignamaddy and Mullaghbane hills, to the south-east of Plumbridge. The viewpoint is representative of road users on Slievebeg Road, as well as residents at dispersed properties in the rural area.

From this elevated position, there are open views over lower land within the valley of the Glenelly River to the north-west. Beyond this, there are long-distance views towards rolling hills which form the horizon, and which feature moorland and pastoral land cover. The foreground is formed by rough grassland, and there are several areas of woodland which partially screen outward views. To the east, the rising landform of Slievemore contains outward views. Slievebeg Road occupies the foreground to the north and south, and long-distance views in these directions are largely screened by vegetation along the road. Turbines within Owenreagh I and II are visible beyond the ridgeline formed by Owenreagh Hill to the north-west. There is also a domestic scale turbine visible above the skyline near the summit of Craigatuke Hill, and the mast on Koram Hill is visible to the north-west.

Sensitivity

The value of the view is medium-high. Although the viewpoint is at an incidental point on the road, it is covered by the Sperrin AONB which indicates a formal recognition of the national scenic value of this landscape, despite the lack of formal viewpoints.

The susceptibility of road-users is medium. The view towards the Site would be oblique for road users travelling in both directions, although more visible when travelling north. It would be experienced as a transitory view whilst travelling at speeds of typically 40 to 60 mph. The susceptibility of residents is medium-high, and views towards the Development are static and would be experienced over a long duration. However, the operational Owenreagh I and II turbines are already visible, establishing this type of development as a feature of the baseline view.

The combination of the medium-high value of the view and the medium susceptibility of road-users and medium-high susceptibility of residents leads to an overall **medium** sensitivity for road users and **medium-high** sensitivity for residents.

Magnitude of change during decommissioning and construction

The magnitude of change on the views of road-users would be **medium-low** during the decommissioning and construction phase. The intervening ridgeline would screen most of the ground level construction works, such that the tall cranes, removal of existing turbines and addition of emerging turbines would be those components that would be readily visible in the views of road-users and residents on Slievebeg Road. The proposed turbines would be seen to rise above the ridgeline, albeit with the lower parts of most of the cranes and turbines screened. While these components of the construction would form an apparent feature, the magnitude of change would be moderated by the minimum separation of 8.61 km, their location behind the ridgeline and the baseline influence of operational wind farms across the Site in this sector of the view.

Magnitude of change during operation

The magnitude of change on the views of road-users and residents would be **medium-low** during the operational phase. The Development would be located a minimum distance of more than 8.6 km from the viewpoint, with nine of the 14 turbines visible along or behind the ridgeline formed by Owenreagh Hill and Craigatuke, as shown on the wireline and photomontage on Figures 6.35c and 6.35d. The hubs and towers of seven turbines would be visible, with the remaining turbines being seen as blade tips only. The larger scale of the turbines within the Development would be apparent, although their position further north across Owenreagh Hill than the existing turbines means that from this location they would occupy an apparent trough between the summits of Owenreagh Hill and Craigatuke. The turbines would be seen to occupy a larger extent of the horizon compared to the turbines within Owenreagh I and II wind farms and would extend development further east.

Those factors which would add to the magnitude of change include the position of the turbines slightly higher above the horizon than the smaller-scale turbines within Owenreagh I and II, and the apparent difference in scale between the existing turbines and the proposed turbines.

The factors which would moderate the magnitude of change include the separation distance, the containment of wind farm development in this same sector of the view and the position of the turbines behind the ridgeline of Owenreagh Hill and in the apparent trough between two areas of higher ground. The minimum distance of 8.6 km means that the proposed turbines would appear as medium-scale elements within the view, and as shown on the horizontal angle ZTV on Figure 6.7, they would occupy between 5 and 10 degrees of the full 360 degree view. The existing presence of Owenreagh I and II has established the precedent of wind farm development on the Site, meaning that the Development would not be seen as a new feature in the view.

Significance of effect

The effect of the Development on views experienced by road users and residents would be **moderate** and **not significant** during the decommissioning and construction phase and the operational phase. This finding relates chiefly to the separation distance, the contained extents of the Development and the position of the Development in the same sector of the view as the baseline wind farm development. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase, with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.60)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple Wind Farm is present, the magnitude of change would be **low** during the decommissioning and construction phase and the operational phase. All six of the turbines within Craignagapple would be seen above the horizon, with all seen to almost their full extents. They would be located to the north-east of the turbines within Owenreagh I and II and would not be seen to overlap with these developments. They would be appreciably larger in scale than the Owenreagh turbines.

The turbines within the Development would slightly extend the field of view occupied by turbines to the north-east of those within Craignagapple and Owenreagh I and II wind farms. They would be seen to a similar extent above the horizon as those within Craignagapple Wind Farm and would appear similar in scale. These factors would slightly reduce the magnitude of change in comparison to the main assessment.

When combined with the medium-high or medium sensitivity, this would result in a **moderate / minor** and **not significant** effect on residents and road users during both the decommissioning and construction phase and the operational phase.

6.9.11 Viewpoint 11: B48 Ballynamallaght (Figure 6.36)

Baseline

This viewpoint is a minimum of 4.9 km to the north-east of the Development. It is located on the B48 at Ballynamallaght, a dispersed settlement which stretches along the B48. The viewpoint is located to the west of Lough Ash, at the northern extent of the settlement. It is representative of road users travelling in both directions on the B48, as well as residents within Ballynamallaght.

This viewpoint is located in an elevated position above the valley of the Burn Dennet to the south. Views to the south and west are most open, offering long-distance views towards higher ground to the west and south-west. Views comprise lower ground within the valley, with predominantly agricultural land cover interspersed with areas of woodland, towards moorland hills including Owenreagh Hill which forms the horizon to the west. Craigatuke and Balix Hill are also visible and form the horizon further south. Turbines within Owenreagh I and II form an array across the summit of Owenreagh Hill to the south-west. Views in other directions are more contained. Rising landform to the north limits outward views in this direction, while to the south-east and north-west the B48 can be seen stretching into the middle distance, with residential properties positioned on the western side of the road. These properties generally have principal views to the east and open views to the west over the surrounding landscape.

Sensitivity

The value of the view is medium-high. The viewpoint is covered by the Sperrin AONB which indicates a formal recognition of the national scenic value of this landscape, despite the lack of formal viewpoints.

The susceptibility of road-users is medium. The view towards the Site would be oblique for road users travelling in both directions. It would be experienced as a transitory view whilst travelling at speeds of typically 40 to 60 mph. The susceptibility of residents is medium-high, and views towards the Development are static and would be experienced over a long duration. However, the operational Owenreagh I and II turbines are already visible, establishing this type of development as a feature of the baseline view.

The combination of the medium-high value of the view and the medium susceptibility of road-users and medium-high susceptibility of residents leads to an overall **medium-high** sensitivity for road users and residents.

Magnitude of change during decommissioning and construction

The magnitude of change experienced at this viewpoint would be **medium** during the decommissioning and construction phase. The position of the Development towards the north of Owenreagh Hill means that the ground of parts of the Site would be exposed in this view, such that the construction of access tracks, crane pads and foundations would be visible around the closer range, more prominent turbines towards the north of the Development. This site infrastructure would appear as a notable human influence in an upland area in which the influence of wind farm development was previously restricted to views of turbines only. Ground level works across western parts of the Site would be screened by the ridgeline formed by Owenreagh Hill. The removal of the existing turbines, the addition of the emerging turbines and presence and activity of the associated cranes would also form a readily visible feature of the decommissioning and construction phase.

Although the baseline influence from operational Owenreagh I and II Wind Farms across the horizon to the south-west would limit the effect of the Development, the closer range and larger scale of the proposed turbines replacing the operational turbines, would increase the magnitude of change. The separation distance of approximately 5 km and the visibility of existing wind farm development across the Site would act to moderate the magnitude of change.

Magnitude of change during operation

The magnitude of change on the views of road-users and residents would be **medium** during the operational phase. The Development would be located a distance of approximately 4.9 km from the viewpoint, with all of the 14 turbines visible upon Owenreagh Hill, as shown on the wireline and photomontage on Figures 6.36c and 6.36d. A number of closer-proximity turbines would be partially backclothed by the ridgeline beyond, while the remaining turbines would be seen above the horizon. The larger scale of the turbines within the Development would be apparent, and they would bring wind farm development into closer proximity than the existing turbines across the Site. They would occupy a slightly larger horizontal extent than the existing turbines and would extend development further west in views from this location.

Those factors which would add to the magnitude of change include the position of the turbines closer to the viewpoint and the larger scale of the turbines than the existing Owenreagh I and II. Access tracks and crane pads would be visible across the hillside and would appear at variance with the rural context. The Development would be seen in open views to the south-west, albeit at an oblique angle from the road. For residents, the Development would be seen in direct views in the sector of the view in which most open views are available.

The faIs which would moderate the magnitude lange include the partial backclothing of several turbines against the landscape beyond, as well as the containment of wind farm development in the same sector of the view as the existing turbines within Owenreagh I and II, which would be replaced by the Development. The horizontal angle ZTV in Figure 6.7 shows that the Development would occupy only 10 to 20 degrees of the wider 360 degree view.

Significance of effect

The effect of the Development on road users would be **moderate** and **significant** during the decommissioning and construction phase and the operational phase. This finding relates chiefly to the closer proximity and apparent larger scale of the turbines than those within the baseline, as well as their position in the open views to the south-west of the B48 and the settlement. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase, with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.61)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple Wind Farm is present, the magnitude of change would be **medium-low** during the decommissioning and construction phase and the operational phase. All six of the turbines within Craignagapple would be seen above the horizon to their full extents. They would be located to the north of turbines within Owenreagh I and II and would, therefore, bring wind farm development into closer proximity to this viewpoint. They would be appreciably larger in scale than the Owenreagh turbines.

The turbines within the Development would bring wind farm development closer to the viewpoint than the turbines within Craignagapple. The Development would also slightly extend the field of view occupied by turbines to the east of those within Craignagapple and Owenreagh I and II wind farms. Although ground level infrastructure associated with Craignagapple Wind Farm is likely to be visible from this location, the Development is likely to bring this into closer proximity.

Despite these factors, the magnitude of change would be reduced in comparison to the findings of the main assessment due to the greater influence of wind farm development at the Site when Craignagapple Wind Farm is included. This means that the introduction of the Development would be more consistent with the existing pattern of development. The turbines would be seen to a similar extent above the horizon as those within Craignagapple Wind Farm and would be of a similar scale. They would only slightly increase the horizontal extent occupied by turbines. These factors would combine to result in a **medium-low** magnitude of change during the decommissioning and construction phase and the operational phase.

When combined with the medium-high sensitivity, this would result in a **moderate** and **not significant** effect on residents and road users during both the decommissioning and construction phase and the operational phase.

6.9.12 Viewpoint 12: B48 Dunnamanagh (Figure 6.37)

Baseline

This viewpoint is a minimum of 5.5 km to the north of the Development, located on the B48, which passes broadly north-west to south-east to the south of Dunnamanagh. The viewpoint is located on the southern settlement edge, adjacent to a small housing estate. The viewpoint is representative of road users travelling on the B48, as well as residents within the settlement of Dunnamanagh.

The B48 passes along the southern edge of a fairly elevated area north of the valley of the Burn Dennet. Longer-distance views are available to the north and west towards higher ground, while to the south and east views are more contained by rising landform and vegetation along the B48. To the west, views are available over a patchwork of agricultural land within the valley of the Burn Dennet towards slightly higher land beyond. To the south-west Owenreagh Hill forms the horizon with moorland on the summit visible, as well as turbines within Owenreagh I and II. The mast on Koram Hill is also visible to the south-west. Vegetation along field boundaries to the west of the road limits views any further south. To the north, housing within the settlement is visible on either side of the B48. Beyond this, moorland hills to the north-west of Dunnamanagh form the horizon. Some properties on the edge of the residential development adjacent to the viewpoint have open views to the south and west.

Sensitivity

The value of the view is medium-high. There are no formal viewpoints in this area although the viewpoint is covered by the Sperrin AONB which indicates a formal recognition of the national scenic value of this landscape.

The susceptibility of road-users is medium. The view towards the Site would be oblique for road users travelling in both directions, although when travelling south-east it would be slightly more direct. It would be experienced as a transitory view whilst travelling at speeds of typically 40 to 60 mph. The susceptibility of residents is medium-high, and views towards the Development are static and would be experienced over a long duration. However, the operational Owenreagh I and II turbines are already visible, establishing this type of development as a feature of the baseline view.
The combination of the medium-high value of the view and the medium or medium-high susceptibility leads to an overall **medium-high** sensitivity for road users and residents.

Magnitude of change during decommissioning and construction

The magnitude of change experienced at this viewpoint would be **medium** during the decommissioning and construction phase. The position of the Development towards the north of Owenreagh Hill means that the construction of access tracks, crane pads and foundations would be visible around the closer range, more prominent turbines towards the north of the Development. This site infrastructure would appear as a notable human influence in an upland area in which the influence of wind farm development was previously restricted to views of turbines only. Ground level works across western parts of the Site would be screened by the ridgeline formed by Drumman Hill, to the north-west of Owenreagh Hill. The removal of the existing turbines, addition of the emerging turbines and presence and activity of associated cranes would also form a readily visible feature of the decommissioning and construction phase. Although there would be the baseline influence from the operational Owenreagh I and II turbines across the horizon to the south-west, the closer range and larger scale of the proposed turbines would increase the magnitude of change. The separation distance of 5.5 km and the baseline influence from the existing wind farm on the Site would act to moderate the magnitude of change.

Magnitude of change during operation

The magnitude of change on the views of road-users and residents would be **medium** during the operational phase. The Development would be located a minimum distance of 5.5 km from the viewpoint, with all 14 of the turbines visible upon Owenreagh Hill, as shown on the wireline and photomontage on Figures 6.37e and 6.37f. Several turbines would be screened by vegetation to the west of the road from this viewpoint, although this view is likely to change when travelling along the road. Two of the turbines to the south of the Development would be partially screened by the ridgeline formed by Drumman Hill and would be visible as blade tips only. The larger scale of the proposed turbines would be apparent, and they would bring wind farm development into closer proximity than the existing turbines on the Site. They would occupy a slightly larger horizontal extent than the existing turbines and would extend development further east and west in views from this location. Those factors that would add to the magnitude of change include the position of the turbines closer to the viewpoint and the larger scale of the turbines than the existing Owenreagh I and II. The Development would be seen in open views to the south-west, albeit at a slightly oblique angle from the road. For residents, the Development would be seen in direct views in the sector of the view in which most open views are available.

The factors that would moderate the magnitude of change include the screening of several turbines to the south of the Development beyond high ground to the north-west of Owenreagh Hill, as well as the containment of wind farm development in the same sector of the view as the existing turbines within Owenreagh I and II. Vegetation to the west of the road is likely to filter this view, also reducing the magnitude of change, although this effect is likely to change when travelling along the road.

Significance of effect

The effect of the Development on residents and road users would be **moderate** and **significant** during the decommissioning and construction phase and the operational phase. This finding relates chiefly to the closer proximity and apparent larger scale of the turbines than those within the existing development, as well as their position in more open views to the south-west. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase, with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.62)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple Wind Farm is present, the magnitude of change would be **medium-low** during the decommissioning and construction phase and the operational phase. All six of the turbines within Craignagapple would be seen above the horizon to their full extents. They would be located to the north of turbines within Owenreagh I and II and would, therefore, bring wind farm development into closer proximity to this viewpoint. They would be appreciably larger in scale than the Owenreagh turbines.

The turbines within the Development would be seen at a similar distance from the viewpoint as the turbines within Craignagapple Wind Farm, and at a similar elevation above the horizon. They would also be similar in scale. The Development would extend the field of view occupied by turbines to the east and west of those within Craignagapple and Owenreagh I and II wind farms. These factors would combine to result in a slightly reduced magnitude of change in comparison to the findings of the main assessment due to the greater influence of wind farm development at the Site when Craignagapple Wind Farm is included.

When combined with the medium-high sensitivity, this would result in a **moderate** and **not significant** effect on residents and road users during both the decommissioning and construction phase and operational phase.

6.9.13 *Viewpoint 13: Lenamore picnic site, above Gortin (Figure 6.38)*

Baseline

This viewpoint is a minimum of 13.9 km to the south-east of the Development and located at a small picnic area adjacent to Lenamore Road, to the south-east of the settlement of Gortin. It is located to the east of Oak Lough and at the northern extent of an upland area focussed on the summits of Mullaghcarn and Slieveard. The viewpoint is representative of the views of recreational users of the picnic area.

Due to the position of the picnic area on the northern flank of an area of elevated land, open views are afforded over the valley landscape in this direction. Views in other directions, particularly to the south and west, are relatively contained by the surrounding rising uplands, which feature open moorland and areas of commercial forestry.

To the north, long-distance views are available over the valley of the Owenkillew River, which features a complex pattern of agricultural land delineated by vegetation along field boundaries, as well as areas of woodland and dispersed settlement. The wooded corridor of the Owenkillew River is visible in the middle distance. Beyond the lower-lying valley landscape, higher ground within the Sperrin mountains is visible forming the horizon to the north and east. The mast on Koram Hill is visible upon the horizon to the north-west, and turbines within Owenreagh I and II wind farms can also be seen upon Owenreagh Hill in long-distance views to the north-west.

Sensitivity

The value of this view is high. The viewpoint lies within the Sperrin AONB which denotes scenic value of national importance and offers extensive views over the landscape within the AONB. Furthermore, the viewpoint is located at a recreational area which offers long-distance views, and although not marked on OS maps as a formal viewpoint, it does nonetheless offer a natural viewpoint with expansive views opening out to the north.

The susceptibility ”f re’reational visitors to the effects of the Development is medium-high. Typically, recreational visitors have a heightened awareness of their surroundings that increases their susceptibility to new developments. The views from the picnic area are focussed to the north, and visitors would be susceptible to changes in this sector of the view from this viewpoint, albeit taking into account the presence of existing wind farm development in the baseline context.
The combination of the high value of the view and the medium-high susceptibility of viewers leads to an overall **medium-high** rating for sensitivity.

Magnitude of change during decommissioning and construction

The magnitude of change on the views of recreational visitors to the picnic site above Gortin would be **medium-low** during the decommissioning and construction phase. Ground level construction works would be distant and largely screened by intervening landform. The removal of the existing turbines, the addition of the emerging turbines and presence and activity of the associated construction cranes would be visible, although the minimum separation distance of 13.9 km would ensure that they would appear as relatively small and distant structures. Their position in the same sector of the view as the operational Owenreagh I and II turbines would reduce their influence on the character of the view as they would not appear as a new type of development in this location.

Magnitude of change during operation

The magnitude of change on the views of recreational visitors to the picnic site would be **medium-low** during the operational phase. The wireline and photomontage on Figures 6.38c and 6.38d show that all 14 of the turbines would be visible above the horizon to the north-west, with the lower towers somewhat screened by the intervening landform. The Development would increase the horizontal extent occupied by turbines, although their position further north than the turbines within the operational wind farms would increase the separation distance at this viewpoint. The larger scale of the turbines within the Development would be apparent, despite their position beyond the ridgeline. While the Development would be an apparent change in the view from this viewpoint, its effect would be moderated by the existing presence of wind farm development at the Site, its containment within the same sector of the view, and the long-distance and panoramic views available from this location. The Development would be seen largely to occupy a lower area between the summits of Owenreagh Hill and Craigatuke, which would limit its prominence above the horizon. The horizontal angle ZTV in Figure 6.7 shows that the Development would occupy between 5 and 10 degrees of the full 360 degree view.

Significance of effect

The effect of the Development on the views of recreational users would be **moderate** and **not significant** during both the decommissioning and construction and the operational phase. This finding relates chiefly to the minimum separation distance of 13.9 km which would mean the Development occupies only a small proportion of the wider views, but also the presence and influence of operational wind farms in this sector of the view. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase, with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.63)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple Wind Farm is present, the magnitude of change would be **low** during the decommissioning and construction phase and the operational phase. All six of the turbines within Craignagapple would be seen above the horizon to at least hub height. They would be located to the east of turbines within Owenreagh I and II and would therefore increase the extent of the horizon occupied by wind farm development in views from this location. They would be appreciably larger in scale than the Owenreagh turbines.

The turbines within the Development would be seen at a similar distance from the viewpoint as the turbines within Craignagapple, and at a similar elevation above the horizon. They would also be similar in scale. The Development would extend the field of view occupied by turbines to the east and west of those within Craignagapple and Owenreagh I and II wind farms. These factors would combine to result in a slightly reduced magnitude of change in comparison to the findings of the main assessment due to the greater influence of wind farm development at the Site when Craignagapple Wind Farm is included.

When combined with the medium-high sensitivity, this would result in a **moderate / minor** and **not significant** effect on recreational visitors during both the decommissioning and construction phase and the operational phase.

6.9.14 Viewpoint 14: Ulster Way at Bolaght Mountain (Figure 6.39)

Baseline

This viewpoint is located on the Ulster Way, near Bolaght Mountain, a minimum of 23.6 km to the south-west of the Development. It is situated on Kirlish Road, near to Slieveglass Wind Farm. The Ulster Way passes through the Study Area from the east to the south-west, within approximately 5 km of the Site near Gortin.

The route passes through the range of hills around Bolaght Mountain, which include Bin Mountain and Slieveglass. These hills form a gentle ridgeline which runs broadly east to west. From the viewpoint, views to the south are restricted by rising ground within this area, but open views are afforded over lower ground within the valleys to the north, including the valley of the Fairy Water and the Derg Valley.

To the south, the horizon is formed at close proximity by rising rough grassland. Turbines within Slieveglass Wind Farm are visible above the skyline in this direction in relatively close proximity. To the west, the view is over rolling moorland hills, and several wind farms within the cluster of developments around Bin Mountain are visible upon the horizon. Open views are afforded to the north and north-east, over a series of valleys and hills within the Sperrin Mountains. To the immediate north of the viewpoint the land cover comprises rough grassland. Within the middle distance, the land cover is predominantly agricultural, while the hills visible at distance comprise moorland and rough grassland landcover. There are a number of domestic-scale single turbines within the lower-lying landscape to the north, while developments including the Bessy Bell cluster and Owenreagh I and II wind farms are visible above the horizon formed by moorland hills to the north-east.

Sensitivity

The value of the view is medium-high. Although the viewpoint is not a formally recognised viewpoint and is not within any designations which would indicate a high value, it is located at a high point along the Ulster Way which does mark a natural viewpoint in this upland area.
The susceptibility of walkers to the Development would be medium-high. The susceptibility of walkers to changes in the baseline is heightened by their awareness of their surroundings. Effects may be experienced over a relatively long duration by recreational visitors to the upland landscape, although the close proximity of operational wind turbines as a feature of the baseline view moderates the susceptibility.

The combination of the medium-high value of the view and the medium-high susceptibility of viewers leads to an overall **medium-high** rating of sensitivity.

Magnitude of change during decommissioning and construction

The magnitude of change on the views of walkers on the Ulster Way at Bolaght Mountain would be **low** during the decommissioning and construction phase. Ground level construction works would be distant and screened by intervening landform. The removal of the existing turbines, addition of the emerging turbines and presence of associated construction cranes would potentially be visible, although the separation distance of 23.6 km would ensure that they would appear as relatively small and distant structures, while their location in the same sector of the view as the operational Owenreagh I and II wind farms would reduce their influence.

Magnitude of change during operation

The magnitude of change on the views of walkers on this section of the Ulster Way would be **low** during the operational phase. The Development would be located a minimum distance of 23.6 km, making it a relatively distant and small-scale feature. The wireline and photomontage on Figures 6.39f and 6.39g show that the Development would occupy a similar horizontal extent as the existing operational Owenreagh I and II wind farms. The larger scale of the turbines within the Development than the existing Owenreagh I and II would not be readily apparent at this separation distance. While the Development would be apparent from this viewpoint, the factors set out above would moderate the magnitude of change such that the additional effect would be very limited.

Significance of effect

The effects of the Development on the views of walkers on the Ulster Way at Bolaght Mountain would be **moderate / minor** and **not significant** during the decommissioning and construction phase and the operational phase. Whilst the Development would be visible above the skyline to the north in views from this upland viewpoint, the separation distance of 23.6 km combined with the existing visibility of wind farm development at the Site would moderate its effect on this view. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase, with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.64)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple Wind Farm is present, the magnitude of change would be low during the decommissioning and construction phase and the operational phase. All six of the turbines within Craignagapple would be seen above the horizon. They would extend wind farm development to the west of the turbines within Owenreagh I and II wind farms and would, therefore, increase the extent of the horizon occupied by wind farm development in views from this location. They would be appreciably larger in scale than the Owenreagh turbines.

The turbines within the Development would be seen at a similar distance from the viewpoint as the turbines within Craignagapple, and at a similar elevation above the horizon. They would also be similar in scale. The Development would extend the field of view occupied by turbines to the west of those within Craignagapple and Owenreagh I and II wind farms. These factors would combine to result in a slightly reduced magnitude of change in comparison to the findings of the main assessment due to the greater influence of wind farm development at the Site when Craignagapple Wind Farm is included.

When combined with the medium-high sensitivity, this would result in a moderate / minor and not significant effect on walkers during both the decommissioning and construction phase and the operational phase.

6.9.15 Viewpoint 15: Foreglen Road, Killaloo (Figure 6.40)

Baseline

This viewpoint is located along Foreglen Road, within the dispersed settlement of Killaloo, a minimum of 14.9 km to the north of the Development. It is representative of the views of road users along Foreglen Road and residents within the settlement and at rural properties in the local area. Foreglen Road passes broadly north-west to south-east and connects the settlement of Killaloo with the A6 which passes to the south.

The viewpoint is situated to the south of a property on the northern side of Foreglen Road. Dense vegetation along the property boundary screens views to the north from this location. To the south, the foreground is formed by rough grassland which borders the road. A modern housing development along Gulf Road is visible in the middle distance to the south-east, and there are other residential properties visible across the landscape to the south. Foreglen Road is visible stretching into the middle distance to the east and north-west. Longer-distance views are available to the west and south, over relatively flat land with areas of woodland in the valley of the Faughan. The horizon is formed by large, rounded hills within the Slievekirk range to the west, while to the south and south-east, high ground to the north of the Glenmornan River Valley forms the horizon, just visible above the housing and woodland in the middle distance.

The Development would be located to the rear of operational Eglish Mountain Wind Farm which is located a minimum of 4.4 km from the viewpoint. Other operational wind farms in this sector of the view includes Slieve Kirk readily visible to the west of Eglish Mountain and at a minimum of 3.9km from the viewpoint. Turbines within operational Owenreagh I and II are seen beyond Eglish Mountain Wind Farm at a minimum distance of 14.9 km.

Sensitivity

The value of this view is medium. The viewpoint is not a formal viewpoint, nor is it covered by any formal landscape planning designation which would otherwise denote a special scenic value.
The susceptibility of road-users is medium. The view towards the Site would be oblique for road users travelling in both directions, although when travelling south-east it would be slightly more apparent. It would be experienced as a transitory view whilst travelling at speeds of typically 40 to 60 mph. The susceptibility of residents is medium-high, and views towards the Development are static and would be experienced over a long duration. However, turbines are visible across the view to the south, including the operational Owenreagh I and II turbines, establishing this type of development as a feature of the baseline view.

The combination of the medium value of the view and the medium or high susceptibility leads to an overall medium sensitivity for road users and medium-high sensitivity for residents.

Magnitude of change during decommissioning and construction

The magnitude of change on the views of road users and residents on Foreglen Road would be **low** during the decommissioning and construction phase. Ground level construction works would be distant and screened by intervening landform. The removal of the existing turbines, addition of the emerging turbines and presence of associated construction cranes would be visible, although the minimum separation of 14.9 km would ensure that they appear as relatively small and distant structures, while their location in the same sector of the view, and as a distant feature behind the operational Eglish Mountain Wind Farm, would reduce their prominence in the view.

Magnitude of change during operation

The magnitude of change on the views of road users and residents on Foreglen Road would be **low** during the operational phase. Eleven of the 14 turbines would be theoretically visible, although the majority of these would be restricted to views of the very tips of the blades only. The hubs of five turbines would be seen above the horizon as shown on the wireline and photomontage on Figures 6.40d and 6.40e. The turbines would be seen at a minimum distance of 14.9 km, and as a distant feature beyond turbines within Eglish Mountain. The Development would occupy a slightly larger extent of the horizon than the existing turbines within Owenreagh I and II and would extend wind farm development slightly further west of the turbines within Eglish Mountain, however the total horizontal extent occupied would still be small. The larger scale of the turbines within the Development than the existing Owenreagh I and II wind farm would not be readily apparent at this separation distance. There would be some stacking of turbines in the view from this location. Although the proposed turbines would be larger than the existing turbines, comparison with the closer range operational turbines would moderate their effect.

Significance of effect

The effect of the Development on road users and residents on Foreglen Road and in Killaloo would be **moderate / minor** or **minor** and **not significant** during both the decommissioning and construction phase and the operational phase. This finding relates chiefly to the distance of the Development from the viewpoint and the baseline influence from closer proximity wind farms in the same sector of the view. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase , with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.65)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple Wind Farm is present, the magnitude of change would be **low** during the decommissioning and construction phase and the operational phase. All six of the turbines within Craignagapple would be seen above the horizon, with five seen to hub height and one as blade tips only. They would be located to the north-east of turbines within Owenreagh I and II and would extend the field of view occupied by turbines to the north-west and south-east of turbines within Owenreagh I and II. They would be appreciably larger in scale than the Owenreagh turbines.
The turbines within the Development would be seen at a similar distance from the viewpoint as the turbines within Craignagapple. Several turbines would be seen to a slightly greater extent than those within Craignagapple Wind Farm and would appear at slightly greater elevation above the horizon. The proposed turbines would be similar in scale to those within Craignagapple Wind Farm. Development would extend the field of view occupied by turbines to the east and west of those within Craignagapple and Owenreagh I and II wind farms, albeit that the turbines which increase the horizontal extent of development would be seen as blade tips only.

Overall, these factors would combine to result in a slightly reduced magnitude of change in comparison to the findings of the main assessment due to the greater influence of wind farm development at the Site when Craignagapple Wind Farm is included.
When combined with the medium-high or medium sensitivity, this would result in a **moderate / minor** or **minor** and **not significant** effect on residents and road users during both the decommissioning and construction phase and the operational phase.

6.9.16 Viewpoint 16: A5, Strule River Valley (Figure 6.41)

Baseline

This viewpoint is located on the A5 to the south of Newtownstewart, a minimum of 14.2 km to the south of the Development. This section of the A5 passes broadly north to south through the valley of the River Strule. The Strule begins at the confluence of the Camowen and Drumragh in Omagh and passes north-west from there to the north-west of Newtownstewart where it meets the River Derg and forms the Mourne. In this section, the A5 connects Newtownstewart with Omagh and follows the western bank of the Strule. The viewpoint is located adjacent to several residential properties and a parking area between the road and the river. It is representative principally of the views of road users travelling north on the A5, but also of residents in the area.
The view is longer distance to the north and south along the valley, while to the east and west, rising landform on either side of the valley contains views in relatively close proximity. The land cover generally comprises agricultural land with areas of woodland, particularly to the east along the course of the Strule. A small number of properties are visible in the foreground to the east. To the north, longer distance views are contained by the landform of Owenreagh Hill, and operational turbines within Owenreagh I and II are visible above the horizon. A single domestic scale turbine is visible on elevated ground in the middle distance to the north.

Sensitivity

The value of the view is medium-high. There are no formal viewpoints in this area, although the viewpoint is covered by the Sperrin AONB which indicates a formal recognition of the national scenic value of this landscape.
The susceptibility of road-users is medium. The view towards the Site would be direct for road users travelling north, and it would be experienced as a transitory view whilst travelling at speeds of typically 40 to 60 mph. The susceptibility of residents is medium-high, and views towards the Development are static and would be experienced over a long duration. However, there is an influence from the busy A5 in this area and the operational Owenreagh I and II turbines are visible above the horizon to the north, establishing this type of development as a feature of the baseline view.
The combination of the medium-high value of the view and the medium or medium-high susceptibility leads to an overall **medium-high** sensitivity for road users and residents.

Magnitude of change during decommissioning and construction

The magnitude of change on the views of road users and residents in this section of the A5 would be **medium-low** during the decommissioning and construction phase. Ground level construction works would be distant and screened by the ridgeline of Owenreagh Hill from this viewpoint. The removal of the existing turbines, addition of the emerging turbines and presence of associated construction cranes would potentially be visible, although the minimum separation distance of 14.2 km would ensure that they would appear as a relatively small and distant feature, albeit seen in direct views framed at the head of the valley.

Magnitude of change during operation

The magnitude of change on the views of road-users and residents along the A5 would be **medium-low** during the operational phase. The Development would be located a minimum distance of 14.2 km from the viewpoint, making it a relatively distant and small-scale feature. The wireline and photomontage on Figures 6.41c and 6.41d show that all 14 of the turbines would be theoretically visible, seen framed upon the horizon at the head of the valley to the north. This would be perceived by road users in direct views when travelling north along this stretch of the A5. Residential properties are generally orientated east to west towards the Strule and are unlikely to experience direct views towards the Development.

Although the proposed turbines would be larger than the operational turbines, at this distance the difference in scale would not be readily noticeable. The Development would extend the horizontal extent of wind farm development slightly to the east and west, as compared to the existing turbines, although the proposed turbines at either extent would be seen as blade tips only, making the larger horizontal extent less apparent. Although the Development would be seen in direct views from this viewpoint and would occupy a larger horizontal extent than the existing turbines, the magnitude of change would be moderated by the following factors. Firstly, the presence of Owenreagh I and II wind farms, which have created a precedent for wind farm development seen in views in this direction. Secondly, the separation distance of 14.2 km, which means the proposed turbines would be seen as relatively small-scale elements. Thirdly, the horizontal containment of 5 to 10 degrees as shown on Figure 6.7, which means they will occupy only a small proportion of the 360 degree view.

Significance of effect

The effect of the Development on the views of road users and residents in this section of the A5 would be **moderate** and **not significant** during both the decommissioning and construction phase and the operational phase. This finding relates chiefly to the separation distance between the viewpoint and the Development, which would ensure that the turbines would be seen as small and distant components occupying a position where there is an existing influence from wind farm development. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase , with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.66)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple Wind Farm is present, the magnitude of change would be **low** during the decommissioning and construction phase and the operational phase. All six of the turbines within Craignagapple would be seen above the horizon, with five visible to hub height and one as blade tips only. The turbines would be contained within the horizontal extent occupied by Owenreagh I and II in views from this location. They would be appreciably larger in scale than the Owenreagh turbines. The turbines within the Development would lppear similar in scale to those within Craignagapple Wind Farm and would be seen to a similar extent above the horizon. They would increase the horizontal extent occupied by wind farm development to the east and west from this viewpoint. Turbines within the Development would be seen at a similar separation distance from the viewpoint as those within Craignagapple Wind Farm, and all would be contained beyond the ridgeline formed by Owenreagh Hill.

The larger scale o” the’turbines within Craignagapple compared to those within Owenreagh would result in a slightly increased influence of wind farm development at the Site. As a result, the Development would lead to a slightly reduced magnitude of change in comparison to the findings of the main assessment when Craignagapple Wind Farm is included.
When combined with the medium-high or medium sensitivity, this would result in a **moderate / minor** or **minor** and **not significant** effect on residents and road users during both the decommissioning and construction phase and the operational phase.

6.9.17 Viewpoint 17: Bells Park Road, Glebe (Figure 6.42)

Baseline

This viewpoint is a minimum of 10.0 km west-south-west of the Development, and located on Bells Park Road, on the western settlement edge of Glebe, which is a small settlement, located west of Sion Mills and to the south-west of the River Mourne. The settlement is located at a slight elevation above the Mourne valley. Because of this position, views are most open to the north-east over the valley landscape, while to the south and west rising land and built development within the settlement largely screen long-distance views.

Views to the north-east are over built form within Glebe and Sion Mills in the foreground and middle distance. Longer-range views are available towards rolling hills to the north and east of the Mourne valley. Land cover across these hills generally comprises a pattern of development on the lower slopes followed by agricultural land defined by field boundaries, with moorland visible at the summits of some of the higher hills. There are several domestic-scale single turbines visible across this landscape to the north-east, and turbines within Owenreagh I and II are seen above the horizon at a distance of approximately 10 km.

Sensitivity

The value of the view is medium. There are no formal viewpoints in this area and Glebe is not covered by any national or local scenic landscape designations, that would otherwise denote a special value. The susceptibility of residents in Glebe would be medium-high in those parts with an open aspect to the north and east and low in those parts without. The elevated nature of this part of the settlement increases the potential for open views to occur across the surrounding landscape, although this is largely restricted to the western edge of the settlement which is located on higher ground. The susceptibility of residents would, however, be moderated by the extent of settlement and the presence of operational wind farms in this easterly sector, including Owenreagh I and II. The susceptibility of road users would be medium. The Site would be visible in slightly oblique views to the north-east for road users travelling east on Bells Park Road.

The combination of the medium value of the view and the medium-high susceptibility of residents and medium susceptibility of road-users leads to an overall **medium-high** sensitivity for residents and **medium** sensitivity for road-users.

Magnitude of change during decommissioning and construction

The magnitude of change on the views of residents and road-users as a result of the Development would be **low** during the decommissioning and construction phase. Ground level construction works associated with the western edge of the Development may be visible, although the majority of ground level works would be screened by the ridgeline. The removal of the existing turbines, the addition of the emerging turbines and presence of associated construction cranes would also be visible. Despite this, the minimum separation of 10.0 km, combined with the limited extent to which most of the turbines would be visible means that these structures would appear relatively distant and small-scale, and their location in the same sector of the view as the operational Owenreagh I and II wind farms would further moderate the magnitude of change.

Magnitude of change during operation

The magnitude of change on the views of residents and road users as a result of the Development would be **low** during the operational phase. The wireline and photomontage on Figures 6.42d and 6.42e shows that eight of the turbines within the Development would be visible, seen set on, or behind the ridgeline of Owenreagh Hill. The proposed turbines would be seen at a minimum distance of 10.0 km which would make them appear as distant and relatively small-scale structures, albeit larger than the existing turbines they would replace. The openness of this view would mean they would form a readily visible feature, although the baseline influence from development such as the surrounding settlement and more distant wind farms would moderate their effect.
The horizontal angle ZTV on Figure 6.7 shows that the Development would occupy between 5 and 10 degrees of the 360 degree view. This shows that the Development would appear as a contained feature within a much wider view that would continue to be defined by the rural landscape.

Significance of effect

The effect of the Development on residents and road users in Glebe would be **moderate / minor** or **minor** and **not significant** during the decommissioning and construction phase and the operational phase, owing principally to the separation distance which would limit the influence of the proposed turbines, but also the existing influence of development in the baseline view, including the operational turbines at the Site. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase , with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.67)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple is present, the magnitude of change would be **low** during the decommissioning and construction phase and the operational phase. Five of the six turbines within Craignagapple would be seen above the horizon, with three visible to hub height and two as blade tips only. The turbines would extend the horizontal field of view occupied by turbines to the north-west and south-east of Owenreagh I and II in views from this location. They would be appreciably larger in scale than the Owenreagh turbines.

The turbines within the Development would appear similar in scale to those within Craignagapple and would be seen to a similar extent above the horizon. They would increase the horizontal extent occupied by wind farm development to the north-west. The Development would bring wind farm development into closer proximity to the viewpoint, and ground level construction works on the western edge of the Development may be visible, while ground level infrastructure associated with Craignagapple is screened by the intervening ridgeline.

Overall, the magnitude of change associated with the Development is likely to be similar under this hypothetical scenario as in the main assessment. When combined with the high to medium-high sensitivity, this would result in a **moderate / minor** or **minor** and **not significant** effect on residents and road users during both the decommissioning and construction phase and the operational phase.

6.9.17.1 Viewpoint 18: Mullaghclogha, Sperrin Mountains (Figure 6.43)

Baseline

This viewpoint is a minimum of 11.5 km to the east of the Development, and located on the summit of Mullaghclogha (635 m AOD), within the main Sperrin range. The Sperrin Mountains pass broadly east to west between Strabane and Slieve Gallion, however this main ridge passes to the north of the Glenelly River between the Eden River valley in the west and the Douglas River valley in the east. This is one of the largest upland areas in Northern Ireland, and the ridge forms a prominent feature in the surrounding landscape.

Mullaghclogha is one of a number of summits along this range and is flanked on either side by the summits of Mullaghsturrakeen to the south-west and Mullaghdoo to the north-east. Mullaghclogha is the second-highest summit in the Sperrins and is located towards the western extent of the hill range. As the highest point in the surrounding landscape, extensive views are afforded in all directions from this summit. There is, however, no signage or path to the summit, ground conditions are boggy, and no other walkers were seen during two site visits on this hill.

Mullaghclogha is covered in a mix of rough grassland and heather moorland, as are many of the surrounding upland areas. The summits are generally moorland, with rough grazing in the uplands and fields of improved pasture on the lower slopes of the hills. Access through this area is limited, and main transport routes and settlement are contained within the surrounding valleys.

Views to the north and east are slightly more contained by the upland areas which stretch in these directions, while the land slopes down more steeply to the south and west and affords longer-distance views in these directions. Further summits within the Sperrins are visible to the south-west and north-east. To the south, the focus of views is over lowland areas in the Glenelly River Valley towards a smaller range within the Sperrins which also stretches east to west to the south of the valley, and beyond this towards further summits beyond the Owenkillew and Owenreagh river valleys. To the south-west adjacent smaller summits are visible in the middle distance, and turbines within Owenreagh I and II are visible beyond in longer-distance views to the west. The horizon is formed at distance by hills within the Bluestack Mountain range. Turbines within the group of developments to the south of Derry, including Eglish Mountain, Slieve Kirk, Curryfree and Carrickatane wind farms are visible to the north-west.

Sensitivity

The value of this view is medium-high. The viewpoint lies within the Sperrin AONB which denotes scenic value of national importance. The viewpoint is not marked as a formal viewpoint on OS maps, and while the summit offers extensive views over the landscape within the AONB, there is no car parking, path or sign posting to encourage walkers.

The susceptibility of walkers to the Development would be medium-high. Although operational wind turbines form a feature of the baseline view, the susceptibility of walkers to changes in this baseline is heightened by their awareness of their surroundings. Effects may be experienced over a relatively long duration by recreational visitors to the upland landscape.
The combination of the high value of the view and the medium-high susceptibility of viewers leads to an overall **medium-high** rating of sensitivity.

Magnitude of change during decommissioning and construction

The magnitude of change on the views of walkers on Mullaghclogha would be **medium-low** during the decommissioning and construction phase. Due to the position of several of the turbines on the north-eastern flank of Owenreagh Hill, ground level construction works would be visible from this viewpoint. This would include the construction of access tracks, crane pads and foundations, visible around the closer range or more prominent turbines on the eastern extent of the Development. Ground level works around several turbines would be screened by the intervening ridgeline formed by Balix Hill. This site infrastructure would appear as a notable human influence in this upland area, although this effect would be moderated by the existing visibility of site infrastructure including access tracks associated with the operational Owenreagh I and II wind farms across this Site. The removal of the existing turbines, addition of the emerging turbines and presence and activity of the associated cranes would also form a readily visible feature, and although there is the baseline influence from the operational Owenreagh I and II wind farms across these hills, the larger scale of the proposed turbines replacing the operational turbines would increase the magnitude of change. The separation distance of 11.5 km and the visibility of baseline wind farm development across the Site and the wider landscape would act to moderate the magnitude of change.

Magnitude of change during operation

The magnitude of change on the views of walkers on Mullaghclogha would be **medium-low** during the operational phase. The wireline and photomontage on Figures 6.43f and 6.43g show that the Development would be visible, at a minimum distance of 11.5 km, such that the proposed turbines would be seen as distant and relatively small-scale features from this viewpoint in which long-distance and panoramic views are available. They would be seen in the same sector of the view as existing Owenreagh I and II turbines, although the larger scale, and extended horizontal field of view of the turbines is likely to be apparent. However, the overall field of view occupied by the Development would be limited to approximately 6°, and as such would comprise a small proportion of the overall wide-ranging and panoramic views available from this upland viewpoint. The focus of views from this summit is generally to the east towards other summits within the main Sperrin range, rather than to the west towards the lower-lying landscape in which the Development would be located. The turbines would be fully backclothed against the landscape beyond from this upland area.
The factors which would moderate the magnitude of change include the small overall proportion of the view occupied by turbines, and the backclothing of turbines against the landscape beyond. The existing presence of Owenreagh I and II has established the influence of wind farm development on the Site, meaning that the Development would not be seen as a new feature in the view.

Significance of effect

The effect of the Development on the views of walkers on Mullaghclogha would be **moderate** and **not significant** during the decommissioning and construction phase and the operational phase. This finding relates chiefly to the separation distance between the viewpoint and the Development, the contained extent of the Development within the wider view, the existing influence of operational wind farms in this southerly sector of the view, and the main focus of views away from the Development. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase, with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.68)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple is present, the magnitude of change would be **low** during the decommissioning and construction phase and the operational phase. All six of the turbines within Craignagapple would be visible to almost their full extents, with the base of the tower of one turbine slightly screened by intervening landform. The turbines would bring wind farm development closer to the viewpoint than the turbines within Owenreagh I and II and would be appreciably larger in scale. They are likely to be fully backclothed against the landscape beyond from this high elevation. They would also extend the horizontal field of view occupied by turbines to the north of the extent occupied by Owenreagh I and II. Ground level infrastructure associated with the turbines is likely to be visible.

The turbines within the Development would extend the field of view occupied by turbines to the north of those within Craignagapple and Owenreagh I and II and would bring wind farm development into closer proximity to this viewpoint than the turbines within Craignagapple. Ground level construction works are likely to be visible. However, the presence of the Craignagapple turbines would slightly reduce the magnitude of change associated with these effects compared to the main assessment, due to their closer proximity, greater horizontal extent, and presence of ground level infrastructure. From this relatively distant viewpoint, turbines within the Development would appear similar in scale to the turbines within Craignagapple. They would also be seen backclothed against the landscape beyond.

When combined with the medium-high sensitivity, this would result in a **moderate / minor** and **not significant** effect on recreational visitors during both the decommissioning and construction phase and the operational phase.

6.9.17.2 Viewpoint 19: Ballindrait (Figure 6.44)

Baseline

This viewpoint is a minimum of 11.5 km to the west-north-west of the Development, and located on St Patrick’s Terrace within the settlement of Ballindrait in RoI. It is representative of views experienced by road users on St Patrick’s Terrace, and residents within the settlement and at dispersed properties within the rural area. Ballindrait is a small settlement located between Liffey and Raphoe and situated along the Deele River. St Patrick’s Terrace passes broadly east to west and connects Rossgier in the east with the R264 at Ballindrait in the west.

The viewpoint is located towards the northern extent of the settlement, within a small greenspace to the south-east of St Patrick’s Terrace. From this greenspace, relatively open views are available to the south-east. Views in other directions are generally contained within close proximity from this viewpoint, by built form within the settlement, vegetation along the roadside or rising landform in the middle distance. Views to the east are more open and longer-distance. The land to the immediate east is lower lying along the valley of the Deele River. Beyond this, the landform rises up towards a rounded plateau formed by the north-eastern slopes of Croaghan Hill. The land cover across this plateau comprises fields of improved pasture and some arable land, delineated by hedgerows and areas of woodland. Beyond this, there are longer-distance views towards the rounded hill of Knockavoe. Land cover on this longer-range summit comprises woodland on the lower slopes and a pattern of pastoral and arable fields above. There are two domestic scale turbines on the slopes of this hill and the mast on Koram Hill is also visible above the sloping landform to the south-east.

This long-distance view to the south-east is relatively narrow and framed on either side by vegetation within the settlement. Certain residential properties along St Patrick’s Terrace would have similar views, although likely more contained by intervening vegetation.

Sensitivity

The value of this view is medium. There are no formal viewpoints and Ballindrait is not covered by any national or local scenic landscape designations, that would otherwise denote a special value.
The susceptibility of residents in Ballindrait would be high in those parts with an open aspect to the south-east and low in those parts without. Properties within Ballindrait tend to be orientated north-south towards the valley of the Deele River, although along St Patrick’s Terrace, close to the viewpoint, there are houses which are orientated with the potential for views to the east. The susceptibility of road users would be medium. The Site would be visible in slightly oblique views to the east for road users travelling south-east on the R264.
The combination of the medium value of the view and the medium-high or medium susceptibility leads to an overall **medium-high** sensitivity for residents, and **medium** sensitivity for road-users.

Magnitude of change during decommissioning and construction

The magnitude of change on the views of road users and residents within Ballindrait would be **low** during the decommissioning and construction phase. The construction works would be located a minimum of 11.5 km from the viewpoint. This separation distance combined with the screening effect of the intervening hills, would mean that ground level construction works would not be readily visible. While the higher-level works associated with the removal of the existing turbines, the addition of the emerging turbines and the presence of the construction cranes would be visible, the separation distance would ensure these would be seen as relatively distant and small-scale features. The effect would be further moderated by the position of the Development beyond the ridgeline of Knockavoe, which would screen visibility of much of the construction works, meaning that just the tips of the turbines and cranes would be visible.

Magnitude of change during operation

The magnitude of change on the views of road users and residents within Ballindrait would be **low** during the operational phase. The wireline and photomontage on Figures 6.44c and 6.44d show that eight of the 14 turbines within the Development would be visible, at a minimum distance of 11.5 km, such that they would be seen as relatively distant and small-scale structures. The majority of the Development would be screened from view by the intervening ridgeline of Knockavoe, and where turbines are seen this would be restricted to views of the blade tips, with the hubs and towers also screened by the ridgeline. Turbines within the Development would be seen in the context of two domestic scale turbines on the western flank of Knockavoe. The difference in scale between these developments is unlikely to be notable due to the position of the turbines within the Development. Although the Development would introduce a commercial scale wind energy development into a view in which this type of development is not currently present, the limited visibility of the Development would mitigate its influence and moderate the magnitude of change.
The viewpoint represents an open view from an elevated position within the settlement, and visibility of the Development from other parts of the settlement is likely to be more contained. Some residential properties orientated north-west to south-east within Ballindrait are likely to experience views towards the Development, although these are likely to be filtered by vegetation. Views towards the Development would be oblique for road users travelling in both directions along St Patrick’s Terrace.

Significance of effect

The effect of the Development on the views of road users and residents in Ballindrait would be **moderate / minor** or **minor** and **not significant** during both the decommissioning and construction phase and the operational phase. This relates principally to the screening of the majority of the Development by the intervening ridgeline, as well as the separation distance between the viewpoint and the Development. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase , with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.69)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple Wind Farm is present, the magnitude of change would be **low** during the decommissioning and construction phase and the operational phase. Three of the turbines within Craignagapple would be seen beyond the ridgeline, with two visible to hub height and one as blade tips only. This would introduce wind farm development at the Site into this view from which Owenreagh I and II are not visible. Ground level infrastructure would not be visible.
The turbines within the Development would extend the field of view occupied by turbines to the north and south of those within Craignagapple. However, the presence of the Craignagapple turbines would slightly reduce the magnitude of change associated with the Development compared to the main assessment, as they would create a precedent of wind farm development at the Site seen in views from this viewpoint. From this relatively distant viewpoint, turbines within the Development would appear similar in scale to the turbines within Craignagapple.
When combined with the medium-high or medium sensitivity, this would result in a **moderate / minor** or **minor** and **not significant** effect on residential receptors and road users during both the decommissioning and construction phase and the operational phase.

6.9.17.3 Viewpoint 20: Meendamph Road, Crockrour Hill (Figure 6.45)

Baseline

The viewpoint is a minimum of 2.3 km to the south-east of the development, and located on Meendamph Road, close to its junction with Napple Road, and to the west of Crockrour Hill. Meendamph Road passes broadly north to south, and links Glenmornan Road to the west of Altishane in the north with Plumbridge in the south. In the vicinity of the viewpoint, it passes through a broadly upland landscape, characterised by a landcover of rough grassland and moorland. The viewpoint is located close to Meendamph Road's most elevated point, and long-distance views are available to the south, west and north. To the east, the rising landform of Crockrour Hill limits views. The viewpoint represents road users on Meendamph Road.

The longest-range views are available to the north, towards hills within the Slievekirk range at a distance of approximately 10 km. Turbines within the cluster of wind farms across these hills are visible in this direction. Moor Lough is visible in the middle distance to the north-west, with the more settled, relatively wooded valley of the Burn Dennett seen beyond. To the west, the foreground is formed by rough pasture on the eastern side of a shallow valley formed by a tributary of the Burn Dennett. Within the valley bottom there are several properties and areas of commercial forestry. The landform rises up beyond this towards a rounded moorland plateau formed by Owenreagh Hill. Turbines within Owenreagh I and II are visible above the skyline at the summit of the hill. To the south-west, Napple Road is visible in the foreground, with rough grassland beyond. The moorland summit of Craigatuke rises up beyond, with agricultural land visible on the lower slopes. Views to the south are long-range towards summits to the south of the Owenkillew River, at a distance of approximately 10 km.

Sensitivity

The value of the view is medium-high. There are no formal viewpoints in this area, with this viewpoint located at an arbitrary point along the road. This area is, however, covered by the Sperrin AONB, which indicates a landscape of nationally scenic value.

The susceptibility of road-users on Meendamph Road is medium. This relates to the transitory nature and short duration of their views. Views towards the Site would be oblique for road users travelling in both directions on this route.

The combination of the medium-high value of the view and the medium susceptibility of road-users leads to an overall **medium-high** rating for sensitivity.

Magnitude of change during decommissioning and construction

The magnitude of change experienced at this viewpoint would be **high** during the decommissioning and construction phase. The position of the turbines towards the north-east of Owenreagh Hill means that the ground of parts of the Site is exposed in this view, and that the construction of access tracks, crane pads and foundations would be visible around the group of proposed turbines on the left and the group of proposed turbines in the middle of the Development. While site infrastructure would appear as a notable human influence in this upland area, because Owenreagh I and II wind farms are already visible across the Site, the Development would be adding infrastructure into a view in which this already forms a feature. Ground level works across lower-lying north-eastern parts of the Site would be screened by higher ground to the east of this area. The removal of the existing turbines, addition of the emerging turbines and presence of associated cranes would also form a readily visible feature of the decommissioning and construction phase, and although there is the existing influence from the operational turbines across these hills, the closer proximity and larger scale of the proposed turbines would increase the magnitude of change.

Magnitude of change during operation

The magnitude of change resulting from the Development on views experienced at this location would be **high** during the operational phase. The wireline and photomontage on Figures 6.45f and 6.45g show that all of the 14 turbines would be visible to varying degrees. The majority would be seen to almost their full extents, while the lower towers of several would be screened, either by the ridgeline to the east, or due to their position towards the western flank of Owenreagh Hill.

Those factors which would add to the magnitude of change include the proximity of the proposed turbines to the viewpoint and their larger scale compared to the existing turbines at the Site. The Development would extend wind farm development across a greater proportion of the skyline in views from this viewpoint than the existing turbines, increasing the horizontal extent occupied by turbines to the north. The proposed turbines would also bring wind farm development into closer proximity to the viewpoint than the existing turbines. In views from this position, there would be stacking of several turbines within the Development, and gaps in the layout, although the transitory nature of the view would mean this arrangement would change with movement along the road. While road users travelling in both directions would experience oblique views towards the Development, its close range would make it a prominent feature.

Those factors which would moderate the magnitude of change include the existing presence and influence of the operational Owenreagh I and II turbines in the same sector of the view and in the same upland landscape. This has established a precedent of wind farm Development in this area and would ensure that the Development would not be seen as a new type of development.

Significance of effect

The effect of the Development would be **major** and **significant** during the decommissioning and construction phase and the operational phase. This is mainly due to the closer proximity and larger scale of the proposed turbines within the Development than the existing turbines, despite the precedent of wind farm development at the Site. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase , with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.70)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple Wind Farm is present, the magnitude of change would be **medium** during the decommissioning and construction phase and the operational phase. Each of the six turbines within Craignagapple would be visible to almost their full extents on the north-eastern flank of Owenreagh Hill. These turbines would increase the influence of existing wind farm development at the Site in comparison to the operational Owenreagh I and II. The turbines within Craignagapple would bring wind farm development into closer proximity to the viewpoint than the turbines within Owenreagh I and II, and they would be appreciably larger in scale.

The Development would extend the field of view occupied by turbines to the north-east of the extent occupied by Craignagapple and Owenreagh I and II and would bring turbines into slightly closer proximity to the viewpoint. However, the presence of Craignagapple turbines would increase the influence of wind farm development at the Site and would result in the overall magnitude of change associated with the Development being slightly reduced in comparison to the main assessment during the operational phase. Turbines within the Development would be seen to a similar extent above the horizon than the turbines within Craignagapple, and turbines within both developments would appear similar in scale. Ground level infrastructure and construction works associated with both developments would be visible.

When combined with the medium-high sensitivity, this would result in a **moderate** and **significant** effect on road-users during both the decommissioning and construction phase and the operational phase.

6.9.17.4 Viewpoint 21: Glenmornan (Figure 6.46)

Baseline

This viewpoint is a minimum of 2.7 km to the north-west of the Development, and located in Glenmornan, a small settlement situated in the valley of the Glenmornan River. The core of the settlement is focussed along a short stretch of Moorlough Road, while there are further dispersed properties within the local area. The viewpoint is taken from the churchyard, towards the western extent of the settlement. This occupies a relatively elevated position above the rest of the village and affords slightly longer-range views. It is representative of residents within the settlement, as well as road users travelling along Moorlough Road.

The settlement is situated on lower-lying land within the valley of the Glenmornan River. The land cover around the settlement generally comprises improved pasture delineated by hedgerows and trees along field boundaries, while the wooded Glenmornan River passes to the south. Stretches of Moorlough Road are enclosed by built form, although there are areas from which open views to the south are experienced. A number of properties to the south of Moorlough Road and towards the west of the settlement, have open views to the south, while properties to the east of the settlement are generally orientated east to west.

Views are generally contained in relatively close proximity, either by built form within the settlement, or rising land to the north. Where there are open views to the south, these are slightly longer-range, towards rising land to the south of the Glenmornan River. Views in this direction are over pastoral land with areas of woodland. The summit of Owenreagh Hill is visible beyond closer-proximity upland areas. A number of turbines within Owenreagh I and II are visible on this summit. From higher ground to the western edge of the settlement, including the viewpoint, there are also views to the east over built form within the settlement, towards Balix Hill.

Sensitivity

The value of the view is medium-high. There are no formal viewpoints in this area and the viewpoint is located at an arbitrary point on the road. The viewpoint is, however, covered by the Sperrin AONB which indicates a formal recognition of the national scenic value of this landscape.
The susceptibility of road-users is medium. The view towards the Site would be more readily visible to road users travelling east than travelling west. It would be experienced as an oblique, transitory view whilst travelling at speeds of 30 mph. Furthermore, the operational Owenreagh I and II turbines are already visible, establishing this type of development as a feature of the baseline view. The susceptibility of residents is high, although only a limited number of properties within the settlement would have open views to the south.

The combination of the medium-high value of the view and the medium or high susceptibility of viewers leads to an overall **medium-high** sensitivity for road users and a **high** sensitivity for residents.

Magnitude of change during decommissioning and construction

The magnitude of change on the views of road-users and residents would be **medium-high** during the decommissioning and construction phase. The intervening ridgeline would screen most of the ground level construction works, with the exception of the access tracks and crane pads associated with T3, T4, T5 and T12, which would appear at variance with the predominantly rural character. The presence of the tall cranes and the removal and emergence of turbines would be the most readily visible features in the views of road-users on the minor road, where the viewpoint is located. These structures would be seen to rise above the ridgeline, albeit with the lower parts of some of the cranes and turbines screened. While these components of the construction would form an apparent feature, the magnitude of change would be moderated by their location behind the ridgeline and the baseline influence of operational wind farms across the Site in this sector of the view.

Magnitude of change during operation

The magnitude of change on the views of road users and residents would be **high** during the operational phase. The Development would be located a minimum distance of 2.7 km from the viewpoint, with all 14 of the turbines visible along or behind the ridgeline as sown in the wireline and photomontage on Figures 6.46c and 6.46d. The turbines would be visible to variable degrees, with those towards the west of the Development seen to a greater extent than those to the east due to their closer proximity and the higher elevation of land across this part of the Site.

The presence of the operational wind farms means that the Development would not form a new feature in the view. The turbines would be seen to overlap with the extent of the operational turbines of the Owenreagh I and II wind farms but would also bring wind farm development closer to the viewpoint and extend the horizontal field of view occupied by turbines to the north and east. The proposed turbines would appear notably larger in scale than the operational turbines, especially where proposed turbines would be seen to almost their full extent. While the lower parts of some of the turbines would be screened by the intervening ridgeline, the hubs of all 14 would be visible, as shown in the wireline on Figure 6.46c.

Those factors which would moderate the magnitude of change include the established presence of wind farm development in the sector of the view to the south, and the partial screening of the lower parts of certain turbines. The Development will, however likely to become a defining feature in the view from this viewpoint. This viewpoint represents the most open views towards the Development which are likely to be gained from the settlement. Built form and vegetation to the south of Moorlough Road, as well as the slightly lower elevation of land throughout most of the settlement, would combine to slightly reduce the magnitude of change from most of the settlement itself in comparison to this viewpoint.

Significance of effect

The effect of the Development on residents in Glenmornan would be **major** or **major / moderate** and **significant** during the decommissioning and construction phase and the operational phase. These findings relate principally to the close proximity of the Development, the proportion of the view to the south that the turbines would occupy, and the larger scale of turbines compared to the operational developments present in this sector of the view. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase, with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.71)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple is considered to be present, the magnitude of change would be **medium** during the decommissioning and construction phase and the operational phase. The hubs and blade tips of all six turbines within Craignagapple would be visible above the horizon. The lower parts of several turbines towards the south of the development would be screened by the intervening landform, while some turbines towards the north would be seen to their full extent. These turbines would increase the influence of existing wind farm development at the Site in comparison to the operational Owenreagh I and II wind farms. The turbines within Craignagapple would bring wind farm development into closer proximity to the viewpoint than the turbines within Owenreagh I and II, and they would be appreciably larger in scale.

The Development would extend the field of view occupied by turbines to the east and west of the extent occupied by Craignagapple and Owenreagh I and II and would bring turbines into slightly closer proximity to the viewpoint. However, the presence of Craignagapple turbines would increase the influence of wind farm development at the Site and would result in the overall magnitude of change associated with the Development being slightly reduced in comparison to the main assessment during the operational phase. Turbines within the Development would be less prominent above the horizon than the turbines within Craignagapple, and turbines within both developments would appear similar in scale.

When combined with the medium-high sensitivity, this would result in a **major / moderate** and **significant** effect on road-users and residents during both the decommissioning and construction phase and the operational phase.

6.9.17.5 Viewpoint 22: Aghafad Road

Baseline

This viewpoint is a minimum of 5.8 km to the north-east of the Development, and located on Aghafad Road, to the north-east of Ballynamallaght. It is representative of the views of road users travelling south-west on Aghafad Road. Aghafad Road passes broadly south-west to north-east through an undulating upland area, to the north of the Burndennet River valley. The road passes through a small valley between two areas of higher ground to the east and west. Views in these directions are therefore more contained, while views to the north and south are slightly longer-range.

To the east and west, land cover comprises rough grassland, with field boundaries defined by hedgerows and areas of woodland. Views to the east are contained in close proximity, while to the west there are middle distance views towards the rounded form of Curradrolan Hill. To the north, views are longer distance, towards high ground around Eglish Mountain. Several turbines within Eglish Mountain Wind Farm are visible above the horizon.

To the south, Aghafad Road stretches into the middle distance along relatively flat ground, before higher ground to the north of Balix Hill eventually rises up and contains the view. There is some settlement visible in the middle distance in this direction, and the lower slopes of the hill feature agricultural land, while land cover across the higher slopes comprises moorland. To the south-west, Owenreagh Hill is also visible in longer-range views, with a similar pattern of land cover. Turbines within Owenreagh I and II are visible above the horizon.

Sensitivity

The value of the view is medium-high. There are no formal viewpoints in this area and the viewpoint is located at an arbitrary point on the road. The viewpoint is, however, covered by the Sperrin AONB which indicates a formal recognition of the national scenic value of this landscape.

The susceptibility of the road-users on Aghafad Road is medium. This relates to the transitory nature and short duration of their views. Views towards the Site would be readily apparent albeit slightly oblique for road users travelling south-west on this route, while road users travelling north-east are unlikely to experience views towards the Site.

The combination of the medium-high value of the view and the medium susceptibility of road-users leads to an overall **medium-high** rating for sensitivity.

Magnitude of change during decommissioning and construction

The magnitude of change experienced at this viewpoint would be **medium** during the decommissioning and construction phase. The position of the Development towards the north of Owenreagh Hill means that the ground of parts of the Site would be exposed in this view, such that the construction of access tracks, crane pads and foundations would be visible around the closer range, more prominent turbines towards the north-east of the Development from this location. This site infrastructure would appear as a notable human influence in an upland area in which the influence of wind farm development was previously restricted to views of turbines only. Ground level works across western parts of the Site would be screened by intervening landform. The removal of the existing turbines, addition of the emerging turbines and presence of associated cranes would also form a readily visible feature of the decommissioning and construction phase. Although there is the baseline influence from the operational Owenreagh I and II wind farms across the horizon to the south-west, the closer range and larger scale of the proposed turbines would increase the magnitude of change. The separation distance of 5.8 km and the visibility of existing wind farm development across the Site would act to moderate the magnitude of change.

Magnitude of change during operation

The magnitude of change on the views of road users as a result of the Development would be **medium** during the operational phase. The magnitude of change would be moderated by the fact that the Development would be seen in a sector of the view in which wind farm development is already a feature. Also, the position of the Development on the northern flank of Owenreagh Hill means that a number of the turbines would be seen backclothed against the landform of Owenreagh Hill beyond, in comparison to the existing turbines within Owenreagh I and II which are almost all seen against the skyline. The horizontal angle ZTV on Figure 6.7 shows that the Development would occupy between 10 and 20 degrees of the full 360 view.

The wireline and photomontage on Figures 6.47d and 6.47e do, however, show that although the turbines would be seen in the same sector of the view as the existing Owenreagh I and II, their larger scale and closer proximity would be apparent. The Development would slightly extend the horizontal field of view occupied by wind turbines to the north and would form a prominent feature, especially in the views of road-users travelling south-west on Aghafad Road. Although the baseline influence of Owenreagh I and II, the Development would present a contrast with the small scale and rural character of the landscape seen along Aghafad Road.

Significance of effect

The effect of the Development on road users travelling south-west on Aghafad Road would be **moderate** and **significant** during the decommissioning and construction phase and the operational phase. This finding relates to the medium-high sensitivity of road users, the relatively close proximity of the Development to the viewpoint and the defining feature it would form in the views of road-users. The effects would be short-term and reversible during the decommissioning and construction phase and long-term and reversible during the operational phase, with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.72)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple is present, the magnitude of change would be **medium-low** during the decommissioning and construction phase and operational phase. Each of the six turbines within Craignagapple would be seen above the horizon to their full extent, with the towers of some turbines partially backclothed against the landform of Owenreagh Hill. The turbines would extend the horizontal field of view occupied by turbines to the west of Owenreagh I and II in views from this location. They would be appreciably larger in scale than the Owenreagh turbines and also appear at variance with the small scale and rural character of the landscape.

The turbines within the Development would appear similar in scale to those within Craignagapple and would be seen to a similar extent above the horizon. They would increase the horizontal extent occupied by wind farm development slightly to the north-west. The Development would bring wind farm development into closer proximity to the viewpoint. Ground level infrastructure and construction works associated with both developments would be visible.

Overall, the magnitude of change associated with the Development is likely to be slightly lower under this hypothetical scenario as in the main assessment, due to the increased influence of wind farm development at the Site resulting from Craignagapple. When combined with the medium-high sensitivity, this would result in a **moderate** and **significant** effect on road users during both the decommissioning and construction phase and the operational phase.

6.9.17.6 Viewpoint 23: Bessy Bell (Figure 6.48)

Baseline

This viewpoint is a minimum of 14.5 km to the south of the Development and is located on the summit of Bessy Bell, which lies approximately 4 km south of Newtownstewart. Bessy Bell is an outlier of the main Sperrin mountains and forms a high point in its immediate surroundings. It is representative of the views of hill walkers. The hill can be accessed along a track from the minor road to the south. It has a large telecommunications mast at the summit. The hill has a generally rounded form, with steeper slopes to the south and a more gently rising flank to the north. The land cover at the summit comprises heather moorland. On the western flank there is an area of forestry, while the lower slopes in other directions have land cover comprising agricultural fields.

Views are relatively open in all directions. To the west, the telecommunications mast and associated built form screen views from this viewpoint, although from parts of the approach to the summit views are open in this direction. To the north and north-east, views over the valley landscape are slightly filtered by close-proximity forestry, although there are views of the enclosing hills seen at distance, and with several wind farm developments visible on their summits. These developments include Owenreagh I and II and the cluster of developments around Slieve Kirk.

Hill ranges within the Sperrin mountains can be seen running broadly east to west to the north-east, with land cover comprising moorland across the summits. Woodland and agricultural fields are visible in the Strule Valley to the north-east. To the east, the horizon is formed in the middle range by Mullaghcarn, with a pattern of forestry visible on its western flanks. Settlement and agricultural land are visible in the valley also in the middle range.

To the south-east, views are long-range across the low-lying valley landscape towards Omagh and beyond. Turbines within Bessy Bell II are seen in close proximity to the south-east, although their position on lower ground to the south of the Bessy Bell summit means that from this viewpoint, they are fully backclothed by the landscape beyond. The towers of the turbines are largely screened by the landform of the summit. There are also wind farm developments seen at distance in this direction. Views to the south and south-west are also long-range, although the landform is more undulating in this direction. Turbines within Bessy Bell I wind farm are visible in close proximity to the south, backclothed by the landscape beyond. There are also several wind farm developments visible in longer-distance views to the south-west, including Pollnalaght, Tappaghan Mountain, Lough Hill, Bin Mountain and Church Hill.

Sensitivity

The value of the view is medium-high. While the viewpoint is not marked as a formal viewpoint on OS maps, the summit does provide a natural viewpoint. Bessy Bell is not covered by any landscape planning designations which would otherwise denote a special scenic value.
The susceptibility of walkers is medium-high. This relates to the heightened awareness they are likely to have of their surroundings and their expectation to experience a largely undeveloped upland landscape. Their susceptibility is prevented from being rated high owing to the existing influence of operational wind farms on Bessy Bell and visible throughout the surrounding landscape.
The combination of the medium-high value of the view and the medium-high susceptibility of viewers leads to an overall **medium-high** rating for sensitivity.

Magnitude of change during decommissioning and construction

The magnitude of change on the views of walkers would be **low** during the decommissioning and construction phase. The intervening landform of Owenreagh Hill would ensure that ground level construction works would largely be screened from this viewpoint. This would mean that the only components that would be visible would be the removal of the existing turbines, addition of the emerging turbines and presence of associated construction cranes. These would be seen at a minimum of 14.5 km from the viewpoint, such that they would appear as small components of the wider view. While the construction of the Development would form a visible feature, the separation distance combined with the existing influence of wind farm developments throughout the view, including Owenreagh I and II in the same sector of the view, would limit the magnitude of change.

Magnitude of change during operation

The magnitude of change on the views of walkers as a result of the Development would be **low** during the operational phase. The wireline and photomontage on Figures 6.48f and 6.48g show that all 14 of the turbines within the Development would be seen above the horizon to the north, with the majority of the towers screened by the intervening landform.

The main moderating factors in assessing the magnitude of change on walkers is the separation distance, which at 14.5 km would ensure that the Development turbines would appear as relatively small components, occupying a very small proportion of the much wider view available – the horizontal angle ZTV in Figure 6.7 shows this to be between 5 and 10 degrees. Furthermore, they would be seen in the same sector of the view where the operational Owenreagh I and II turbines are visible, albeit extending the field of view occupied by turbines to the east and west. The operational turbines would, nonetheless, ensure that the Development would not be introducing a new type of development into a previously undeveloped upland landscape.

Significance of effect

The effect of the Development on walkers on Bessy Bell would be **moderate / minor** and **not significant** during the decommissioning and construction phase and the operational phase. This finding relates chiefly to the separation distance between the viewers and the Development, the limited extents to which the Development would be visible and the existing influence from wind farms throughout the view, including Owenreagh I and II in the same northerly sector. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase, with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.73)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple is present, the magnitude of change would be **low** during the decommissioning and construction phase and the operational phase. All six of the turbines within Craignagapple would be visible, with two visible to almost their full extents and the other four partially screened by the intervening ridgeline.

The turbines would be appreciably larger in scale than those within Owenreagh I and II. They would also extend the horizontal field of view occupied by turbines slightly to the west of the extent occupied by Owenreagh I and II. Ground level infrastructure associated with the turbines would not be visible. The turbines within the Development would extend the field of view occupied by turbines to the east and west of those within Craignagapple and Owenreagh I and II. They would be seen at a similar distance from the viewpoint as those within Craignagapple and would appear similar in scale. The presence of the Craignagapple turbines would slightly reduce the magnitude of change associated with the Development compared to the main assessment, due to the increased influence of wind farm development at the Site.

When combined with the medium-high sensitivity, this would result in a **moderate / minor** and **not significant** effect on recreational visitors during both the decommissioning and construction phase and the operational phase.

6.9.17.7 Viewpoint 24: Silverhill Road (Figure 6.49)

Baseline

The viewpoint is a minimum of 1.8 km to the west of the Development and is located on Silverhill Road, on a section to the north of where it meets Curlyhill Road. Silverhill Road is a minor road which passes north to south to the west of the Site and connects Holyhill Road in the north with Dergalt Road and Koram Road in the south. This viewpoint is representative of the views experienced by road users on Silverhill Road, as well as the views experienced by rural residents at properties in the vicinity. Silverhill Road is located on lower ground to the east of Evish Hill, and the land slopes gently down to the east from this viewpoint.

Views from this road are relatively contained by high ground to the east and west. Views to the north and south are slightly longer-range. Silverhill Road stretches into the middle distance to the north and south, and is flanked on either side by intermittent vegetation, some of which filters views. To the south, the horizon is formed by the rounded summit of Koram Hill, which features moorland land cover on the summit, as well as a block of forestry to the south-west. To the north and north-east, there are relatively long-distance views towards high ground to the north of the Glenmornan River valley. Turbines within the cluster of wind farm developments around Slieve Kirk are visible above the horizon to the north-east.

The land cover to the east and west primarily comprises rough grassland. To the west the landform rises up towards a high plateau in the middle distance. The land cover across this high ground is primarily scrub. Several properties along Curlyhill Road are visible to the north-west and south-west. To the east the land slopes gently down away from the viewpoint towards the valley formed by a small tributary of the Glenmornan River. Sparse deciduous woodland is present within the valley floor, and beyond this, the land slopes up towards Owenreagh Hill, which features agricultural fields on the lower slopes and moorland at the summit. Forestry covers the southern slopes of the hill in views from this location. Turbines within Owenreagh I and II are visible against the skyline above the northern, moorland parts of the summit.

Sensitivity

The value of the view is medium-high. There are no formal viewpoints in this area and the viewpoint is located at an arbitrary point on the road. The viewpoint is, however, covered by the Sperrin AONB which indicates a formal recognition of the national scenic value of this landscape.

The susceptibility of road-users is medium. The view towards the Site would be oblique for road users travelling in both directions along Silverhill Road, although readily visible owing to the open nature of the landscape. It would be experienced as a transitory view whilst travelling at speeds of 40 to 60 mph. Furthermore, the operational Owenreagh I and II turbines are already visible, establishing this type of development as a feature of the baseline view. The susceptibility of residents is high, although there are only a limited number of properties in the vicinity of this viewpoint.

The combination of the medium-high value of the view and the medium to high susceptibility of viewers leads to an overall **medium-high** sensitivity for road users and residents.

Magnitude of change during decommissioning and construction

The magnitude of change experienced at this viewpoint would be **high** during the decommissioning and construction phase. The position of several turbines on the western flank of Owenreagh Hill means that ground-level parts of the Site are exposed in this view, and that the construction of access tracks, crane pads and foundations would be visible around the closer range or more prominent proposed turbines. This site infrastructure would appear as a notable human influence in an upland area in which the influence of wind farm development was largely restricted to views of turbines only. Ground level works across eastern parts of the Site would be screened by the ridgeline formed by Owenreagh Hill. The removal of the existing turbines, addition of the emerging turbines and presence of the associated cranes would also form a readily visible feature of the decommissioning and construction phase. Although there is the baseline influence from the operational Owenreagh I and II turbines across these hills, the closer range and larger scale of the proposed turbines would increase the magnitude of change. The visibility of existing wind farm development across the Site would act to moderate the magnitude of change.

Magnitude of change during operation

The magnitude of change on the views of road users and residents would be **high** during the operational phase. The Development would be located a minimum distance of 1.8 km from the viewpoint, with 12 of the 14 turbines visible along or behind the ridgeline as shown on the wireline and photomontage on Figures 6.49d and 6.49e. The turbines would be visible to variable degrees. The closest proximity turbine would be seen partially backclothed against Owenreagh Hill, while the other turbines would be seen above the horizon. The hubs of eight turbines would be visible, with the remaining turbines restricted to views of blade tips only.

The presence of the operational wind farms means that the Development would not form a new feature in the view. The turbines would be seen to partially overlap with the operational turbines of the Owenreagh I and II Wind Farms but would also bring wind farm development closer to the viewpoint and extend the horizontal field of view occupied by turbines to the north. The proposed turbines would appear notably larger in scale than the operational turbines, especially where proposed turbines would be seen to almost their full extent. This effect would be compounded by the closer proximity of the Development than the existing turbines. The lower parts of some of the turbines would be screened by the intervening ridgeline, but several would be seen to their full extents.

The factors which would moderate the magnitude of change include the established presence of wind farm development in the sector of the view to the east, and the screening or partial screening of several turbines within the Development beyond the ridgeline formed by Owenreagh Hill. Despite this, the Development is likely to become a defining feature in the view from this viewpoint.

Significance of effect

The effect of the Development would be major and **significant** during the decommissioning and construction phase and the operational phase. This is mainly due to the closer proximity and larger scale of the turbines within the Development than the existing, as well as the visibility of several turbines to their full extents, although this is moderated by the existing influence of wind farm development on the Site, and the transitory views road-users would experience. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase, with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.74)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple is present, the magnitude of change would be **medium** during the decommissioning and construction phase and the operational phase. The hubs and blade tips of all six turbines within Craignagapple would be visible above the horizon. The lower parts of several turbines towards the south of the development would be screened by the intervening landform, while some turbines towards the north would be seen to almost their full extent. These turbines would increase the influence of existing wind farm development at the Site in comparison to the operational Owenreagh I and II. The turbines within Craignagapple would be appreciably larger in scale than those within Owenreagh I and II.

The Development would extend the field of view occupied by turbines slightly to the north of the extent occupied by Craignagapple and Owenreagh I and II and would bring turbines into closer proximity to the viewpoint. However, the presence of Craignagapple turbines would increase the influence of wind farm development at the Site and would result in the overall magnitude of change associated with the Development being slightly reduced in comparison to the main assessment during the operational phase. Ground level infrastructure and construction works associated with the Development would be visible, while for Craignagapple views are likely to be restricted to the turbines themselves.

When combined with the medium-high sensitivity, this would result in a **major / moderate** and **significant** effect on road-users and residents during both the decommissioning and construction phase and the operational phase.

6.9.17.8 Viewpoint 25: Raphoe (Figure 6.50)

Baseline

The viewpoint is a minimum of 16.3 km to the north-west of the Development, and is located on the eastern edge of the settlement of Raphoe, a village in County Donegal, RoI. The village is located in a relatively flat, low-lying area to the north of the Deele River. The R236 passes through Raphoe from the north-east to south-west and links the settlement with the N14 to the north-east and neighbouring settlements to the south-west, including Convoy. Built form within the settlement largely limits outward views. While there are outward views from parts of the village, including towards the east, there are few clear and uninterrupted views.

The viewpoint is located on a minor road to the south of the R236, on the eastern edge of the settlement, from where clear and uninterrupted views can be experienced. This viewpoint is representative of the views of residents and road-users in the area. The view looks south-east towards high ground to the east of the Foyle River valley, where the Development would be located and where there is existing visibility of the operational Owenreagh I and II wind farms.
The view to the north-west is contained in the middle distance by rising topography. In the foreground there is rough grassland and settlement along the R236, as well as woodland across higher ground. To the south-west and north-east, the minor road stretches into the middle distance, with a number of residential properties visible on either side. To the east and south the foreground is formed by agricultural land. To the east this forms the horizon, while to the south woodland filters outward views. To the south-east there are long-distance views over lower-lying land within the Foyle Valley towards moorland and forested hills beyond, at a distance of approximately 15 km. Ten turbines within Owenreagh I and II are distantly visible above the ridgeline in this direction.

Sensitivity

The value of the view is medium-high. There are no formal viewpoints in this area, and Raphoe is not covered by any national or local scenic landscape designations, that would otherwise denote a special value. The viewpoint is an incidental viewpoint, located to the east of the village of Raphoe along a stretch of road with open views to the east, selected to include the fullest extent of the Development and other operational wind farms.

The susceptibility of residents is medium-high. While visibility of the Site is likely to be limited across most of the settlement, where long-range and open views do occur from this eastern settlement edge, they are likely to be broadly orientated towards the Site. Furthermore, the views of residents are static and experienced over long periods of time. The susceptibility of residents is, however, tempered by the baseline influence of development, including settlement and distant wind farms.

The susceptibility of road-users on the minor road and other roads through the village is medium. While the enclosure formed by the buildings in the village reduces the occurrence of open views, there are some areas from which views towards the Site can be glimpsed. The views of road-users would, however, be transitory and experienced only over short periods of time. From this route, views towards the Site are oblique. These factors would reduce the potential prominence of the Development in the views of road-users on this minor road.

The combination of the medium-high value of the view and the medium-high or medium susceptibility of views leads to a **medium-high** sensitivity for residents and road users.

Magnitude of change during decommissioning and construction

The magnitude of change on the views of residents and road users at this viewpoint would be **low** during the decommissioning and construction phase. Ground-level construction works across the closest-proximity, south-western parts of the Development are unlikely to be visible from the minimum distance of 16.3 km. While the higher-level works associated with the removal of the existing turbines, addition of the emerging turbines and presence of construction cranes would be visible, the minimum separation distance of 16.3 km would mean that these structures would be seen as relatively small scale within the wider view. Visibility of these elements of the decommissioning and construction phase would be experienced by road users over a short duration and residents over a longer duration, albeit seen on a Site associated with wind farm development.

Magnitude of change during operation

The magnitude of change on the views of road-users and residents would be **low** during the operational phase. Of the 14 proposed turbines, all would be visible, albeit to variable extents. The towers of 10 turbines would be visible, with the remaining four restricted to views of hubs or blade tips only as shown on the wireline and photomontage on Figures 6.50d and 6.50e. The Development would bring wind turbines of a larger scale into closer proximity to the viewpoint than the existing Owenreagh I and II wind farms. They would occupy a greater extent of the horizon than the existing turbines and would extend wind farm development to the north in views from this location.
Factors which would moderate the magnitude of change include the existing presence of wind farm development in this south-eastern sector of the view, as well as the separation distance of 16.3 km, which would ensure that the turbines would be seen as relatively small features within wider view. The horizontal angle ZTV on Figure 6.7 shows that the proposed turbines would occupy between 1 to 5 degrees of the full 360 degree view.

Significance of effect

The effect of the Development on residents and road users would be **moderate / minor** and **not significant**. This finding relates to the notable separation distance between the viewpoint and the Development, the small proportion of the wider view it would occupy and the baseline influence form wind farm development in the same location. The effects would be short-term and reversible during the decommissioning and construction phase, and long-term and reversible during the operational phase , with all effects being adverse.

Craignagapple Comparative Assessment (Figure 6.75)

Assessing the Development under a hypothetical baseline scenario in which the consented Craignagapple is present, the magnitude of change would be **low** during the decommissioning and construction phase and the operational phase. All six of the turbines within Craignagapple would be seen beyond the ridgeline, with three seen to almost their full extents, two visible to hub height and one as blade tips only. This would increase the influence of wind farm development at the Site. The turbines would be seen to increase the horizontal extent occupied by turbines to the north of Owenreagh I and II.

The turbines within the Development would extend the field of view occupied by turbines to the north of those within Craignagapple and Owenreagh I and II. They would also bring wind farm development into closer proximity to the viewpoint. However, the presence of the Craignagapple turbines would slightly reduce the magnitude of change associated with the Development compared to the main assessment, as they increase the influence of wind farm development at the Site. From this relatively distant viewpoint, turbines within the Development would appear similar in scale to the turbines within Craignagapple.

When combined with the medium-high or medium sensitivity, this would result in a **moderate / minor** and **not significant** effect on residential receptors and road users during both the decommissioning and construction phase and the operational phase.

6.9.18 Assessment of Effects on Visual Receptors

The second part of the assessment of effects on views is the assessment of the effects that the Development would have on the views from principal visual receptors. The principal visual receptors considered in the assessment include settlements and route corridors, including roads, walking routes and national cycle routes, shown on Figure 6.4, and shown in conjunction with the ZTV on Figure 6.10.

Settlement and roads within the Study Area are widespread and generally dispersed throughout the rural area, including within close proximity of the Site. As a result of this extensive pattern of development, it is not possible to conduct a full assessment of all visual receptors likely to experience significant effects. Instead, a broader assessment has been made, with reference to the assessment of the representative viewpoints, in order to define thresholds between those receptors that are likely to undergo significant and not significant effects. This assessment is based on the likely visibility of the Development, combined with the proximity and sensitivity of the receptors.

6.9.18.1 Settlements

Where visibility occurs, receptors within close range settlements are likely to experience significant effects. Due to the pattern of theoretical visibility, as shown on Figure 6.10, this is likely to be more widespread to the north and east of the Site. Settlements to the south and west experience more intermittent visibility and are therefore less likely to experience significant effects.

To the north and east, settlements likely to experience significant effects include Glenmornan within the Glenmornan River valley to the north, and Dunnamanagh and Ballynamallaght within the Burndennet River valley to the north-east. Dispersed settlement within the valleys surrounding the Site is also likely to experience significant effects. Viewpoint 21 is representative of views from Glenmornan, while viewpoints 5 and 20 represent views likely to be experienced by residential receptors throughout the scattered settlement to the north and east of the Site. Viewpoints 11 and 12 represent views from the settlements of Ballynamallaght and Dunnamanagh respectively. In this direction, significant effects within settlements are likely to extend to approximately 6 km.

Settlement to the south and west within the immediate vicinity of the Site is more limited, and where settlement does occur, it is likely to have more limited visibility of the Development, due to the position of the turbines on the north-eastern flank of Owenreagh Hill and the concentration of settlement within valleys with more limited outward visibility. Viewpoints 1, 2, 6 and 24 are representative of the views experienced by residential receptors within this scattered settlement to the west. Viewpoints 1, 2, and 24 are located within a minimum of approximately 2 km, while viewpoint 6 is located a minimum of approximately 4.5 km from the Development. These viewpoints have been assessed as likely to experience significant effects, while viewpoints within settlements beyond this distance have been assessed as likely to experience non-significant effects. Beyond this distance of approximately 5 km, significant effects are considered unlikely to occur at settlements to the south and west of the Site.

In all directions, beyond approximately 6 km, significant effects are unlikely to occur, even where theoretical visibility is experienced. This is primarily down to the separation distance, the small proportion of the view that the Development would occupy as shown on the horizontal angle ZTV on Figure 6.7, and the existing influence of wind farm development at the Site in views from these settlements. Viewpoints 8, 10, 15, 16, 17, 19 and 25 illustrate this effect.

6.9.18.2 Roads and routes

Roads are also widespread throughout the Study Area. A complex network of minor roads in particular traverses the upland landscape surrounding the Site. Again, it is not possible to assess each of these routes individually. As determined through the assessment of the representative viewpoints, roads within approximately 5 km which experience visibility of the Development within the forward-facing sectors are likely to be subject to significant effects.

Routes within approximately 5 km are more widespread throughout the valleys of the watercourses which pass through this upland landscape, although there are also roads which pass across higher ground. Generally, routes to the north, west and east are more likely to be subject to significant effects, while routes to the south would have more limited visibility due to screening of the Development by the landform of Owenreagh Hill. Some routes would have direct views towards the Site, including Holyhill Road, represented by viewpoint 5. Generally, however, views from surrounding routes would be slightly oblique to the direction of the Development, with some sections enclosed by hedgerows and tree cover, albeit occurring typically in the valley rather than the upland landscapes. Other viewpoints which represent views from roads within approximately 5 km comprise viewpoints 1, 2, 3, 11, 12, 20, 21 and 24. As identified within the viewpoint assessment, road users at these viewpoints would experience significant effects.

Beyond this approximate distance, road users are unlikely to experience significant effects, due to a combination of the small proportion of the overall view that the Development would occupy, the existing influence of wind farm development at the Site, and the slightly lower sensitivity of road users. The assessment of the effects on road users at viewpoints beyond this distance supports this judgement.

National Cycle Route 92 passes within approximately 4 km to the south of the Site, to the north of Newtownstewart and west of Plumbridge. Theoretical visibility along the route would be intermittent, as shown on the ZTV on Figure 6.10. Along short stretches of the route within approximately 4 to 6 km of the Development, there is likely to be visibility of the Development. Where this occurs, views would be oblique and unlikely to include all turbines within the Development, due to screening by the ridgeline of Owenreagh Hill, as shown on Figure 6.10. However, due to the proximity to the Development, and the high sensitivity of recreational receptors on this route, significant effects are considered likely to occur. These would occur along a distinct and isolated section of route of approximately 1 to 2 km, while the remaining sections of the route would not be subject to significant effects.

6.9.19 Assessment of Cumulative Effects

6.9.19.1 Introduction

All operational and under construction wind farms have been included as part of the baseline situation in the main assessment. This means that their influence on the main assessment has been taken into account in relation to the landscape and visual receptors assessed in detail in the ‘Assessment of effects on landscape character’ and ‘Assessment of effects on views’ respectively. The cumulative effect of the Development in conjunction with the operational and under construction wind farms is assessed in more detail in this section, in relation to two different cumulative scenarios.

- Cumulative Scenario 1 assesses the effects of adding the Development to a cumulative situation comprising all operational, under construction and consented wind farms; and,
- Cumulative Scenario 2 assesses the effects of adding the Development to a cumulative situation comprising all operational, under construction, consented and application wind farms.

The potential for significant cumulative effects as a result of the Development in-combination with the Scenario 1 and Scenario 2 cumulative wind farms is also assessed and these detailed assessments are presented below.

6.9.19.2 Methodology for the cumulative assessment

The methodology used in the assessment of cumulative effects differs in some respects from that used in the rest of the assessment. The full methodology for the cumulative assessment is described in **Technical Appendix A6.1: Landscape and Visual Impact Assessment Methodology**.

It is important to remember that the objective of the cumulative assessment is different from the assessment of effects of the Development as carried out previously in this chapter. The main assessment focuses primarily on the effects of the Development with consideration given to the baseline context which the operational wind farms present. The cumulative assessment differs in that the focus is less on the effects of the Development, and more on the effects arising as a result of the relationship with the other wind farms, whether they are operational or proposed.

In the cumulative assessment the intention is to establish whether or not the addition of the Development, in combination with other relevant existing and proposed wind farms, may lead to a landscape character or view where wind farm developments become a prevailing characteristic as a result of the addition of the Development, albeit that they may become one of a number of prevailing characteristics.

It should be noted that even if the Development itself is assessed to have a significant effect, it does not necessarily follow that the cumulative effect would also be significant.

6.9.19.2.1 Wind Farm sites included in the cumulative assessment

Table 6.5 in Section 6.4.7 sets out which of the cumulative sites would be relevant to the cumulative assessment. Cumulative sites that lie within a 30 km radius of the Development have been listed in Table 6.5 and their locations shown on Figure 6.12. This shows that there are no wind farms within a 10 km radius of the Development, only single turbines. It also shows that there are few consented and application stage wind farms within the 30 km Study Area and those that do occur are mostly beyond 20 km, with a few in the 15 to 20 km radius. The size and location of the cumulative wind farms, combined with the baseline influence from Owenreagh I and II wind farms on the Site, indicate that there would be limited cumulative interaction arising from the addition of the Development.

Cumulative ZTVs that show the visibility of the cumulative site, or group of sites, along with the visibility of the Development have been run for all of the operational, under construction, consented and application wind farms that are considered relevant in the cumulative assessment, as shown on Figures 6.13 to 6.22. These show the extent of visibility of each wind farm in conjunction with the Development and are referred to in the following detailed assessments.

The cumulative sites are shown in the cumulative wirelines for each of the representative viewpoints, as shown on Figures 6.26 to 6.50. In these wirelines, the Development turbines are shown in red; operational wind farms are shown in black; under-construction wind farms are shown in purple; consented wind farms are shown in green and application wind farms are shown in blue.

In some instances, wind farms show up in the wirelines although they are beyond their own Study Area radius. Where this occurs, the wind farm is not included in the written assessment as it lies outwith its own Study Area radius and is, therefore, considered to lie beyond the radius within which it may contribute to a significant cumulative effect.

6.9.19.2.2 Assessment of Cumulative Effects on Landscape Character

The assessment of cumulative effects on landscape character uses the same receptors as the assessment of effects on landscape character carried out previously in this chapter. These are in two groups:

- Landscape character types; and,
- Designated areas.

The cumulative assessment for both of these groups of receptors is described in the following section of this chapter. The detailed methodology for the assessment of cumulative effects on landscape character is described in **Technical Appendix A6.1: Landscape and Visual Impact Assessment Methodology**.

The first stage in the cumulative assessment of the landscape character types and designated areas is a filtering process to ascertain which of them have the potential to undergo significant cumulative effects as a result of the wind farm. This process is carried out through a desk study and site survey which examines the visibility of the wind farm in conjunction with other wind farm sites from the landscape character types and designated areas around the Study Area, using the ZTV and wirelines.

This filtering process indicates that two landscape character types and one designated landscape have the potential to undergo significant cumulative effects as a result of the addition of the Development.

Table 6.7: Potential for Significant Cumulative Effects on Landscape Receptors

<table>
<tr><th>Receptor</th><th>Main Assessment during operational phase</th><th>Potential for Scenario 1 and / or Scenario 2 significant cumulative effect</th></tr>
<tr><td>LCA 20: Derg Valley</td><td>Not significant</td><td>There would be no potential for significant cumulative effects owing to:
▪ The minimum separation distance of 10 km from the Development;
▪ The contained horizontal angle of the Development within the wider landscape; and,
▪ The closer range influence of wind farms in the southern part of this LCA and in adjacent Bessy Bell and Gortin LCA.
These factors would limit the cumulative influence of the Development on the landscape character of this LCA.</td></tr>
<tr><td>LCA 24: South Sperrins</td><td>Not significant</td><td>There would be no potential for significant cumulative effects owing to:
▪ the minimum separation distance of 7 km from the Development;
▪ The very limited extent to which the Development would be visible across this LCA; and,
▪ The limited influence of other cumulative wind farms across this LCA as shown on the cumulative ZTVs on Figures 6.13 to 6.22.
These factors would limit the cumulative influence of the Development on the landscape character of this LCA.</td></tr>
<tr><td>LCA 26: Bessy Bell and Gortin</td><td>Not significant</td><td>There would be no potential for significant cumulative effects owing to:
▪ The minimum separation distance of 8 km from the Development;
▪ The contained horizontal angle of the Development within the wider landscape; and,
▪ The closer range influence of wind farms in this LCA which would moderate the influence of the Development through comparison.
These factors would limit the cumulative influence of the Development on the landscape character of this LCA.</td></tr>
<tr><td>LCA 27: Foyle Valley</td><td>Significant across eastern part out to approximately 5 km.</td><td>There would be no potential for significant cumulative effects owing to:
▪ The minimum separation distance of 3.5 km from the Development;
▪ The limited extent to which the Development would be visible across this LCA; and,
▪ The limited influence of other cumulative wind farms across this LCA as shown on the cumulative ZTVs on Figures 6.13 to 6.22.
These factors would limit the cumulative influence of the Development on the landscape character of this LCA.</td></tr>
<tr><td>LCA 28: Glenelly Valley</td><td>Not significant</td><td>There would be no potential for significant cumulative effects owing to:
▪ the minimum separation distance of 7 km from the Development;
▪ the very limited extent to which the Development would be visible across this LCA; and,
▪ the limited influence of other cumulative wind farms across this LCA as shown on the cumulative ZTVs on Figures 6.13 to 6.22.
These factors would limit the cumulative influence of the Development on the landscape character of this LCA.</td></tr>
</table>

Receptor	Main Assessment during operational phase	Potential for Scenario 1 and / or Scenario 2 significant cumulative effect
LCA 29: Sperrin Mountains	Significant across north-western part out to approximately 4.5 km west, 4.0 km east and 5.0 km south-east and 3 km south. Not significant – remaining parts	Yes – consented Ballyhanedin and Barr Cregg would have an influence on this LCA, as well as application stage Magheramore.
LCA 30: Sperrin Foothills	Significant – out to 5 km north. Not significant – remaining parts	Yes – consented Ballyhanedin and Barr Cregg would have an influence on this LCA, as well as application stage Magheramore.
LCA 31: Burngibbagh and Drumahoe	Not significant	There would be no potential for significant cumulative effects owing to: ▪ The minimum separation distance of 8 km from the Development; ▪ The very limited extent to which the Development would be visible across this LCA; and, ▪ The limited influence of other cumulative wind farms across this LCA as shown on the cumulative ZTVs on Figures 6.13 to 6.22. These factors would limit the cumulative influence of the Development on the landscape character of this LCA.
LCA 13: Foyle Valley	Not significant	There would be no potential for significant cumulative effects owing to: ▪ The minimum separation distance of 7 km from the Development; ▪ The very limited extent to which the Development would be visible across this LCA; and, ▪ The limited influence of other cumulative wind farms across this LCA as shown on the cumulative ZTVs on Figures 6.13 to 6.22. These factors would limit the cumulative influence of the Development on the landscape character of this LCA.
LCA 14: Finn Valley (RoI)	Not significant	There would be no potential for significant cumulative effects owing to: ▪ The minimum separation distance of 7 km from the Development; ▪ The very limited extent to which the Development would be visible across this LCA; and, ▪ The limited influence of other cumulative wind farms across this LCA as shown on the cumulative ZTVs on Figures 6.13 to 6.22. These factors would limit the cumulative influence of the Development on the landscape character of this LCA.

6.9.20 LCA 29: Sperrin Mountains

This LCA has been assessed as having a medium-high sensitivity, a magnitude of change that would range between medium-high and no change, during the decommissioning and construction phase and the operational phase, and effects that would be significant within parts of the 5 km radius of the Development and not significant in all remaining parts, during the decommissioning and construction phase and the operational phase, as a result of the addition of the Development.

6.9.20.1 Cumulative Scenario 1

The addition of the Development to the operational and consented wind farms is considered under Scenario 1. Scenario 1 includes the following wind farms some of which are shown in the cumulative ZTVs on Figures 6.13 to 6.22.

- Operational: Slieveglass, Monnaboy, Thornog, Meenagrauv, Crockdun, Seegronan, Tappaghan Mountain Extension, Bin Mountain, Bessy Bell II, Eglish Mountain, Curryfree, Meenanilta, Lough Hill Resubmission, Church Hill, Altahullion II, Carrickatane, Bessy Bell I, Castlecraig, Slieve Kirk, Pollnalaght, Tappaghan Mountain, Altahullion I, Glenconway and Clunahill; and,
- Consented: Gronan, Bessy Bell II Extension, Barr Cregg, Ballyhanedin, Pigeon Top and Dooish.

Although not included in the Scenario I developments because they will be decommissioned and removed as part of the Development, the operational Owenreagh I and II Wind Farms are located within this LCA. The operational Eglish Mountain, Slieve Kirk, Curryfree and Carrickatane are located within LCA 30 to the north.

This LCA is represented by Viewpoints 1, 2, 3, 6, 8, 18, 20 and 24. Viewpoint 5 is located on the boundary between this LCA and LCA 27: Foyle Valley.

Cumulative magnitude of change

The Development is located within this LCA and has been identified as resulting in significant effects in the main assessment. Cumulative interactions within this LCA would be limited, owing to the separation distance between the Development and the closest consented wind farms. As shown on the cumulative ZTV on Figure 6.22, there would be very limited occurrence of inter-visibility between the Development and Ballyhanedin and Barr Cregg, owing to their location in visually separate landscapes divided by intervening hills. Those localised patches where intervisibility would occur, would be concentrated across western parts of the LCA, within approximately 10 to 15 km of the Development. While there would be a cumulative effect resulting from inter-visibility of the Development alongside these consented schemes, the separation distances between the Development and the consented wind farms would mean that they would never occur within close proximity and that they would all occupy a relatively small proportion of the wider surrounding landscape. The addition of the Development would not give rise to a wind farm landscape and it is considered to give rise to a **low** cumulative magnitude of change.

Significance of cumulative effect

The cumulative effect of the Development on the landscape character of the Sperrin Mountains LCA would be moderate / minor and **not significant**. This is due to the very limited extent of intervisibility between the Development and the consented wind farm developments, owing to their location in separately defined landscapes.

6.9.20.2 Cumulative Scenario 2

The addition of the Development to the operational, consented and application stage wind farms is considered under Scenario 2.

In addition to the operational and consented wind farms assessed for Scenario 1, Scenario 2 includes the following wind farms some of which are shown in the cumulative ZTVs on Figures 6.13 to 6.22.

- Application: Thornog Extension, Altgolan, Magheramore and Binnawooda.

Turbines within Magheramore are located within this LCA and the adjacent LCA 30: Sperrin Foothills.

Cumulative magnitude of change

Magheramore is located partially within this LCA. However, areas from which both the Development and Magheramore would be visible would be very limited, owing to the separation distance of approximately 26 km between them, the extent of intervening hills within this separation distance and the relatively small scale of both developments in terms of number and size of turbines. As a result, the magnitude of change would be **low** to **no change**.

Significance of cumulative effect

The cumulative effect that would arise from the addition of the Development to the operational, consented and application wind farms would not change from that assessed under Scenario 1, and would be **moderate / minor** and **not significant**.

6.9.21 LCA 30: Sperrin Foothills

This LCA has been assessed as having a medium-high sensitivity, a magnitude of change that would range between medium-high and no change, during the decommissioning and construction phase and the operational phase, and effects that would be significant within parts of the 5 km radius of the Development and not significant in all remaining parts, during the decommissioning and construction phase and the operational phase, as a result of the addition of the Development.

6.9.21.1 Cumulative Scenario 1

The addition of the Development to the operational and consented wind farms is considered under Scenario 1. Scenario 1 includes the following wind farms as shown in the cumulative ZTVs on Figures 6.13 to 6.22.

- Operational: Slieveglass, Monnaboy, Thornog, Meenagrauv, Crockdun, Seegronan, Tappaghan Mountain Extension, Bin Mountain, Bessy Bell II, Eglish Mountain, Curryfree, Meenanilta, Lough Hill Resubmission, Church Hill, Altahullion II, Carrickatane, Bessy Bell I, Castlecraig, Slieve Kirk, Pollnalaght, Tappaghan Mountain, Altahullion I, Glenconway and Clunahill; and,
- Consented: Gronan, Bessy Bell II Extension, Barr Cregg, Ballyhanedin, Pigeon Top and Dooish.

The operational Eglish Mountain, Slieve Kirk and parts of Curryfree, Carrickatane and Altahullion II are located within this LCA. The consented Ballyhanedin is also located within this LCA.

This LCU is represented by Viewpoints 4, 11, 12, 15, 21 and 22.

Cumulative magnitude of change

The Development is located within the adjacent LCA 29: Sperrin Mountains. The Site Boundary is located within close proximity to the boundary of this LCA. The Development has been identified as resulting in significant effects on this LCA in Section 6.7 above. Cumulative interactions within this LCA would largely be restricted to those resulting from interactions with operational schemes, as identified within the main assessment. This is due to the limited nature of development at consented stage, including schemes within the LCA and those beyond the LCA of which visibility is available from within the LCA. There may be some limited areas which experience intervisibility of the Development and the consented Ballyhanedin. However, due to the separation distance of approximately 20 km and the occurrence of intervening hills between these developments, cumulative interactions are considered to be very limited and the cumulative magnitude of change would be **low**.

Significance of cumulative effect

The cumulative effect of the Development on the landscape character of the Sperrin Foothills LCA would be **moderate / minor** and **not significant**. This is due to the very limited nature of intervisibility between the Development and the consented wind farm developments.

6.9.21.2 Cumulative Scenario 2

The addition of the Development to the operational, consented and application stage wind farms is considered under Scenario 2.

In addition to the operational and consented wind farms assessed for Scenario 1, Scenario 2 includes the following wind farms some of which are shown in the cumulative ZTVs on Figures 6.13 to 6.22.

- Application: Thornog Extension, Altgolan, Magheramore and Binnawooda.

Turbines within Magheramore are located within this LCA and the adjacent LCA 29: Sperrin Mountains.

Cumulative magnitude of change

Magheramore is located to the east of the eastern boundary of this LCA and areas from which both the Development and Magheramore would be visible would be very limited, owing to the separation distance of approximately 26 km between them, the extent of intervening hills within this separation distance and the relatively small scale of both developments in terms of number and size of turbines. As a result, the magnitude of change would be **low** to **no change**.

Significance of cumulative effect

The cumulative effect that would arise from the addition of the Development to the operational, consented and application wind farms would not change from that assessed under Scenario 1, and would be **moderate / minor** and **not significant**.

6.9.22 Sperrin AONB

This designation has been assessed as having a medium-high sensitivity, a magnitude of change that would range between medium-high and low or no change during the decommissioning and construction phase and the operational phase, and effects that would be significant within parts of the 5 km radius of the Development and not significant in all remaining parts, during the decommissioning and construction phase and the operational phase, as a result of the addition of the Development.

6.9.22.1 Cumulative Scenario 1

The addition of the Development to the operational and consented wind farms is considered under Scenario 1. Scenario 1 includes the following wind farms some of which are shown in the cumulative ZTVs on Figures 6.13 to 6.22.

- Operational: Slieveglass, Monnaboy, Thornog, Meenagrauv, Crockdun, Seegronan, Tappaghan Mountain Extension, Bin Mountain, Bessy Bell II, Eglish Mountain, Curryfree, Meenanilta, Lough Hill Resubmission, Church Hill, Altahullion II, Carrickatane, Bessy Bell I, Castlecraig, Slieve Kirk, Pollnalaght, Tappaghan Mountain, Altahullion I, Glenconway and Clunahill; and,
- Consented: Gronan, Bessy Bell II Extension, Barr Cregg, Ballyhanedin, Pigeon Top and Dooish.

The operational Eglish Mountain, and parts of the operational Slieve Kirk, are located within the AONB. The operational Crockdun is located on the edge of the AONB in the south-east of the Study Area. Although not included in the list of Scenario 1 schemes, the operational Owenreagh I and II are located within the AONB.

The AONB is represented by Viewpoints 1, 2, 3, 4, 6, 8, 9, 10, 11, 12, 13, 16, 18, 20, 21, 22 and 24.

Cumulative magnitude of change

Cumulative landscape effects on the AONB would be similar to those described above for LCA 29: Sperrin Mountains, and LCA 30: Sperrin Foothills, which are both covered by the designation. Across western parts of the AONB within the Study Area, there may be some limited intervisibility of the Development with consented developments including Ballyhanedin and Barr Cregg to the north of the AONB; Bessy Bell II to the west; and Pigeon Top and Dooish to the south-west. However, due to the separation distances of 15 to 28 km between the Development and these schemes, the intermittent patterns of visibility as shown on the cumulative ZTVs, the baseline influence from operational wind farms in these areas and at these ranges and the relatively small scale and small number of turbines in the cumulative wind farms, the cumulative magnitude of change is considered to be **low**.

Significance of cumulative effect

The cumulative effect of the Development on the landscape character of the Sperrin AONB would be **moderate / minor** and **not significant**. This is due to the very limited nature of intervisibility between the Development and the consented wind farm developments.

6.9.22.2 Cumulative Scenario 2

The addition of the Development to the operational, consented and application stage wind farms is considered under Scenario 2.

In addition to the operational and consented wind farms assessed for Scenario 1, Scenario 2 includes the following wind farms, some of which are shown in the cumulative ZTVs on Figures 6.13 to 6.22.

- Application: Thornog Extension, Altgolan, Magheramore and Binnawooda.

Magheramore is located within the AONB.

Cumulative magnitude of change

Again, cumulative effects experienced under Scenario 2 would be similar to those experienced within LCA 29: Sperrin Mountains, and LCA 30: Sperrin Foothills. Areas from which intervisibility between the Development and application stage schemes would occur would be limited.

Magheramore is located in the AONB, close to the northern boundary. The extent of intervisibility between this application stage wind farm and the Development would be limited owing to the minimum separation distance of approximately 26 km, the intervening hills within this separation distance and the relatively small scale of both developments in terms of number and size of turbines. As a result, the magnitude of change would be **low** to **no change**.

Significance of cumulative effect

The cumulative effect that would arise from the addition of the Development to the operational, consented and application wind farms would not change from that assessed under Scenario 1 and would be **moderate / minor** and **not significant**.

6.9.22.3 Summary of Cumulative Landscape Effects

The assessment of cumulative effects on landscape character has identified that the effect of the Development on all LCAs and landscape designations in respect of the cumulative Scenario 1 and Scenario 2 would be **not significant**.

6.9.23 Assessment of Cumulative Effects on Views

The assessment of cumulative effects on views is carried out using the same two categories of effects on views as described previously in this chapter:

- Assessment of effects on representative viewpoints; and,
- Assessment of effects on principal visual receptors.

The detailed methodology for the assessment of cumulative effects on views is described in **Technical Appendix A6.1: Landscape and Visual Impact Assessment Methodology**.

The first stage in the cumulative assessment of the viewpoints and principal visual receptors is a filtering process to ascertain which of them have the potential to undergo significant cumulative effects as a result of the Development. This process is carried out through a desk study and site survey which examines the visibility of the Development in conjunction with other wind farm sites from the viewpoints and principal visual receptors around the Study Area, using the cumulative ZTVs and wirelines.

This filtering process indicated that none of the viewpoints or principal visual receptors have the potential to undergo significant cumulative effects as a result of the addition of the Development. The other visual receptors were discounted from the detailed assessment owing to a number of factors that reduced the likelihood for a significant cumulative effect to arise, relating mainly to the limited visibility of the Development and the limited visibility of the cumulative developments, as shown on the cumulative ZTVs and wirelines, and the distance of the Development and other sites from the viewpoints and receptors. As shown on the map of cumulative wind farms on Figure 6.12, there are no wind farms within a 10 km radius of the Development, only single turbines.

Table 6.8: Potential for Significant Cumulative Effects on Visual Receptors

Receptor	Main Assessment	Potential for Scenario 1 significant cumulative effects	Potential for Scenario 2 significant cumulative effects
VP1: Koram Road, Ligfordrum.	Major / Moderate or moderate **Significant**	No - visibility of any of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.
VP2: Koram Road, north of Ligfordrum.	Moderate **Significant**	No - visibility of any of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.
VP3: Napple Road, Ballykeery Bridge.	Major / moderate **Significant**	No - visibility of any of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.
VP4: Moor Lough picnic area.	Major **Significant**	No - visibility of any of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.
VP5: Holyhill Road, Holly Hill	Major or major / moderate **Significant**	No - visibility of any of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.
VP6: President Wilson's House	Moderate Not significant	No - visibility of any of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.
VP7: Strathmourne Road, Strabane	Moderate Not significant	No - visibility of any of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.
VP8: Victoria Bridge	Moderate / minor or minor Not significant	No - visibility of any of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.
VP9: Harry Avery's Castle, Newtownstewart	Moderate / minor Not significant	No – owing mainly to the limited influence of the Development as well as the limited influence of the consented wind farms.	No – owing mainly to the limited influence of the Development as well as the limited influence of the application stage wind farms.
VP10: Slievebeg Road, Slievebeg	Moderate or moderate / minor Not significant	No - visibility of any of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.
VP11: B48 Ballynamallaght	Moderate **Significant**	No - visibility of any of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.
VP12: B48 Dunnamanagh	Moderate **Significant**	No - visibility of any of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.

Receptor	Main Assessment	Potential for Scenario 1 significant cumulative effects	Potential for Scenario 2 significant cumulative effects
VP13: Lenamore picnic site, above Gortin	Moderate Not significant	No – owing mainly to the limited influence of the Development as well as the limited influence of the application stage wind farms.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.
VP14: Ulster Way at Bolaght Mountain above Castlederg	Moderate / minor Not significant	No – owing mainly to the limited influence of the Development as well as the limited influence of the consented wind farms.	No – owing mainly to the limited influence of the Development as well as the limited influence of the application stage wind farms.
VP15: Foreglen Road, Killaloo	Moderate / minor or minor Not significant	No - visibility of any of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.
VP16: A5, Strule River Valley	Moderate Not significant	No - visibility of any of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.
VP17: Bells Park Road, Glebe	Moderate / minor or minor Not significant	No - visibility of any of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.
VP18: Mullaghclogha, Sperrin Mountains	Moderate Not significant	No – owing mainly to the limited influence of the Development as well as the limited influence of the consented wind farms.	No – owing mainly to the limited influence of the Development as well as the limited influence of the application stage wind farms.
VP19: Ballindrait	Moderate / minor or minor Not significant	No - visibility of any of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.
VP20: Meendamph Road, Crockrour Hill	Major **Significant**	No - visibility of any of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.
VP21: Glenmornan	Major or major / moderate **Significant**	No - visibility of any of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.
VP22: Aghafad Road	Moderate **Significant**	No - visibility of any of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.
VP23: Bessy Bell	Moderate / minor Not significant	No – owing mainly to the limited influence of the Development as well as the limited influence of the consented wind farms.	No – owing mainly to the limited influence of the Development as well as the limited influence of the application stage wind farms.
VP24: Silverhill Road	Major **Significant**	No - visibility of any of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.

Receptor	Main Assessment	Potential for Scenario 1 significant cumulative effects	Potential for Scenario 2 significant cumulative effects
VP25: Raphoe	Moderate / minor Not significant	No - visibility of the consented wind farms would be limited from this viewpoint.	No - visibility of any of the application stage wind farms would be limited from this viewpoint.
Settlements within 6 km	**Significant**	No – visibility of any of the consented wind farms would be limited from these areas, owing partly to the position of most settlement within valleys, as well as the separation distance of approximately 10 km with the nearest consented developments likely to contribute to cumulative effects, Barr Cregg and Ballyhanedin.	No - visibility of any of the application stage wind farms would be limited from these areas.
Routes within 5 km	**Significant**	No – visibility of any of the consented wind farms would be limited from these routes, owing partly to the position of most settlement within valleys, as well as the separation distance of more than 10 km with the nearest consented developments likely to contribute to cumulative effects, Barr Cregg and Ballyhanedin.	No - visibility of any of the application stage wind farms would be limited from these areas.

As indicated by Table 6.8 above, none of the viewpoints or principal visual receptors associated with them, are considered likely to undergo significant cumulative effects. This is largely due to the limited nature of cumulative wind farm developments across the Study Area, as well as limited intervisibility between the Development and those cumulative schemes which are present and the limited influence of the cumulative wind farms where visibility does occur, owing to the relatively small size and contained nature of these developments.

6.10 Summary of Effects

The potential effects on the landscape and visual receptors that would arise as a result of the Development have been assessed in this chapter. The assessment process involved identifying those receptors with the potential to be significantly affected and assessing the potential effects that the decommissioning and construction and operation of the Development would give rise to. The significance of these effects has been assessed through combining the sensitivity of each receptor with a prediction of the magnitude of change that would occur as a result of the Development. The findings of the assessment are presented in summary in Table 6.9 below.

The Development comprises the decommissioning and removal of the existing turbines and infrastructure of Owenreagh I and II Wind Farms, the construction of 14 proposed turbines each up to 156.5 m to tip, associated infrastructure, including access tracks, substation and control buildings. The Site layout is shown on Figure 3.1.

The Study Area for the Development covers a radius of 30 km and within this area, those receptors with the potential to be significantly affected have been assessed in detail. This has included one landscape element, nine LCAs, one designated landscape area, and 25 viewpoints. Photomontages have been prepared for all viewpoints. The figures also include a wireline of the Development on its own and a wireline with all other cumulative developments. These visualisations have helped assist in the assessment process. Figures 6.1 to 6.22 show plans of the Study Area, landscape receptors, visual receptors and ZTVs of the Development on its own and in combination with other cumulative wind farms, while Figures 6.23 to 6.50 show the photographs, wirelines and photomontages from the representative viewpoints.

Table 6.9: Summary of Effects during the Decommissioning and Construction Phase and Operational Phase

Receptor	Sensitivity	Decommissioning and Construction: Magnitude of change	Decommissioning and Construction: Significance of effect	Operation: Magnitude of Change	Operation: Significance of Effect
Rough grass moorland	Medium	Medium-low	Moderate / Minor Not significant	NA	NA
LCA 20: Derg Valley	Medium	Medium-low	Moderate / Minor Not significant	Medium-low	Moderate / Minor Not significant
LCA 24: South Sperrins	Medium-high across eastern part Medium across western part	No change across most of LCA Medium-low or low	No effect across most of LCA Moderate or moderate / minor Not significant	No change across most of LCA Medium-low or low	No effect across most of LCA Moderate or moderate / minor Not significant
LCA 26: Bessy Bell and Gortin	Medium-high across eastern part Medium across western part	No change across southern part Medium-low or low across northern part	No effect across southern part Moderate or moderate / minor across northern part Not significant	No change across southern part Medium-low or low across northern part	No effect across southern part of LCA Moderate or moderate / minor across northern part Not significant
LCA 27: Foyle Valley	Medium-high across eastern part Medium across western and northern part	Medium across eastern part 3 to 5 km Medium-low or low across remaining parts No change	Moderate **Significant** Moderate or moderate / minor Not significant No effect	Medium-high across eastern part 3 to 5 km Medium-low or low across remaining parts No change	Moderate **Significant** Moderate or Moderate / minor Not significant No effect
LCA 28: Glenelly Valley	Medium-high	No change across most of LCA Medium-low or low	No effect across most of LCA Moderate or moderate / minor Not significant	No change across most of LCA Medium-low or low	No effect across most of LCA Moderate or moderate / minor Not significant
LCA 29: Sperrin Mountains	Medium-high	Medium-high or medium out to ~4.5 km west, 4.0 km east, 2 km south, 5.0 km south-east	Major / moderate **Significant** out to ~4.5 km west, 4.0 km east, 3 km south, 5.0 km south-east	Medium-high or medium out to ~4.5 km west, 4.0 km east, 3 km south,	Major / moderate **Significant** out to ~4.5 km west, 4.0 km east, 3 km

Receptor	Sensitivity	Decommissioning and Construction: Magnitude of change	Decommissioning and Construction: Significance of effect	Operation: Magnitude of Change	Operation: Significance of Effect
		Medium-low / Low – all remaining parts	Moderate / minor Not significant – all remaining parts	5.0 km south-east Medium-low / Low – all remaining parts	south, 5.0 km south-east Moderate / minor Not significant – all remaining parts
LCA 30: Sperrin Foothills	Medium-high	Medium–high or medium across southern part to ~5 km Medium-low or low across remaining parts No change	Major/ moderate or Moderate **Significant** across southern part to ~5 km Moderate or Moderate / minor Not significant across remaining parts No effect	Medium-high or medium across southern part to ~5 km Medium-low or low across remaining parts No change	Major/ moderate or Moderate **Significant** across southern part to ~5 km Moderate or Moderate / minor Not significant across remaining parts No effect
LCA 31: Burngibbagh and Drumahoe	Medium	Medium-low No change	Moderate / Minor Not significant No effect	Medium-low No change	Moderate / Minor Not significant No effect
LCA 13: Foyle Valley (RoI)	Medium	Medium-low No change	Moderate / Minor Not significant No effect	Medium-low No change	Moderate / Minor Not significant No effect
Sperrin AONB	Medium-high	Medium-high or medium out to ~4.5 km west, 5.0 km north, 4.0 km east, 2 km south, 5.0 km south-east Medium-low / Low – all remaining parts	Major/ moderate or Moderate **Significant** out to ~4.5 km west, 5.0 km north, 4.0 km east, 3 km south, 5.0 km south-east Moderate or Moderate / minor Not significant – all remaining parts	Medium-high or medium out to ~4.5 km west, 5.0 km north, 4.0 km east, 3 km south, 5.0 km south-east Medium-low / Low – all remaining parts	Major/ moderate or Moderate **Significant** out to ~4.5 km west, 5.0 km north, 4.0 km east, 3 km south, 5.0 km south-east Moderate or moderate / minor Not significant – all remaining parts
VP1: Koram Road, Ligfordrum.	High – residents / Medium-high – road-users	Medium – residents / Medium-low – road users	Major / Moderate or moderate **Significant**	Medium – residents / Medium-low – road users	Major / moderate or Moderate **Significant**

Receptor	Sensitivity	Decommissioning and Construction: Magnitude of change	Decommissioning and Construction: Significance of effect	Operation: Magnitude of Change	Operation: Significance of Effect
VP2: Koram Road, north of Ligfordrum.	High – residents / Medium-high – road-users	Medium-low	Moderate **Significant**	Medium-low	Moderate **Significant**
VP3: Napple Road, Ballykeery Bridge.	Medium-high – road-users	Medium-high	Major / moderate **Significant**	High	Major **Significant**
VP4: Moor Lough picnic area.	High	High	Major **Significant**	High	Major **Significant**
VP5: Holyhill Road, Holly Hill	High – residents / Medium-high – road-users	Medium-high	Major or major / moderate **Significant**	Medium-high	Major or major / moderate **Significant**
VP6: President Wilson's House	Medium-high	Medium-low	Moderate Not significant	Medium-low	Moderate Not significant
VP7: Strathmourne Road, Strabane	Medium	Medium	Moderate Not significant	Medium	Moderate Not significant
VP8: Victoria Bridge	Medium-high – residents / Medium – road-users	Low	Moderate / minor or minor Not significant	Low	Moderate / minor or minor Not significant
VP9: Harry Avery's Castle, Newtownstewart	Medium-high	Low	Moderate / minor Not significant	Low	Moderate / minor Not significant
VP10: Slievebeg Road, Slievebeg	Medium-high – residents / Medium – road-users	Medium-low	Moderate or moderate / minor Not significant	Medium-low	Moderate or moderate / minor Not significant
VP11: B48 Ballynamallaght	Medium-high – residents / road-users	Medium	Moderate **Significant**	Medium	Moderate **Significant**
VP12: B48 Dunnamanagh	Medium-high – residents / road-users	Medium	Moderate **Significant**	Medium	Moderate **Significant**
VP13: Lenamore picnic site, above Gortin	High	Medium-low	Moderate Not significant	Medium-low	Moderate Not significant

Receptor	Sensitivity	Decommissioning and Construction: Magnitude of change	Decommissioning and Construction: Significance of effect	Operation: Magnitude of Change	Operation: Significance of Effect
VP14: Ulster Way at Bolaght Mountain above Castlederg	Medium-high	Low	Moderate / minor Not significant	Low	Moderate / minor Not significant
VP15: Foreglen Road, Killaloo	Medium-high – residents / Medium– road-users	Low	Moderate / minor or minor Not significant	Low	Moderate / minor or minor Not significant
VP16: A5, Strule River Valley	Medium-high – residents / road-users	Medium-low	Moderate Not significant	Medium-low	Moderate Not significant
VP17: Bells Park Road, Glebe	Medium-high – residents / Medium– road-users	Low	Moderate / minor or minor Not significant	Low	Moderate / minor or minor Not significant
VP18: Mullaghclogha, Sperrin Mountains	Medium-high	Medium-low	Moderate Not significant	Medium-low	Moderate Not significant
VP19: Ballindrait	Medium-high – residents / Medium– road-users	Low	Moderate / minor or minor Not significant	Low	Moderate / minor or minor Not significant
VP20: Meendamph Road, Crockrour Hill	Medium-high	High	Major **Significant**	High	Major **Significant**
VP21: Glenmornan	High – residents / Medium-high – road-users	Medium-high	Major or major / moderate **Significant**	High	Major or major / moderate **Significant**
VP22: Aghafad Road	Medium-high	Medium	Moderate **Significant**	Medium	Moderate **Significant**
VP23: Bessy Bell	Medium-high	Low	Moderate / minor Not significant	Low	Moderate / minor Not significant
VP24: Silverhill Road	High – residents / Medium-high – road-users	High	Major **Significant**	High	Major **Significant**
VP 25: Raphoe	Medium-high – residents / road-users	Low	Moderate / minor Not significant	Low	Moderate / minor Not significant

In respect of the physical effects on landscape elements, the assessment found no significant effects would arise in relation to the loss of the rough grass moorland as a result of the construction of the Development. The losses would comprise only a small proportion of a much wider landscape resource and would occur in an area where operational Owenreagh I and II wind farms occur and where the upland landscape has been modified by farming and forestry practices. Rough grass moorland would be relatively easy to re-establish either post-construction (including in the areas where the operational Owenreagh I and II turbines and infrastructure will be decommissioned and removed) or post-final-decommissioning, depending on the short, or long-term use of the area. This would occur across all parts where infrastructure would be removed and therefore with the exception of where tracks will be retained.

The assessment of effects on landscape character found that significant effects, during the decommissioning and construction phase and the operational phase would arise as a result of the Development within parts of three of the LCAs that occur in the Study Area. Those parts of the LCTs that would undergo significant effects are as follows:

- LCA 29 Sperrin Mountains - during the decommissioning and construction phase and the operational phase across the north-western part of the LCA out to approximately 4.5 km to the west, 4.0 km to the east, 5.0 km to the south-east and 3.0 km to the south;
- LCA 30 Sperrin Foothills - during the decommissioning and construction phase and the operational phase across southern part of the LCA out to approximately 5 km; and,
- LCA 27 Foyle Valley - during the decommissioning and construction phase and the operational phase across eastern part of the LCA out to approximately 5 km.

Collectively, these significant effects would extend out to a radius of approximately 4.5 km to the west, 5 km to the north-west, 5 km to the north, 4.0 km to the east, 5.0 km to the south-east and 3 km to the south. The effect of the Development on all other LCTs and LCAs during the decommissioning and construction phase and the operational phase would be not significant.

A detailed assessment of the effects on the Sperrin AONB found that the Development would give rise to significant effects on those parts of the AONB that correspond with the extent of the significant effects on the three LCAs as described above.

The assessment of the effects of the Development has found that significant effects would occur during the decommissioning and construction phase and the operational phase at 11 of the 25 viewpoints. The viewpoints significantly affected during the decommissioning and construction and operational phases all lie within a 6 km radius of the Development and comprise:

- Viewpoint 1: Koram Road, Ligfordrum;
- Viewpoint 2: Koram Road, north of Ligfordrum;
- Viewpoint 3: Napple Road, Ballykeery Bridge;
- Viewpoint 4: Moor Lough Picnic Area;
- Viewpoint 5: Holyhill Road, Holly Hill;
- Viewpoint 11: B48 Ballynamallaght;
- Viewpoint 12: B48 Dunnamanagh;
- Viewpoint 20: Meendamph Road, Crockrour Hill
- Viewpoint 21: Glenmornan;
- Viewpoint 22: Aghafad Road; and,
- Viewpoint 24: Silverhill Road.

The viewpoints would mostly be affected owing to either their close proximity to the decommissioning and construction works and operation of the Development, or their greater sensitivity from their location in the Sperrin AONB or representing residents. All viewpoints beyond this range would not be significantly affected as a result of the Development.

In respect of the principal visual receptors, settlements within approximately 6 km to the north and east, and within approximately 5 km to the south and west, are considered likely to experience significant effects during the decommissioning and construction phase and the operational phase, although these effects would be localised within the settlements in relation to the extent and level of actual visibility. Road users within approximately 5 km would experience significant effects, and the NCR 92 would be significantly affected across a short section of the route to the south of the Site, within 6 km.

The most relevant wind farms to the cumulative assessment are operational and these form part of the baseline situation. The assessment of the Development in addition to the cumulative situation is, therefore, partly covered by the main assessment as this takes into account all the operational wind farms, including developments within the Slieve Kirk range to the north. Significant cumulative effects are not considered to arise as a result of the Development, due to the limited intervisibility of the Development with consented and application stage wind farms across the Study Area.

Appendix A6.2 sets out the assessment of effects on residential visual amenity. The RVAA has assessed 54 of the 79 properties within the RVAA Study Area to experience significant visual effects. However, the Development is not considered to lead to the 'Residential Visual Amenity Threshold' being reached in respect of any of these properties. That is to say, the Development does not have the potential to give rise to overbearing or over whelming effects on any of the properties in respect of the visual amenity of residents at the property.

Appendix A6.3 sets out the assessment of night-time effects as a result of visible aviation lighting on the peripheral turbines. At night the turbines would not in themselves be conspicuous during times of darkness. Nevertheless, the assessment of night-time effects for the Development has predicted a significant effect for one of the three representative night-time viewpoints, namely at Viewpoint 4: Moor Lough as a result of the 2000 cd scenario and the 200 cd scenario. For the other representative viewpoints, the effect is assessed as not significant.

In summary, the Development would give rise to significant effects on landscape character during the decommissioning and construction phase and the operational phase of the Development, albeit contained within the localised extent of approximately 5 km. It would also give rise to significant effects on visual amenity out to approximately 6 km during the decommissioning and construction phase and the operational phase of the Development.

While landscape and visual receptors beyond these ranges may be affected by the influence of the Development, these effects would not be significant. Furthermore, not all landscape and visual receptors within these ranges would be significantly affected, for example tracts of landscape enclosed by forest cover or where screening by landform occurs. No significant cumulative effects would occur.

All effects during the decommissioning and construction of the Development would be short-term and reversible and all effects during the operation of the Development would be long-term and reversible. All effects would be adverse in nature.

6.11 Statement of Significance

The rationale for site selection and scheme design is presented in **Chapter 4: Site Selection and Design**. The suitability of the Site relates to the existing influence of the Owenreagh I and II Wind Farms, which establish wind farm development as a feature of the baseline context in this local area and much of the visibility of the Development would occur in areas where the Owenreagh I and II Wind Farms are currently visible, as shown on the cumulative ZTV on Figure 6.13. The 15 Owenreagh I and II turbines at a blade tip height of 60 to 66 m, would be replaced by 14 proposed turbines at a blade tip height of 156.5 m, which is a reduction from the original proposal of a blade tip height of 180 m in response to concerns from statutory consultees regarding height.

The LVIA has found that there will be significant effects on landscape and visual receptors within the local area around the Development. Such effects are to be expected within the local area around the Development, as these tall and dynamic structures will have direct and indirect effects on landscape character out to approximately 5 km and indirect effects on visual amenity out to approximately 6 km (in locations and in conditions from where clear views towards the Development are available). While landscape and visual receptors beyond these ranges may gain views of the Development, these effects would not be significant. Furthermore, not all landscape and visual receptors within these ranges would be significantly affected, for example tracts of landscape enclosed by forest cover or where screening by landform occurs. Significant effects would, therefore, be contained within a localised area and occur intermittently within that localised area.

6.12 Glossary

Term	Definition
The Site	The land on which the Development is to be built (see Figure 3.1).
The Development	Refers to all elements of the application for Owenreagh / Craignagapple Wind Farm. These elements include the wind turbines, all site infrastructure and access tracks.
The Applicant	Ørsted Onshore Ireland Midco Limited.
Study Areas	Refers to areas which are considered as part of the assessment process. Guidance from Department for the Environment indicates that an area with a radius of 30 km from the nearest turbines is an appropriate Study Area for the LVIA.
The Council	Refers to Derry City and Strabane District Council.
EIA Regulations	Refers to The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 as amended.
The Onsite Substation and Control Building	Refers to the onsite substation and control building including the compound in which it is located.
The Scoping Opinion	Refers to the formal response to the Scoping Request made by statutory consultees.
T1, T2 etc	Refers to individual proposed wind turbines within the Development.

The Netherlands
New Zealand
Norway
Panama
Peru
Poland
Portugal
Puerto Rico
Romania
Singapore
South Africa
South Korea
Spain
Sweden
Switzerland
Taiwan
Tanzania
Thailand
UK
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Vietnam

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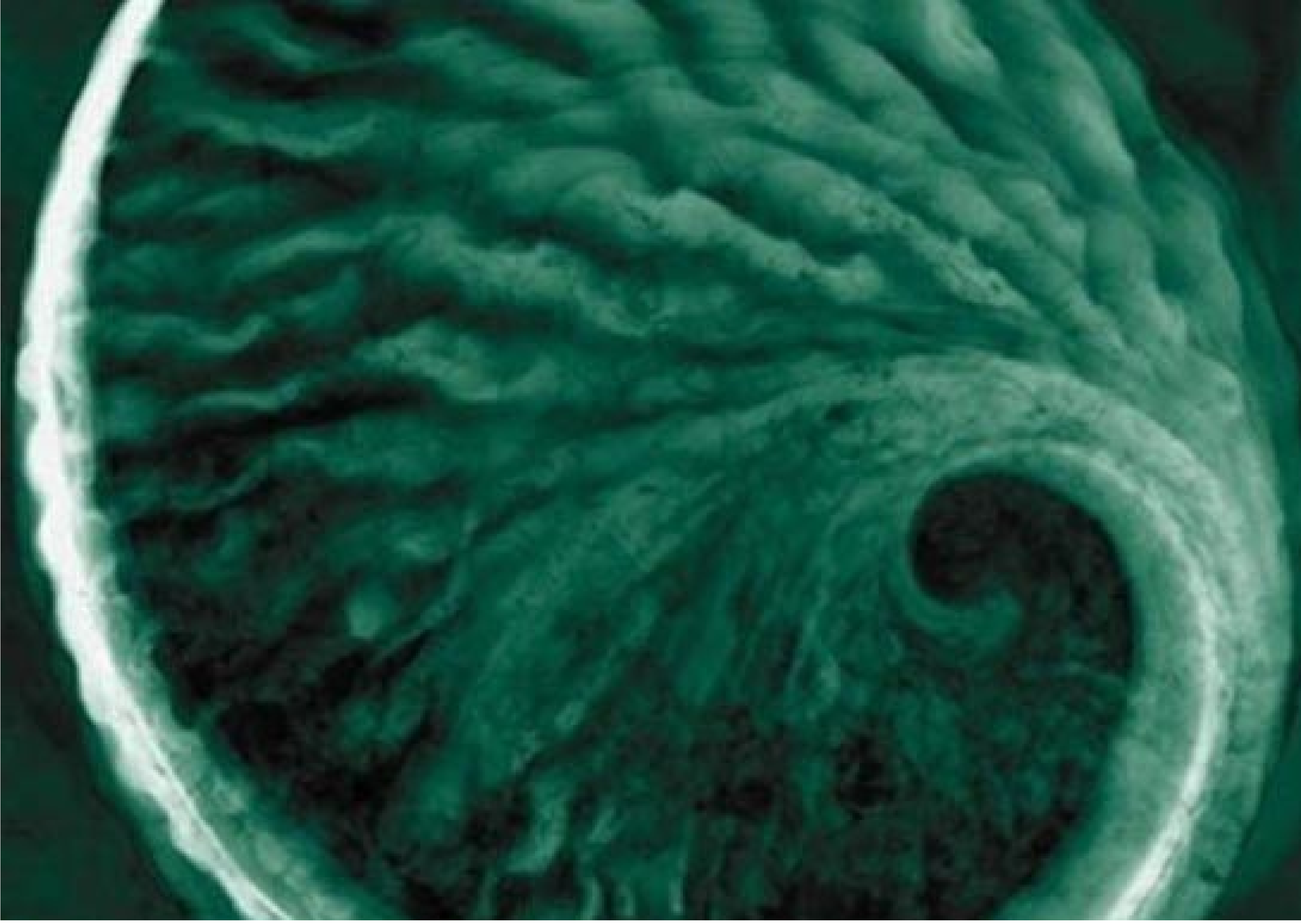


Ørsted Onshore Ireland Midco Limited

Owenreagh/Craignagapple Wind Farm

Environmental Statement – Chapter 7
Archaeology and Cultural Heritage

12 September 2023

Project No.: 0696177

The business of sustainability

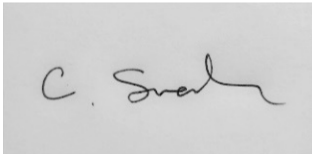
ERM

Signature Page

12 September 2023

Owenreagh/Craignagapple Wind Farm

Environmental Statement – Chapter 7 Archaeology and Cultural Heritage



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CONTENTS

List of Tables

Acronyms and Abbreviations

Name	Description
ACoW	Archaeological Clerk of Works
ALR	Abnormal Load Route
AOD	Above Ordnance Datum
BS	Battlefield Sites
CIfA	Chartered Institute for Archaeologists'
CHVP	Cultural Heritage Viewpoint
CSA	Core Study Area
DBA	Desk-based Assessment
DfC	Department for Communities
DCSDLDP	Derry City Strabane District Local Development Plan
EIA	Environmental Impact Assessment
ES	Environmental Statement
HB	Historic Buildings
HED	Historic Environment Division
HNUS	Historic Nucleated Urban Settlements
HPG	Historic Park and Gardens
ICOMOS	International Council on Monuments & Sites
LB	Listed Buildings
LVIA	Landscape Visual Impact Assessment
NGR	National Grid Reference
NI	Northern Ireland
NIAH	National Inventory of Architectural Heritage
NISMR	Northern Ireland Sites and Monuments Records
OSNI	Ordnance Survey Northern Ireland
PPS	Policy Planning Statement
RMP	Record of Monuments and Places
ROI	Republic of Ireland
SM	Scheduled Monuments
SMR	Sites and Monuments Records
SPPS	Strategic Planning Policy Statement
VP	Viewpoint
ZTV	Zone of Theoretical Visibility

7. ARCHAEOLOGY AND CULTURAL HERITAGE

7.1 Introduction

This Chapter of the Environmental Statement (ES) evaluates the likely significant effects of the Owenreagh / Craignagapple Wind Farm (the Development) on cultural heritage and archaeology resources. This assessment was undertaken by Environmental Resources Management Limited (ERM).

This Chapter of the ES includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects; and,
- Statement of Significance.

This Chapter is supported by the following Technical Appendix documents and their associated figures provided in **Volume 4** Technical Appendices:

- **Technical Appendix A7.1: Owenreagh / Craignagapple Wind Farm Archaeological Desk-Based Assessment (DBA);**
- **Technical Appendix A7.2: Setting Sieving Exercise for Designated Assets Between 5 and 15 km;**
- **Technical Appendix A7.3: Assessment of Indirect Effects for Designated Assets within 5 km;**
- **Technical Appendix A7.4: Assessment of Indirect Effects for Designated Assets Between 5 and 15 km;**
- **Technical Appendix A7.5: Cultural Heritage Wirelines;**
- **Figure A7.1.1: Site Location and Study Areas;**
- **Figure A7.1.2: Non-Designated Assets within CSA and 1 km Study Area;**
- **Figure A7.1.3: Designated Assets within the 1 km Study Area;**
- **Figure A7.1.4: OS Map 1832-1846;**
- **Figure A7.2.1: Designated Assets within 15km ZTV North Eastern Quadrant (NI);**
- **Figure A7.2.2: Location of Curryfree and Slieve Kirk WF to Designated Assets;**
- **Figure A7.2.3: Designated Assets within 15km ZTV South Eastern Quadrant (NI);**
- **Figure A7.2.4: Designated Assets within 15km ZTV South Western Quadrant (NI);**
- **Figure A7.2.5: Location of Bessy Bell WF to Designated Assets;**
- **Figure A7.2.6: Designated Assets within 15km ZTV South Western Quadrant (ROI);**
- **Figure A7.2.7: Designated Assets within 15km ZTV North Western Quadrant (NI);**

- **Figure A7.2.8: Designated Assets within 15km ZTV North Western Quadrant (ROI);**
- **Figure A7.3.1: Designated assets within 5 km Study Area;**
- **Figure A7.4.1: Designated Assets within 15km Study Area (NI); and,**
- **Figure A7.4.2: NIAH and SMR Assets within15km Study Area (ROI).**

The assessments presented in the Technical Appendices are supported by the following visualisations provided in **Volume 3c**:

- **Figure 6.26a-f: VP1 - Koram Road, Ligfordrum;**
- **Figure 6.27a-f: VP2 - Koram Road, north of Ligfordrum;**
- **Figure 6.28a-e: VP3 - Napple Road, Ballykeery Bridge;**
- **Figure 6.29a-f: VP4 - Moor Lough picnic area;**
- **Figure 6.30a-e: VP5 - Holyhill Road, Holly Hill;**
- **Figure 6.31a-d: VP6 - President Wilson's House;**
- **Figure 6.32a-d: VP7 - Strathmourne Road, Strabane;**
- **Figure 6.33a-e: VP8 - Victoria Bridge;**
- **Figure 6.34a-g: VP9 - Harry Avery's Castle, Newtownstewart;**
- **Figure 6.35a-d: VP10 - Slievebeg Road, Slievebeg;**
- **Figure 6.36a-d: VP11- B48 Ballynamallaght;**
- **Figure 6.37a-f: VP12 - B48 Dunnamanagh;**
- **Figure 6.38a-d: VP13 - Lenamore picnic site, above Gortin;**
- **Figure 6.39a-g: VP14 - Ulster Way at Bolaght Mountain above Castlederg;**
- **Figure 6.40a-e: VP15 - Foreglen Road, Killaloo;**
- **Figure 6.41a-d: VP16 - A5, Strule River Valley;**
- **Figure 6.42a-e: VP17 - Bells Park Road, Glebe;**
- **Figure 6.43a-g: VP18 - Mullaghclogha, Sperrin Mountains;**
- **Figure 6.44a-d: VP19 - Ballindrait;**
- **Figure 6.45a-g: V P20 - Meendamph Road, Crockrour Hill;**
- **Figure 6.46a-d: VP21- Glenmornan;**
- **Figure 6.47a-e: VP22 - Aghafad Road;**
- **Figure 6.48a-g: VP23 - Bessy Bell;**
- **Figure 6.49a-e: VP24 - Silverhill Road; and,**
- **Figure 6.50a-e: VP25 - Raphoe**

7.2 Legislation, Policy and Guidance

Relevant heritage legislation, policy and guidance is listed below, with a detailed review provided within **Technical Appendix A7.1: DBA**. Further details on relevant legislation, policy, and guidance are provided in **Chapter 5: Policy and Legislative Context** and the **Planning Statement**.

7.2.1 Legislation

Statutory protection for archaeology and cultural heritage is principally outlined in:

- Ancient Monuments and Archaeological Areas Act (1979)[1], as amended;
- The Planning (Listed Buildings) Regulations (Northern Ireland) 2015[2]; and,
- Historic Monuments and Archaeological Objects (Northern Ireland) Order 1995[3];

7.2.2 National Policy

- Planning Policy Statement (PPS) 6: Planning, Archaeology and Built Heritage (March 1999)[4]; and,
- Strategic Planning Policy Statement for Northern Ireland (SPPS)[5] (September 2015).

7.2.3 Local Policy

- The Strabane area plan 1986-2001; and,
- Derry City and Strabane District Local Development Plan 2032 (Draft)[6]

7.2.4 Relevant Guidance

At present, there is no specific guidance in Northern Ireland for assessing archaeological impacts; however, several government and professional organisations have established guidelines relevant to assessing development impacts on archaeology and cultural heritage which are considered best practice. These include:

- Standards and Guidance for Archaeological Desk-Based Assessments provided by the Chartered Institute for Archaeologists (CIfA)[7];
- International Council on Monuments and Sites (ICOMOS) guidance on Heritage Impact Assessments[8];
- HED Conservation Principles: Guidance for the sustainable management of the historic environment in Northern Ireland[9]; and,
- HED Guidance on Setting and the Historic Environment.[10]

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[1] Ancient Monuments and Archaeological Areas Act (1979). Available at http://www.legislation.gov.uk/ukpga/1979/46. [Accessed on 02/02/2023].
[2] Planning (Listed Buildings) Regulations (Northern Ireland) 2015. Available at http://www.legislation.gov.uk/nisr/2015/108/contents/made [Accessed on 02/02/2023].
[3] https://www.legislation.gov.uk/nisi/1995/1625/contents/made
[4] Department of the Environment (1999) PPS 6: Planning, Archaeology and the Built Heritage. Available at https://www.planningni.gov.uk/index/policy/planning_statements_and_supplementary_planning_guidance/pps06-archaeology-built-heritage.pdf [Accessed on 02/02/2023].
[5] Department of the Environment (2015) Strategic Planning Policy Statement for Northern Ireland (SPPS). Available at Strategic Planning Policy Statement for Northern Ireland (SPPS) (infrastructure-ni.gov.uk) [Accessed 06/02/2023]
[6] Draft Derry City & Strabane - Local Development Plan (LDP) 2032 (derrystrabane.com) [accessed 06/02/2023]
[7] Chartered Institute for Archaeologists (December 2014, Updated January 2017 and October 2020) Standards and Guidance for Historic Environment Desk-Based Assessment. Available at CIfAS&GDBA_4.pdf (archaeologists.net) [Accessed 06/02/2023]
[8] icomos_guidance_on_heritage_impact_assessments_for_cultural_world_heritage_properties.pdf (iccrom.org) [accessed 06/02/2023]
[9] SNH and HESHED (2021). Conservation Principles: Guidance for the sustainable management of the historic environment in Northern Ireland HED Conservation Principles - Guidance for the sustainable management of the historic environment in Northern Ireland (belfastcity.gov.uk) [Accessed 1406/042/2023]
[10] HED 2018 Guidance on Setting and the Historic Environment https://www.communities-ni.gov.uk/sites/default/files/publications/communities/guidance-on-setting-and-the-historic-environment.pdf [Accessed 14/04/2023]

7.3 Assessment Methodology and Significance Criteria

7.3.1 Scoping Responses and Consultations

Consultation for this ES topic was undertaken with the organisations shown in Table 7.1.

Table 7.1. Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Department for Communities (DfC) Historic Environment Division (HED)	Scoping Response, 26th September 2021	HED (Historic Monuments) broadly agrees with the scope of the assessment presented within this report. However, the applicant should consider the results of the Zone of Theoretical Visibility (ZTV) to widen the list of viewpoints selected for assessment. This should include Scheduled and State Care monuments further out than 5km from the site as the proposed turbines are much taller than the existing turbines and may have an impact on the setting or views from monument further away. The applicant should also consider the impact on the non-statutorily protected monuments much closer to the application site as these will not have been previously considered. The mitigation methodology should also include mitigation for cabling trenches.	A full assessment into the potential effects on cultural heritage assets, including that of setting impacts, has been undertaken in Section 7.5 of this Chapter. At the time Scoping was submitted, no ancillary infrastructure had been agreed. Ancillary infrastructure locations have now been confirmed and can be seen in Figure 3.1 of this ES, with heritage assets on Figure A7.1.2 and A7.1.3. A cumulative assessment is presented in Section 7.7 of this Chapter.
Department for Communities (DfC) Historic Environment Division (HED)	Teams Meeting 4th November 2021	ERM consulted with DfC HED regarding the wider heritage considerations, regional heritage sites and monuments, and regional heritage areas for consideration in the heritage assessment as part of the Application. Key assets included Holy Hill House (T-022), Standing Stone and Stone Circle (TYR 006:007), Killeen (TYR 011:017), 6 Balbane Road Donemana Strabane (HB10/09/28), Prehistoric Landscape (TYR 006:046) and Prehistoric Landscape of the Inver Burn Valley, including TYR 006:004, TYR 006:022, TYR 006:030, TYR 011:018 and TYR 006:006. HED gave general agreement that assets included were the key considerations, but also	ERM agreed to include Harry Avery's Castle (TYR 017:012).

		mentioned Harry Avery's Castle (TYR 017:012). HED also indicated that where assets were omitted, clarification should be provided on why said assets were omitted.	
Department for Communities (DfC) Historic Environment Division (HED)	Phone call re proposed visualisations 13th January 2023- JUNO Planning and HED	In response to the final design layout and supporting wireframe visualisations from key assets previously discussed, provided by ERM and issued by JUNO to HED by e-mail. HED were satisfied with the visualisation proposals. Requested that where there are assets that have not been selected that clarification text should be provided detailing why these assets were not included in the visualisations.	The visualisations are included within **Technical Appendix A7.5: Cultural Heritage Wirelines** and further viewpoint visualisations are provided in Figure 6.26 through 6.50. These are discussed further in **Technical Appendices A7.2 through A7.4**.

7.3.2 Scope of Assessment

The assessment of potential cultural heritage impacts relating to the Development is focused upon physical (direct) effects to Cultural Heritage assets and changes to setting (indirect) effects. As defined by HED *'the term 'setting' applies to the physical space that is part of – and contributes to – the significance and distinctive character of a heritage asset, and through which the asset may be seen, experienced, understood and enjoyed.'*

A direct impact is an effect upon features of cultural heritage interest, where sites or potential sites / buried archaeology are in danger of being physically disturbed or destroyed. Direct effects are likely to occur during the construction of the Development and are considered permanent and irreversible.

An indirect effect is any change to the setting of a heritage asset that affects its cultural significance or the way in which it is valued by both specialists and the wider public.

The potential effects from the Development to cultural heritage assets are:

- Permanent, direct effects due to land take by infrastructure associated with the Development;
- Temporary, indirect effects arising from the decommissioning and construction phase, such as noise and higher vehicular and pedestrian activity, which may cause reduced access to and / or reduced appreciation of the historical environment; and,
- Indirect effects during operation of the Development, including changes to the settings of cultural heritage assets, which may affect cultural significance. These are largely visual effects and are likely to occur as a consequence of the height and breadth of the Development. They are especially likely to occur on cultural heritage assets located on high ground where their historical significance lies in the wider landscape setting including long-distance views to, and from, the asset.

As part of the scoping exercise and pre-application consultation, several cultural heritage viewpoints (CHVPs) were selected to represent various locations in the landscape and heritage asset locations. The CHVP visualisations form part of this ES and are detailed in Section 7.1 and are further addressed in **Chapter 6: Landscape Visual Impact Assessment (LVIA)**.

7.3.3 Study Area / Survey Area

To inform the assessment, Study Areas were defined based upon the likelihood of potential significant effects upon archaeology and cultural heritage, as summarised in Table 7.2. These Study Areas were determined based on relevant guidance, professional judgement, and best practice.

Table 7.2. Study Areas

Effect	Name	Range	Description
Direct (Known Archaeology)	Core Study Area (CSA)	The Scoping Site Boundary	Area used to establish the baseline within the DBA (**Technical Appendix A7.1).**
Direct (Known Archaeology)	Potential Development Footprint with 50 m micrositing allowance	Potential Development Footprint as shown on Figure A7.1.1	Area within which the Development may have direct effects upon known, and unknown, archaeological remains.
Direct (Informing Archaeological Potential)	1 km DBA Study Area	1 km radius surrounding the CSA as shown on Figure A7.1.1	Area used to ensure a full understanding of the archaeological potential for unknown subsurface archaeology to survive within the CSA. Further details are provided in **Technical Appendix A7.1: DBA**.
Setting (Indirect Effects)	5 km Setting Study Area	5 km radius from CSA as shown on Figure A7.3.1	All designated assets within 5 km of the CSA were assessed for changes to setting. Further details are provided in **Technical Appendix A7.3: Assessment of Indirect Effects for Designated Assets within 5 km**.
Setting (Indirect Effects)	15 km Setting Study Area	15 km radius from CSA as shown on Figures A7.4.1 and A7.4.2	A review was undertaken for all designated heritage assets between 5-15 km to identify heritage assets for inclusion in the consideration of changes to setting as detailed in **Technical Appendix A7.2: Setting Sieving Exercise for Designated Assets Between 5 and 15 km**. The final selection of heritage assets included in the assessment is based on their location within the ZTV or, where views across an asset may include the Development, with consideration for the contribution of long-distance views and distant landscape context contribution to cultural significance. The final selection of designated heritage assets assessed for changes to setting is detailed in **Technical Appendix A7.4: Assessment of Indirect Effects for Designated Assets Between 5 and 15 km**.

7.3.4 Elements Scoped Out of Assessment

An assessment of heritage potential and any impacts relating to a proposed Abnormal Load Route (ALR) has been scoped out of this ES Chapter, as set out in **Technical Appendix A2.3: Abnormal Load Route Works**.

All undesignated heritage assets were scoped out of the indirect effect assessment as part of the scoping exercise. Undesignated assets include DfC records for Historic Buildings (not Listed) and Northern Ireland Sites and Monuments Records (NISMR) not recognised as being Scheduled or under State Care.

All designated heritage assets within the 5 km Setting Study Area were considered for the indirect effect assessment (**Technical Appendix A7.3**), comprising 36 nationally designated heritage assets (15 Scheduled Monuments, 20 Listed Buildings and 1 Designated Park and Garden).

For heritage assets between the 5 and 15 km Setting Study Area, a sieving exercise (**Technical Appendix A7.2**) was undertaken to determine the designated heritage assets that lie within the Zone of Theoretical Visibility (ZTV) and / or for which their cultural significance relies on long-distance views and distant landscape context. Only those heritage assets identified as having potential to receive a change in setting as a result of the Development have been included in the assessment. The remainder of this section provides a summary of the sieving exercise and its results.

Designated Assets within Northern Ireland (NI) and the Republic of Ireland (ROI) are discussed separately within **Technical Appendix A7.2: Setting Sieving Exercise for Designated Assets Between 5 and 15 km** and the **Technical Appendix A7.4: Assessment of Indirect Effects for Designated Assets Between 5 and 15 km**.

Within Northern Ireland (NI) there are 231 nationally designated assets in the 15 km Setting Study Area. These assets consist of:

- 70 Scheduled Monuments or Monuments in State Care;
- Two Conservation Areas (Sion Mills and Newtownstewart);
- 153 Listed Buildings (3 Category A, 2 Category B, 20 Category B+, 55 Category B1 and 73 Category B2); and,
- Six Parks and Gardens.

There are no World Heritage Sites or Battlefield Sites within the 15 km Setting Study Area.

Within the Republic of Ireland (ROI) and the 15 km Setting Study Area there are 115 assets from the National Inventory of Architectural Heritage (NIAH) that consist of: Four Nationally Important structures and 111 Regionally Important structures. There are a further 136 assets recorded within the Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP).

There are no National Monuments, Heritage Towns or World Heritage Sites within the 15 km Setting Study Area.

Within NI, a review was carried out of:

- The ZTV (see Figure 6.5);
- Screening of views between assets and the CSA by modern infrastructure/existing turbines, trees and vegetation;
- The historic or archaeological links between assets and the CSA; and,
- The contribution of long distance views to the cultural significance of an asset.

This resulted in 172 nationally designated heritage assets (39 scheduled monuments and 130 listed buildings and three Parks and Gardens), of a combined total of 231 nationally designated assets, being scoped out of consideration for changes to setting that affects cultural significance.

With the ROI, the sieving exercise resulted in 88 NIAH assets of a total of 115 NIAH assets, being scoped out of consideration for changes to setting that affects cultural significance. A further 97 SMR/RMP assets have been scoped out.

All remaining assets within the 15 km Setting Study Area have been included for the setting appraisal. The final selection of assets scoped out of consideration are detailed in full within **Technical Appendix A7.2: Setting Sieving Exercise for Designated Assets Between 5 and 15 km**.

7.3.5 Design Parameters

The parameters of the design that influence the archaeological and cultural heritage assessment in relation to direct effects are based on the turbine layout and associated infrastructure, together with potential micrositing of these locations, as shown in Figure A7.1.1: Site Location and Study Area. No additional design parameters, other than those set out in **Chapter 3: Development Description** of this ES, are required for the assessment presented in this Chapter.

As set out in **Chapter 3: Development Description**, the turbines and associated infrastructure may be microsited up to 50 m, where constraints allow. Such relocations have been considered when undertaking this assessment, with mitigation recommended, where appropriate.

7.3.6 Baseline Survey Methodology

An archaeological and cultural heritage DBA was undertaken to review available documentary, cartographic, and photographic evidence to establish the baseline of the Site as well as its archaeological and cultural heritage potential in lines with best practice and guidance as detailed in **Technical Appendix A7.1: DBA.**

A site visit was undertaken in the March 2022 to identify and, where possible, record any previously unrecorded cultural heritage features within the Site. A general walkover of the area around the infrastructure associated with the Development and known archaeological sites were conducted. During the March 2022 visit, nearby heritage assets were visited to inform the indirect effects assessment. Full details of the walkover survey are provided in the DBA (**Technical Appendix A7.1**).

7.3.7 Methodology for the Assessment of Effects

The assessment of effects is based on the Development as detailed in **Chapter 3: Development Description**. This approach is in line with ICOMOS guidance (see Section 7.2.4). The assessment considers the sensitivity of a cultural heritage feature and the magnitude of any potential change, to conclude whether the effect is significant. The assessment conclusions are informed by professional judgement.

7.3.7.1 Sensitivity of Receptors

As a starting point, the value of the cultural heritage assets / receptors has been initially equated with designation status, as shown in Table 7.3 and more broadly defined in **Chapter 2: Methodology** of this ES.

Table 7.3. Framework for Determining the Value (Sensitivity) of Heritage Assets as Equated with Designation Status

Sensitivity Receptor	Definition
Very High	World Heritage Sites - these are internationally important.
High	Heritage Assets valued at a national level. These may include Scheduled Monuments, Category A Listed Buildings, Registered Battlefields, Historic Park and Gardens (HPGs) and nationally important archaeological features and selected Conservation Areas.
Medium	Heritage Assets valued at a regional level. These may include Category B+ Listed Buildings, regionally important archaeological features (as defined in the NISMR datasets) and most Conservation Areas.
Low	Heritage assets valued at a local level. These may include locally important Category B1/B2 Listed Buildings, and undesignated assets of local value (as defined in the NISMR datasets).
Negligible	Badly preserved and / or damaged or very common archaeological features and buildings of little or no value at local or any other scale

The key aspects in defining the value and sensitivity of a heritage asset are how these, along with setting, contribute to the cultural significance of the heritage asset.

Heritage assets derive their significance and distinctive character from a range of factors, cultural traditions and meanings, many of which will comprise aspects of their setting. These factors may include perceived social, spiritual, historic, artistic, aesthetic, natural, scientific or other cultural values[11].

The significance and distinctive character of a heritage asset is embodied in the physical fabric of the asset, as well as in its use, meanings, associations and relationships with other assets, places and objects. Our understanding of significance may change over time as a result of new information and research, or as a result of use and community values.

Settings can be complex and multi-faceted and any assessment of the setting of a heritage asset should include, as a minimum, consideration of the following aspects:

- Physical aspects of setting;
- Visual aspects of setting; and,
- Functional aspects of setting

Due to the unique qualities of each heritage asset, the sensitivity of a heritage asset's setting to change is variable and must be determined on a case-by-case basis for each receptor in lines with setting[10] and HED[12][13] guidance as per the following methodology:

- Identification of heritage assets that might be affected by the Development to include a summary of their cultural significance;
- Definition of the setting of the heritage assets and how this contributes to its cultural significance to determine its sensitivity to change; and,
- Assessment of the way in which the Development may change the setting and affect the cultural significance of the heritage asset (magnitude of change as discussed in Section 7.3.7.2 below).

7.3.7.2 Magnitude of Effect

Magnitude is the measure of change to a heritage asset's cultural significance as a result of the Development. In relation to cultural heritage, these changes are generally negative and are classified, for both direct and indirect effects, in line with the EIA Handbook as detailed in Table 7.4 and more broadly defined in **Chapter 2: Methodology** of this ES.

Table 7.4. Framework for Determining Magnitude of Effects

Magnitude of Effects	Definition
High	A fundamental change to the baseline condition of the asset, leading to total loss or major alteration of character.
Medium	A material, partial loss or alteration of character.

[11] DfC guidance on setting. Available at https://www.communities-ni.gov.uk/sites/default/files/publications/communities/guidance-on-setting-and-the-historic-environment.pdf [accessed on 06/02/2023]

[12] HED (2021). Conservation Principles: Guidance for the sustainable management of the historic environment in Northern Ireland HED Conservation Principles - Guidance for the sustainable management of the historic environment in Northern Ireland (belfastcity.gov.uk)
[Accessed 14/04/2023]

[13] HED 2018 Guidance on Setting and the Historic Environment https://www.communities-ni.gov.uk/sites/default/files/publications/communities/guidance-on-setting-and-the-historic-environment.pdf [Accessed 14/04/2023]

Low	A slight, detectable, alteration of the baseline condition of the asset.
Negligible	A barely distinguishable change from baseline conditions.

For the purpose of assessing indirect effects resulting from a change to setting, professional judgement and distance to the Development is considered the initial determinant in the degree of magnitude of any change that might be caused. Simple intervisibility with the Development is not necessarily considered to be harmful, unless this affects the cultural significance of the heritage asset so as to diminish its understanding, appreciation or experience. Where appropriate, consideration has been given to the effect that the Development will have on the settings of historical assets in views towards and across the asset when moving through the landscape, as well as in views towards the Development from the asset.

7.3.7.3 Significance of Effect

The sensitivity of the asset and the magnitude of the predicted effects will be used as a guide, in addition to professional judgement, to predict the significance of the likely effects. Table 7.5 summarises guideline criteria for assessing the significance of effects, which is more broadly defined in **Chapter 2: Methodology** of this ES.

Table 7.5. Framework for Assessment of the Significance of Effects

Magnitude of Effect	Sensitivity of Resource or Receptor				
	Very High	**High**	**Medium**	**Low**	**Negligible**
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

Effects predicted to be of major or moderate significance are considered to be ‘significant’ in the context of the EIA Regulations, and are shaded in light grey in the above table. Where a range of effect is predicted (i.e., Major/Moderate, Moderate/Minor, or Minor/Negligible), both professional judgement as well as consideration of cultural significance and the range of factors that could affect cultural significance, as detailed in the previous sections, are used to inform the final evaluation of the significance of effect.

7.3.7.4 Cumulative Effects

A cumulative effect is an additional effect upon cultural significance arising from the Development in combination with other consented or proposed developments likely to affect the cultural heritage environment. Existing operational wind farms and those with an application submitted have been considered as part of the baseline as detailed in Table 7.6.

Table 7.6. Wind Farms Considered as Part of the Baseline within 15 km Study Area[14]

Wind Farm Name	Status	Number of turbines	Blade tip height (m)	Approximate distance from Development (KM)
Ballykeery Road	Operational	1	85	1.5
Ballykeery Road 2	Application	1	85	1.6
Ballylaw Road	Operational	1	67	5.7
Bessy Bell I	Operational	10	59.75	15.4
Bessy Bell II	Operational	6	76	14.9
Bessy Bell II Extn.	Consented	4	115	15.6
Carrickatane	Operational	9	110	10.0
Castlewarren Road	Operational	1	59.5	10.4
Concess Road	Application	1	70.5	11.2
Curlyhill Road	Application	1	66.5	4.2
Curryfree	Operational	6	100	12.1
Drumcraig Road (19)	Operational	1	54	11.7
Dunnyboe Road	Application	1	76.5	3.4
Eglish Mountain	Operational	6	107	10.2
Greenville Road	Consented	1	68.5	13.7
Ligford Rd	Consented	1	55	4.8
Lislafferty Road	Operational	1	68.5	13.9
Lislafferty Road II	Operational	1	68.5	13.9
Loughan Road	Under Construction	1	26	6.5
Peacock Road	Operational	1	59.5	11.7
Rushall Road	Operational	1	63.5	13.9
Slieve Kirk	Operational	12	106.2	11.2

Table 7.6 and Section 6.9.19 of **Chapter 6: LVIA** demonstrate that there are no wind farms within a 10 km radius of the Development, only single turbines and the NIE grid connection 33kv overhead

[14] Note that the operational Owenreagh I and II Wind Farms are not included in this table. Although they are operational wind farms in the baseline, they will be removed as part of the Development and so would not remain following construction of the Development, so do not have the potential to contribute to cumulative effects.

power line for the Dalradian mine (Planning Ref: LA11/2019/1000/F). The size and location of these turbines and grid connection, combined with the baseline influence from the operational Owenreagh I and II Wind Farms, indicate that there would be limited cumulative interaction within 10 km arising from the addition of the Development.

Given the limited cumulative interaction within 10 km, for the purposes of the assessment of cumulative effects, only wind farm developments (in operation, planning or consented) between 10 and 15 km from the Development are considered for the potential to create a significant effect.

The potential for a significant cumulative effect is considered likely to occur only within the area where the ZTVs for each wind farm development would overlap, i.e. where each is theoretically simultaneously visible. The wind farms considered in the cumulative assessment are detailed in Table 7.7 and assessed in Section 7.7. Planned developments that have not entered the planning process have not been considered as there is limited information on the proposed layout of these wind farms at this stage.

Further detail on cumulative effects on landscape can be found in **Chapter 6: LVIA** of this ES. Locations of sites considered as part of the LVIA cumulative assessment are shown in Figure 6-12.

Table 7.7. Wind Farms Considered for Cumulative Assessment

Wind Farm name	Status (March 2022)	Number of Turbines	Blade Tip Height (m)	Approximate Distance and Direction (km)
Eglish Mountain	Operational	6	107	10.2km NE
Carrickatane	Operational	9	110	10.0 km NE
Lislafferty Road	Operational	1	68.5	13.9 km SW
Lislafferty Road II	Operational	1	68.5	13.9 km SW
Slieve Kirk	Operational	12	106.2	11.2 km NE
Curryfree	Operational	6	100	12.1 km NE
Drumcraig Road (19)	Operational	1	54	11.7 km N
Peacock Road	Operational	1	59.5	11.7 km SW
Rushall Road	Operational	1	63.5	13.9 km N
Bessy Bell II	Operational	6	76	14.9 km S
Bessy Bell I	Operational	10	59.75	15.4 km S
Castlewarren Road	Operational	1	59.5	10.4 km NE
Greenville Road	Consented	1	68.5	13.7 km
Concess Road	Application	1	70.5	11.2 km
Bessy Bell II Extn.	Consented	4	115	15.6 km S (1 turbine within 15 km)

7.3.8 Assessment Limitations

This assessment comprises a desk-based review of information taken from DfC datasets as well as a variety of secondary sources identified within **Technical Appendix A7.1: DBA**. Whilst this information is assumed to be accurate, it does not constitute a complete record of the historic environment and does not preclude the potential for hitherto unidentified archaeological remains or deposits to be encountered within the Site.

The setting site visits were undertaken from publicly accessible areas only, with limited access to private curtilage beyond the Site Boundary due to access restrictions at the time of survey.

Due to the restricted access of archival services during the COVID-19 pandemic, the historic environment baseline data has been primarily restricted to readily available digital sources only and on-site surveys. Given the trend of digitisation of historical records, which was accelerated by the pandemic, it is unlikely that any further significant information that could affect the baseline would be available on site.

7.3.9 Embedded Mitigation

Minimising and avoiding direct effects, setting effects and cumulative effects on heritage assets and archaeological features were considered as part of the design process, as detailed in **Chapter 4: Site Selection and Design.**

Key non-designated assets are 04116:000:00, 04121:000:00 a pair of Post-Medieval industrial assets located on the western edge of the CSA, TYR005:001, a Megalithic tomb located 1.6 km north of the nearest turbine, TYR006:008, a standing stone, located 1.7 km north of the nearest turbine and HB10/11/015, a non-listed historic building located 1 km north of the nearest turbine. Initial design layout and subsequent design iterations through to final layout of the Development have maintained a distance of at least 800 m from assets to the north and west, to avoid direct impacts and keep indirect impacts to a minimum. Assets to the east and south are largely screened by topography.

In addition, the final layout of the Development has sought to avoid heritage assets recorded within the Site, where feasible, in order to avoid direct impacts upon known archaeological features and securing preservation in situ. The results of a walkover survey undertaken as part of the DBA (**Technical Appendix A7.1**) were used to inform the location of turbines and associated access tracks, with Turbine 1 sited to ensure a suitable buffer to assets identified within the CSA (WS1, see Table 7.8 below). Direct impacts to WS1, a modern clearance cairn, may still be possible as a result of the micrositing of access tracks due to wider environmental constraints. Direct impacts to heritage assets are further explored in section 7.5 of this chapter.

7.4 Baseline Conditions

Full detail of the baseline conditions for the turbines can be found within the DBA (**Technical Appendix A7.1)**, which includes a brief description of the study areas' archaeological and historical sites within the context of the area's background history, presented by period. A summary of the baseline conditions presented in the DBA is provided in the following section.

In 2008 an archaeological watching brief was undertaken on groundworks associated with the installation of 6 new turbines and associated infrastructure of the Owenreagh II Wind Farm (Doc Ref: AE/08/01). No archaeological features were identified.

The Development site comprises upland moorland and pasture. A series of small watercourses drain off the hill and into the lowland areas. The area surrounding the Development site is rural in nature with scattered farmsteads, areas of enclosed pasture and plantation woodland at lower elevations c. 300 m Above Ordnance Datum (AOD; approximately sea level).

Designated Assets are defined as:

- Scheduled Monuments (SM) (sites and zones);
- Listed Buildings (LB);
- Historic Parks and Gardens (HPG);
- Conservation Areas;
- World Heritage Sites; and,
- Battlefield Sites (BS)

Whilst not Designated, Historic Buildings (HB) and Historic Nucleated Urban Settlements (HNUS) are also considered here.

There are no Designated Assets recorded within the CSA. There are two non-designated assets relating to the post-medieval period recorded within the CSA. A walkover survey undertaken as part of the DBA, did not identify these sites but did identify two previously unknown assets within the CSA (i.e. WS1 and WS2). A full list of assets identified within the CSA is provided within Table 7.8.

Table 7.8. List of Non-designated Assets within the CSA

Reference	Name	Period	Easting	Northing
04116:000:00	Still House	Post-Medieval	241040	397450
04121:000:00	Slate Quarry & Limekiln	Post-Medieval	240980	397340
WS2	Enclosure	Post-Medieval	241062	396944
WS1	Clearance Cairn	Modern	241647	397057

There are three Designated Assets recorded within the 1 km DBA Study Area. These consist of:

- Two Scheduled Monuments; and,
- One Listed Building.

A full list of designated assets identified within the 1 km DBA Study Area is provided within Table 7.9.

Table 7.9. List of Designated Assets within 1 km DBA Study Area

Designation	Main Ref	LB Grade	Description	Period	Location
SM	TYR005:014		Stone circle	Prehistoric	1 km N of CSA
SM	TYR011:017		Killeen	Early Christian	600 m SE of CSA
LB	HB10/09/028	B2	House and outbuilding	Post-Medieval	640 m E of CSA

Within the 1 km DBA Study area there are 14 non-designated assets listed within the DfC datasets, inclusive of a single Historic Building. A full list of non-designated assets identified within the 1km DBA Study Area is provided within Table 7.10.

Table 7.10. List of Non-designated Assets within 1 km DBA Study Area

Designation	Main Ref	Grade	Description	Period	Location
Not designated	TYR005:011		Carnanbane Megalithic tomb:	Prehistoric	680 m N of CSA
Not designated	TYR006:008		Standing stone	Prehistoric	720 m N of CSA
Not designated	TYR011:030		Mound	Uncertain	650 m SE of CSA
Not designated	HB10/11/015	HB	Moorlough shooting lodge	Post-medieval	60 m N of CSA

Not designated	TYR011:036		Mass rock	Post-medieval	450 m E of CSA
Not designated	04105:000:00		Corn kiln	Post-medieval	425m N of the CSA
Not designated	04106:000:00		Bridge	Post-Medieval	950 m NW of the CSA
Not designated	04107:000:00		Bridge	Post-Medieval	380 m NW of the CSA
Not designated	04108:000:00		Bridge	Post-Medieval	300 m N of the CSA
Not designated	04122:000:00		Still House	Post-Medieval	200 m W of the CSA
Not designated	04125:000:00		Old Still House	Post-Medieval	890 m W of the CSA
Not designated	04147:000:00		Bridge	Post-Medieval	15 m E of the CSA
Not designated	04148:000:00		Bridge	Post-Medieval	290 m E of the CSA
Not designated	04149:000:00		Bridge	Post-Medieval	500 m E of the CSA

There are no World Heritage Sites, Inventory Battlefields, Conservation Areas or Garden and Designed Landscapes within the CSA or 1 km DBA Study Area. The location of all assets is shown on Figures A7.1.2 and A7.1.3 and detailed in relation to the CSA within Tables 7.8-7.10 above.

The archaeological potential of the site is low in upland areas. The potential across the entire CSA for unknown assets predating the Post-Medieval period is low. There is high potential for Post-Medieval and modern finds and features. The known assets within the CSA date to the Post-Medieval and modern period, the bulk of these are located in the western half of the scheme at lower elevations. As such, it is considered probable that groundworks within these lower elevations have the potential to impact on known assets unless suitable mitigation measures are put in place. There is also the potential to impact previously unknown assets and individual finds.

A detailed baseline interpretation and summary of archaeological potential can be found within the DBA (**Technical Appendix A7.1)**. Proposed mitigation is detailed in Section 7.6 below.

7.4.1 Setting Study Area and Selected Heritage Assets for Consideration of Changes to Setting

All designated heritage assets within the 5 km Study Area were considered for the indirect effect assessment, totalling 36 nationally designated heritage assets (15 Scheduled Monuments, 20 Listed Buildings and one Designated Park and Garden.

Within the between 5 and 15 km Study Area in NI, the figure showing the ZTV of the turbines (Figure A7.4.1) indicates that the greatest potential intervisibility between heritage assets and the Development lies within 5-10 km of the CSA. The greatest potential for intervisibility from Scheduled Monuments within this zone is found to the north and north-east, between the Burndennett River Valley and the Slievekirk Hill range to the north, and between the Inver Burn River Valley and the Sperrin Hills to the East. A cluster of Scheduled Monuments are also recorded to the south in and around the Owenkillew River valley and between this river valley and the Curraghchosaly Mountain as shown on Figure A7.4.1. Within a distance of 5-10 km Listed Buildings and Parks and Gardens within the ZTV are typically clustered around settlement sites, to the west, south-west and south of the CSA, namely; Strabane, Sion Mills, Victoria Bridge, Newtownstewart and Gortin. To the north-west and north of the CSA, Listed Buildings are grouped around the settlements of Ballymagorry and

Donemana, with a scattering of Listed Buildings across the Slievekirk Hill Range and associated valleys.

Within a distance of 10-15 km from the CSA, Scheduled Monuments within the ZTV of the development site are chiefly located to the east of the CSA, just to the north of the Sperrin Hills around the settlement of Park, as well as to the south and south-west around the Strule River Valley and River Derg. Listed Buildings and Parks and Gardens within the ZTV are typically found grouped to the south, south-west of the CSA in and around the settlement sites of Gortin, Newtownstewart and to the west of the Bessy Bell hill range. A thin scattering of assets is also recorded to the north-east around and between the settlements of Park and Claudy.

With 172 heritage assets scoped out of consideration, all remaining assets within the 15 km Study Area have been included for the setting appraisal. The final selection includes 59 nationally designated heritage assets consisting of:

- 31 Scheduled Monuments;
- Three Parks and Gardens;
- Two Conservation Areas; and,
- 23 Listed Buildings.

Between the 5 and 15 km Study Area in the ROI, the ZTV of the turbines indicates that the greatest potential intervisibility between heritage assets and the Development lay to the north and north-west of Strabane, between the settlements of Lifford, Raphoe and Saint Johnston. Within 5-15 km, NIAH assets within this triangle are only obscured by when positioned behind the Binion Hill and Argery Hill. A second cluster of assets lay to the south-west of Strabane, along the length of the River Finn between Lifford and Castelfinn, and to the south of Castlefinn, as shown on Figure A7.4.2.

The final selection of heritage assets included in the assessment is based on falling within the ZTV of the Development, having a known historic or archaeological links between assets and the CSA, as well as the contribution of long-distance views to the cultural significance of an asset. Between a distance of 10-15 km assets were included only if they had a High Cultural Value or with a demonstrable historic or archaeological links between assets and the CSA.

With 88 NIAH heritage assets scoped out of consideration, plus 97 SMR/RMP records, all remaining assets within the 15 km Study Area have been included for the setting appraisal. The final selection includes 27 nationally designated heritage assets consisting of:

- 27 national Inventory of Architectural Heritage assets (2 Nationally important, 25 Regionally Important);
- 39 SMR/RMP records made up of:
  - Bawns;
  - Castles;
  - Hillforts;
  - Historic Towns;
  - Megalithic tombs;
  - Ringforts; and,
  - Standing stones.

7.5 Assessment of Potential Effects

7.5.1 Potential Decommissioning and Construction Phase Effects

7.5.1.1 Direct Effects

Direct effects are only likely to occur as a result of construction within the footprint of the Development. These effects are restricted to ground disturbance associated with construction activities set out in **Chapter 3: Development Description** as shown on Figure 3.1.

7.5.1.2 Direct Effects on the Known Heritage Resource

As shown in Table 7.2, asset WS1 is located approximately 100m south-west of turbine T1, which is outside the 50m micrositing allowance depicted in Figure 3.3; therefore, the potential for direct effects is unlikely. No known assets are recorded within the vicinity of the substation site and/or construction compound.

Table 7.11 lists all assets that have the potential for direct effects during construction of the core and ancillary Development infrastructure. These assets are within the CSA or within the 1 km Study Area.

Any asset included within this table is sited within 100 m of construction activity or on a possible access/transport route. This table subsequently provides information on any construction activities that will take place within 100 m of recorded assets and summarises the effect on that asset. Full details of each asset are provided within **Technical Appendix A7.1: DBA**.

Table 7.11. Recorded Assets Potentially Affected by Construction

Reference	Name	Period	Location	Direct Effect
WS1	Clearance Cairn	Modern	Within CSA	The asset is located within the locale of turbine T1. It is outside the 50 m buffer for micrositing of turbines but may be effected by vehicle/equipment movement during construction.

The asset listed in Table 7.11 are low value heritage assets, which could result in a moderate effect, should construction completely destroy or badly damage these assets. This moderate effect would be a likely **significant** effect in terms of EIA Regulations if suitable mitigation measures are not put in place to either protect the asset or record the asset ahead of it being disturbed.

As archaeology is a finite and irreplaceable resource, mitigation is proposed in Section 7.6 to reduce the potential effect and ensure preservation by record for any inadvertent effects.

7.5.1.3 Direct Effects on the Unknown Heritage Resource

Within the wider 5 km Setting Study Area assets firmly ascribed to the prehistoric period are all funerary or ritual monuments comprising tombs, stone circles or funerary cairns. Monuments dating to this period are generally sited on high ground or at lower elevations with commanding views. The nearest prehistoric asset is Carnanbie Megalithic Tomb (TYR005:011), located 680 m north of the CSA at the base of Owenreagh Hill.

The assets firmly ascribed to the Early Christian periods are predominantly settlement sites. These sites are typically located adjacent to watercourses with commanding views over river/stream valleys. The nearest Early Christian site to the CSA is however a burial site and not a settlement

(TYR011:017) and is located 540 m east of the CSA. The asset is sited c. 200 m AOD in a glen with a watercourse, between Owenreagh Hill and rising ground to the east.

No assets assigned to the Medieval period are recorded within the CSA or within the 5 km Setting Study Area.

Post-medieval assets within the 5 km Setting Study Area can be separated out into four categories; estates and private dwellings, religious buildings/sites, industrial assets comprising mills and quarries and infrastructure such as bridges. Two non-designated industrial assets are located within the CSA, including 04116:000:00 and 04121:000:00. Outside the CSA designated assets mostly comprise of Listed Buildings or Historic Buildings. These assets are largely located north-east, north and north-west of the CSA within existing settlements and Holy House and its Historic Park and Garden. The remaining designated assets securely dated to this period comprise religious monuments. Non-designated assets outside of the CSA comprise bridges and industrial sites.

Modern assets within the CSA comprise a single asset; clearance cairn WS1. Within the wider 5 km Study Area a single asset dating to the modern era is recorded, identified as HB10/09/025 is located 4.1 km north-east of the CSA.

Based on the baseline and walkover conducted for the DBA (**Technical Appendix A7.1**), the archaeological potential for previously unknown assets within the CSA is considered low in upland areas above 260m AOD (inclusive of turbines T2, T3 ,T4, T5, T6, T10, T11, and T12). The potential across the CSA for unknown assets predating the Post-Medieval period is considered low.

The known assets within the CSA date to the Post-Medieval and modern periods, the bulk of these are located in the western half of the scheme at lower elevations below 206 AOD (inclusive of turbines T1, T7, T8, T9, T13, and T14). As such, it is considered probable that any groundworks within these lower elevations would have the potential to impact on further unknown assets dating to this period.

Should any unknown subsurface archaeological deposits survive within the Development footprint, they have the potential to be damaged during decommissioning/construction phases. **In the absence of mitigation, this would be a low to high magnitude effect (see Table 7.4) on a receptor of between negligible and medium sensitivity (see Table 7.3), leading to effects of between negligible and moderate significance (see Table 7.5)**. Mitigation is proposed in Section 7.6 to ensure preservation in situ or by record should any unknown archaeology be present.

7.5.1.4 Indirect Effects

Any indirect likely significant effects on heritage assets during the decommissioning and construction phases will generally be limited to construction infrastructure (e.g., visual impact from cranes). Any effects would be short-term and less than during the operational phase. As such, indirect decommissioning and construction phase effects are considered as part of the potential operational effects.

7.5.2 Potential Operational Phase Effects

7.5.2.1 Direct Effects

There are no anticipated likely significant direct effects during the operational phase of the Development.

7.5.2.2 Indirect Effects

The assessment of likely significant indirect effects considers changes to setting to designated and regionally significant heritage assets within the CSA, 5 km Setting Study Area, and selected designated assets beyond 5 km and within the 15 km Setting Study Area.

The final selection of heritage assets included in the assessment is based on their location within the ZTV or where views across an asset may include the Development with consideration for the contribution of long-distance views and distant landscape context to cultural significance. The section criteria presented in **Technical Appendix A7.2: Setting Sieving Exercise for Designated Assets Between 5 and 15 km,** with the full indirect assessment text presented in **Technical Appendices A7.3: Assessment of Indirect Effects for Designated Assets within 5 km** and **A7.4: Assessment of Indirect Effects for Designated Assets Between 5 and 15 km**.

7.5.2.3 Indirect Effects – Within 5 km

The number of assets to be assessed within 5 km Setting Study Area totals 36, consisting of two scheduled monuments and a single listed building within the 1 km Study Area, as well as a further 13 scheduled monuments, 19 listed buildings and a single Park and Garden between 1 km and 5 km from the Development.

Of the 36 assets assessed, likely minor significance effects were identified for 11 assets (9 Scheduled Monuments, 1 Listed Buildings and 1 Historic Park and Garden). The remaining 25 assets were assessed as having likely negligible and/or no significant effects.

The full assessment for changes to setting is presented in **Technical Appendix A7.3** supported by Figure A7.3.1 with a summary presented in Table 7.12

Table 7.12. Summary of Potential Operational Effects – 5 km

Group	Asset Type	Reference	Grade	Asset Name	Sensitivity	Magnitude of Change	Likely Significance of Effect
Glenmornan: Stone Circle	Scheduled Monument	TYR005:014	N/A	Glenmornan: Stone Circle	High	Negligible	Minor
Lower Balix: Kileen	Scheduled Monument	TYR011:017	N/A	Lower Balix: Kileen	High	Negligible	Minor
6 Balbane Road Donemana	Listed Building	HB10/09/028	B2	6 Balbane Road Donemana	Low	Low	Negligible
Inver Burn Neolithic and Bronze Age Ritual and Funerary monuments	Scheduled Monument	TYR011:018	N/A	Wedge Tomb & Stone Circle: Giant's Grave	High	None	None
	Scheduled Monument	TYR006:006	N/A	Court Tomb: The White Rocks	High	None	None
	Scheduled Monument	TYR011:019	N/A	Clogherny: Five Stone Circles	High	None	None
	Scheduled Monument	TYR006:022	N/A	Doorat: Two stone circles and alignment	High	None	None
	Scheduled Monument	TYR006:030	N/A	Doorat: Two Stone Circles, standing stone & alignment	High	Negligible	Minor
Artigarvan Neolithic Funerary monuments	Scheduled Monument	TYR002:007	N/A	Wedge Tomb & Stone Circle: Giant's Grave	High	Negligible	Minor
	Scheduled Monument	TYR005:002	N/A	Windyhill. Giants Grave Wedge Tomb	High	Negligible	Minor

Wedge Tomb: Dermot and Grania's Bed	Scheduled Monument	TYR005:010	N/A	Wedge Tomb & Stone Circle: Giant's Grave	High	Negligible	Minor
Meendamph: Two stone circles and alignment	Scheduled Monument	TYR006:007	N/A	Meendamph: Two stone circles and alignment	High	Negligible	Minor
Mennagorp: Court Tomb	Scheduled Monument	TYR011:012	N/A	Mennagorp: Court Tomb	High	None	None
Balix Lower:Cashel	Scheduled Monument	TYR006:004	N/A	Balix Lower: Cashel	High	None	None
Lisnargh Irish: Rath	Scheduled Monument	TYR006:015	N/A	Lisnargh Irish: Rath	High	Negligible	Minor
Silver Brook House	Scheduled Monument	TYR006:048	N/A	Silver Brook House	High	Negligible	Minor
Holy Hill House Park and Gardens	Historic Park and Garden	T-022	N/A	Holy Hill House Park and Gardens	High	Negligible	Minor
Holy Hill House Listed Buildings	Listed Building	HB10/11/001 A	A	Holy Hill House	High	Negligible	Minor
	Listed Building	HB10/11/001 B	B	HB10/11/001 B: Outbuilding, dog house, ash pit farmyard walling and gates	Medium	Negligible	Negligible
	Listed Building	HB10/11/001 C	B1	Yardman's House	Low	Negligible	Negligible

	Listed Building	HB10/11/001 D	B1	Outbuildings	Low	Negligible	Negligible
	Listed Building	HB10/11/001 E	B1	Outbuildings	Low	Negligible	Negligible
	Listed Building	HB10/11/001 F	B1	Forge	Low	Negligible	Negligible
	Listed Building	HB10/11/001 G	B1	Couch House	Low	Negligible	Negligible
	Listed Building	HB10/11/001 H	B1	Byres	Low	Negligible	Negligible
	Listed Building	HB10/11/001 J	B1	Stables	Low	Negligible	Negligible
	Listed Building	HB10/11/001 K	B2	Saw Mill	Low	Negligible	Negligible
	Listed Building	HB10/11/001 L	B2	Walled Garden	Low	Negligible	Negligible
Glenmornan Listed Buildings	Listed Building	HB10/11/20	B1	Christie's Mill Beside 8 Crockan Road Artigarvan Strabane	Low	Negligible	Negligible
	Listed Building	HB10/11/007	B1	St Joseph's RC Church, Moorlough Road, Glenmornan, Strabane, Co Tyrone BT82 0ER	Low	Negligible	Negligible
Wilson House 28 Spout Road Dergalt Strabane Co.	Listed Building	HB10/06/011	B+	Wilson House 28 Spout Road Dergalt Strabane Co. Tyrone BT82 8NB	Medium	Negligible	Negligible

Tyrone BT82 8NB							
St Marys RC Church, Aghabrack Lisnaragh Road Donemana Strabane Co Tyrone BT82 0SD	Listed building	HB10/09/006	B1	St Marys RC Church, Aghabrack Lisnaragh Road Donemana Strabane Co Tyrone BT82 0SD	Low	None	None
Silverbrook Mills 90 Brook Road Donemanagh Strabane Co Tyrone BT82 0RX	Listed Building	HB10/09/027	B1	Silverbrook Mills 90 Brook Road Donemanagh Strabane Co Tyrone BT82 0RX	Low	None	None
Artigarvan Listed Buildings	Listed Building	HB10/09/019	B1	38 Station Road Ballymagorry Strabane Co. Tyrone BT82 0A	Low	None	None
	Listed Building	HB10/11/009	B2	Miller’s Mill 3 Art Road Artigarvan Strabane Co Tyrone BT82 0HA	Low	None	None
Donemana Presbyterian Church Church View Donemana Strabane Co Tyrone BT82 0PB	Listed Building	HB10/09/005	B2	Donemana Presbyterian Church Church View Donemana Strabane Co Tyrone BT82 0PB	Low	None	None

7.5.2.4 Indirect Effects – Between 5-15 km

Within NI, the number of assets to be assessed within the between 5 and 15 km Setting Study Area totals 59, consisting of 31 Scheduled Monuments, three Parks and Gardens; two Conservation Areas, and 23 Listed Buildings.

Within the ROI the number of assets to be assessed within the between 5 and 15 km Setting Study Area totals 66, consisting of 27 National Inventory of Architectural Heritage (NIAH) assets and 39 Sites and Monuments Record (SMR) and Records of Monuments and Places (RMP) assets.

Of the 125 assets assessed, likely minor significance effects were assessed for 28 assets (27 Scheduled Monuments, one Park and Garden and one NIAH asset. The remaining 97 assets were assessed as having likely negligible and/or no significant effects.

The full assessment for changes to setting is presented in **Technical Appendix A7.4** supported by Figure A7.4.1 and A7.4.2 with a summary presented in Tables 7.13 (for NI) and 7.14 (for ROI).

Table 7.13. Summary of Potential Operational Effects – 5-15 km (NI)

Group	Asset Type	Reference	Grade	Asset Name	Quadrant	Sensitivity	Magnitude of Change	Likely Significance of Effect
Burndennet River Prehistoric Monuments	Scheduled Monument	TYR006:024	N/A	Wedge Tomb: Giant's Grave	NE	High	Negligible	Minor
	Scheduled Monument	TYR006:044	N/A	Stone Circle, Cairns (2) & alignments (2), part of pre-bog landscape	NE	High	Negligible	Minor
	Scheduled Monument	TYR006:045	N/A	Cairn (12) Field Wall & alignment, part of pre-bog landscape	NE	High	Negligible	Minor
	Scheduled Monument	TYR006:046	N/A	FIELD WALLS, CAIRNS (13) & STANDING STONE, part of PRE-BOG LANDSCAPE	NE	High	Negligible	Minor
	Scheduled Monument	TYR006:047	N/A	Field Wall & Cairns (3), part of pre-bog landscape	NE	High	Negligible	Minor
Dunnamanagh Airstrip Prehistoric Monuments	Scheduled Monument	LDY028:009	N/A	Stone Circle	NE	High	Negligible	Minor
	Scheduled Monument	LDY028:012	N/A	Cairn (1 of 4 in same field)	NE	High	Negligible	Minor
	Scheduled Monument	LDY028:013	N/A	Cairn (1 of 4 in same field)	NE	High	Negligible	Minor
	Scheduled Monument	LDY028:014	N/A	Cairn (1 of 4 in same field)	NE	High	Negligible	Minor

River Faughan Prehistoric Monuments	Scheduled Monument	LDY029:007	N/A	Standing Stone	NE	High	Negligible	Minor
	Scheduled Monument	LDY029:015	N/A	Standing Stone - The White Stone	NE	High	Negligible	Minor
Donemana Listed Buildings	Listed Building	HB10/09/001	B1	Church	NE	Low	None	None
	Listed Building	HB10/09/002	B1	House	NE	Low	None	None
Carrickatane Road Listed Building	Listed Building	HB10/10/001	B1	House	NE	Low	Negligible	Negligible
Dullerton Manor House Listed Buildings	Listed Building	HB10/10/002 A	B2	House	NE	Low	None	None
	Listed Building	HB10/10/002 B	B1	Gates/ Screens/ Lodges	NE	Low	None	None
	Listed Building	HB10/10/002 C	B2	Outbuildings	NE	Low	Low	None
Owenkillew River Prehistoric monuments	Scheduled Monument	TYR018:055	N/A	Stone circle and standing stones (2)	SE	High	Negligible	Minor
	Scheduled Monument	TYR018:056	N/A	Stone circle	SE	High	Negligible	Minor
Owenkillew River Early Christian settlement sites	Scheduled Monument	TYR018:020	N/A	Rath	SE	High	Negligible	Minor
	Scheduled Monument	TYR017:005	N/A	Rath: Attyhole Fort	SE	High	Negligible	Minor

Owenkillew River Christian Religious sites	Scheduled Monument	TYR018:012	N/A	Franciscan friary & graveyard: Corick Abbey	SE	High	None	None
Strule Burn Prehistoric Monuments to SE	Scheduled Monument	TYR026:004	N/A	Two stone circles, cairn(s) & standing stone(s)	SE	High	Negligible	Minor
	Scheduled Monument	TYR026:005	N/A	Stone circle and possible alignment	SE	High	Negligible	Minor
Beltrim Castle	Park and Garden	T-005	N/A	Beltrim Castle	SE	High	Negligible	Minor
Girnknock Burn Prehistoric Monuments	Scheduled Monument	TYR017:008	N/A	Portal Tomb: Cloghogle	SW	High	Negligible	Minor
	Scheduled Monument	TYR017:009	N/A	Portal Tomb: Druids altar or Cloghole	SW	High	Negligible	Minor
Mourne River Valley Prehistoric Monuments	Scheduled Monument	TYR017:023	N/A	Court Tomb: Carnmore	SW	High	Negligible	Minor
Newtonstewart Defended settlements	Scheduled Monument	TYR017:011	N/A	Castle site (mound & foundation): Pigeon Hill	SW	High	None	None
	Scheduled Monument	TYR017:012	N/A	Castle & bailey: Harry Avery's Castle	SW	High	Negligible	Minor
	Scheduled Monument	TYR017:047	N/A	Castle & bawn: Newtownstewart Castle	SW	High	None	None
Bessy Bell Prehistoric Monuments	Scheduled Monument	TYR017:035	N/A	Portal Tomb: Ballyrenan chambered grave or Cloghole	SW	High	Negligible	Minor

Strule River Prehistoric Monuments to SW	Scheduled Monument	TYR025:007	N/A	Court Tomb: Cloghogle	SW	High	Negligible	Minor
	Scheduled Monument	TYR025:008	N/A	Court Tomb: Cloghogle	SW	High	Negligible	Minor
	Scheduled Monument	TYR025:037	N/A	Wedge tomb	SW	High	Negligible	Minor
Moyle House	Park and Garden	T-061	N/A	Moyle House	SW	High	None	None
Barons Court	Park and Garden	T-004	N/A	Barons Court	SW	High	None	None
	Scheduled Monument	TYR017:034	N/A	Fortified house: Derrywoone Castle	SW	High	None	None
	Listed Building	HB10/04/001 A	A	Country House	SW	High	None	None
Scion Mills and Listed Buildings	Conservation Area	N/A	N/A	Scion Mills Conservation Area	SW	Medium	None	None
	Listed Building	HB10/07/017	B1	House	SW	Low	Negligible	Negligible
	Listed Building	HB10/07/020	B1	House	SW	Low	None	None
	Listed Building	HB10/08/013	B1	House	SW	Low	None	None
Newtonstewart and Listed Buildings	Conservation Area	N/A	N/A	Newtonstewart Conservation Area	SW	Medium	Negligible	Negligible
	Listed Building	HB10/04/007	B+	Bridge	SW	Medium	Negligible	Negligible
Victoria Bridge Listed Buildings	Listed Building	HB10/06/001	B1	House	SW	Low	Negligible	Negligible

Counterscarp Rath	Scheduled Monument	TYR002:004	N/A	Counterscarp Rath: Ballynabwee Fort	NW	High	Negligible	Minor
Mount Castle	Scheduled Monument	TYR002:003	N/A	Plantation Castle: Mount Castle	NW	High	Negligible	Minor
Altrest Road Listed Buildings	Listed Building	HB10/10/003	B2	House	NW	Low	Negligible	Negligible
	Listed Building	HB10/10/008	B2	Church	NW	Low	Negligible	Negligible
Ballymagorry Listed Buildings	Listed Building	HB10/10/009	B+	House	NW	Medium	Negligible	Negligible
	Listed Building	HB10/11/003	B1	Pump	NW	Low	Negligible	Negligible
	Listed Building	HB10/11/005	B+	Church	NW	Medium	Negligible	Negligible
	Listed Building	HB10/11/014	B2	Railway Station Structures	NW	Low	Negligible	Negligible
	Listed Building	HB10/11/016	B2	House	NW	Low	Negligible	Negligible
Grange House	Listed Building	HB10/10/009	B+	House	NW	Medium	Negligible	Negligible
Strabane Listed Buildings	Listed Building	HB10/08/003	B1	House	NW	Low	None	None
	Listed Building	HB10/08/004 B	B1	Stables	NW	Low	None	None
	Listed Building	HB10/08/004 C	B1	Gates/ Screens/ Lodges	NW	Low	None	None
	Listed Building	HB10/08/007	B1		NW	Low	None	None

Table 7.14. Summary of Potential Operational Effects – 5-15 km (ROI)

Group	Asset Type	Reference	Importance/Value	Asset Name	Quadrant	Sensitivity	Magnitude of Change	Significance of Effect
Lifford to Ballindrait	NIAH	40834001	Regional	Cavanacor House	NW	Medium	None	None
	NIAH	40834002	Regional	Ballindrait Presbyterian Manse	NW	Medium	None	None
	NIAH	40834003	Regional	St. Patrick's Catholic Church	NW	Medium	None	None
	NIAH	40834006	Regional	Outbuilding	NW	Medium	None	None
	NIAH	40834007	Regional	House	NW	Medium	None	None
Lifford and environs	NIAH	40835026	Regional	Drumboy House	NW	Medium	None	None
	NIAH	40835028	Regional	Croghan House	NW	Medium	None	None
	NIAH	40907130	Regional	Coneyburrow House	NW	Medium	None	None
	NIAH	40907140	Regional	Russborough House	NW	Medium	None	None
Lifford standing stones	SMR/RMP	DG071-003001-	Regional	Standing stone	NW	Medium	None	None
	SMR/RMP	DG071-003002-	Regional	Standing stone	NW	Medium	None	None
	SMR/RMP	DG071-005----	Regional	Standing stone	NW	Medium	None	None
Deele River South settlement	SMR/RMP	DG071-001----	Regional	Ringfort - rath	NW	Medium	None	None
River Foyle	NIAH	40906311	Regional	Porthall House (country house)	NW	Medium	Negligible	Negligible

	NIAH	40907113	National	Port Hall	NW	High	Negligible	Minor
	NIAH	40907121	Regional	Port Hall (outbuildings)	NW	Medium	Negligible	Negligible
	NIAH	40907132	Regional	Foyle Bridge	NW	Medium	None	None
	NIAH	40907133	Regional	Island More Bridge	NW	Medium	None	None
Buildings along R625	NIAH	40906312	Regional	House	NW	Medium	None	None
	NIAH	40906314	Regional	Lisieux House	NW	Medium	None	None
	NIAH	40906315	Regional	Bridge	NW	Medium	None	None
	NIAH	40907111	Regional	House	NW	Medium	None	None
	NIAH	40907114	Regional	Windmill	NW	Medium	None	None
	NIAH	40907117	Regional	Clonleigh House (walled garden, outbuilding)	NW	Medium	None	None
	NIAH	40907120	Regional	Clonleigh House (gate lodge)	NW	Medium	None	None
	NIAH	40907122	Regional	House	NW	Medium	None	None
	NIAH	40907125	Regional	Kiln	NW	Medium	None	None
	NIAH	40907127	Regional	demesne walls/gates/railings for Clonleigh House	NW	Medium	None	None
	NIAH	40907131	Regional	Hall Green Farm (house)	NW	Medium	None	None

Carrigans Standing Stones	SMR/RMP	DG055-017----	Regional	Standing stones	NW	Medium	None	None
	SMR/RMP	DG055-020----	Regional	Standing stones	NW	Medium	None	None
	SMR/RMP	DG055-021----	Regional	Standing stones	NW	Medium	None	None
	SMR/RMP	DG055-023001-	Regional	Standing stones	NW	Medium	None	None
	SMR/RMP	DG055-023002-	Regional	Standing stones	NW	Medium	None	None
	SMR/RMP	DG055-027----	Regional	Standing stones	NW	Medium	None	None
Carrigan Castle Site	SMR/RMP	DG055-022----	Regional	Castle (unclassified)	NW	Medium	None	None
St Johnstone Historic Town	SMR/RMP	DG063-003----	Regional	Historic Town	NW	Medium	None	None
Dooish Mountain standing Stone	SMR/RMP	DG062-039----	Regional	Standing stone	NW	Medium	None	None
Swilly Burn Settlement sites	SMR/RMP	DG062-022----	Regional	Ringfort - unclassified	NW	Medium	None	None
	SMR/RMP	DG062-023----	Regional	Ringfort - cashel	NW	Medium	None	None

	SMR/RMP	DG063-006----	Regional	Ringfort - unclassified	NW	Medium	None	None
	SMR/RMP	DG063-010----	Regional	Ringfort - unclassified	NW	Medium	None	None
Raphoe Standing Stones	SMR/RMP	DG070-002----	Regional	Standing Stones	NW	Medium	None	None
	SMR/RMP	DG070-005----	Regional	Standing Stones	NW	Medium	None	None
	SMR/RMP	DG070-006----	Regional	Standing Stones	NW	Medium	None	None
	SMR/RMP	DG070-007----	Regional	Standing Stones	NW	Medium	None	None
Ballindrait Standing Stones	SMR/RMP	DG070-031----	Regional	Standing Stones	NW	Medium	None	None
	SMR/RMP	DG070-032----	Regional	Standing Stones	NW	Medium	None	None
	SMR/RMP	DG070-033----	Regional	Standing Stones	NW	Medium	None	None
	SMR/RMP	DG070-034----	Regional	Standing Stones	NW	Medium	None	None
	SMR/RMP	DG070-047----	Regional	Standing Stones	NW	Medium	None	None
	SMR/RMP	DG070-048----	Regional	Standing Stones	NW	Medium	None	None

Deele River Prehistoric assets	SMR/RMP	DG070-042----	Regional	Standing stone	NW	Medium	None	None
	SMR/RMP	DG070-043----	Regional	Megalithic tomb - unclassified	NW	Medium	None	None
	SMR/RMP	DG070-046----	Regional	Megalithic tomb - unclassified	NW	Medium	None	None
Croaghan Hill Prehistoric sites	SMR/RMP	DG070-074001-	Regional	Hillfort	NW	Medium	None	None
	SMR/RMP	DG070-074002-	Regional	Megalithic tomb - passage tomb	NW	Medium	None	None
Kilmonaster Hill settlement	SMR/RMP	DG079-003----	Regional	Ringfort - cashel	NW	Medium	None	None
Buildings along N15	NIAH	40907950	Regional	Inchenagh House	NW	Medium	None	None
Clady Bridge	NIAH	40907914	National	Clady Bridge	SW	High	None	None
Castlefinn Historic Town	SMR/RMP	DG079-023002-	Regional	Bawn	SW	Medium	None	None
	SMR/RMP	DG079-023001-	Regional	Castle - unclassified	SW	Medium	None	None
	SMR/RMP	DG079-046001-	Regional	Historic town	SW	Medium	None	None
	SMR/RMP	DG079-031----	Regional	Standing stone	SW	Medium	None	None

Castlefinn Standing Stones	SMR/RMP	DG079-032----	Regional	Standing stone	SW	Medium	None	None

7.6 Potential Decommissioning Phase Effects

The final decommissioning of the Development will involve similar processes to the initial decommissioning and construction phase effects but involve the dismantling and removal of the majority of the above ground infrastructure of the Development. As mitigation will have been undertaken at construction, no direct effects are likely from the decommissioning phase of the Development. Any effects arising from this phase are therefore assessed as being **not significant** in terms of the EIA Regulations.

7.7 Mitigation and Residual Effects

7.7.1 Decommissioning and Construction Phase

To mitigate the potential for direct effects on the non-designated asset, WS1, 100 m southwest of turbine T1 and on unknown heritage assets, the following mitigation is recommended to ensure avoidance and/or preservation by record:

- A pre-construction walkover survey of the final infrastructure layout shall be carried out to ensure preservation by record should any previously undiscovered archaeological assets be present. Should the survey identify such assets, consultation with HED would be undertaken to determine an appropriate and proportionate mitigation strategy;
- A photographic survey of assets WS1 be undertaken ahead of construction, to further record this feature;
- Barrier fencing offset 10 m from WS1 will be erected to ensure accidental damage to this asset is avoided;
- Should construction related activities require ground-breaking within 25 m of WS1, then these groundworks will be subject to archaeological monitoring; and,
- A watching brief will be required during groundworks associated with construction of turbines T1, T3, T4, T6, T7, T8, T9, T13 and T14, and their associated infrastructure, inclusive of groundworks for hardstanding, construction compounds, substations, access tracks and cable trenching.

The above scope of archaeological works will require agreement with HED. Consultation with HED over the exact scope of works required to satisfy Policy BH4[15] will need to be agreed prior to any works on site commencing, with the agreed scope of works detailed in an archaeological 'Programme of Works' document to be submitted to HED as part of the planning process.

The requirements for any ongoing watching brief will be reviewed regularly with HED. Should initial results prove negative, with no archaeological features identified, then the scope of attendance may be reduced.

Embedded mitigation in the form of an archaeological clerk of works (ACoW) will also be utilised to further reduce potential direct effects to known and unknown archaeological and cultural heritage assets. Further details on the ACoW can be found in **Technical Appendix A3.1: Outline Decommissioning and Construction Environmental Management Plan.**

Following the above mitigation, residual effects are assessed as being a negligible to low magnitude effect (see Table 7.4) on receptor of between negligible and medium sensitivity (see Table 7.3), leading to effects of between negligible and minor significance (see Table 7.5), and **not significant** in terms of the EIA Regulations.

7.7.2 Operational Phase

Mitigating the indirect effects on the settings of heritage features from operating a wind farm is not straightforward. The options for reducing visual effects are limited to redesigning the layout or in a

[15] HED (2019) Development and Archaeology: Guidance on Archaeological Works in the Planning Process
[HED guidance (communities-ni.gov.uk)](https://www.communities-ni.gov.uk) [Accessed 2023/04/14]

relatively small number of cases where it is effective and would not worsen effects on the setting of a feature, screening sensitive views. Due to the lack of significant effects identified on heritage assets, no mitigation is proposed, and the residual effects are the same as assessed in Section 7.5.2. All indirect visual effects upon these cultural heritage features will continue throughout the operational phase of the Development and are long-term but reversible upon decommissioning.

7.8 Cumulative Effect Assessment

A cumulative effect is considered to be an additional effect upon cultural heritage resources arising from the Development to a baseline including other consented or proposed developments.

The wind farms set out in Table 7.7 have been added to the current baseline for the assessment of cumulative effects. They are considered below in groups, depending on their direction from the Development site.

7.8.1 Eglish Mountain, Carickatane, Slieve Kirk and Curryfree Wind Farms

This group of windfarms are located between 10 km and 11.75 km northeast of the Development, atop the Eglish, Slievekirk and Curryfree Hill ranges.

Eglish Mountain is an operational six turbine wind farm with a tip height of 107 m, located approximately 10 km northeast of the Development, sitting at the southeast limit of this group. Carrickatane, Slievekirk and Curryfree Wind Farms represent a cluster of 25 turbines with tip heights of between 100 m and 110 m, located between 10 km and 11.75 km north-northeast of the Development.

Heritage assets to the south of these wind farms, within the 15 km Study Area, whilst likely to have visibility of the Development and this group of turbines, do not have key views taking in the Development and this north-east cluster of wind farms. Assets to the north and north-east, either do not share visibility, lying outside of the combined ZTV or, as in the case of assets LDY022:013 and LDY028:009, are in such close proximity to these north-east turbines, that the Development would only appear in the background and more distant landscape context when viewed from the north and north-east.

Cumulative effects on the settings of heritage assets of adding the Development to the existing baseline together with these cumulative developments would be of negligible magnitude (see Table 7.4), and hence of negligible-minor significance (see Table 7.5), which is **not significant** in terms of the EIA Regulations.

7.8.2 Bessy Bell I, II Wind Farms and the Bessy Bell II Extension

This group of windfarms are located between 14.2 km and 15.3 km south-southwest of the Development, atop the Bessy Bell Hill range.

Bessy Bell I and II represent a cluster of 16 turbines with tip heights between 59.75 m and 76 m, sited on Bessy Bell hill to the west of the River Strule. Heritage assets to the north of these windfarms, within the 15 km Study Area, whilst likely to have visibility of the Development and this group of turbines, do not have key views taking in the Development and this south-southwest cluster of wind farms. Key assets around Bessy Bell Hill to the east along the River Strule, either do not share visibility, lying outside of the combined ZTV or, as in the case of assets TYR025:007, TYR025:007 are in such close proximity to these south-west turbines, that the Development would only appear in the more distant landscape context, barely registering against the proximity of the nearby Bessy Bell turbines.

Cumulative effects on the settings of heritage assets of adding the Development to the existing baseline together with these cumulative developments would be of negligible magnitude (see Table 7.4), and hence of negligible-minor significance (see Table 7.5), which is **not significant** in terms of the EIA Regulations.

7.9 Summary of Effects

Table 7.15 provides a summary of the effects detailed within this chapter.

Table 7.15. Summary of Effects

Receptor	Potential Effect	Significance of Effect	Mitigation Proposed	Residual Effect
Decommissioning and Construction Phase				
Known archaeological remains	Physical damage to or destruction of WS1 (non-designated)	Negligible to moderate	• Walkover survey of the final infrastructure layout; • A photographic survey of assets undertaken ahead of construction; • Barrier fencing; and, • Should construction related activities require ground breaking within 25m of any assets identified within the CSA, then these groundworks will be subject to archaeological monitoring.	Negligible to minor
Unknown (buried) archaeological remains	Physical damage to or destruction of unknown (buried) archaeological remains, with the greatest potential for disturbing unknown assets around Turbines, 1, 3, 4, 6, 7, 8 , 9 , 13 and 14, and their associated infrastructure.	Negligible to moderate	• Walkover survey of the final infrastructure layout; • If warranted, a photographic survey of assets undertaken ahead of construction; and, • A watching brief during groundworks associated with construction of turbines T1, T3, T4, T6, T7, T8, T9, T13 and T14, and their associated infrastructure.	Negligible to minor
Operational Phase				

Designated Heritage Assets within 5 km	Indirect effect on settings (reversible on decommissioning)	Negligible to minor	No mitigation is proposed.	Negligible to minor
Designated Heritage Assets within 5-15 km	Indirect effect on settings (reversible on decommissioning)	No effect to minor	No mitigation is proposed.	No effect to minor
Decommissioning Phase				
Designated Heritage Assets within 5 km	Temporary Indirect effect on setting during restoration of existing site conditions (visual)	No effect	None	None – Existing setting will be restored
Cumulative effects				
Heritage assets up to 15 km to the northeast of the Development site	Cumulative effects on settings	Negligible	None	Negligible
Heritage assets up to 15 km to the south-southwest of the Development site	Cumulative effects on settings	Negligible	None	Negligible

7.10 Statement of Significance

Effects are considered to be significant for the purposes of the EIA Regulations where the effect is classified as being of 'major' or 'moderate' significance.

There is a single known asset at risk of direct effects during construction. Asset WS1 (non-designated) is located 100 m south-west of turbine T1 and in the vicinity of the associated access track.

The archaeological potential for previously unknown assets predating the Post-Medieval period within the Development footprint allowing for micro-siting is considered low.

With mitigation in the form of a walkover survey, photographic record, barrier fencing and (if necessary) archaeological monitoring, potential direct likely significant effects are reduced to negligible or minor significance.

Indirect (settings) effects upon designated assets within the Setting Study Area were assessed as being negligible or minor for the Development with the existing baseline, and for the Development when added to a baseline including other proposed wind farm developments.

Following mitigation, all archaeology and heritage effects were assessed as being **not significant** in terms of the EIA Regulations.

The Netherlands
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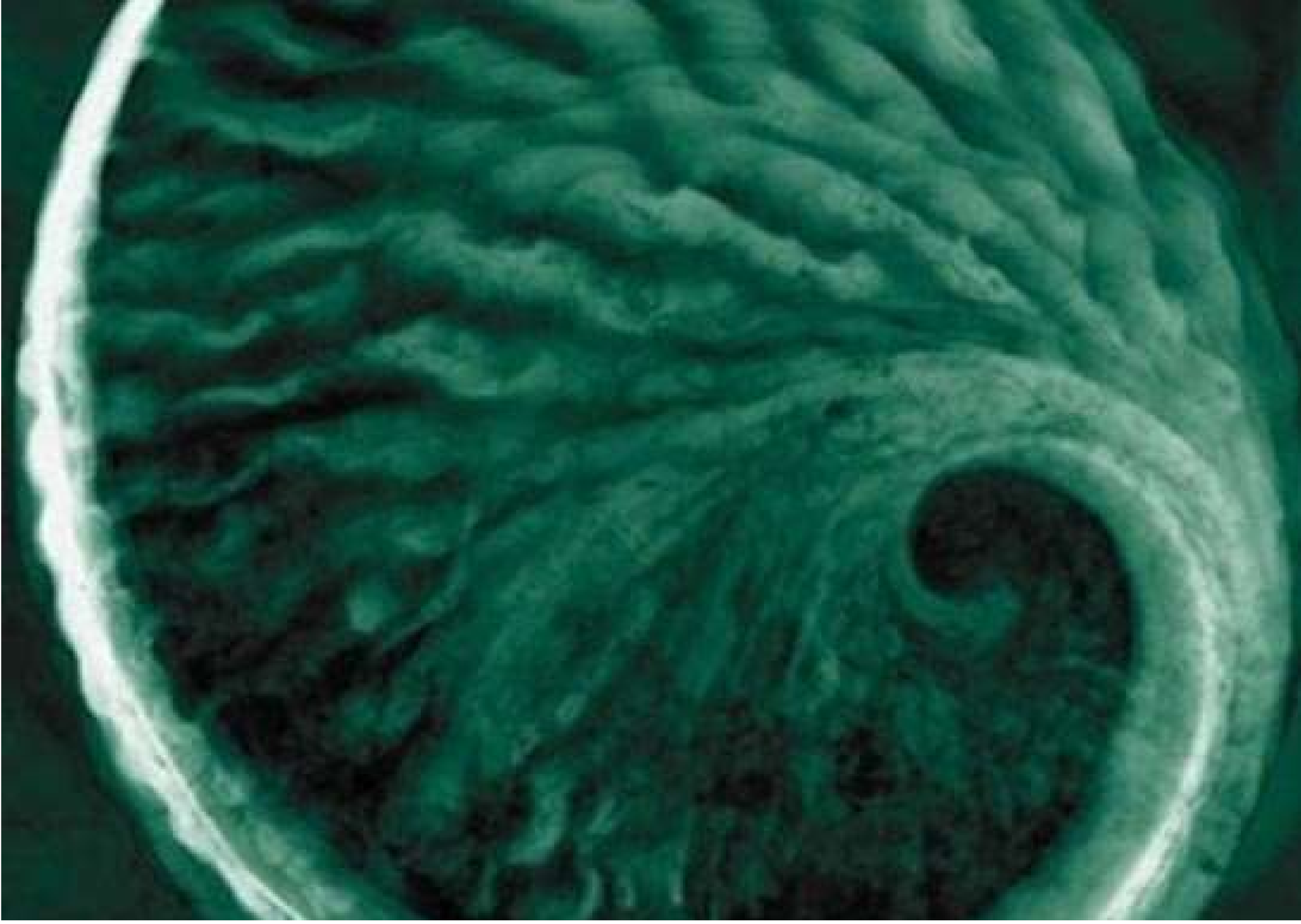

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Owenreagh/Craignagapple Wind Farm

Ørsted Onshore Ireland Midco Limited

Environmental Statement- Chapter 8 Hydrology and Hydrogeology

06 September 2023

Project No.: 0696177

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				ERM approval to issue		
Version	Revision	Author	Reviewed by	Name	Date	Comments
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06 September 2023

Owenreagh/Craignagapple Wind Farm

Environmental Statement- Chapter 8 Hydrology and Hydrogeology

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Acronyms and Abbreviations

Name	Description
ASSI	Areas of Special Scientific Interest
CIRIA	Construction Industry Research and Information Association
CHSA	Core Hydrological Study Area
CLO	Community Liaison Officer
DAERA	Department of Agriculture, Environment and Rural Affairs
DFI	Department for Infrastructure Rivers Agency
DWI	Drinking Water Inspectorate
ECoW	Ecological Clerk of Works
ES	Environmental Statement
GPP	Guidance for Pollution Prevention
GSNI	Geological Survey of Northern Ireland
HRA	Habitat Regulations Assessment
LA	Loughs Agency
LGW	Land and Groundwater Team
NIEA	Northern Ireland Environment Agency
NRFA	National River Flow Archive
NVC	National Vegetation Classification
oDCEMP	Outline Decommissioning and Construction Environmental Management Plan
PPG	Pollution Prevention Guidelines
PPP	Pollution Prevention Plan
PPS	Policy Planning Statement
PWS	Private Water Supplies
PWSRA	Private Water Supply Risk Assessment
SAC	Special Area of Conservation
SPPS	Strategic Planning Policy Statement for Northern Ireland
SuDS	Sustainable Drainage Systems
WCI	Watercourse Crossing Inventory
WFD	Water Framework Directive

8. HYDROLOGY AND HYDROGEOLOGY

8.1 Introduction

This Chapter of the Environmental Statement (ES) evaluates the likely significant effects of the proposed Owenreagh/Craignagapple Wind Farm (the Development) on the hydrology and hydrogeology resource.

This Chapter of the ES is supported by the following Technical Appendix documents provided in **Volume 4** ES Technical Appendices:

- **Technical Appendix A8.1: Hydrological Unit Assessment;**
- **Technical Appendix A8.2: Private Water Supply Risk Assessment (PWSRA);**
- **Technical Appendix A8.3: Note on Indirect Effects of Dewatering;**
- **Technical Appendix A8.4: Watercourse Crossing Inventory (WCI);**
- **Technical Appendix A8.5: Outline Drainage Strategy;**
- **Technical Appendix A8.6: Dipwell Monitoring Dataset;**
- **Technical Appendix A3.1: Outline Decommissioning and Construction Environmental Management Plan (oDCEMP); and,**
- **Technical Appendix A10.2: Habitat Regulations Assessment (HRA).**

This Chapter of the ES is supported by the following Figures provided in **Volume 3**:

- **Figure 8.1: Hydrological Study Area;**
- **Figure 8.2: Hydrological Catchments;**
- **Figure 8.3: Hydrological Features;**
- **Figure 8.4: Watercourse Crossings;**
- **Figure 8.5: Wetland Habitats;**
- **Figure 9.1: Superficial Geology;**
- **Figure A10.4.1: Active Peat Constraints;**
- **Figure A8.1.1: Existing Drainage Survey;**
- **Figure A8.1.2: Dipwell Locations;**
- **Figure A8.1.3: Hydrological Unit Assessment; and,**
- **Figure A8.1.4: Flush Assessment.**

This Chapter includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects; and,
- Statement of Significance.

8.2 Legislation, Policy and Guidance

The following guidance, legislation and information sources have been considered in carrying out this assessment. The Water Framework Directive (WFD) (2000/60/EC)[1] establishes a framework for the protection, improvement, and sustainable use of all water environments. It is transposed in Northern

[1] European Commission, The Water Framework Directive (2000/60/EC). http://ec.europa.eu/environment/water/water-framework/index_en.html. Accessed 06 Sept. 2023.

Ireland by The Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017 (as amended)[2] and subsidiary Regulations.

Other relevant legislation includes:

- The Fisheries Regulations (Northern Ireland) 2014[3];
- The Private Water Supplies Regulations (Northern Ireland) 2017[4];
- The Water Supplies (Water Quality) (Amendment) Regulations (Northern Ireland) Regulations 2017[5];
- The Water (Northern Ireland) Order 1999[6]; and,
- Foyle Fisheries Act (Northern Ireland) 1952[7].

The hydrology and hydrogeology assessment of the Development will be undertaken in accordance with good practice guidance (Guidance for Pollution Prevention (GPPs) and Pollution Prevention Guidelines (PPGs)[8] which include:

- PPG1: General guide to the prevention of water pollution (July 2013);
- GPP2: Above ground oil storage tanks (June 2021);
- GPP4: Treatment and disposal of wastewater where there is no connection to the public foul sewer (June 2021);
- GPP5: Works and maintenance in or near water (January 2017);
- PPG6: Working at construction and demolition sites (2012);
- GPP8: Safe storage and disposal of used oils (July 2021);
- PPG18: Managing fire water and major spillages (June 2000);
- GPP21: Pollution incident response planning (June 2021); and,
- GPP22: Dealing with spills (October 2018).

Other relevant guidance comprises of the following;

- Best Practice Guidance to PPS 18 ‘Renewable Energy’ (NI Planning Service 2009)[9];
- Policy Re1(d) the PPS18 (2009)[10];

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[2] The Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017. http://www.legislation.gov.uk/nisr/2017/81/contents/made. Accessed 06 Sept. 2023.

[3] Fisheries Regulations (Northern Ireland) 2014. http://www.legislation.gov.uk/nisr/2014/17/made. Accessed 06 Sept. 2023.

[4] The Private Water Supplies Regulations (Northern Ireland) 2017. https://www.legislation.gov.uk/nisr/2017/211/contents/made. Accessed 06 Sept. 2023.

[5] The Water Supply (Water Quality) (Amendment) Regulations (Northern Ireland) 2017. http://www.legislation.gov.uk/nisr/2017/211/contents/made. Accessed 06 Sept. 2023.

[6] Northern Ireland Orders in Council (1999) The Water (Northern Ireland) Order 1999. https://www.legislation.gov.uk/nisi/1999/662/contents/made. Accessed 06 Sept. 2023.

[7] Northern Ireland Parliament (1952) Foyle Fisheries Act (Northern Ireland) 1952. https://www.legislation.gov.uk/apni/1952/5/contents. Accessed 06 Sept. 2023.

[8] NetRegs (2021). Guidance for Pollution Prevention (GPPs) Available at: https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/. Accessed 06 Sept. 2023.

[9] Northern Ireland Infrastructure Assembly (2021). Best Practice Guidance to PPS 18 ‘Renewable Energy’. https://www.infrastructure-ni.gov.uk/publications/best-practice-guidance-pps-18-renewable-energy. Accessed 06 Sept. 2023.

[10] Department of the Environment (2009) Planning Policy Statement 18 ‘Renewable Energy’. https://library2.nics.gov.uk/pdf/drd/2009/0021.pdf. Accessed 06 Sept. 2023.

- Revised Planning Policy Statement 15 'Planning and Flood Risk' (2014)[11];
- The Construction Industry Research and Information Association (CIRIA) Report C689 Culvert Design and Operation Guide (2010);
- CIRIA Report C532 Control of water pollution from construction sites. Guidance for consultant and contractors (2001)[12];
- CIRIA Report C648 Control of water pollution from linear construction proposed developments; technical guidance (2006)[13];
- CIRIA Report C753 - The SuDS Manual[14];
- Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments[15];
- UKTAG. Guidance on the Identification and Risk Assessment of Groundwater Dependent Terrestrial Ecosystems[16];
- DAERA Standing Advice – RU – Single Wind Turbines and Groundwater[17];
- CIRIA Report (C741) Environmental Good Practice on Site Guide (2015)[18];
- Strategic Planning Policy Statement for Northern Ireland (SPPS);
- Forest and Water, UK Forestry Standard Guidelines (Forestry Commission, 2011)[19];
- Best Practice Guidelines for the Irish Wind Energy Industry (Irish Wind Energy Association, Wind Skillnet (2012)[20];
- EPA Towards the Quantification of Blanket Bog Ecosystem Services to Water (Report No.378)[21];

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11 Department of the Environment (2014) Revised Planning Policy Statement 15 'Planning and Flood Risk'. https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/PPS15%20Planning%20and%20Flood%20Risk.pdf. Accessed 06 Sept. 2023.

12 Construction Industry Research and Information Association Report (2001). C532 Control of water pollution from construction sites. Guidance for consultants and contractors. https://www.ciria.org/ProductExcerpts/C532.aspx. Accessed 06 Sept. 2023.

13 Construction Industry Research and Information Association Report (2009) C648 Control of water pollution from linear construction proposed developments; technical guidance. https://www.ciria.org/ProductExcerpts/C648.aspx. Accessed 06 Sept. 2023.

14 CIRIA, 2007. The SUDS Manual. http://www.scotsnet.org.uk/documents/nrdg/ciria-report-c753-the-suds-manual-v6.pdf. Accessed 06 Sept. 2023.

15 Scottish Government, 2017. Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments. https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2017/04/peat-landslide-hazard-and-risk-assessments-best-practice-guide-proposed-electricity/documents/00517176-pdf/00517176-pdf/govscot%3Adocument/00517176.pdf Accessed 06 Sept. 2023.

16 UKTAG, 2004. Guidance on the Identification and Risk Assessment of Groundwater Dependent Terrestrial Ecosystems. https://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Risk%20assessment%20of%20terrestrial%20ecosystems%20groundwater_Draft_210104.pdf. Accessed 06 Sept. 2023.

17 DAERA (2018) DAERA Environmental Advice for Planning, Standing Advice – Single Wind Turbines and Groundwater. https://www.daera-ni.gov.uk/sites/default/files/publications/daera/DAERA%20%20Standing%20Advice%20-%20RU%20-%20Single%20Wind%20Turbines%20and%20Groundwater%20-%20August%202018.PDF Accessed 06 Sept. 2023.

18 CIRIA (2015) Construction Industry Research and Information Association Report C741 Environmental Good Practice on a Construction Site. https://www.ciria.org/ItemDetail?iProductCode=C741&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91. Accessed 06 Sept. 2023.

19 Forestry Commission (2014). Forest and Water, UK Forestry Standard Guidelines. https://www.forestresearch.gov.uk/research/the-uk-forestry-standard. Accessed 09 Sept. 2023.

20 Irish Wind Energy Association, Wind Skillnet (2012) Best Practice Guidelines for the Irish Wind Energy Industry. https://windenergyireland.com/policy/best-practice-guidelines. Accessed 09 Sept. 2023.

21 Environmental Protection Agency (2015) Towards the Quantification of Blanke Bog Ecosystem Services to Water. https://www.epa.ie/publications/research/water/Research_Report_378.pdf Accessed 06 Sept. 2023.

- NIEA (2015) Wind farms and groundwater impacts - A guide to EIA and Planning considerations[22]; and,
- DAERA (2022) Standing Advice– Pollution Prevention Guidance[23].

8.3 Assessment Methodology and Significance Criteria

8.3.1 Scoping Responses and Consultations

Consultation for this ES topic was undertaken with the organisations shown in Table 8.1. The response to each point raised by consultees is also presented within the table, demonstrating where the design of the Development has addressed the response to specific issues identified by Northern Ireland Environment Agency (NIEA), Northern Ireland Water (NI Water) and other consultees.

[22] NIEA (2015) Wind farms and groundwater impacts - A guide to EIA and Planning considerations. https://niopa.qub.ac.uk/bitstream/NIOPA/7351/1/Wind%20farms%20and%20groundwater%20impacts.pdf Accessed 06 Sept. 2023.

[23] DAERA (2022) Standing Advice– Pollution Prevention Guidance. https://www.daera-ni.gov.uk/articles/standing-advice-0 Accessed 06 Sept. 2023.

Table 8.1. Consultee Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Northern Ireland Environment Agency- Drinking Water Inspectorate	Scoping Response 27/10/2022	It is suggested that the applicant should contact any landowners within 500 m of a turbine to determine if any of the properties utilise a Drainage & Water Drinking Water Inspectorate (DWI) private water supply for any purpose. If a private supply is identified, actions should be taken to ensure no impact to quality or sufficiency. Consultation with NI Water is required to be consulted to ensure there are no public drinking water sources which may be impacted by the Development. If public drinking sources could be impacted, mitigation actions must be provided to ensure quality and sufficiency of supply.	A 2 km private water supply (PWS) study area has been implemented and all PWS identified have been assessed within **Technical Appendix A8.2: PWSRA**.
Northern Ireland Environment Agency Regulation Unit, Land and Groundwater Team (LGW)	Scoping Response 27/10/2022	The foundations of wind turbines have the potential to impact on the groundwater environment for example groundwater flow paths, groundwater receptors (aquifers) or secondary receptors (including private water supplies). An assessment of the potential impact facilitates LGW to form an opinion on the application. Groundwater receptors should be identified and the risk of potential impact assessed and, where required, mitigation measures should be identified. These steps should be assessed through both a desktop and field based Water Feature Survey.	Potential groundwater receptors have been identified in **Section 8.4** and assessed in **Section 8.5**. To inform on the identification and assessment of these receptors, a hydrological field survey was carried out in addition to a desk-based assessment. Details on the hydrological field survey are provided within **Section 8.3.5.3**
Natural Environment Division (NED)	Scoping Response 27/10/2022	As the Development is hydrologically connected to the River Foyle and Tributaries ASSI/SAC, the following information should be considered within the above assessments: ▪ All potential pathways of surface water run-off, during construction, operation and decommissioning phases, which could cause pollution of any watercourses that are linked to the River Foyle and Tributaries ASSI/SAC; ▪ The construction of water crossings over watercourses linked to the designated sites. Natural Heritage and Conservation Areas; ▪ Any risk of peat slide and the impacts this could have on the surrounding watercourses linked to the designated sites; ▪ The storage of materials, machinery, and fuels etc. and buffer zones from watercourses;	Potential hydrologically connected designated receptors are identified in **Section 8.4.9** and potential impacts are fully assessed in **Section 8.5.2.4**. Buffer zones included as design parameters are noted in **Section 8.3.7.** Areas where these buffers have been encroached are fully assessed within **Section 8.5.1.1**. Information on the storage of materials, machinery and fuels can be found in **Technical Appendix A3.1: oDCEMP**. Assessment of the construction and decommissioning of turbines can be

		▪ The construction and decommissioning of the turbines and buffer zones from watercourses; and, ▪ The outcomes of the Aquatic and Fisheries Assessment. All proposed mitigation measures for the above points should be clearly stated and demonstrated via drawings, in order for the department to fully assess the potential impacts on the designated sites. The following information should be included in any future submissions to the Department in order to fully assess the potential impacts to the nearby designated sites: ▪ All designated sites which are hydrologically linked to the proposed site should be included in the Habitats Regulations Assessment and Ecological Impact Assessment. ▪ All proposed mitigation measures to prevent pollution of the watercourses linked to the designated sites should be clearly stated and demonstrated via drawings.	found in **Section 8.5.2** and **Section 8.5.5.** Information on the risk of peat slide can be found in Chapter 9: Geology, Soils and Peat, and in **Technical Appendix A9.1: PRSA**. Information relating to the Aquatic fisheries assessment and HRA can be found in **Chapter 10: Ecology**. Information on hydrologically linked designated sites can be found in **Section 10.4.2 of Chapter 10: Ecology** and the accompanying HRA. An Outline Drainage Plan is included as **Technical Appendix A8.5** and all mitigation is identified within **Technical Appendix A3.1: oDCEMP**.
		NED emphasise the following: ▪ For sites that are hydrologically connected to a designated site, NED would advise that buffers are provided to watercourses on site in which there should be no infill, disturbance, construction activity or storage of materials. For upland sites this is recommended to be at least 50m. The ES should include a description of the likely significant effects, both positive and negative, at all stages of the development to include direct, indirect, secondary and cumulative effects in the short, medium and long term. A description of the forecasting methods used to predict these effects should also be included.	As a design parameter, a 50 m buffer of watercourses has been implemented across the Site. Instances where this buffer could not be adhered to have been discussed in **Section 8.5**. Potential impacts to receptors from construction are discussed in **Section 8.5.2** while cumulative impacts are discussed in **Section 8.7**.
NIEA Water Management Unit & Inland Fisheries	Scoping Response 27/10/2022	Water Management Unit would request that any future consultation / environmental statement clearly demonstrate the following: ▪ How foul sewage will be dealt with during the construction phase of the development; ▪ How surface water will be managed during both the construction and the operational phases of the development; ▪ The application must clearly demonstrate compliance with all the relevant precepts contained in DAERA Standing Advice on Pollution Prevention Guidance including identifying all necessary mitigation measures to protect the aquatic environment during these works; and	**Technical Appendix A3.1: oDCEMP** identifies how foul waste will be dealt with across the site and how surface water will be managed. **Section 8.2** identifies legislation and guidance used to inform this assessment including DAERA – Standing Advice on Pollution Prevention Guidance. An Outline Drainage Plan is included as **Technical Appendix A8.5** and all DAERA compliant mitigation is

		Clearly identify all works in / near or liable to affect a waterway. Where culverting is proposed the applicant should clearly identify the length and position of any proposed culvert.	identified within **Technical Appendix A3.1: oDCEMP**. Watercourse crossings and dimensions of these watercourses are discussed in **Technical Appendix A8.4: WCI** and shown on **Figure 8.4**.
Dfi Rivers Planning Advisory and Modelling Unit	Scoping response 19/10/2021	"FLD 1- Development in Fluvial floodplains: the strategic flood maps (NI) indicates that portions of the development lie partially within the 1 AEP Floodplain, however due to the nature of the proposal DfI Rivers would have no specific reasons to object to the proposal. DfI Rivers would have no specific reasons to object to the proposed development from a fluvial flood risk perspective." FLD 2- Protection of Flood Defence & Drainage Infrastructure- Numerous undesignated watercourses flow through the site. Under 6.32 of this policy a 5 m maintenance strip is required. It should be marked up on a drawing and be protected from impediments, land raising or future unapproved development by way of a planning condition. Clear access and egress should be provided at all times. FLD 3- Development & Surface Water- Due to the size and nature of the development FLD3 of PPS15 applies. DfI Rivers recommends that a Drainage Assessment is carried out for our consideration. The applicant should refer to paragraph D17 and D18 of PPS15. In carrying out the DA the applicant should acquire from the relevant authority evidence that the proposed storm water run-off from the site can be safely discharged. If the proposal is to discharge into a watercourse then an application should be made to the local DfI Rivers Office for consent to discharge storm water under Schedule 6 of the Drainage (NI) Order 1973. FLD4- Artificial modification of Watercourses- Under FLD4 of PPS15, artificial modification of a watercourse is not normally permitted unless it is necessary to provide access to a development site for engineering reasons. This is a matter for the Planning Authority. Any culverting approval by the Planning Authority would also be subject to approval by DfI Rivers under S6 of the Drainage Order 1993. The two approvals are independently necessary.	Areas potentially at risk of flooding have been identified within **Section 8.4.7** and assessed within **Section 8.5.2.13.** Included as a design parameter, a 50 m buffer of watercourses has been implemented throughout the Development. Encroachments on this buffer are discussed in **Section 8.5.1.1.**. An Outline Drainage Assessment has been provided as **Technical Appendix A8.5**. No watercourses will be artificially modified as part of this Development for access purposes. Watercourse crossings which may require culverting have been identified within **Technical Appendix A8.4: WCI**.
Loughs Agency	Scoping response 06/01/2022	LA would like to note the potential impact of windfarms on fisheries interests, water quality and the aquatic environment: ▪ Obstruction to fish migration during & post construction. ▪ Disturbance to spawning neds (redds) during construction.	Potential impacts to ecological receptors are identified and assessed within **Chapter 10: Ecology**.

		▪ Increased silt and sediment form construction works, potential for silt laden discharge or run-off from the site including the potential for highly toxic cement and wet concrete to enter the environment. ▪ Point source pollution incidents during construction. ▪ Peat slippages adjacent to watercourses can smother spawning beds and peat can be come entrained in the river gravel and can damage the aquatic habitat in the entire downstream receiving water environment. ▪ Drainage issues, including increased flow and loss of headwaters (LA note the proposed turbine locations in close proximity to the headwater of Glenmornan River). The project appears to be hydrologically linked to the River Foyle and Tributaries SAC which acts as a key corridor from migrating Atlantic Salmon, downward migrating juvenile smolts and European eels among other noteworthy species. There is concern in relation to the subsequent impact on the hydrological environment, peat bogs absorb large volumes of water flow, the removal of such may increase the velocity of surface water run-off in times of flood and affect resident fish species. The cutting and drainage associated with the Development of wind turbine infrastructure can have negative effects on the rainwater attenuation of properties of peat. As well as an increased flood risk in local streams and rivers, Development involves a risk of large-scale bog movement resulting in landslide or bog burst. The following factors should be considered in evaluating the potential impacts of the development to fish populations and fisheries: ▪ LA request sight of any proposed culverts within the WF site – this includes all pipe and box culverts for road/track crossing and any work on drainage. ▪ If silt traps and settlement ponds are utilised, they must be capable of settling out materials prior to drainage off site. The traps and ponds must be regularly inspected and maintained according to present surface water pollution of surface waters which is detrimental to fisheries. ▪ Work methods and materials must not impinge on any nearby watercourses. The use of cement/concrete on site will require careful management. ▪ Adequate containment should be provided for all chemical, fuel and oil storage on site. Refuelling of vehicles should occur in designated areas such as the temporary company away from watercourses.	Potential impacts from chemical pollution and sedimentation & erosion are identified and assessed within **Section 8.5.2.6.** An Outline Drainage Strategy is provided as **Technical Appendix A8.5: Outline Drainage Strategy**. Hydrologically linked designated receptors including the River Foyle and Tributaries SAC have been identified in **Section 8.4.9** and the potential impacts to the receptors are discussed in **Section 8.5.2.4.** As noted in **Technical Appendix A3.3: oPMP**, the total volume of peat excavated for the Development will also be utilised for in reinstatement and restoration. A drainage assessment is also provided in **Technical Appendix A8.5: Outline Drainage Strategy**. **Technical Appendix A3.1: oDCEMP** contains information regarding culverts, silt mitigation, construction best practice, natural peat slide, and storage of chemicals and materials. Peat slippage risk from the Development is assessed in **Technical Appendix A9.1: PSRA.** Potential impacts from decommissioning are discussed in **Section 8.5.2**. However, specific impacts to fisheries are discussed in **Chapter 10: Ecology**.

		▪ The potential impact on fisheries from the decommissioning of operation Owenreagh WF 1 and site restoration and the decommissioning of the new project which is subject of the application and should be considered. ▪ The applicant should demonstrate best environmental practice when working close to watercourses as per guidance in GPP5: Works and Maintenance in or near water and GPP6: Working at Construction and Demolition Sites.	
Northern Ireland Water	Scoping response 03/08/2021	Further to consultations with S. Rutherford (Magdelene) the following is noted: “I have checked the grids and can find no issues regarding NIW telecoms. Windfarm Management didn't receive the first request for information and it was NIW Infrastructure Dept who responded and suggested there may be telecoms issues. Having checked the site NIW wind farms would have no objection to the WF extension subject to further checks to be made at planning stage.”	Noted.

8.3.2 Scope of Assessment

The issues for the assessment of potential hydrological effects relating to the different phases of the Development include short-term (decommissioning and construction) and long-term (operation and final decommissioning).

Short-term effects arising from the decommissioning and construction phase such as:

- Chemical pollution (including accidental pollution) of surface water, near-surface water and groundwater as a result of construction works;
- Erosion and sedimentation of surface water, near-surface water and groundwater as a result of construction works;
- Impediments to watercourse and near-surface water flow the introduction of obstructions to active peat and changes to hydrology;
- Increased run-off and flood risk from increased area of hardstanding including access tracks;
- Potential effects on private water supplies (PWS) in terms of water quantity, quality and continuity;
- Potential effects on the hydrological function of wetland habitats (i.e. bogs and active peat habitats); and,
- Potential effects on designated sites in terms of deterioration in condition of qualifying interests.

Long-term effects arising from the operational phase such as:

- Increased run-off and flood risk from increased hardstanding including permanent access tracks;
- Operational changes to groundwater flow resulting in impacts to active peat;
- Chemical pollution as a result of battery fires from the substation; and,
- Chemical pollution as a result of spills from maintenance vehicles.

Short-term effects arising from the final decommissioning phase, similar to the initial decommissioning and construction phase, such as:

- Chemical pollution (including accidental pollution) of surface water, near-surface water and groundwater as a result of construction works;
- Erosion and sedimentation of surface water, near-surface water and groundwater as a result of construction works;
- Impediments to watercourse and near-surface water flow from impacts to active peat and changes to hydrology;
- Potential effects on the hydrological function of bog communities; and,
- Potential effects on designated sites in terms of decrease in condition of qualifying interests.

The sensitive receptors are considered to be:

- River Foyle;
- Glenmornan River;
- Dennet Burn;
- Douglas Burn;
- Claudy groundwater body;
- Hydrologically connected designated receptors;
- Hydrological function of potential bog communities;
- Underlying active peat;
- Quantity, quality, and continuity of Private Water Supplies (PWS) (residential and commercially owned); and,
- Quantity, quality and continuity of Public Water Supplies (Northern Ireland Water abstractions).

Potential effects during the decommissioning and construction, operation and final decommissioning phases have been assessed, as well as potential cumulative effects.

8.3.3 Elements Scoped Out of Assessment

The following effects are scoped out of the assessment (as proposed in the Scoping Request, and on which points no consultees in the Scoping process objected):

- Migration of pollutants from contaminated land as the Site has not previously been developed for heavy industry and it is unlikely contaminated land will be encountered;
- Designated receptors not hydrologically connected to the Development, as outlined in Table 8.8, as there is no potential for effects on these receptors; and,
- Pollution and sedimentation effects on the water environment at distances greater than 10 km and it is proposed that receptors beyond this distance are scoped out.

Northern Ireland Water were consulted at the scoping stage and did not note any public water abstractions hydrologically connected to the Development. Therefore, public water supplies can be scoped out of further assessment.

8.3.4 Study Area / Survey Area

The hydrology and hydrogeology study area (the Core Hydrological Study Area, CHSA) is based on the site area at the timing of EIA Scoping and is shown in Figure 8.1**.** A study area of 2 km from the CHSA has been defined to assess the potential effects on both private water supplies (the PWS Study Area), and a wider study area of 10 km from the CHSA to assess potential effects on the downstream water environment (the Wider Hydrological Study Area). All study areas are shown in Figure 8.1.

It is considered that the potential for hydrological connectivity between the Project and PWS is limited beyond distances of 2km.

The Project is not expected to impact the hydrological or hydrogeological environment outside of the Wider Hydrological Study Area due to dilution and attenuation of potential pollutants.

8.3.5 Baseline Survey Methodology

A desk-based assessment, consultation, site walkover, drainage survey, water quality monitoring and dipwell installation and monitoring have been conducted to inform the hydrology and hydrogeology assessment.

8.3.5.1 Desk-based Assessment

The desk-based assessment included:

- Identification of watercourses, surface water catchments and springs;
- Identification of underlying hydrogeology and connectivity to the Development;
- Assessment of topography and slope to inform drainage patterns;
- Collation of data provided through consultation, including details on private water supply sources;
- Assessment of flood risk data and mapping;
- Hydrological Unit Assessment; and,
- Assessment of potential for the presence of bog communities.

The following sources of information were used to inform the desk-based assessment:

- OSNI 1:50,000 Discoverer Series;
- National River Flow Archive (NRFA)[24];
- Flood Maps (NI) 2017[25];
- Meteorological Office Rainfall Data[26];

[24] National Rivers Flow Archive https://nrfa.ceh.ac.uk Accessed 07 Sept. 2023

[25] Flood Maps NI, Department for Infrastructure, https://www.infrastructure-ni.gov.uk/topics/rivers-and-flooding/flood-maps-ni Accessed 07 Sept. 2023

[26] Met Office Rainfall Data, https://www.metoffice.gov.uk/services/data/business-data/rainfall Accessed 07 Sept. 2023

- Geological Survey of Northern Ireland (GSNI) Geology Map (Digital)[27];
- NIEA Water Information Request Viewer[28]; and,
- Drinking Water Inspectorate Viewer.

8.3.5.2 Consultation

In addition to Scoping consultation outlined in Section 8.3.1, the following consultees were contacted to inform the hydrology and hydrogeology assessment:

- Residents and owners of properties which are identified as being supplied by a PWS to obtain information on the source and supply of the PWS.

Further information on this consultation is provided in Section 8.4.8.

8.3.5.3 Site Walkover/visits

An initial site walkover was conducted in August 2021. A second site walkover/drainage survey was undertaken on the 1st November 2021 to visually inspect surface water features, obtain an understanding of the local topography and drainage patterns and to ground-truth the information reviewed and collated in the desk-based assessment. The site walkover covered the CHSA shown in Figure 8.1. The data gathered from this site visit was used to inform on the hydrological unit assessment and the drainage survey.

On 21st and 22nd July 2022, in-situ biological and chemical monitoring was undertaken by Woodrow as part of their ecological surveys. In addition to this, Woodrow visited the Site on 27th September 2022 to collect grab samples.

A geomorphology walkover was undertaken by an ERM engineer and hydrologist on 30th January – 3rd February 2023. The purpose of this walkover was to inspect areas which may have a higher risk of peat slide and to survey drainage of the surrounding area.

8.3.5.4 Dipwell Monitoring

The installation of 35 dipwells was carried out in August 2021 to allow long term baseline monitoring of groundwater levels across the CHSA. Dipwells were installed up to a depth of 1.5 m (or to a shallower depth where peat deposits did not extend to 1.5 m). Monthly monitoring was carried out using a handheld dip meter over a period of 12 months. The first three months of monitoring data was used to inform on the hydrological unit assessment in Section 8.4.5**.**

Dipwell monitoring was conducted across the Site by Woodrow on behalf of Ørsted. This monitoring was conducted monthly between September 2021 and August 2022.

8.3.6 Methodology for the Assessment of Effects

The significance of the likely significant effects of the Development has been classified by professional consideration of the sensitivity of the receptor and the magnitude of the likely significant effect.

The assessment follows the systematic approach outlined in Sections 8.3.6.

The assessment is based on a source-pathway-receptor methodology, where the sensitivity of the receptors and the magnitude of potential change upon those receptors identified within the study areas outlined in Section 8.3.4**.**

Conclusions, state whether the residual significance will be major, moderate, minor or negligible, once appropriate mitigation has been implemented. This assessment relies on professional judgment to ensure that the effects are appropriately assessed.

[27] Geological Survey of Northern Ireland (2023) Geology Map. https://www2.bgs.ac.uk/gsni/geology/index.html Accessed 07 Sept. 2023

[28] Northern Ireland Environment Agency, Department of Agriculture, Environment and Rural Affairs (2023) NIEA Water Information Request Viewer. https://www.daera-ni.gov.uk/articles/information-requests Accessed 07 Sept. 2023

8.3.6.1 Sensitivity of Receptors

The sensitivity of the baseline conditions, including the importance of environmental features on or near to the Site or the sensitivity of potentially affected receptors, has been assessed in line with best practice guidance (such as that provided NatureScot[29]), legislation, statutory designations and / or professional judgement.

Error! Reference source not found. details the framework for determining the sensitivity of receptors.

Table 8.2. Criteria for Sensitivity of Receptors

Sensitivity of Receptor	Definition
High	▪ A large, medium, or small waterbody with an NIEA water quality classification of 'High' or 'Good'; ▪ The hydrological receptor and downstream environment has limited capacity to attenuate natural fluctuations in hydrochemistry and cannot absorb further changes without fundamentally altering its baseline characteristics / natural processes; ▪ The hydrological receptor is of high environmental importance or is designated as national or international importance, such as a Special Area of Conservation (SAC) or an Area of Special Scientific Interest (ASSI); ▪ The receptor acts as an active floodplain or other flood defence; ▪ The receptor is located within an active flood plain, in accordance with PPS 15 2014; ▪ Wetland habitats, as classified by UKTAG, which are classified as having "high groundwater dependency" have no functional impairment by man-made influence (such as drainage or forestry); ▪ The hydrological receptor will support abstractions for public water supply or private water abstractions for more than 25 people; ▪ Abstractions used for the production of mass produced food and drinks; ▪ Areas containing geological or geomorphological features considered to be of national importance (e.g. geological ASSIs); ▪ Local groundwater constitutes a valuable resource because of its high quality and yield; ▪ Aquifer(s) of local or regional value. Statutorily designated nature conservation sites (e.g. SACs and ASSIs) dependent on groundwater; and, ▪ Pristine or active peat bog habitat; evidence that peat body has an intact hydrological system or possibility that peat may not recover to pristine status.
Medium	▪ A large, medium or small waterbody with a NIEA water quality classification of 'Moderate'; ▪ The hydrological receptor and downstream environment will have some capacity to attenuate natural fluctuations in hydrochemistry but cannot absorb certain changes without fundamentally altering its baseline characteristics / natural processes; ▪ The hydrological receptor is of regional environmental importance (such as Local Nature Reserves), as defined by NIEA; ▪ The hydrological receptor does not act as an active floodplain or other flood defence; and, ▪ The hydrological receptor supports abstractions for public water supply or private water abstractions for up to 25 people;

[29] Scottish Natural Heritage (NatureScot) and Historic Environment Scotland (2018), Environmental Impact Assessment Handbook. Publication 2018 - Environmental Impact Assessment Handbook V5.pdf (nature.scot).Accessed 07 Sept. 2023.

	▪ Active peat habitats which are classified as having "high groundwater dependency", as classified by UKTAG, but have functional impairment by man-made influence (such as drainage or forestry); ▪ Wetland habitats which are classified as "moderately groundwater dependent" have no functional impairment by man-made influence (such as drainage or forestry); ▪ Areas containing geological features of designated regional importance including Regionally Important Geological/geomorphological Sites (RIGS), considered worthy of protection for their historic or aesthetic importance; ▪ Aquifer of limited value (less than local) as water quality does not allow potable or other quality sensitive uses. Exploitation of local groundwater is not far-reaching. Local areas of nature conservation known to be sensitive to groundwater effects; and, ▪ Pristine or active peat bog habitat; evidence that peat body has an intact hydrological system or possibility that peat could recover to pristine status.
Low	▪ A large, medium or small waterbody with a NIEA water quality classification of 'Poor' or 'Bad'; ▪ The hydrological receptor and downstream environment will have capacity to attenuate natural fluctuations in hydrochemistry but can absorb any changes without fundamentally altering its baseline characteristics / natural processes; ▪ The hydrological receptor is not of regional, national or international environmental importance; ▪ The hydrological receptor is not designated for supporting freshwater ecological interest; ▪ Wetland habitats which are classified as having "low or moderate groundwater dependency", as classified by UKTAG, but have functional impairment by man-made influence (such as drainage or forestry); ▪ The hydrological receptor does not act as an active floodplain or other flood defence; ▪ The hydrological receptor is not used for recreational use; ▪ The hydrological receptor does not support abstractions for public water supply or private water abstractions; ▪ Geological features or geology not protected and not considered worthy of specific protection; ▪ Poor groundwater quality and / or very low permeability make exploitation of groundwater unfeasible. Changes to groundwater not expected to affect local ecology; and, ▪ Degraded or inactive peat; small isolated areas of peat; soil not sensitive to change, e.g. degraded / grazed; shallow, evidence of widespread erosion. Significant active land drainage has occurred resulting in ongoing dewatering of peat.

8.3.6.2 Magnitude of Effect

The magnitude of potential effects will be identified through consideration of the Development, the degree of change to baseline conditions predicted as a result of the Development, the duration and reversibility of an effect and professional judgement, best practice guidance (such as that provided by NatureScot[29] and legislation.

The criteria for assessing the magnitude of an effect are presented in Table 8.3.

Table 8.3. Framework for Determining Magnitude of Effects

Magnitude of Effects	Definition
High	▪ A short or long term major shift in hydrochemistry or hydrological conditions sufficient to negatively change the ecology of the receptor. This change will equate to a downgrading of a NIEA water quality classification by two classes e.g. from ‘High’ to ‘Moderate’; ▪ A sufficient material increase in the probability of flooding onsite and offsite, adding to the area of land which requires protection by flood prevention measures or affecting the ability of the functional flood plain to attenuate the effects of flooding by storing flood water (in accordance with PPS 15); ▪ A major (greater than 50%) or total loss of a geological receptor or peat habitat site, or where there will be complete severance of a site such as to fundamentally affect the integrity of the site (e.g. blocking hydrological connectivity); ▪ A major loss of (greater than 50% of study area) or total loss of highly dependent and wetland habitats, or where there will be complete hydrological severance which will fundamentally affect the integrity of the feature; ▪ A major permanent or long term negative change to groundwater quality or available yield; ▪ A major permanent or long term negative change to geological receptor, such as the alteration of pH or drying out of peat; and, ▪ Changes to groundwater quality or water table level that will negatively alter local ecology or will lead to a groundwater flooding issue.
Medium	▪ A short or long term non-fundamental change to the hydrochemistry or hydrological environment, resulting in a change in ecological status. This change will equate to a downgrading of a NIEA water quality classification by one class e.g. from ‘High’ to ‘Good’; ▪ A moderate increase in the probability of flooding onsite and offsite, adding to the area of land which requires protection by flood prevention measures or affecting the ability of the functional flood plain to attenuate the effects of flooding by storing flood water (in accordance with PPS); ▪ A loss of part (approximately 5% to 50%) of a geological receptor or peat habitat site, major severance, major effects to its integrity as a feature, or disturbance such that the value of the site will be affected but could still function; ▪ A loss of part (approximately 10% to 50% of study area) of a moderately dependent and moderate value wetland habitats – significant hydrological severance affects the integrity of the feature, but it could still function; ▪ Changes to the local groundwater regime that may slightly affect the use of the receptor; ▪ The yield of existing supplies may be reduced or quality slightly deteriorated; and, ▪ Fundamental negative changes to local habitats may occur, resulting in impaired functionality.
Low	▪ A detectable non-detrimental change to the baseline hydrochemistry or hydrological environment. This change will not result in a downgrading of the NIEA water quality classification; ▪ A marginal increase in the probability of flooding onsite and offsite, adding to the area of land which requires protection by flood prevention measures or affecting the ability of the functional flood plain to attenuate the effects of flooding by storing flood water (in accordance with PPS);

	▪ A detectable but non-material effect on the receptor (up to 5%) or a moderate effect on its integrity as a feature or where there will be a minor severance or disturbance such that the functionality of the receptor will not be affected; ▪ A detectable effect on a wetland habitats (loss of between 5% - 10% of study area) or a minor effect on a wetland habitat's integrity as a feature or where there will be a minor severance or disturbance such that the functionality of the receptor will not be affected; ▪ Changes to groundwater quality, levels or yields do not represent a risk to existing baseline conditions or ecology; ▪ Small loss of soils or peatland, or where soils will be disturbed but the value not impacted; ▪ Short-term change to baseline resource; and, ▪ Small effect on a geological site or mineral deposit, such that the value of the site would not be affected.
Negligible	▪ No perceptible changes to the baseline hydrochemistry or hydrological environment; ▪ No change to the NIEA water quality classification; ▪ No increase in the probability of flooding onsite and offsite; ▪ A slight or negligible change from baseline condition of geological resources; ▪ Change hardly discernible, approximating to a 'no change' in geological condition; ▪ Minimal detectable effect on wetland habitats (between to 0.1% - 5% of study area) or no discernible effect on its integrity as a feature or its functionality; ▪ Minimal or no change to soils or peatlands; ▪ A very slight change from the baseline conditions. The change is barely distinguishable, and adopts a 'no-change' situation; and, ▪ Minimal or no change to a geological site or mineral deposit.

8.3.6.3 Significance of Effect

The sensitivity of the asset and the magnitude of the predicted effects will be used as a guide, in addition to professional judgement, to predict the significance of the likely effects. Table 8.4 summarises guideline criteria for assessing the significance of effects, informed by NatureScot Guidance[29];.

Table 8.4. Guideline Criteria for Assessment of the Significance of Effects

Magnitude of Effect	**Sensitivity of Resource or Receptor**		
	High	**Medium**	**Low**
High	Major	Major	Moderate
Medium	Major	Moderate	Minor
Low	Moderate	Minor	Negligible
Negligible	Negligible	Negligible	Negligible

Effects predicted to be of major or moderate significance are considered to be 'significant' in the context of the EIA Regulations and are shaded in light grey in the above table.

8.3.7 Assessment Limitations

All data considered necessary to identify and assess the potential significant effects resulting from the Development was available and was used in the assessment reported in this chapter. If any additional

Private Water Supplies (PWS) are identified in the future full details of water management measures and mitigation will be provided in the oDCEMP. Examples of embedded mitigation to protect PWS include the adoption of a 50 m buffer zone between watercourses and infrastructure (excluding watercourse crossings) and the use of impermeable membranes and bunding of the construction compound.

8.4 Baseline Conditions

8.4.1 Topography and Land Use

The CHSA occupies an upland location which is used as agricultural land for pastoral farming and an existing wind farm. The lower topography to the north-east of the CHSA is dominated by agricultural land acid grassland and isolated areas of shrub. A small area of coniferous woodland is present to the south-west. Wet dwarf shrub heath and bracken are found across the CHSA. Vegetation associated with flushes and springs are present at the higher topography to the centre of the CHSA. This is discussed in greater detail in **Chapter 10: Ecology**.

The CHSA rises from approximately 58 m above ordnance datum (AOD, approximately equivalent to sea level) at the western boundary of the CHSA to 266 m AOD at Owenreagh Hilll at the southern boundary of the CHSA, resulting in lower topography to the north and west of the CHSA, where the Allt Beag and Armadale Burn both drain to the north.

The CHSA is bound by Koram Road to the west, Napple Road to the north-east and Ballykeery Road to the east. The CHSA extends south to the summit of Owenreagh Hill. The CHSA is largely covered in upland vegetation with varying quality of peatland.

8.4.2 Climate

The National River Flow Archive (NRFA) report Average Annual Rainfall (AAR 1961 – 1990) at the Mourne at Drumnabuoy House gauging station, approximately 6.5 km west of the CHSA, as 1,288 millimetres (mm).

As monthly long-term climate data is not freely available from the NRFA, long term average rainfall data (1991 to 2020) obtained by the Meteorological Office at the Castlederg gauging station, located 19 km south-west of the CHSA, are presented in Table 8.5. Annual average rainfall at the Castlederg gauging station is recorded as 191.64 mm (1991 to 2020).

Table 8.5. Long term average rainfall data (1991 - 2020), Castlederg

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	124.06	100.64	88.39	74.38	70.25	76.55	86.90	90.98	88.41	111.82	121.99	132.83

8.4.3 Surface Hydrology

Surface hydrology features include natural features such as watercourses and drains, as well as artificial features such as ditches and cuttings. A summary of these features can be seen in Figure A8.1.1 in **Technical Appendix A8.1: Hydrological Unit Assessment**.

The CHSA is predominantly situated within the River Foyle catchment with sub-catchments including, Glenmornan River, Owenreagh Burn and Dunnyboe Burn. Figure 8.2 shows the surface water catchments present within the CHSA. As a result of previous land use, including the construction of the pre-existing wind farm, there are many artificial drainage channels present across the CHSA.

The western area of the CHSA slopes west and consists of several drainage channels. To the south-west, these drainage channels are largely natural, but some are artificial. These channels all drain into an unnamed tributary of Owenreagh Burn. The north of the CHSA is bound by Glenmornan Road. Within this area, the surface hydrology consists of natural drainage channels and a number of artificial channels as a result of peat cutting. These drainage channels flow into Glenawanda Burn, a tributary of Owenreagh Burn.

Owenreagh Burn is within the catchment of Glenmornan River which has a WFD classification of "Moderate" as specified by the NIEA map viewer[30]. Glenmornan River flows downstream before intersecting with the River Foyle which has an overall water quality classification of "Moderate".

The central aspect of the CHSA is south of Glenmornan Road and west of the pre-existing access tracks slopes to the north. The drainage channels present in this area all flow north towards Glenmornan Road. A large number of these are artificial or modified as a result of previous construction activities and peat cutting. Many of these channels converge before crossing the Glenmornan Road via culverts. The channels all flow north into the agricultural fields north of Glenmornan Road and drain into two watercourses; Glentransa Burn and Legnavadder Burn. These two burns flow north-west before converging into Glemornan River.

Within the south and central areas of the CHSA, there are several of surface water drainage channels which flow continuously from the south of the CHSA, flowing north-east, to the central areas of the CHSA where they discharge into a large tributary of Dunnyboe Burn.

Dunnyboe burn itself is classed as having "Moderate" WFD status from combined ecological and chemical status. While many these drainage channels are natural, there are also many smaller channels which are modified/artificial which were installed for drainage from the existing wind farm. To the north of this area, north of Glenmornan Road, the north-east of the CHSA is made up of small artificial channels because of peat cutting. Some channels in this area drain west to Legnavadder Burn, while others drain to the tributary of Dunnyboe Burn. While much of the area is bound by Napple Road, there is potential for surface water to drain north-east into Moor Lough, north-east of the CHSA.

The far east of the CHSA is situated on the northern slopes of Craignagapple. The area generally slopes north, however the western aspect of the area drains north-east towards the unnamed tributary watercourse of Dunnyboe Burn, while the western aspect of the area slopes north-west and drains into Ballykerry burn. Both Ballykeery Burn and Dunnyboe burn drain north, converging, before draining into Burn Dennet, which ultimately drains into the River Foyle.

As of 2021, as specified by the NIEA map viewer, Dunnyboe Burn has a WFD classification of "Moderate" from combined ecological and chemical status, however the tributary of this which flows north from the north-east area of the CHSA presents with a prominent ochre colour as shown in Plate 8.1. The surrounding drainage is heavily modified and while it is thought that this watercourse is natural, there appears to have been works carried out along the riparian area which has eroded some of the banks of the watercourse south of Glenmornan Road.

[30] Northern Ireland Environment Agency, Department of Agriculture, Environment and Rural Affairs (2023) WFD Status, NIEA Map Viewer. https://www.daera-ni.gov.uk/articles/daera-map-viewers Accessed 07 Sept. 2023.

Plate 8.1. Tributary of Dunnyboe Burn, located to the north-east of the Site (left photograph – facing upstream, right photograph – facing downstream). Grid reference: 243603, 396808.

To the south of the CHSA, surface water drains south from the southern slopes of Owenreagh Hill into Garrowalt Burn and several other smaller tributaries of Douglas Burn. Douglas Burn is classified as having "Moderate" WFD status from combined ecological and chemical status and flows south and west before ultimately discharging into the River Foyle.

8.4.4 Hydrogeology

Based on the Department for Agriculture, Environment and Rural Affairs (DAERA) Groundwater bodies dataset (2015)[31], the CHSA is underlain by the Claudy groundwater body (IDUKGBNI4NW003) which has an overall status of 'Good'.

GSNI 10K digital mapping and the GSNI GeoIndex map[32] shows the bedrock geology underlying the majority of the CHSA to consist of psammite, pelite and semipelite of the Dart Formation. There are also smaller intrusions of metalimestone through the northern-central area of the CHSA. These are separated by a large thrust fault, that bisects the CHSA from north-west to south-east. There are several other perpendicular faults along this larger fault. The bedrock groundwater units are overlain by peat superficial deposits within the CHSA. These deposits, along with alluvium and glacial till are widely found across the CHSA.

As shown in the GSNI GeoIndex, the bedrock aquifer is of "limited potential productivity – fractured flow" where "Moderate yields unusual. Low yields more common. Regional flow limited. Mainly shallow, local flow.". No mapped superficial aquifer has been identified by GSNI. As shown by GSNI Geoindex, the majority of the CHSA is underlain with a bedrock aquifer with a vulnerability of 4 and 5. This reflects to a moderate-high level of groundwater vulnerability.

The CHSA is underlain by superficial deposits primarily comprising of peat but may also include other deposits such as sand and gravels, confirmed from both peat probing surveys across the site and habitat mapping data which confirmed the presence of peatland habitats (including areas of active peat). In hydrologically intact areas, groundwater levels are close to the surface (between 0.1 – 0.2 m depth) with the presence of groundwater confirmed by dipwell monitoring.

[31] DAERA (2015) Groundwaters Digital Datasets. https://www.daera-ni.gov.uk/publications/groundwaters-digital-datasets Accessed 07 Sept. 2023.

[32] GSNI (2020) GeoIndex Map https://mapapps2.bgs.ac.uk/gsni_geoindex/home.html Accessed 07 Sept. 2023.

8.4.4.1 Dipwell Monitoring

As stated in Section 8.3.5.4, groundwater levels varied across the site with highest groundwater levels recorded at each borehole between -0.44 metres below ground level (mbgl) and 0.79 mbgl. Most dip meter readings showed groundwater levels to be relatively shallow, at less than 1.0 mbgl. The full dataset is presented in **Technical Appendix A8.6: Dipwell Monitoring Dataset**.

8.4.5 Hydrological Unit Assessment

A hydrological unit assessment was carried out by ERM, presented in **Technical Appendix A8.1: Hydrological Unit Assessment**. A baseline review of hydrological features was carried out to identify natural features, such as mapped watercourses or unmapped drains, as well as artificial features such as ditches and cuttings. A drainage survey took place in November 2021 to ground truth the baseline hydrological mapping. The location of these features indicated where groundwater flow is likely to coincide with surface water features and therefore separate hydrological units were identified. This assessment utilised these hydrological units and cross-referenced them with groundwater level data derived from dipwell monitoring data to determine which units are ‘Intact’, ‘Non-Intact’ and ‘Compromised’.

The results of this assessment showed that substantial areas of the CHSA are identified as ‘Non-Intact’ (384 ha) and ‘Compromised’ (549 ha) with a slightly smaller area identified as ‘Intact’ (249 ha). ‘Non-Intact’ and ‘Compromised’ areas are considered to be degraded; whereby hydrological units have either been altered by artificial features or is artificial in origin. Whilst active peat may be present within ‘Intact’ or ‘Compromised’ units, it is unlikely to be present within ‘Non-Intact’ areas. A summary of this assessment can be seen in Figure A8.1.3. As detailed in **Technical Appendix A10.4: Active Peat Assessment**, no direct impacts to active peat are expected from the siting of the Development turbines and infrastructure.

8.4.6 Wetland Habitats

In accordance with standard National Vegetation Classification guidance, a Phase 1 habitat survey was undertaken by Woodrow to identify wetland habitats occurring within the Core Study Area. Wetland habitats were identified in line with the criteria outlined in UKTAG Guidance. Where wetland habitats were identified, further detailed habitat assessment was undertaken, with identification of National Vegetation Classification (NVC) communities. The survey methods employed, and assessment results are outlined in **Chapter 10: Ecology.**

There are a significant number of artificial features across the Site including artificial drainage features such as ditches, large areas of peat cuttings resulting in exposed peat and areas of depression, and man-made features such as agricultural tracks, existing wind farm access tracks and public roads. These features have the potential to impair the function of wetland habitats and therefore, the wetland habitat polygons effected by these features have been assessed as impaired receptors. These polygons are represented on Figure 8.5.

8.4.7 Flood Risk

Flood Maps (NI) produced by DfI Rivers show areas of Northern Ireland with a 0.5% (1:200) or greater chance of flooding. These areas are known as medium to high risk areas for flooding.

These flood maps shows that several waterbodies across the CHSA are at medium to high risk of flooding from surface water. This includes Glenwanda Burn and the other tributary of Owenreagh Burn to the west of the CHSA. To the north of the CHSA, Glentrasna Burn and Legnavadder Burn are also at risk of flooding from surface waters. The large tributary of Dunnyboe Burn which flows through the centre of the CHSA also presents with medium to high risk of annual flooding from surface waters.

Annual risk of flooding from river flooding is also seen in the same watercourses as above. However, the extent of flooding does not extend as far into the CHSA as the mapped flood extent from surface waters does.

The flood maps show flooding is restricted to the waterbodies and do not indicate widespread flooding across the CHSA.

8.4.8 Private Water Supplies

8.4.8.1 Residential PWS

Through previous survey letter consultation in the area, ten properties were identified to be potentially served by PWS. In order to ascertain more information on the supplies, survey letters were sent to the addresses of the identified PWS on 21st December 2021. A review of the Craignagapple Wind Farm Environmental Statement (2010) identified two additional potential PWS within the PWS Study Area (Figure 8.1). To obtain further information on the identified PWS, the community Liaison Officer (CLO) carried out PWS inspections in June/July 2022. These visits identified a further two potential PWS. A summary of these PWS is shown in Table 8.6 in addition to the potential hydrological connectivity and displayed on Figure 8.3.

Table 8.6. PWS Identified with the Water Supplies Study Area

PWS Supply	PWS Source	Grid Reference (approx.)	Distance from Site (approx.)	Scoped in or out of Assessment
31 Koram Road	Well	240890 397415	60 m east of CHSA (160 m AOD)	**Scoped into** assessment – hydrologically connected as property and source are located in close proximity to and downslope of the Development.
60 Glenmornan Road	Well	241500 397460	76 m north of CHSA (220 m AOD)	**Scoped into** assessment – groundwater source downslope of proposed Development.
33 Koram Road	Mains Water Supply	240866 397470	83 m east of CHSA (160 m AOD)	**Scoped out** of assessment – confirmed to be on mains supply.
40 Koram Road	Well	240520 398115	360 m north-west of CHSA (150 m AOD)	**Scoped out** of assessment – groundwater source is disconnected from the Development by Owenreagh Burn.
91 Holyhill Road	Well	240940 398434	525 m north-west and of CHSA (160 m AOD)	**Scoped into** assessment – property is downslope of the Development and in proximity to road used for access.
93 Holyhill Road	Well	241015 398504	602 m north-west and of CHSA (160 m AOD)	**Scoped into** assessment – property is downslope of the Development and in proximity to road used for access.
125 Curlyhill Road	Well	239800 396600	856 m south-west of CHSA (230 m AOD)	**Scoped out** of assessment – hydrologically disconnected as both source and property are in separate hydrological catchments.

10 Ballykeery Road	Well	242640 394139	876 m south of CHSA (240 m AOD)	**Scoped out** of assessment – hydrologically disconnected as both source and property are in separate catchments.
12 Ballykeery Road	Borehole	242792 394660	920 m south of the CHSA (240 m AOD)	**Scoped out** of assessment – hydrologically disconnected as both source and property are in separate catchments.
78 Holyhill Road	Mains Water Supply	No coordinates provided for this property	Approximately 976 m north-west of CHSA	**Scoped out** of assessment – confirmed to be on mains supply.
11 Koram Road	Spring	241130 394876	1.47 km south of CHSA (260 m AOD)	**Scoped out** of assessment – hydrologically disconnected as both source and property are in separate hydrological catchments.
8 Koram Road	Spring	241093 394610	1.73 km south of the CHSA (240 m AOD)	**Scoped out** of assessment – hydrologically disconnected as property and source are in separate catchments from the Development.
84 & 86 Meendamph Road	Four Well Sources	246057 398670	2 km north-east of the CHSA (150 m AOD)	**Scoped out** of assessment – hydrologically disconnected by Ballykeery and Dunnyboe Burn.

The properties identified in Table 8.6 are fully assessed within **Technical Appendix A8.2: PWSRA** and discussed in Section 8.5.2.10**.**

8.4.8.2 Commercial PWS

A review of the 2010 Craignagapple Wind Farm Environmental Statement (Planning Ref: J/2010/0481/F) was carried out in which three potential commercial abstractions were found; two PWS utilised by Devine, Sand and Gravel, and one PWS used by Acheson and Glover. This information was followed up by a CLO visit in June/July 2022. This showed that Devine Sand and Gravel are now served by a mains water supply only and is therefore not hydrologically connected. The CLO visited the location in which Acheson and Glover was noted in the 2010 ES to be located and recorded that there was no property present. Therefore, impacts to commercial water supplies are scoped out of assessment.

8.4.9 Designated Hydrological Receptors

The statutory designated sites relating to water within the Wider Study Area, identified using DAERA[33] and NIEA[34] GIS datasets. The statutory designations that are potentially hydrologically connected to the Development are listed in Table 8.7. Statutory Designations which are not potentially hydrologically connected are listed in Table 8.8.

Table 8.7. Statutory Designated Sites Hydrologically Connected within 10 km Wider Study Area

Designation	Distance from the CHSA	Qualifying Interest	Hydrologically Connected to the Development
Lisnaragh ASSI[35]	2.6 km north-east	Morainic Ridge	Yes – downstream of Dunnyboe Burn.
Silverbrook Wood ASSI[36]	2.71 km north	Diverse woodland: Downy Birch, Oak, Ask, Beech, alder. Shrub: Hazel, Holly, Hawthorn, Willow, Bramble, Bilberry and Bluebell.	Yes – downstream of Dunnyboe Burn.
River Foyle and Tributaries SAC[37]	5.5 km west	Otters, Atlantic Salmon and Water-Crowfoot	Yes - Downstream of the Development, connected by Burn Dennet, Douglas Burn and Glenmornan Burn.
Corbylin Wood ASSI[38]	6.4 km north	Downy Birch, Ash, Alder, Hazel, Hawthorn, willow, Bramble and Bilberry	Yes – downstream of Burn Dennet.

Table 8.8. Statutory Designated Sites Hydrologically Disconnected within 10 km Wider Study Area

Designation	Distance from the Development	Qualifying Interest	Hydrologically Connected to the Development
Aghabrack ASSI[39]	4.9 km east	Hummocky moraine ridge	No – Disconnected by topography of Crockrour and Baix Hill.
Butterlope Glen ASSI[40]	4.5 km east	Dalradian stratigraphy	No – Disconnected by topography of Crockrour and Baix Hill.

[33] DAERA (2019) DAERA Digital Datasets. https://www.daera-ni.gov.uk/articles/download-digital-datasets. Accessed 07 Sept. 2023.
[34] NIEA (2020) NIEA Water Management Unit, Water Information Request Viewer. https://gis.daera-ni.gov.uk/arcgis/apps/webappviewer/index.html?id=7e234827aa7a405d990359aa92c7c287 Accessed 07 Sept. 2023.
[35] DAERA (2015) Lisnaragh ASSI. https://www.daera-ni.gov.uk/publications/lisnaragh-assi Accessed 07 Sept. 2023
[36] DAERA (2015) Silverbrook Wood ASSI. https://www.daera-ni.gov.uk/publications/silverbrook-wood-assi Accessed 07 Sept. 2023.
[37] DAERA (2015) River Foyle and Tributaries SAC. https://www.daera-ni.gov.uk/publications/reasons-designation-special-area-conservation-river-foyle-and-tributaries Accessed 07 Sept. 2023.
[38] DAERA (2015) Corbylin Wood ASSI https://www.daera-ni.gov.uk/publications/corbylin-wood-assi Accessed 07 Sept. 2023.
[39] DAERA (2015) Aghabrack ASSI. https://www.daera-ni.gov.uk/publications/aghabrack-assi Accessed 07 Sept. 2023.
[40] DAERA (2015) Butterlope Glen ASSI. https://www.daera-ni.gov.uk/publications/butterlope-glen-assi Accessed 07 Sept. 2023.

Owenkillew and Glenelly Woods ASSI[41]	6.5 km south	Woodland and Shrub: Oak, Beech, Birch, Hazel, Sycamore, Goat willow, Holly, Greater wood-rush, Bilberry, Bluebell and Lesser Celandine.	No - disconnected by topography.
Owenkillew River ASSI[42]	6.7 km south	Freshwater Pearl Mussel, River physical diversity and flora and fauna	No – located in separate hydrological catchment.
Bond's Glen ASSI[43]	9.17 km north-east	Toothwort, Wood fescue, Wood club rush, Goat willow, fen vegetation, wet woodland canopy.	No – disconnected by topography.
River Faughan and Tributaries ASSI[44]	9.25 km north-east	Brown Trout, Atlantic Salmon, Brook Lamprey, Sea Lamprey,	No – disconnected by topography.

8.4.10 Sensitivity of Receptors

The sensitivities of the identified receptors, and their relationship to the potential effects from the Development, are set out in Table 8.9.

Table 8.9. Sensitivity of Receptors

Receptor	Potential Effects	Sensitivity	Sensitivity Description
Surface hydrology (watercourses)	Increased run-off, erosion and sedimentation, stream flow impediments and pollution as a result of construction groundworks and chemical handling and storage.	High	Glenwanda Burn, Owenreagh Burn and Legnavadder Burn are all tributaries of Glenmornan River which is a waterbody with a WFD classification of 'Moderate'. Bunnyboe Burn has a WFD classification of "Moderate". While the above watercourses have a WFD classification of "Moderate", they are hydrologically connected to River Foyle and Tributaries SAC, which has a High sensitivity. This then reflects that surface hydrology should be treated as a High sensitivity receptor.
Bedrock Aquifer (groundwater)	Pollution as a result of erosion and sedimentation from construction activities and	Medium	Groundwater body is noted to a 'limited productivity aquifer' and is therefore of limited value.

41 DAERA (2015) Owenkillew and Glenelly Woods ASSI. https://www.daera-ni.gov.uk/publications/owenkillew-and-glenelly-woods-assi Accessed 07 Sept. 2023.
42 DAERA (2015) Owenkillew River ASSI. https://www.daera-ni.gov.uk/publications/owenkillew-river-assi Accessed 07 Sept. 2023.
43 DAERA (2015) Bonds Glen ASSI https://www.daera-ni.gov.uk/publications/bonds-glen-assi Accessed 07 Sept. 2023.
44 DAERA (2015) River Faughan and Tributaries ASSI. https://www.daera-ni.gov.uk/publications/river-faughan-tributaries-assi Accessed 07 Sept. 2023.

	uncontained spills from chemical handling and storage.		However, the groundwater in this area supports several PWS in the surrounding area which are of Medium sensitivity. This then reflects that the groundwater is also of Medium sensitivity.
Superficial Aquifer (including peat deposits) – near-surface water	Diversion of near-surface flow as a result of track construction and the installation of turbine foundations / hardstanding. Pollution as a result of erosion and sedimentation from construction activities and uncontained spills from chemical handling and storage.	High	Areas of peatland across this Site have been identified as areas of active peat. NIEA Advice Note PPS18 indicates that Active peat habitats are a European priority habitat.
Designated Hydrological Receptors	Increased run-off, erosion and sedimentation, stream flow impediments and pollution as a result of construction groundworks.	High	River Foyle and Tributaries SAC is of high environmental importance or is designated as European or international importance (Special Area of Conservation (SAC)).
Wetland habitats (moderately groundwater dependent)	Pollution as a result of infrastructure construction and uncontained spills from chemical handling / storage. Drying out or changes to groundwater interflow patterns from impediments to flow as a result of construction.	Medium	Wetland habitats which are classified by UKTAG as “moderately groundwater dependent” and have no functional impairment by man-made influence (such as drainage or forestry).
Wetland habitats (moderately groundwater dependent with impairments)	Pollution as a result of infrastructure construction and uncontained spills from chemical handling / storage. Drying out or changes to groundwater interflow patterns from impediments to flow as a result of construction.	Low	Wetland habitats which are classified as having “low or moderate groundwater dependency”, as classified by UKTAG, but have functional impairment by man-made influence (such as drainage or forestry).
PWS	Pollution as a result of uncontained spills from vehicles, and chemical handing/ storage. Pollution as a result of erosion and sedimentation from decommissioning and construction activities. Drying out or changes to quantity as a result of hydrological changes caused by decommissioning and construction activities.	Medium	Householder and farm practices are reliant on quantity and quality of water from the PWS, and some have the potential to be affected (see section 8.4.8).

8.5 Assessment of Potential Effects

The effect of the Development on hydrological receptors has been considered for the decommissioning and construction, operation and final decommissioning phases of the Development. Effects occurring during construction and decommissioning are considered to be short term effects, with those occurring as a result of the operational phase of the Proposed Development being considered to be long term effects. Embedded mitigation considered within the design is outlined within Section 8.5.1.

8.5.1 Embedded Mitigation

The following mitigation measures relating to the hydrological environment are embedded into the design and construction of the Development:

- 50 m watercourse buffers for construction works with the exception of watercourse crossings with the exception of a crane outpad and a section of access track, discussed in Section 8.5.1.1.
- Active peat has the potential to be impacted indirectly by the Development through changes in the water table caused by localised draw-down of water resulting from drainage or dewatering activities. To understand the potential extent of this, **Technical Appendix A8.3: Note on Indirect Effects of Dewatering** assesses the indirect effects of dewatering on groundwater and concludes that a buffer of 15 m should be used around turbine base excavations and a 5 m buffer should be used around access track infrastructure with drainage ditches. This buffer was implemented during the design phase to minimise the potential for indirect effects on active peat.
- Good practice methods and works for protection of hydrological receptors as outlined in **Technical Appendix A3.1: oDCEMP**; and,
- The requirement for access tracks crossing watercourses has been minimised.

The oDCEMP comprises methods and works that are established and effective measures to which the Applicant will be committed through the development consent. Accordingly, the assessment of significance of effects of the Development are considered with the inclusion of **Technical Appendix A3.1: oDCEMP** as standard mitigation procedure.

The oDCEMP describes water management measures to control surface water run-off and drain hardstandings and other structures during the construction and operation of the Development. This will form part of a Pollution Prevention Plan (PPP) to be implemented for the Development. Measures outlined in the oDCEMP are based on good construction practice. The DCEMP and PPP are to be agreed with relevant consultees prior to the construction phase.

8.5.1.1 Deviation from Embedded Mitigation

50 m Watercourse Buffer

Buffer distances between proposed construction works and watercourses have been maximised to reduce the potential for chemical pollutants to be transferred to the water environment. A 50 m buffer for natural watercourses from infrastructure (excluding watercourse crossings) has been adopted, where possible. This buffer has been encroached on in some areas of the north-east of the CHSA and one area to the north-west of the CHSA in order to avoid areas of active peat. The new access track to turbines T1 and T2 briefly encroaches on the 50 m buffer zone to avoid encroaching on the 5 m buffer area of active peat. The distance between the access track and the watercourse at the closest point is 33 m. A small section of the access track to turbine T13 lies within the watercourse buffer, with the closest point measuring a distance of 8 m, however this is to enable access from the existing Napple Road which passes between the proposed infrastructure and the watercourse. The access track and auxiliary crane pad located between the proposed turbines T8 and T9 also occupy space within a 50 m watercourse buffer, in order to avoid areas of active peat but also to utilise the existing access track and therefore minimise potential effects. The watercourse in question passes directly underneath the crane pad area and it the closest point, the adjacent access track is 2 m from the watercourse.

Active Peat Buffer

Potential impacts to active peat are assessed within **Chapter 10: Ecology** and within **Technical Appendix 10.4: Active Peat Assessment**.

8.5.2 Potential Decommissioning and Construction Effects

The nature and magnitude of effects that could result from decommissioning and construction phase activities, as described in **Chapter 3: Development Description**, are assessed in the following paragraphs, which include:

- Decommissioning of the existing Owenreagh I and II turbines and infrastructure;

- Construction of new and upgraded access tracks, turbines and associated infrastructure, hardstanding, substation and temporary construction compounds; and,
- Drainage features serving the other Development components.

8.5.2.1 Chemical Pollution

Potential chemical pollution effects involved with the decommissioning and construction phase are a risk management issue, with the effects being assessed on the basis that the risk is realised. Should the Development proceed as described in **Chapter 3: Development Description**, i.e., with no spills, there would be no effects.

Potential risks include the spillage or leakage of chemicals, fresh concrete, foul water, fuel or oil, during use or storage onsite. These pollutants have the potential to adversely affect soils, subsurface water quality, peat, surface water quality, and groundwater, and hence effects on the biodiversity of receiving watercourses.

The transportation, storage and use of potentially polluting chemicals at a wind farm is limited. The greatest use of such chemicals is of fresh concrete, used in foundations and hardstandings, which may be created on-site or transported onto site.

8.5.2.2 Surface Hydrology

Watercourses could be at risk from a pollution incident during construction. Watercourses which flow into Glenmornan River, specifically Glenwanda Burn, Owenreagh Burn, Glentransa Burn and Legnavadder Burn are all considered to be High sensitivity. Additionally, watercourses which flow into Donnyboe Burn, including the tributary flowing north-east of the turbine T8 are also of High sensitivity.

Best practice construction methods and mitigation as outlined in **Technical Appendix A3.1: oDCEMP** including use of impermeable membranes and bunding of the construction compound will safeguard water quality within these areas and where the watercourse buffer has been encroached on. These locations have been discussed in Section 8.5.1.1. **Technical Appendix A8.5: Outline Drainage Strategy** has addressed the encroachment of the 50 m watercourse buffer at the access track and crane pad between turbines T8 and T9. This Appendix has included a drainage plan which details locations of drainage ditches between the infrastructure and the watercourse to ensure there will be no significant impacts to the watercourse.

Best practice embedded construction methods are proposed within **Technical Appendix A3.1: oDCEMP** that will effectively limit uncontained release of chemicals to minor fugitive releases. Potentially contaminating chemicals will be stored within a secure bunded area, which is covered to prevent rainwater collecting in this area. Storage tanks should have minimum design life of 20 years, have sufficient strength and structural integrity to hold without leaking, and be closed and locked when not in use.

Given the High sensitivity of surface hydrology, but negligible significance of the effect associated with chemical pollution following the implementation of mitigation measures, this is **not significant** in terms of the EIA Regulations.

8.5.2.3 Groundwater and Near Surface Water

Pollutants encountering bedrock also have the potential to indirectly alter the quality of the groundwater resource. pH and chemical alterations to groundwater are difficult to rectify due to the fractured nature of the rock and the lengthy attenuation and dispersal of chemicals. As noted previously, due to the underlying hydrogeology consisting of a limited productivity bedrock aquifer where moderate yields are unusual and small yields are more common. However, dipwell monitoring has shown that there are relatively high groundwater levels within the superficial aquifer with highest levels of groundwater recorded between -0.44 mbgl and 0.79 mbgl across the Site. This makes it likely for groundwater to be present near the surface and therefore there is the potential for pollutants to come into direct contact with groundwater.

Best practice embedded construction methods are proposed within **Technical Appendix A3.1: oDCEMP** that will effectively limit the uncontained release of chemicals to minor fugitive releases. The construction compound will be located within a bunded area underlain by an impermeable ground membrane layer. The bund will have a capacity of 110% of the stored liquid containers, reducing the contamination potential of any spillages.

Although near-surface water is of high sensitivity and groundwater is of medium sensitivity, given the mitigation measures that will be implemented, the magnitude of effect is negligible. The significance of the effect associated with chemical pollution is therefore considered to be negligible for both near-surface water and groundwater. This is considered to be **not significant** in terms of the EIA Regulations.

8.5.2.4 Designated Receptors

Designated receptors downstream of the Development, River Foyle and Tributaries SAC, Lisnaragh ASSI, Silverbrook Wood ASSI and Corbylin Wood are hydrologically connected and could be at risk from a pollution incident during construction.

While SAC and ASSIs have been identified within a 10 km radius of the Site, the net path distances along hydrologically connected watercourses between the Development and designated receptors has also been measured. The distance between the Development and Lisnaragh and Silverbrook Wood is approximately 3.5 km via Dunnyboe Burn and the distance between the Development and Corbylin Wood via Burn Dennet is approximately 11.93 km. The River Foyle and Tributaries SAC is hydrologically connected via Burn Dennet and Glenmornan River. Via Burn Dennet, the distance between the SAC and the Development is approximately 22.6 km, while the distance via Glenmornan River is approximately 12.82 km.

Due to the significant distance between these designated receptors and construction activities, it is likely that the concentration of sediment within a hydrologically connected watercourse will be decreased because of dilution. These designated sites are of very high sensitivity.

Best practice embedded construction measures set out in **Technical Appendix A3.1: oDCEMP** will be in place to limit release of chemicals to surface watercourses and waterbodies. Appropriately sized spill kits will be placed, maintained, and located at strategic points across the Site to prevent spillages from entering watercourse should the above mitigation measures be bypassed.

Therefore, effects on designated receptors, which are of high sensitivity, have the potential to be of negligible magnitude of change and (in accordance with Table 8.4. Guideline Criteria for Assessment of the Significance of Effects) of negligible significance. This is **not significant** in terms of the EIA Regulations.

8.5.2.5 Private Water Supplies

As outlined in Section 8.4.8 and **Technical Appendix A8.2: PWSRA**, four PWS were scoped into the assessment. Of these, two were determined to be hydrologically connected to the Development. In accordance with NIEA guidance only PWS groundwater abstractions within 250 m of Development infrastructure are considered to have greater potential to be affected by changes in groundwater levels during construction. As the abstraction points for 31 Koram Road and 60 Glenmornan Road are out with these distances from excavations, potential effects on groundwater from the Development are unlikely to affect these PWS. However, hydrogeological connectivity exists between the Development and these PWS, therefore there is the potential for chemical pollution to affect these groundwater supplies. The measures set out in **Technical Appendix A3.1: oDCEMP** will be in place to prevent release of chemicals to receptors that could affect the PWS, which would limit potential effects to a low or negligible magnitude, which would be of minor or negligible significance. Notwithstanding this, monitoring is proposed for the two PWS, so that any changes in quantity or quality of water at the PWS can be investigated and, if necessary, mitigated at the time. This is **not significant** in terms of the EIA Regulations.

8.5.2.6 Erosion and Sedimentation

Erosion and sedimentation can occur from excavations, ground disturbance and overburden stockpiling. Sediment entering watercourses has the potential to affect water quality, ecology and flood storage capacity.

Areas of large earthworks (e.g., turbine foundation excavations) are particularly at risk of erosion and sedimentation. As substantial cut/fill is required in some areas due to topography, substantial volumes of deposits will require to be excavated/in-filled, leaving a larger area of exposed ground and larger stockpiles required to hold deposits. This has the potential to increase sediment wash off from these areas.

8.5.2.7 Surface Hydrology

The overland distance between construction areas and watercourses (with the exception of crossings), as a result of the embedded buffers, combined with the good practice measures set out in **Technical Appendix A3.1: oDCEMP,** will minimise risk of any silt or other materials reaching watercourses.

Where the buffers are encroached by new access tracks to the north-west and north-east of the CHSA, good practice construction measures will effectively prevent sediment entering the watercourses adjacent to the proposed infrastructure. Additionally, **Technical Appendix A8.5 Outline Drainage Strategy** has addressed the encroachment of the 50 m watercourse buffer at the access track and crane pad between turbines T8 and T9. This Appendix has included a drainage plan which details locations of drainage ditches between the infrastructure and the watercourse to ensure there will be no significant impacts to the watercourse such as sedimentation.

Best practice embedded construction measures, such as check dams, silt traps and settlement lagoons, will effectively prevent sediment entering the watercourse as described in **Technical Appendix A3.1: oDCEMP**. This also includes areas of earthworks being visually inspected by an Ecological Clerk of Works (ECoW) who can provide mitigation methods as necessary.

Other SuDS measures, such as the use of settlement lagoons, swales and interception bunds, will effectively prevent sediment entering watercourses via drainage ditches adjacent to access tracks. As such, there will be limited potential for sediment or erosion effects on watercourses in the CHSA, including the hydrology and water quality of onsite watercourses. These measures are further detailed in **Technical Appendix A3.1: oDCEMP**.

As shown in **Technical Appendix A8.4: WCI**, there are two watercourse crossings identified which will require culverting. These two crossings will be bottomless arched culverts, with typical culvert design as shown on Figure 3.13. Good practice construction measures for culverting and watercourse diversions are detailed within **Technical Appendix A3.1: oDCEMP**. Watercourse diversions will only occur in artificial drains or ditches, not natural watercourses. These measures will also be implemented when diverting the minor drains identified within **Technical Appendix A8.4: WCI**.

Best practice embedded construction methods are proposed within **Technical Appendix A3.1: oDCEMP** that will effectively limit the transport of sediment to watercourses.

Given the high sensitivity of surface hydrology, but negligible significance of the effect associated with erosion and sedimentation, this is **not significant** in terms of the EIA Regulations.

8.5.2.8 Groundwater and Near Surface Water

Released sediment has the potential to change near surface water flow in superficial geology deposits and peaty soil characteristics by creating a physical barrier within naturally occurring drainage micropores. Sediment entering near-surface water in superficial deposits also has the potential to impact on groundwater quality within bedrock deposits / fissures.

Measures described in **Technical Appendix A3.1: oDCEMP**, such as impermeable ground membrane layers and bunded areas, will effectively prevent sediment entering sub-surface water in superficial deposits (and groundwater) and peat. For these reasons, the magnitude of this change will be negligible. Given the high sensitivity of near-surface water and medium sensitivity of groundwater and negligible magnitude of change, the significance of the effect associated with erosion and sedimentation is considered to be negligible for near-surface water and negligible for groundwater. This is **not significant** in terms of the EIA Regulations.

8.5.2.9 Designated Sites

Designated sites downstream of the CHSA, the River Foyle and Tributaries SAC, Lisnaragh ASSI, Silverbrook Wood ASSI and Corbylin Wood ASSI, are hydrologically connected and could be at risk from sediment mobilisation during construction.

While SAC and ASSIs have been identified within a 10 km radius of the Site, the net path distances along hydrologically connected watercourses between the Development and designated receptors has also been measured. The distance between the Development and Lisnaragh and Silverbrook Wood is approximately 3.5 km via Dunnyboe Burn and the distance between the Development and Corbylin Wood via Burn Dennet is approximately 11.93 km. The River Foyle and Tributaries SAC is hydrologically connected via Burn Dennet and Glenmornan River. Via Burn Dennet, the distance between the SAC and the Development is approximately 22.6 km, while the distance via Glenmornan River is approximately 12.82 km.

Due to the significant distance between these designated receptors and construction activities, it is likely that the concentration of sediment within a hydrologically connected watercourse will be decreased because of dilution. These designated sites are of very high sensitivity.

Best practice embedded construction measures outlined in **Technical Appendix A3.1: oDCEMP** will be in place to limit erosion and the release of sediment to surface watercourses and waterbodies.

Therefore, effects on designated receptors, which are considered to be of high sensitivity, have the potential to be of negligible magnitude of change and (in accordance with **Error! Reference source not found.**) of negligible significance. This is **not significant** in terms of the EIA Regulations.

8.5.2.10 Private Water Supplies

As outlined in Section 8.4.8 and **Technical Appendix A8.2: PWSRA**, four PWS were scoped into further assessment. Of these, two were determined to be hydrologically connected to the Development. In accordance with NIEA guidance only PWS groundwater abstractions within 250 m of Development infrastructure are considered to be affected by changes in groundwater levels during construction. As the abstraction points for 31 Koram Road and 60 Glenmornan Road are out with these distances from excavations, potential effects on groundwater from the Development are unlikely to affect these PWS. However, hydrogeological connectivity exists between the Development and these PWS, therefore there is the potential for sedimentation to affect this groundwater supply.

The measures set out in **Technical Appendix A3.1: oDCEMP** will be in place to prevent transport of sediment to receptors that could affect the PWS, which would limit potential effects to a low or negligible magnitude, which would be Minor or Negligible significance. Notwithstanding this, monitoring is proposed for the two PWS, so that any changes in quantity or quality of water at the PWS can be investigated and, if necessary, mitigated at the time. This is **not significant** in terms of the EIA Regulations.

8.5.2.11 Impediments to Flow

The access tracks will require two new watercourse crossings, and these will be bottomless arched culverts. The indicative culvert crossing design is shown in Figure 3.13

The minimisation of the number of proposed watercourse crossings and the re-use of the existing watercourse crossing locations reduces one of the main activities that could give rise to impediment to flows. Following from the indicative culvert design outlined in Figure 3.13, detailed design will be carried out at the construction phase and will be agreed with relevant statutory consultees. Any design changes between indicative design and detailed design will be minimal, e.g., the hydraulic capacity of the culvert will remain the same. Nonetheless, all likely significant effects have been assessed and won't be altered by further detailed culvert design.

As shown on Figure 3.1, the finalised layout of the Development allows for the reuse of existing access tracks to turbines T3, T4 and T5. Additionally, the existing agricultural track will be partially utilised for access to the proposed control room and turbine T6. A separate existing agricultural track will be utilised and upgraded to provide access to turbines T8, T9, T10, T11 and T12. By reusing and upgrading existing infrastructure, this decreases the likelihood of impeding surface water flow throughout the network of artificial drainage channels. This would limit the changes to surface hydrology. Minor drains which are crossed by infrastructure are noted within **Technical Appendix**

A8.4: WCI. **Technical Appendix A8.5 Outline Drainage Strategy** identifies the most appropriate diversion for these drains. This allows for hydrological continuity and therefore, minimal impact to surface water flow.

Therefore, the effects on watercourses of high sensitivity are of negligible magnitude and therefore resulting in an effect of negligible significance. Effects on watercourses of low sensitivity are of negligible magnitude and therefore resulting in an effect of negligible significance. This is **not significant** in terms of the EIA Regulations.

8.5.2.12 Changes in Groundwater Interflow Patterns

Groundwater and Near Surface Water

Some wind turbine base excavations and areas of large earthwork excavations may need temporary sub-surface water controls, such as physical cut-offs or de-watering. These temporarily divert flows away from the excavation, and temporarily lower the local water table and sub-surface water levels. Excavations required to change topography (cut/fill activities), may also result in changes to flow patterns. Localised temporary changes to groundwater and near surface water interflow patterns may therefore arise. Areas of large earthwork excavations, turbine foundations and crane hardstanding also have the potential to change sub-surface water flow by creating physical barriers within naturally occurring drainage macropores in superficial deposits. These areas will be visually inspected regularly by the ECoW and mitigation measures outlined in **Technical Appendix A3.1: oDCEMP** will be implemented.

As outlined in **Chapter 9: Geology and Peat**, superficial peat deposits are located across the majority of the CHSA, particularly within central areas. Peat depths varied across the CHSA between 0 m and 4.5 m in depth, with an average depth of 1.1 m. Areas of peat >1 m deep were avoided were possible. As detailed in **Technical Appendix A3.3: Outline Peat Management Plan**, all peat excavated will be re-used in reinstatement and restoration. As alterations to the natural drainage regime can result in drying out of peaty soil, mitigation measures outlined in **Technical Appendix A3.1: oDCEMP** are considered sufficient, and sufficiently reliable, to avoid substantial alterations to the natural drainage regime. Pre-earthworks drainage relates to the required drainage measures to be installed prior to earthwork activities such as access track and other infrastructure construction. Best practice pre-earthworks drainage measures include cut-off/ diversion ditches, temporary interception bunds, swales, and retention ponds. All earthworks will have a gravity drainage system and all water will drain to an adequately sized sump. Drainage from the Site will include elements of Sustainable Drainage Systems (SuDS) design, where appropriate. SuDS replicate natural drainage patterns. As a result, peat is not expected to dry out, beyond what would be the case in the baseline scenario.

Consequently, effects on Groundwater (medium sensitivity receptor) and Near Surface Water (high sensitivity receptor) are of negligible magnitude and therefore of negligible significance. This is **not significant** in terms of the EIA Regulations.

Private Water Supplies

The quantity and quality of water at the PWS could be affected by changes in groundwater interflow patterns because of de-watering or the impact of turbine foundations and hardstanding on subsurface flow.

As outlined in Section 8.4.8 and **Technical Appendix A8.2: PWSRA**, four PWS were scoped into further assessment. Of these, two were determined to be hydrologically connected to the Development. In accordance with NIEA guidance only PWS groundwater abstractions within 250 m of Development infrastructure are affected by changes in groundwater levels during construction. As the abstraction points for 31 Koram Road and 60 Glenmornan Road are out with these distances from excavations, potential effects on groundwater flow from the Development are unlikely to affect these PWS. However, hydrogeological connectivity exists between the Development and these PWS, therefore there is the potential groundwater quantity and continuity to be affected.

The measures set out in **Technical Appendix A3.1: oDCEMP** will be in place to limit changes to groundwater interflow patterns that could affect the PWS, which would limit potential effects to a low or negligible magnitude, which would be minor or negligible significance. For example, the use of silt traps and settlement lagoons. Notwithstanding this, monitoring is proposed for the two PWS, so that any changes in quantity or quality of water at the PWS can be investigated and, if necessary, mitigated at the time. This is **not significant** in terms of the EIA Regulations.

8.5.2.13 Increase in Runoff and Flood Risk

Increase in Runoff

The increase in hardstanding area associated with construction and operation of the Development could increase the volume and rate of localised surface run-off, although a large proportion of the proposed infrastructure hardstanding, including access tracks and crane hardstandings, would be permeable to some extent. The CHSA has significant superficial peat deposits onsite, as outlined in **Chapter 9: Geology and Peat**. Due to the high proportion of peat onsite, the superficial soils generally are of low permeability. This means that, in the baseline scenario, there will be relatively low infiltration and relatively high run-off rates, and hence the addition of the Development would have minimal effect on the existing run-off scenario.

Measures, including SuDS measures, to attenuate run-off and intercept sediment prior to run-off entering watercourses are described in **Technical Appendix A3.1: oDCEMP** and form a part of the Development.

A Schedule 6 application will be submitted to DfI Rivers in relation to SuDS infrastructure and outfalls, and any relevant consents will be gained as required by law prior to carrying out any works in watercourses or discharging to watercourses.

For these reasons, the effect on watercourses of high sensitivity are considered to be of negligible magnitude and therefore negligible significance. Effect on watercourses of low sensitivity are considered to be of negligible magnitude and therefore negligible significance. This is **not significant** in terms of the EIA Regulations.

Flood Risk

There is a small, isolated area to the north of the CHSA immediately adjacent to the second construction compound which is mapped as having a 0.5 % or greater annual risk of flooding from surface water.

The design of the Development layout has incorporated a buffer zone of 50 m between watercourses and infrastructure except for watercourse crossings and infrastructure discussed in **Section 8.5.1.1**.

Minor areas of the new, existing, and upgraded access tracks are within areas described as having a 0.5 % or greater annual risk of flooding from surface water from modified watercourses and drains, as shown in Flood Hazard and Flood Risk Maps for NI from DFI-NI. As the existing tracks will be retained, and surface water flooding appears to be isolated to minor areas onsite in the vicinity of existing tracks, it is unlikely that pluvial flood water would be displaced by the Development.

As such, the Development is not considered to be at risk of pluvial or river flooding and is unlikely to contribute to the displacement of flood water.

For these reasons, the effect on flood risk of high sensitivity are considered to be of negligible magnitude and therefore negligible significance. This is **not significant** in terms of the EIA Regulations.

8.5.2.14 Effects on the Quality, Quantity and Continuity of Private Water Supplies

As summarised in Section 8.4.8, five private water sources were scoped into the assessment within the 2 km PWS Study Area.

91 and 93 Holyhill Road are located 1.44 km and 1.3 km respectively. As the sources for these PWS are located outside of the zone of influence (250 m) by a large margin, it is unlikely for there to be a hydrologically connection to the Development infrastructure. Due to this and the good practice mitigation measures in place they will not be impacted by effects from construction works.

Both 31 Koram Road and 60 Glenmornan Road are downslope of the proposed T1 and proposed access track from Glenmornan Road. While both source locations are located more than 250 m from infrastructure and therefore less likely to be affected by construction activities, a conservative approach is proposed for water quality monitoring to be undertaken at these locations according to the schedule detailed in **Technical Appendix A3.1: oDCEMP**.

According to DAERA standing advice for single turbines and groundwater, groundwater abstractions may be affected if they are within 250 m of wind farm infrastructure. The potential for hydrological connection to the Development is shown in Table 8.10. Two well sources are marginally outside of the 250 m groundwater buffer so have been included for monitoring.

Table 8.10. Potential Hydrological Connection to the Development

PWS Source	Potential for hydrological connection to the Development	Additional Mitigation Proposed?
31 Koram Road	Well source located 380 m downslope (north-west) of turbine T1 and access track.	Yes – water quality monitoring will be required, as per Section 4.7.1 of the oDCEMP and Section 8.6 of this ES chapter.
60 Glenmornan Road	Well source located 278 m (north-west) downslope of access track.	Yes – water quality monitoring will be required, as per Section 4.7.1 of the oDCEMP and Section 8.6 of this ES chapter.
91 Holyhill Road	Well source located 1.44 km (north-west) downslope of turbine T1 and access track. Disconnected by intervening distance	No further mitigation required.
93 Holyhill Road	Well source located 1.3 km (north-west) downslope of turbine T1 and access track. Disconnected by intervening distance.	No further mitigation required.

Therefore, as outlined in Sections 8.5.2.10 and 8.5.2.12, effects on any PWS identified to be of medium sensitivity, have the potential to be of low or negligible magnitude and therefore (in accordance with Table 8.4) of minor significance. This is **not significant** in terms of the EIA Regulations.

8.5.3 Effects on the Hydrological Function of Wetland Habitats

Wetland habitats supporting NVC communities are present within the Site. All of these communities, according to UKTAG Guidance, have the potential to be of moderate groundwater dependency. These NVC polygons have been assessed against the drainage survey carried out for this site which shows a significant portion of the potential wetland habitats to be in areas of artificial drainage and are therefore potentially impaired. Table 8.11 shows the polygons which are impaired and by what artificial feature. All other polygons have been assessed as intact wetland habitats.

Table 8.11. Wetland Habitats impaired by artificial features

NVC community	Polygons impaired by artificial features	Cause of impairment
U2b / M6c – Acidic Grassland / Flush	42, 43, 45, 46, 47, 48, 49, 53, 54, 55, 58, 61, 62	Polygon 42 is in an area partially occupied by the existing wind farm access track which has significant areas of exposed peat.

		Polygons 43, 47, 48 and 62 occupy areas intersected by peat cuttings. Polygons 45, 46, 49, 53, 54, 55, 61 and 62 are partially intersected by the agricultural tracks. Polygons 53, 58 and 61 are partially intersected by artificial ditches. Polygon 55 is also intersected by the public road to the north of the Site.
M6C – Flush & Spring – acidic/neutral flush	71, 74, 77, 80, 81, 83, 85, 86, 87, 88, 89, 90, 91, 92	Peat cuttings have the potential to affect polygons 71 and 77. Various agricultural tracks intersect polygons 74, 80, 81, 83, 86, 88, 90 and 92. Polygons 71, 80, 85, 87, 89 and 91 are partially intersected by artificial ditches.

As discussed in **Technical Appendix A8.3: Note on Indirect Effects of Dewatering**, a buffer distance has been calculated to mitigate the indirect effects of dewatering caused by infrastructure. This has been calculated to be 5 m for all infrastructure with an excavation depth of up to 1 m and 15 m for all infrastructure with a depth of up to 5 m. All wetland habitats situated outside of this buffer zone will not be subject to indirect dewatering effects caused by excavation. Wetland habitats situated within this buffer zone but out with the infrastructure footprint will be subject to indirect effects such as dewatering which has the potential to impair the communities. Communities situated within the footprint of the infrastructure will be directly impacted which will result in the loss of habitat. Figure 8.5 shows the locations of wetland habitats and Development infrastructure.

Table 8.12 shows the potential for impact to wetland habitats from the Development which indicates that there will be both direct and indirect loss of habitat by the Development.

Table 8.12. Potential for Impact from the Development on Wetland Habitat Communities

Community Number	NVC	Potential for impact from the Development
61	U2b/M6c	61 represents a large area, the majority of which is out with the infrastructure footprint and buffer zone. However, the polygon partially lies within the footprint of buffer zone of turbine T1, the access track from the public road to turbine T1, the access track from turbines T1 to T2 and the west construction compound. Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.
43	U2b/M6c	43 is partially located within the buffer zone and footprint of turbine T2, both upslope and downslope of the turbine and crane pad. Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.
84, 77, 75	M6c	77 and 75 are located within the footprint of the crane pad and earthworks at turbine T2. 84 is located within the footprint of the access track between turbines T1 and T2. Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.
82	M6c	82 is located directly within the footprint of turbine T4 and the associated crane pad and earthworks. Therefore, this will result in direct loss. This polygon extends into the buffer zone which will result in indirect effects.

		Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.
42	U2b/M6c	42 is located within the buffer zone, immediately upslope and downslope of turbine T5. It is also located within the footprint of turbine T5 and the associated crane pad, earthworks and turning head. Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.
81	M6c	81 is situated within the footprint of the crane pad of turbine T6 and within the buffer area immediately downslope of turbine T6 and the associated access track. Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.
91	M6c	91 is located within the footprint of the crane pas at turbine T7 and associated earthworks. It is also located downslope of the turbine within the buffer area. Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.
78	M6c	78 is located 1 m upslope of the earthworks associated with turbine T8. Therefore, there will be no direct loss. However, dewatering is likely to be caused by excavation.
47	U2b/M6c	47 is located within the footprint of the crane pas at turbine T8 and associated earthworks. It is also located downslope of the turbine within the buffer area. Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.
80, 74, 73, 68	M6c	73 and 74 are located directly within the footprint of turbine T9 while 80 lies within the footprint of the access track complex between turbines T8, T9 and T10. 68 lies within the buffer area 2 m upslope of T9. Therefore 73, 74 and 80 are subject to direct loss of habitat as well as indirect effects of excavation. 68 is subject to indirect effect of dewatering.
44	U2b/M6c	A significant portion of 44 lies within the footprint of turbine T9 and the access track/turning head which extends towards turbine T8. Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.
37	U2b/M6c	37 is located within the footprint of turbine T11 and the access track between turbines T11 and T12. Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.
65, 76	M6c	65 is located within the footprint of turbine T11 and the access track between turbines T11 and T12 while 76 is situated in the footprint of turbine T12. Both polygons are situated within the buffer zones of their respective turbines. Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.

62	U2b/M6c	62 is located within the footprint of turbine T12 and the access track entrance from the public road. This polygon extends into the buffer areas of these locations. Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.
54	U2b/M6c	54 is located directly within the crane pad and access track of turbine T14 and within the surrounding buffer areas. Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.

Eighteen of the communities are located directly within the Development infrastructure footprint and therefore there will direct loss of habitat as a result within polygons 37, 42, 43, 44, 47, 54, 61, 62, 65, 73, 74, 75, 77, 80, 81, 82, 84 and 91. These polygons will also be indirectly affected by the Development. Polygons 68 and 78 are only situated within the buffer areas and are therefore likely to be indirectly affected by the Development. Indirect impacts of disturbance to surrounding wetland habitats can include:

- Disruption of near-surface water through superficial deposits through construction of cut and fill access tracks by installation of aggregation causing a physical blockage to water flow in micro and macropores within the communities, where the access track runs perpendicular to natural flow;
- Disruption of near-surface water through superficial deposits by turbine foundations and crane hardstanding creating physical barriers;
- Temporary diverting of sub-surface flows through turbine dewatering works, temporarily lowering the local water table and sub-surface water levels downslope; and,
- Temporary localised lowering of the water levels within the soil layers downslope of the access track and turbine foundations immediately after construction, due to a reduction in the quantity of near-surface water into this area.

Good practice design and construction measures outlined **Technical Appendix A3.1: oDCEMP** will minimise potential indirect effects of the Development on wetland habitats, including those not determined to be groundwater dependent. The embedded design measures outlined in Section 8.5.1 will further minimise the indirect effects on wetland habitats. For example, silt traps and settlement lagoons will be constructed to filter sediment-laden runoff, and actively manage water levels, and site drainage will avoid severance of saturated areas. Any dewatering for the construction of turbine foundations or for excavations are relatively localised and temporary in nature (during construction phase), with shallow groundwater levels anticipated to recover and flow to adjust around turbines on completion.

Habitat loss, both direct and indirect, has been calculated for each of the habitat communities and for the functional and impaired communities. This is shown in Table 8.13. As such, in accordance with Table 8.3, direct hydrological effects on wetland habitats of moderate sensitivity equate to “a detectable but non-material effect on the receptor (up to 5%)” and wetland habitats of low sensitivity will equate to “a loss of part (approximately 10% to 50% of study area) of a moderately dependent and moderate value wetland habitats”.

Table 8.13. Percentage of Habitat Loss from the Development

NVC community	Impaired	Percentage of Habitat Loss (%)
U2b / M6c – Acidic Grassland / Flush	No	6.65
U2b / M6c – Acidic Grassland / Flush	Yes	8.49

M6C – Flush & Spring – acidic/neutral flush	No	9.82
M6C – Flush & Spring – acidic/neutral flush	Yes	18.06

In accordance with Table 8.2, wetland habitats with moderate groundwater dependency are defined as medium sensitivity, however, those habitats of moderate groundwater dependency which are already impaired are defined as low sensitivity. The magnitude of direct and indirect effects is considered to be low for wetland habitats of moderate sensitivity and medium for wetland habitats of low sensitivity in accordance with Table 8.3. As such, there will be an effect of minor predicted significance on the hydrological function of moderately dependent wetland habitats and minor predicted significance on impaired moderately dependent wetland habitats. This is **not significant** in terms of the EIA Regulations.

8.5.4 Potential Operational Effects

Potential effects associated with the operation of the Development are:

- Increased run-off rates and volume;
- Continued erosion and sedimentation from runoff from areas of hardstanding;
- Alterations to natural flow pathways from runoff from areas of hardstanding; and,
- Risk of a chemical pollution event from minor spills from maintenance vehicles.

The nature of these effects has been discussed in relation to the decommissioning and construction phase. As there would be substantially less activity during operation, and as there is unlikely to be any significant ground disturbance during operation, the magnitude of these effects is similarly reduced.

There will be a minor reduction in the potential for increased surface water run-off during the operational phase due to the reduction in hardstanding areas used during the construction phase, such as the removal of the construction compounds.

Whilst alterations to natural flow pathways will not be introduced during the operational phase, any changes during construction will continue through operation, as the majority of infrastructure will remain in place. Alterations to natural flow pathways will be reduced through adopting good practice design and construction, as set out in the **Technical Appendix A3.1: oDCEMP**, such as cross drainage, use of shallow drainage ditches and prevention of blockages.

As a result, the magnitude and significance of all effects associated with operation of the Development are assessed as being minor or negligible, and **not significant** in terms of the EIA Regulations.

8.5.5 Potential Final Decommissioning Effects

Plans for decommissioning works at the end of the operational phase are outlined in **Chapter 3: Development Description**.

Potential effects of decommissioning the Development are similar in nature to those during construction, as some groundwork would be required to remove turbine foundations and hardstandings. These effects would be substantially lesser in magnitude than during construction and would be controlled by appropriate guidance and legislation at the time of decommissioning and would benefit from the existing drainage features. Where infrastructure would be left in place, drainage features would also be left in place, where this is compatible with the decommissioning plan.

Potential effects associated with decommissioning include:

- Risk of chemical pollution (including accidental pollution) from minor spills from onsite vehicles and plant;
- Risk of chemical pollution event from removal of substation compound;
- Increased erosion and sedimentation of surface water, near-surface water and groundwater as a result of decommissioning works;

- Increased impediments to watercourse and near-surface water flow from shallow excavation works; and,
- Potential effects on Designated Sites in terms of decrease in condition of qualifying interests.

Decommissioning activities would be less intrusive than during the construction phase and controlled in a similar manner, and therefore no significant effects are anticipated. The magnitude and significance of all effects on hydrological receptors associated with decommissioning are assessed as being minor or negligible, and **not significant** in terms of the EIA Regulations.

8.6 Mitigation and Residual Effects

Given the levels of certainty in the success of application of the embedded mitigation measures, as set out within Section 8.5.1 of this ES chapter and in **Technical Appendix A3.1: oDCEMP,** and their effectiveness, no further mitigation is required.

As an additional protection for the two closest PWS, 31 Koram Road and 60 Glenmornan Road, it is proposed that water quality monitoring is undertaken. This will monitor any changes to the quantity or quality of water at the PWS. Should any adverse change be noted, an investigation will be undertaken as to whether the change could have been caused by the Development, and appropriate remedial action will be taken. This could include provision of a water bowser as a temporary measure.

Visual inspection of any drainage or nearby surface watercourses will be regularly carried out by the ECoW, allowing rapid identification of changes to water quantity or quality, and subsequent remedial action. Visual inspection will be supplemented with several surface water monitoring points for extractive sampling and analysis. In order to establish baseline hydro-chemical conditions, sampling should be carried out once every month for 12 months prior to the construction phase. Monthly in-situ monitoring and sampling will occur throughout the duration of the construction phase, and for 3 months post construction.

Following the implementation of the additional mitigation measures, all identified residual effects have been assessed as being of minor to negligible significance, which is **not significant** in terms of the EIA Regulations.

8.7 Cumulative Effect Assessment

A cumulative effect is an additional effect on hydrological resources (within the same hydrological catchment) arising from the Development in addition to the combination of other developments likely to affect the hydrological environment.

At distances greater than 10 km, it is considered that schemes are unlikely to contribute to a cumulative hydrological effect due to attenuation and dilution over distance of potentially polluting chemicals. Therefore, for the purposes of the assessment of potential cumulative effects on the immediate catchment and hydrological regime, only proposed developments, which require large scale construction / excavation, within 10 km of the Development have been considered.

Operational wind farms and other large-scale completed developments are unlikely to contribute to pollution and sedimentation effects due to the absence of excavation and presence of plant during the operational period and are therefore scoped out of the assessment.

8.7.1 Cumulative Wind Farms within 10 km

The following wind farms have been identified within 10 km of the Development.

- Ballykeery Road (operational) approximately 1.5 km south of the Development, located within the Doulas Burn catchment;
- Ballykeery Road 2 (application) approximately 1.5 km south of the Development, located within the Douglas Burn catchment;
- Dunnyboe Road (application) approximately 3.0 km north-east of the Development, located within Burn Dennet River catchment;
- Curlyhill Road (consented) approximately 3.0 km west of the Development, located within the Glenmornan River catchment;

- Ballylaw Road (operational) approximately 4.5 km north-west of the Development, located within the Burn Dennet River catchment;
- Loughan Road (under construction) approximately 5.5 km north of the Development, located within the Altinaghrea Burn catchment;
- Carrickatane (operational) approximately 10.0 km north of the Development, located within the Sandville Burn catchment;
- Eglish Mountain (operational) approximately 9.0 km north-east of the Development, located within the Faughan River catchment; and,
- Slieve Kirk (operational) approximately 10.0 km north-east of the Development, located within the Faughan River catchment.

As Ligford Road Wind Farm is located out with the hydrological catchments of the Development, there is no potential for cumulative effects on downstream receptors.

8.7.2 Predicted Cumulative Effects

The greatest potential for cumulative effects arises when the construction phase of another development overlaps with the construction phase of the Development. Cumulative effects are considered to have the potential to be significant only where such an overlap may exist, as activities that could be potentially detrimental to the hydrological environment are greatly reduced during the operational phase of developments (e.g., excavation works, concrete pouring, etc.). Therefore, wind farms that are operational are scoped out of further cumulative effect assessment.

Cumulative effects will therefore be assessed for the Ballykeery Road 2, Dunnyboe Road, Curlyhill Road, and Loughan Road wind farms. Cumulative effects will also be assessed for the proposed NIE overhead powerline that is currently in planning and associated with the Dalradian gold mine (refer to **Chapter 15: Other Uses**).

8.7.3 Decommissioning and Construction Phase

While the dates of the construction phase of Ballykeery Road 2, Dunnyboe Road, Curlyhill Road, and Loughan Road wind farms are currently unknown, it is anticipated unlikely to coincide with the decommissioning and construction phase of the Development. In the scenario where the construction phases coincided it is anticipated that, for those wind farms, mitigation would be implemented in line with the measures identified within **Technical Appendix A3.1: oDCEMP** for the Development, as these are in line with standard practice. This mitigation would reduce the potential for cumulative effects, even if the construction phases coincided.

The date of the construction phase of the Dalradian gold mine and the associated overhead powerline that is proposed to run adjacent to the Development is currently unknown as it has not yet been consented. It is unlikely to coincide with the decommissioning and construction phase of the Development. In the scenario where the construction phases coincided, it is anticipated that mitigation would be implemented in line with the measures identified within **Technical Appendix A3.1: oDCEMP** for the Development, as these are in line with standard practice. This mitigation would reduce the potential for cumulative effects, even if the construction phases coincided. Additionally, the infrastructure associated with the Dalradian gold mine is anticipated to be primarily above ground and will therefore have negligible cumulative impacts on hydrological receptors.

Given this, the magnitude of cumulative effects during the decommissioning and construction phase will be negligible and, therefore, of negligible significance. This is **not significant** in terms of the EIA Regulations.

8.7.4 Operational Phase

It is anticipated that there will be a minor reduction in the potential for increase in flow rates during the operational phase of the Development when compared to the decommissioning and construction phase, due to the reduction in overall hardstanding areas post-construction. Therefore, the magnitude of cumulative effects during the operational phase will be less than those during the decommissioning and construction phase and will therefore be negligible, and the significance of these effects will also be negligible, being **not significant** in terms of the EIA Regulations.

8.7.5 Residual Cumulative Effects

No significant residual cumulative effects are predicted.

8.8 Summary of Effects

Table 8.14 provides a summary of the effects detailed within this Chapter.

Table 8.14. Summary of Effects

Receptor	Potential Effect	Significance of Effect	Additional Mitigation Proposed	Residual Significance
Construction Phase				
Surface hydrology (watercourses)	Chemical Pollution	Negligible	None	Negligible
	Erosion and Sedimentation	Negligible	None	Negligible
	Impediments to Flow	Negligible	None	Negligible
	Increase in Run-off from increase in hardstanding	Negligible	None	Negligible
Hydrogeology (groundwater)	Chemical pollution	Negligible	None	Negligible
	Erosion and Sedimentation	Negligible	None	Negligible
	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible
Near-surface water	Chemical pollution	Negligible	None	Negligible
	Erosion and Sedimentation	Negligible	None	Negligible
	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible
Designated Sites	Chemical pollution	Negligible	None	Negligible
	Erosion and Sedimentation	Negligible	None	Negligible
Private Water Supplies	Chemical pollution	Minor	Water quality monitoring programme.	Negligible

	Erosion and Sedimentation	Minor	Water quality monitoring programme.	Negligible
	Changes in Groundwater Interflow Patterns	Minor	Water quality monitoring programme.	Negligible
Wetland Habitats (Moderate dependency)	Chemical pollution	Minor	None	Negligible
	Changes in Groundwater Interflow Patterns	Minor	None	Minor
Operational Phase				
Surface hydrology (watercourses)	Increase in Run-off from permanent hardstanding	Negligible	None	Negligible
	Changes in flow and drainage patterns	Negligible	None	Negligible
	Chemical pollution	Minor	None	Negligible
	Erosion and Sedimentation	Minor	None	Negligible
Hydrogeology (groundwater)	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible
	Chemical pollution	Negligible	None	Negligible
	Erosion and Sedimentation	Negligible	None	Negligible
Near-surface water	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible
	Chemical pollution	Negligible	None	Negligible
	Erosion and Sedimentation	Negligible	None	Negligible
Designated Sites	Chemical pollution	Negligible	None	Negligible

	Erosion and Sedimentation	Negligible	None	Negligible
Private Water Supplies	Chemical pollution	Minor	Water quality monitoring programme.	Negligible
	Erosion and Sedimentation	Minor	Water quality monitoring programme.	Negligible
	Changes in Groundwater Interflow Patterns	Minor	Water quality monitoring programme.	Negligible
Wetland Habitats (Moderate dependency)	Chemical pollution	Minor	None	Minor
	Changes in Groundwater Interflow Patterns	Minor	None	Minor
Decommissioning Phase				
Surface hydrology (watercourses)	Chemical Pollution	Negligible	None	Negligible
	Erosion and Sedimentation	Negligible	None	Negligible
	Impediments to Flow	Negligible	None	Negligible
Hydrogeology (groundwater)	Chemical pollution	Negligible	None	Negligible
	Erosion and Sedimentation	Negligible	None	Negligible
	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible
Near-surface water	Chemical pollution	Negligible	None	Negligible
	Erosion and Sedimentation	Negligible	None	Negligible
Designated Sites	Chemical pollution	Negligible	None	Negligible
	Erosion and Sedimentation	Negligible	None	Negligible

Private Water Supplies	Chemical pollution	Minor	Water quality monitoring programme.	Negligible
	Erosion and Sedimentation	Minor	Water quality monitoring programme.	Negligible
	Changes in Groundwater Interflow Patterns	Minor	Water quality monitoring programme.	Negligible
Wetland Habitats (Moderate dependency)	Chemical pollution	Minor	None	Minor
	Changes in Groundwater Interflow Patterns	Minor	None	Minor

8.9 Statement of Significance

This Chapter has assessed the likely significance of effects of the Development on hydrology and hydrogeology resources. The Development has been assessed as having the potential to result in effects of minor to negligible significance.

Given that only effects of moderate significance or greater are considered significant in terms of the EIA Regulations, the potential effects on hydrology and hydrogeology are assessed as being **not significant.**

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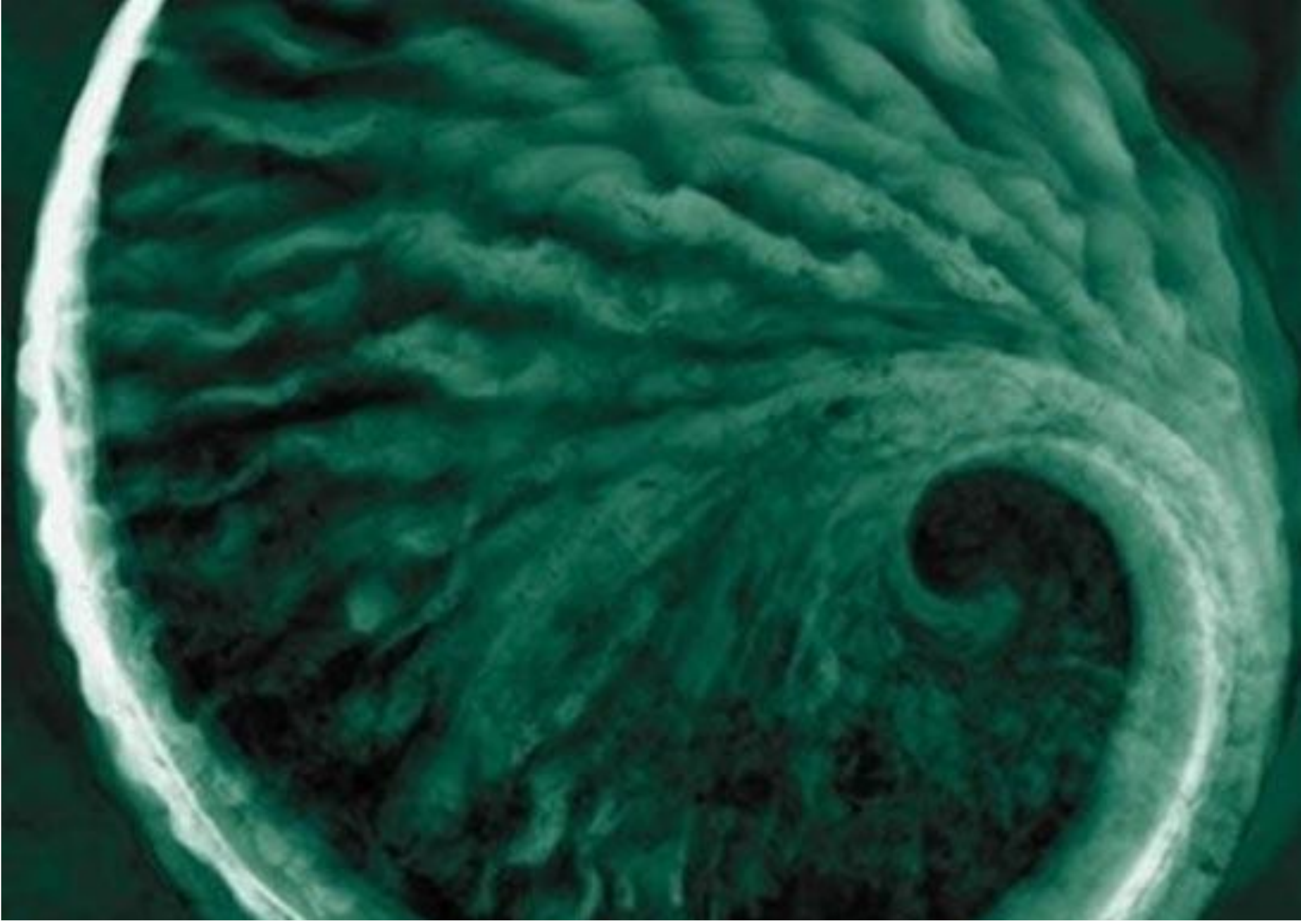

Owenreagh/Craignagapple Wind Farm

Ørsted Onshore Ireland Midco Limited

Environmental Statement- Chapter 9
Geology and Peat

06 September 2023

Project No.: 0696177

The business of sustainability

Signature Page

06 September 2023

Owenreagh/Craignagapple Wind Farm

Environmental Statement- Chapter 9 Geology and Peat

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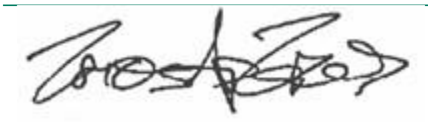

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CONTENTS

List of Tables

Acronyms and Abbreviations

Name	Description
CIRIA	Construction Industry Research and Information Association
DAERA	Department of Agriculture, Environment and Rural Affairs
DHMEP	Draft Habitat Management Enhancement Plan
GSNI	Geological Service Northern Ireland
IWEA	Irish Wind Energy Association
NED	Natural Environmental Division
NIEA	Northern Ireland Environment Agency

oDCEMP	Outline Decommissioning and Construction Environmental Management Plan
oPMP	Outline Peat Management Plan
PPS	Policy Planning Statement
PSA	Peat Survey Area
PSRA	Peat Slide Risk Assessment
SAC	Special Area of Conservation
SEPA	Scottish Environmental Protection Agency
SNH	Scottish National Heritage
SPPS	Strategic Policy Planning Statement

9 GEOLOGY & PEAT

9.1 Introduction

This Chapter of the Environmental Statement (ES) evaluates the likely significant effects of the proposed Owenreagh / Craignagapple Wind Farm ('the Development') on the Geology and Peat resource. This assessment was undertaken by Environmental Resources Management Ltd (ERM).

This Chapter of the ES is supported by the following Technical Appendix documents provided in **Volume 4** ES Technical Appendices:

- **Technical Appendix A9.1: Peat Slide Risk Assessment (PSRA);**
- **Technical Appendix A3.3: Outline Peat Management Plan (oPMP); and,**
- **Technical Appendix A3.1: Outline Decommissioning and Construction Environmental Management Plan (oDCEMP)**.

This Chapter of the ES is supported by the following Figures provided in **Volume 3**:

- **Figure 9.1: Superficial Geology;**
- **Figure 9.2: Bedrock Geology;**
- **Figure 9.3: Interpolated Peat Depths;**
- **Figure A9.1.3: Interpolated Peat Depths; and,**
- **Figure A3.3.1: Proposed Floating Access Track.**

This Chapter includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects; and,
- Statement of Significance.

Please note that, for the purposes of this chapter, the terms "peat" and "peatlands" refer to the soils, rather than to the habitat that the soils support. "Active peat" is a term used in **Chapter 10: Ecology** to refer to the vegetation growing on top of the peat soils that actively contributes to the creation of further peat soils. This chapter does not consider "active peat" habitats, only the soils.

9.2 Legislation, Policy and Guidance

The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017[1], as amended, (the EIA Regulations) establish in broad terms what is to be considered when determining the effects of development proposals on hydrology, hydrogeology, geology and peat resources. The legislation, guidance and information sources considered in carrying out this assessment are detailed in this Section 9.2.

9.2.1 Legislative Background

A summary of land use planning legislation, policy and guidance relating to the Development can be found in **Chapter 5: Policy and Legislative Context** of this ES.

No laws have been introduced which are specifically designed to protect peatlands in Northern Ireland, but all legislation that protects landscapes, habitats, species and certain archaeological sites,

[1] UK Government (2017): The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 [online] Available at: [The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 (legislation.gov.uk)](https://www.legislation.gov.uk) Accessed 12/07/2023

including the Climate Change Act (Northern Ireland) 2022[2], also assists in the conservation of peatlands.

The guidance document 'Northern Ireland Peatland Strategy 2022-2040'[3] outlines a strategy to restore Northern Ireland's peatlands to their optimum value by 2040. This has been considered in assessing the effects of the Development on peat and peaty soils.

In the absence of applicable legislation and guidance for developments in Northern Ireland, the following Scottish sources were adhered to:

- The Scottish Government (2017), Peat Landslide Hazard and Risk Assessments – Best Practice Guide for Proposed Electricity Generation Developments[4];
- NatureScot (Formerly Scottish Natural Heritage (SNH)) (2019), 4th Edition, Good Practice During Wind Farm Construction[5];
- Scottish Environment Protection Agency (SEPA) (2017), Developments on Peat and Off-site Uses of Waste Peat[6];
- Scottish Government, SNH, SEPA (2017), Peatland Guidance on Development on Peatland, online version only[7]; and,
- SEPA (2012), Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and Minimisation of Waste[8].

9.2.2 Northern Ireland Planning Policy and Guidance

The Strategic Planning Policy Statement for Northern Ireland (SPPS)[9] was published in 2015 and supplements the previously published Planning Policy Statements (PPS). It contains a suite of planning policy and is a material planning consideration in the assessment of all planning applications in NI.

Further details of planning policy in Northern Ireland and the policy context for this ES chapter are discussed in **Chapter 5: Policy and Legislative Context**

9.2.3 Other Guidance

Other relevant guidance and regulation comprises the following:

- NI Government (2009), Planning Policy Statement (PPS) 18: Renewable Energy[10];
- CIRIA (2015), Report C741 - Environmental Good Practice on Site Guide[11];

[2] UK Government (2022): Climate Change Act (Northern Ireland) 2022 [online] available at: Climate Change Act (Northern Ireland) 2022 (legislation.gov.uk) (Accessed 12/07/2023)

[3] DAERA (2022): Northern Ireland Peatland Strategy 2022-2040 [online] available at: NI Peatland Strategy - Copy for EQIA Consultation. 8-8-2022. PDF_0.PDF (daera-ni.gov.uk) (Accessed 12/07/2023)

[4] The Scottish Government (2017) Peat Landslide Hazard and Risk Assessments - Best Practice Guide for Proposed Electricity Generation Developments Guidance [Online] Available at: http://www.gov.scot/Resource/0051/00517176.pdf (Accessed 12/07/2023)

[5] NatureScot (2019): Good Practice During Wind Farm Construction [online] Available at: Guidance - Good practice during Wind Farm construction | NatureScot (Accessed 12/07/2023)

[6] SEPA (2017): Developments on Peat and Off-site Uses of waste Peat [online] Available at: wst-g-052-developments-on-peat-and-off-site-uses-of-waste-peat.pdf (sepa.org.uk) (accessed 12/07/2023)

[7] Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey. Guidance on Developments on Peatland, on-line version only Available at: Guidance+on+developments+on+peatland+-+peatland+survey+-+2017.pdf (www.gov.scot)(Accessed 12/07/2023)

[8] SEPA (2012): Guidance on the Assessment of Peat Volumes, reuse of Excavated Peat and Minimisation of Waste [online] Available at: Guidance+on+the+assessment+of+peat+volumes%2C+reuse+of+excavated+peat%2C+and+the+minimisation+of+waste.pdf (www.gov.scot) (Accessed 12/07/2023)

[9] DAERA, NI (2015): Strategic Planning Policy Statement for Northern Ireland (SPPS) [online] Available at: Strategic Planning Policy Statement for Northern Ireland (SPPS) (infrastructure-ni.gov.uk) (Accessed 12/07/2023)

[10] NI Government (2009): PPS 18: Renewable Energy [online] Available at: Best Practice Guidance to PPS 18 'Renewable Energy' | Department for Infrastructure (infrastructure-ni.gov.uk) (Accessed 12/07/2023)

[11] CIRIA (2015): C741 – Environmental Good Practice on Site Guide [online] Available at: Item Detail (ciria.org) (Accessed 12/07/2023)

- Scottish Government (2017), Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments[2];
- Northern Ireland Environment Agency (NIEA) (2015), Wind farms and groundwater impacts - A guide to EIA and Planning considerations[12];
- Department of Agriculture, Environment and Rural Affairs – Northern Ireland (2022), Northern Ireland Peatland Strategy 2022-2040[13];
- Irish Wind Energy Association (IWEA) (2012), Best Practice Guidelines for the Irish Wind Energy Industry[14]; and,
- NI Government – Department of Agriculture, Environment and Rural Affairs (DAERA) (2016), Standing Advice Note 4 – Pollution Prevention Guidance[15].

9.3 Assessment Methodology and Significance Criteria

9.3.1 Scoping Opinion and Consultations

Consultation for this ES topic was undertaken with the organisations shown in Table 9.1. Only organisations that were consulted and that had inputs regarding the geology, soils, and peat are listed in the table below.

[12] NIEA (2015), Wind Farms and groundwater impacts – A guide to EIA and Planning considerations [online] Available at: Wind farms and groundwater impacts.pdf (qub.ac.uk) (accessed 12/07/2023)

[13] DAERA (2022), Northern Ireland Peatland Strategy 2022-2040 [online] Available at: NI Peatland Strategy - Copy for EQIA Consultation. 8-8-2022. PDF_0.PDF (daera-ni.gov.uk) (Accessed 12/07/2023)

[14] IWEA (2012), Best Practice Guidelines for the Irish Wind Energy Industry [online] Available at: Microsoft Word - LE11-563-01_Rpt001-2.doc (windenergyireland.com) (Accessed 12/07/2023)

[15] DAERA (2016), Standing Advice Note 4 – Pollution Prevention Guidance [online] Available at: standing_advice_4_pollution_prevention.pdf (qub.ac.uk) (Accessed 12/07/2023)

Table 9.1. Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
NIEA-NED	Scoping Opinion 27/10/2022	"The Phase 1 and phase 2 peat probing surveys should be undertaken in a way that results in a sufficiently detailed peat depth coverage to enable an assessment of habitat quality/sensitivity. NED notes that GSNI were generally satisfied with the PSRA methodology outline in their response to EIA scoping and would urge the planning authority to seek input from GSNI regarding the suitability of final, substantive proposals for assessing peat slide risk at the Site, when they are submitted. NED recommend that the density of probing locations is also informed by peat depth in neighbouring samples to create a more accurate and suitable map of peat depth. NED would also suggest that infrastructure and track locations are subjected to the same density of peat probing as turbine locations as the difference between these areas in terms of impact to peat stability and hydrology is not clear."	GSNI agreed with the approach to the project. A Peat Slide Risk Assessment is included as **Technical Appendix A9.1: PSRA**. Industry best practice guidance has determined the density of probing at the Site.
Loughs Agency	Scoping Opinion 06/01/2022	Peat Slippage: "Peat slippage adjacent to watercourses can smother spawning beds if peat becomes entrained in the river bed gravel and can damage aquatic habitat in the entire downstream receiving water environment.	A Peat Slide Risk Assessment is included as **Technical Appendix A9.1: PSRA**.
	Scoping Response 06/01/2022	Surface Runoff: There is a concern that because peat bogs absorb and retain large volumes of water flow, that the removal of these peat bogs could lead to an increase in surface flow velocity during flooding and can affect the resident fish species. Even the cutting and draining of peat that takes place during the development of wind turbine infrastructure can lead to increased surface water runoff or even landslides or bog bursts.	A Peat Slide Risk Assessment is included as **Technical Appendix A9.1: PSRA** and drainage strategy for surface runoff is provided in **Technical Appendix A8.5: Outline Drainage Strategy**. Further hydrogeological and ecological information is presented in Chapters 8 and 10, respectively, of this ES.
Geological Survey of Northern Ireland	Scoping Opinion 02/08/2021	Peat Slide Risk Assessment: This document will be used for the decision-making process when the Environmental Statement is submitted.	A Peat Slide Risk Assessment is included as **Technical Appendix A9.1: PSRA**.

	Meetings 02/11/2022 and 31/01/2023	Following consultation, the Geological Survey of Northern Ireland confirmed that they agreed with the project team approach, in particular relating to that of the Peat Slide Risk Assessment.	The Peat Slide Risk Assessment is included as **Technical Appendix A9.1: PSRA.**
RSPB	Scoping Opinion 19/08/2021	The identification of priority biodiversity habitats is particularly important. In particular, active blanket bog is a priority habitat listed under Annex I of Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive). Blanket bog is composed of peat, which is a significant store of carbon as well having an important carbon sequestration role when it is in its active state. The principle aim of wind farm development is to reduce carbon dioxide emissions and combat global warming. Serious consideration must therefore be given to whether the reduction in CO2 emissions arising from wind farm developments justifies the potential reduction in the carbon storing properties of peatland. Analysis must also take into consideration any additional carbon arising from the projects, such as the manufacture, transport, construction and ongoing maintenance of the turbines and concrete bases.	The assessments were carried out in accordance with NIEA advocate Planning Policy Statement 18 Renewable Energy (PPS18). A Climate Change and Carbon Balance assessment for the Development is presented in **Chapter 15: Other Issues** of this ES.
	Scoping Opinion 19/08/2021	The EIA should address the physical impacts on the development, including the works associated with the construction of the development, including soil and peat removal and storage.	The soil and peat removal and storage is addressed in the oPMP, included in **Technical Appendix A3.3.**

9.3.2 Scope of Assessment

The key issues for the assessment of potential geology, soils and peat effects relating to the Development are as follows:

- Potential for peat destabilisation and peat slide risk;
- Potential effects relating to peat disturbance and the subsequent effects from excavated peat and management of peat and peaty soils;
- Potential for compaction of superficial soils; and,
- Potential for loss of important geological minerals.

This is assessed through technical assessment in the form of:

- **Technical Appendix A9.1: PSRA**;
- **Technical Appendix A3.1: oPMP**; and,
- Assessment of effects following the engineering design of development layout, detailed in **Chapter 3: Development Description** of this ES.

The key sensitive receptors in the assessment are:

- Existing infrastructure in the form of tracks and footpaths, existing turbines, existing watercourse crossings and dwellings;
- Proposed infrastructure in the form of turbine foundation, crane hardstandings, tracks and other infrastructure;
- Sensitive areas of wetland habitat, deep peat (>1 m), blanket bog, and other sensitive habitats; and,
- Major and minor watercourses.

9.3.3 Elements Scoped Out of Assessment

No evidence of soil contamination was identified during the site walkovers or desk studies. No areas were identified and therefore no effects are anticipated. Should potentially contaminated land be encountered during excavations or decommissioning, appropriate action will be taken in accordance with the principles set out in Part IIA of the Environmental Protection Act 1990[16] and in accordance with **Technical Appendix A3.1: oDCEMP**. Potential effects arising from contaminated land have, therefore, been scoped out of this assessment.

9.3.4 Study Area / Survey Area

In order to assess the potential effects on the geology and soils resource, a Study Area has been defined:

- Peat Survey Area (PSA).

The PSA comprises the Site boundary at the time of EIA Scoping; the final planning application boundary will be within this, and smaller than this. The PSA is shown on Figure 9.1.

The PSA covers an area of approximately 623 hectares (ha) and is approximately centred on Irish NGR 242862, 396786.

The topography of the PSA and its immediate vicinity is complex and habitats largely consist of improved acid grassland, acid grassland, improved grassland and modified blanket bog. The PSA itself varies significantly in elevation ranging from approximately 150 m above ordnance datum (AOD, approximately equivalent to sea level) in the west of the PSA, to approximately 400 m AOD in the south of the PSA. There are a number of hilltops bordering the PSA, with no summits located within the PSA; Owenreagh Hill to the south (453 m AOD), and Evish Hill to the west (249 m AOD).

The PSA Is located adjacent to the operational Owenreagh I Wind Farm (Planning Ref: J/93/0286) and the operational Owenreagh II Wind Farm (Planning Ref: J/2004/1015/F), which consist of 15 wind

[16] UK Government (1990), Environmental Protection Act [online] Available at: Environmental Protection Act 1990 (legislation.gov.uk) (Accessed 12/07/2023)

turbines and their associated infrastructure, access tracks and a substation. The scope of the Development includes the decommissioning of these wind farms.

9.3.5 Design Parameters

The parameters of the design that will influence the geology and peat assessment in relation to physical effects has been based on the turbine layout and associated infrastructure. No additional design parameters, other than those set out in **Chapter 3: Development Description** of this ES, are required for the assessment presented in this chapter. Details of peatland restoration are outlined in **Technical Appendix A3.2: Draft Habitat Management Enhancement Plan (DHMEP).**

As set out in **Chapter 3: Development Description**, the wind turbines and associated infrastructure may be microsited up to 50 m, where constraints allow. Such relocations have been considered when undertaking the assessment, and mitigation recommended, where appropriate.

9.3.6 Baseline Survey Methodology

The assessment of peat and geology has included the review of publicly available information in relation to the current condition of the soils at the PSA with the information detailed in the baseline description. This was supported by detailed site walkover surveys. The information has been reviewed in the context of the Development to evaluate both short and long-term effects.

The assessment has involved a review of the following data sources detailed below:

- The Geological Survey of Northern Ireland (GSNI) Geology Map (Digital[17]).

Soil types are of high sensitivity where they are categorised as peat soils of high moisture content, such as those found in blanket bog.

In the absence of relevant Northern Irish guidance on PSRAs, the methodology employed for the PSRA is in accordance with Scottish Government guidance on peat landslide hazard and risk assessments[18]. Using experience from other wind farm projects and the consultation process with NIEA and GSNI, the assessment endeavours to assess the effects on geology and peat either affected directly or indirectly by construction or operation of the Development.

9.3.6.1 Stage One Peat Probing

Peat probe data gathered between 2009 and 2016 as part of the Craignagapple Wind Farm application was available and informed part of the assessment. To supplement this, further Phase 1 peat probing was carried out in 2021 by ERM to ensure total coverage of the developable areas within the PSA. The survey was carried out in accordance with Scottish Government guidance in the absence of corresponding NIEA guidance, with probes sunk in a 100 m grid across the PSA and the information gathered used to inform the preliminary Development layout design.

9.3.6.2 Stage Two Peat Probing

As part of the design finalisation process, including during the “chilled” layout and following design freeze, targeted peat probing was carried out across proposed infrastructure. This probing was generally at 50 m intervals along the centre line of the tracks with probes at 10–25 m on either side of the tracks to provide a corridor for micrositing. In addition, probing at turbine locations were recorded at 10 m intervals. This stage of probing was undertaken over a series of visits in September 2022 to capture the iterative process of the Development layout evolution.

It should be noted that the PSRA was undertaken on the findings of all phases of probing with focus on the phase two peat probe data, as this was within the proposed infrastructure envelope. Details of the assessment are included in **Technical Appendix A9.1: PSRA**.

[17] Geological Survey of Northern Ireland (2020) GSNI GeoIndex [Online] Available at: GSNI GeoIndex (bgs.ac.uk) (Accessed 12/07/2023)

[18] The Scottish Government (2017) Peat Landslide Hazard and Risk Assessments - Best Practice Guide for Proposed Electricity Generation Developments Guidance [Online] Available at: http://www.gov.scot/Resource/0051/00517176.pdf (Accessed 12/07/2023)

9.3.7 Methodology for the Assessment of Effects

The methodology outlined in the following section has been developed by ERM in consultation with several regulatory bodies, including GSNI and DEARA-NIEA. As outlined in the Scoping Request accepted by the GSNI and NIEA in the Scoping Opinion, the assessment is based on a source-pathway-receptor methodology, where the sensitivity of the receptors and the magnitude of potential change upon those receptors identified within the PSA.

9.3.7.1 Sensitivity of Receptors

The sensitivity of the baseline conditions, including the importance of environmental features on or near to the PSA or the sensitivity of potentially affected receptors, will be assessed in line with best practice guidance, legislation, statutory designations and / or professional judgement.

Table 9.2 details the framework for determining the sensitivity of receptors, informed by NatureScot guidance[19] and outlined in **Chapter 2: Methodology**.

Table 9.2. Framework for Determining Sensitivity of Receptors

Sensitivity of Receptor	Definition
Very High	The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance.
High	Soil type and associated land use are highly sensitive (e.g. peat/blanket bog); Carbon-rich and peaty soils cover >20% of the development area; or Receptor contains areas of regionally important economic mineral deposits.
Medium	Soil type and associated land use are moderately sensitive (e.g. commercial forestry); Carbon-rich and peaty soils cover <20% of the Development Area; or Receptor contains areas of locally important economic mineral deposits.
Low	Soil type and associated land use not sensitive to change in hydrological regime (e.g. intensive grazing); or Non-peatland areas, with no carbon-rich and/or peaty soils.
Negligible	The receptor is resistant to change and is of little environmental value.

9.3.7.2 Magnitude of Effect

The magnitude of likely significant effects will be identified through consideration of the Development, the degree of change to baseline conditions predicted as a result of the Development, the duration and reversibility of an effect and professional judgement, best practice guidance and legislation.

The NatureScot[20] criteria for assessing the magnitude of an effect are presented in Table 9.3 and are also outlined in **Chapter 2: Methodology**.

[19] Scottish Natural Heritage (NatureScot) and Historic Environment Scotland (2018), Environmental Impact Assessment Handbook [Online] available at: Publication 2018 - Environmental Impact Assessment Handbook V5.pdf (nature.scot) (Accessed: 13/07/2023)

[20] Scottish Natural Heritage (NatureScot) and Historic Environment Scotland (2018), Environmental Impact Assessment Handbook [Online] available at: Publication 2018 - Environmental Impact Assessment Handbook V5.pdf (nature.scot) (Accessed: 13/07/2023)

Table 9.3. Framework for Determining Magnitude of Effects

Magnitude of Effects	Definition
High	▪ Major or total loss of or alteration to peatland resource such that post development characteristics or quality will be fundamentally or irreversibly changed; ▪ Long term/permanent change to human or environmental health; ▪ Catastrophic failure of site infrastructure due to ground instability; ▪ Long term/permanent change to baseline resource; or ▪ Major or total loss of a geological site or mineral deposit, where the value of the site would be severely affected.
Medium	▪ Loss of, or alteration to the baseline resource such that post development characteristics or quality will be partially changed; ▪ Mid-term/permanent change to human or environmental health; ▪ Ground failure that requires remediation but does not cause catastrophic failure of site infrastructure; ▪ Mid-term/permanent change to baseline resource; or ▪ Partial loss of a geological site or mineral deposit, with major effects to the settings, or where the value of the site would be affected.
Low	▪ Small loss of soils or peatland, or where soils will be disturbed but the value not impacted; ▪ Short-term change to human or environmental health; ▪ Ground settlement/subsidence that does not adversely affect site infrastructure or require remedial action; ▪ Short-term change to baseline resource; or ▪ Small effect on a geological site or mineral deposit, such that the value of the site would not be affected.
Negligible	▪ Minimal or no change to soils or peatland deposits; ▪ Minimal or no change to human or environmental health; ▪ Minimal or no change to ground stability; ▪ A very slight change from the baseline conditions. The change is barely distinguishable, and approximates to the 'no-change' situation; or ▪ Minimal or no change to a geological site or mineral deposit.

9.3.7.3 Significance of Effect

The sensitivity of the asset and the magnitude of the predicted effects will be used as a guide, in addition to professional judgement, to predict the significance of the likely effects. Table 9.4 summarises guideline criteria, informed by NatureScot guidance, for assessing the significance of effects and outlined in **Chapter 2: Methodology**.

Table 9.4. Framework for Assessment of the Significance of Effects

Magnitude of Effect	Sensitivity of Resource or Receptor				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

Effects predicted to be of major or moderate significance are considered to be 'significant' in the context of the EIA Regulations, and are shaded in light grey in the above table.

9.3.8 Assessment Limitations

There were no assessment limitations in relation to the peat and geology assessment.

9.3.9 Embedded Mitigation

Embedded mitigation measures are set out within the oDCEMP (provided as **Technical Appendix A3.1**) and as detailed in **Chapter 4: Site Selection and Design**, which sets out specific mitigation which relates to the Development. They comprise good practice methods and works that are established and effective measures to which the Applicant will be committed through the planning consent.

Mitigation also takes place through embedded design of the Development layout avoiding key environmental constraints including avoidance of active peat or limiting the effects on deep peat, where possible, as well as taking cognisance of hydrological and ecological features and associated buffers.

Where probing had identified areas of deep peat, changes were proposed and implemented to reflect the approach to avoid either deep peat or the deepest peat in proximity to wind turbines, where topography permitted.

9.4 Baseline Conditions

9.4.1 Published Geology

The baseline condition has involved a review of the following data sources detailed below:

- The Geological Survey of Northern Ireland (GSNI) GeoIndex.

This published data is based on large scale mapping (1:10,000) which does not necessarily consider the localised environment. Further works are detailed in Section 9.4.2 which documents the field survey and peat probing which provides a more detailed geological context of the local environs within the PSA. Details of baseline peatland habitats are included in Section 10.4.5 of **Chapter 10: Ecology**.

9.4.1.1 Superficial Soils

Published geological mapping, GSNI GeoIndex[21] of superficial soils indicates that most of the PSA is underlain by Peat, particularly throughout central areas of the PSA. Diamicton Till and Glacofluvial deposits (sand and gravel) are present in the north-east and north-west of the PSA.

The Glacofluvial deposits were deposited by meltwater streams and include mostly coarse-grained sediments (i.e. sand and gravel) with some finer-grained layers (i.e. clay and silt). Sand and gravel is embedded locally with lenses of silt, clay or organic material. The Diamicton Till is unsorted and unstratified drift, generally overconsolidated, deposited directly by and underneath a glacier without subsequent reworking by water from the glacier. It consists of a heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape (diamicton).

Figure 9.1 illustrates the 'Superficial Soils'.

9.4.1.2 Bedrock Geology

Published bedrock geology mapping indicates that most of the PSA is underlain by Dart Psammite Formation, there are also Dart Semipelite formations found throughout the PSA. Both of these formations belong to the Argyll Group, which is common throughout western Scotland and Northern Ireland.

[21] Geological Survey of Northern Ireland (2020) GSNI GeoIndex [Online] Available at: GSNI GeoIndex (bgs.ac.uk) (Accessed 12/07/2023)

The GSNI GeoIndex records two geological faults on the PSA, one of which runs NNE-SSW through the central PSA area with the downthrow unspecified. The second fault runs NE-SW through the south eastern PSA area, it is recorded to be a reverse or thrust fault with the hang wall to the north west.

Figure 9.2 illustrates the 'Bedrock Geology'.

9.4.2 Peat Survey Data

Peat is a sedimentary material, which is dark brown or black in colour, and comprises partially decomposed remains of plants and organic materials preserved in anaerobic conditions, essentially within a waterlogged environment. There are two principal types of peat:

- Acrotelm is the upper layer, quite fibrous and contains plant roots. Acrotelmic peat is relatively dry, generally lying above the groundwater table and has some tensile strength; and,
- Catotelm is the lower layer of peat which is highly amorphous and has a very high water content. Catotelm generally lies below the ground water table and has a very low tensile strength.

Interpolation of these principal types are discussed further in **Technical Appendix A3.3: oPMP**.

It has been recognised that the design of the Development is likely to be influenced by the presence of peat, both as a physical consideration in terms of stability and engineering properties, and as a habitat resource. Active peatland is identified as a priority habitat in accordance with the EC Council Directive 92/43/EEC Conservation of Natural Habitats and Wild Fauna and Flora (the Habitats Directive)[22]. In accordance with Policy RE1 of PPS18, applications for wind energy developments need to demonstrate that the Development will not create a significant risk of landslides or bog bursts.

Initial site surveys took place at a pre-scoping stage to ascertain the extent and nature of peat at the PSA, through a robust investigation approach suitable to the identification of active peat characteristics. Initial desk-based research and co-ordination with the project ecologist defined extents of active, possibly active and non-active peat.

The peat data gathered during the Craignagapple application comprised 321 probes, a further 345 probes were sunk during the Phase 1 survey undertaken by ERM, following a 100 m grid methodology. During the phase 2 surveys carried out between September 2022 and February 2023, a further 1,738 probes were sunk bringing the total number of surveyed locations to 2,404. The surveys recorded peat depths between 0 m and 4.3 m, with the deepest peat generally recorded in the south of the PSA, although there are localised areas of deeper peat in some northern areas of the PSA.

The peat probe locations and peat depth interpolation are shown in Figure 9.3 and further details on the peat probing are included in **Technical Appendix A3.3: oPMP**. Table 9.5 summarises the peat depths recorded at the PSA.

Table 9.5. Peat Depth Summary

Peat Depth Range (m)	No of peat probes	Percentage of Total (%)
0 – 0.50	621	25.8
0.51 – 1.00	717	29.8
1.01 – 1.50	472	19.6
1.51 – 2.00	405	16.8
2.01 – 2.50	135	5.6
2.51 – 3.00	38	1.6
3.01 – 3.50	12	<1.0

[22] European Commission (1992), The Habitats Directive [online] Available at: The Habitats Directive - Environment - European Commission (europa.eu) (Accessed 12/07/2023)

3.51 – 4.00	3	<1.0
4.01 – 4.50	1	<1.0
Total	**2,404**	

Recorded peat depths averaged at 1.06 m, with over a quarter of probes recording peat at depths of 0.5 m or less and 55.6% recording 1 m or less. Much of the Development is currently sited in areas of relatively shallow peat, however an area of deeper peat in the south of the PSA is underlying the proposed infrastructure footprint. There are localised areas of peat greater than 2 m deep throughout the PSA, this has been considered during the design process and thus, no infrastructure is sited in these areas.

A more detailed representation of peat within the PSA is available in **Technical Appendix 9.1: PSRA** and **Technical Appendix A3.3: oPMP**.

Table 9.6 displays the average peat depth at each turbine location to a 50 m radius, while

Table 9.7 presents photographs of the current conditions at each proposed turbine location.

Table 9.6. Average Peat Depths Recorded at Wind Turbines

Proposed Turbine No.	Average Peat Depth at a 50 m Radius (m)
T1	0.51
T2	0.84
T3	1.01
T4	1.03
T5	1.62
T6	0.80
T7	0.67
T8	1.44
T9	1.35
T10	1.51
T11	1.19
T12	1.51
T13	0.67
T14	0.72

Table 9.7. Current Conditions at Proposed Turbine Locations

Proposed Turbine No.	Easting	Northing	Current Conditions at Turbine
T1	241749	397104	
T2	241697	396512	
T3	242279	397038	

T4	242607	396876	
T5	242209	396377	
T6	242982	396705	

T7	243326	397192	
T8	243450	396645	
T9	243748	396357	

T10	243345	395923	
T11	242969	396059	
T12	242525	396115	

T13	243895	397108	
T14	244218	396755	

9.5 Assessment of Likely Significant Effects

The effect of the Development on peat and geological receptors has been considered for the decommissioning and construction, operation and final decommissioning phases.

9.5.1 Potential Decommissioning and Construction Effects

9.5.1.1 Decommissioning of Existing Wind Turbines

During the decommissioning of the operational Owenreagh I Wind Farm (Planning Ref: J/93/0286) and the operational Owenreagh II Wind Farm (Planning Ref: J/2004/1015/F) wind turbines, the turbine foundation bases will be broken out to 0.5 m below ground level. All cables will be cut off below ground level, de-energised, and left in the ground. Access tracks will be left for use by the landowner. No stone will be removed from the Site. The decommissioning works are estimated to take three months. This approach is less environmentally damaging than seeking to remove foundations, cables and roads entirely.

Therefore, decommissioning activities will involve minimal disturbance of peat and no significant effects are likely.

9.5.1.2 Disturbance of Deep Peat

In its regulatory position statement, SEPA states that:

"*Developments on peat should seek to minimise peat excavation and disturbance to prevent unnecessary production of waste soils and peat*"[23].

In addition to this, the Northern Ireland Environment Agency states that:

"*PPS18 has introduced a new policy for renewable energy whereby there shall be no development within active peatland unless there are imperative reasons of overriding public interest*"[24].

The key items of infrastructure which influence this effect are the dimensions, location and type of new access tracks, turbine base foundations and crane hardstanding. Other features which should be considered for excavation requirements include the onsite substation and control building as well as temporary construction compound facilities.

Some turbine base excavations may need temporary sub-surface water controls, such as physical cut-offs or de-watering. These temporarily divert flows away from the excavation, and temporarily lower the local water table and sub-surface water levels in peat. Localised temporary changes to soil and peat interflow patterns may therefore arise. Turbine foundations and crane hardstandings also have the potential to change sub-surface water flow by creating physical barriers within naturally occurring drainage macropores in soil or peat.

The drying out of peaty soil can result from alterations to the natural drainage regime. Measures set out in **Technical Appendix A3.3: oPMP**, are considered sufficient, and sufficiently reliable, to avoid substantial alterations to the natural drainage regime. As a result, peat is not expected to dry out, beyond what would be the case in the baseline scenario. No substantial impediments to near-surface water flow will be created as the detailed site drainage design will take into account any severance of saturated areas to ensure hydrological connectivity is maintained, in accordance with SEPA / SNH 'Good practice during wind farm construction' in the absence of equivalent NIEA guidance.

The layout design process has sought to avoid areas of deep peat. Construction activities including the excavation of tracks, turbine foundations, hardstanding areas and other infrastructure can lead to the disturbance of peat. Beyond the main construction activities, other considerations include the temporary storage of soils and peat on site. The details of peat disturbance as a result of excavations and subsequent re-use methods are included in **Technical Appendix A3.3: oPMP**. Figure A9.1.3 'Interpolated Peat Depths' illustrates the areas of deep peat.

Where possible wind turbines have been sited in peat depths less than 1 m, however due to the presence of deep peat, this was not always possible. Floating access tracks are constructed by laying a geotextile layer on the surface of the peat and constructing the road on top. Using this method in areas of deep peat reduces the requirement for peat excavation during construction and hence, reduces peat disturbance. There is a section of floating access track proposed in the south of the PSA between turbines T11 and T12, Figure A3.3.1 displays the proposed floating access tracks.

Given the avoidance of peat greater than 1 m, where possible, use of floating track where practical and avoidance of areas of active peat within the design; the dry/ drained nature of the peat in the south of the PSA, which has historically been subject to peat cutting, combined with consideration that the losses of, or alteration to the baseline resource will be such that post development characteristics or quality of peat will only be partially changed, in the absence of mitigation, the Development will result in a potential minor effect that will be **not significant**, in accordance with the EIA Regulations.

9.5.1.3 Peat Stability

Peat instability is generally the result of a combination of causative factors. Several construction activities have the potential to increase the likelihood of peat slides in areas where peat is present at a sufficient depth and where gradients are sufficiently steep to result in a peat slide event.

Construction activities have the potential to increase the likelihood of peat slides by way of locating proposed infrastructure including track networks on sloping ground where peat is present. All construction activities, with the exception of floating access tracks, involve the removal of surface vegetation and excavation of peat and other near surface soils from either the bedding surface of the

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[23] SEPA (2010), SEPA Regulatory Position Statement – Developments on Peat [online] Available at: Microsoft Word - Peat Position Statement - update 290310.doc (sepa.org.uk) (Accessed 12/07/2023)

[24] NIEA (2013), Guidance note on active peat [online] Available at: NIEA Guidance Note On Active Peat (yumpu.com) (Accessed 12/07/2023)

underlying rock or the formation level within underlying soils, which naturally increases potential for slide.

During construction, care must be taken to ensure that the natural hydrological conditions of the surrounding peatland are maintained, as altering the surface or subsurface water flow and existing drainage patterns can increase the likelihood of bog burst. The measures outlined in **Technical Appendix A3.3: oPMP** and **Technical Appendix A3.1 oDCEMP** are sufficient to ensure that the existing hydrological conditions at the Site will not be substantially altered as a result of the Development.

Due to the presence of peat, a PSRA was undertaken and is included in **Technical Appendix A9.1: PSRA**. The PSRA was carried out in accordance with Scottish Government guidance[25], in the absence of a Northern Irish equivalent.

Peat slides can affect soils, local sensitive habitats and have the potential to affect surface water systems from soil inundation, leading to sedimentation. This can have an effect by slip materials sliding onto areas of sensitive habitat, or causing damage to local surrounding surface soils and can also reduce water quality and/or modify drainage patterns. Receptors identified across the PSA are:

- Active Peat;
- Sensitive Habitat (Blanket Bog);
- Residential dwellings;
- Existing wind farm infrastructure;
- Major and minor watercourses; and,
- Proposed wind farm infrastructure.

The majority of peat probes recorded depths of 1 m or less across the PSA (55.6%), however, areas of deep peat have also been recorded, including some isolated pockets of peat greater than 2 m deep. Where possible, infrastructure associated with the Development has avoided these pockets of deep peat, although localised deep pockets were recorded in areas of proposed infrastructure. The PSRA analysis has highlighted the majority of the PSA to be of 'low' or 'negligible' hazard rank in terms of slide risk, with two areas highlighted as 'medium' hazard rank and one area highlighted as 'high' hazard rank. No infrastructure is proposed in the areas highlighted as posing 'medium' or 'high' risk of peat slide.

Given the increased potential for slide, medium magnitude of effects and high sensitivity of receptors, in the absence of mitigation, the Development will result in a potential 'moderate' effect and is therefore likely **significant**, in accordance with the EIA regulations.

Mitigation measures with regard to peat stability for each area of the PSA are outlined in **Technical Appendix 9.1: PSRA**. The adoption of these measures will reduce the risk of peat instability across the PSA to a level that is not significant in terms of the EIA Regulations.

Good practice measures are embedded in the design principles and adoption of further best practices, as detailed in **Technical Appendix A3.1: oDCEMP**. By adopting the measures set out in the oDCEMP, the risk of peat instability will be further reduced.

9.5.1.4 Loss and Compaction of Peat and Soils

In relation to compaction of soils, investigations at the PSA have recorded a pocket of peat greater than 4 m deep in the north-eastern area of the PSA. The design process has sought to avoid the disturbance of deep peat where possible and peat depths are generally thin across the majority of the proposed Development area. Nonetheless, the construction of turbine hardstands, access tracks and movement of construction traffic, in the absence of construction good practice, could lead to the compaction of soil. This can reduce soil permeability, potentially leading to increased run-off and increased erosion. The superficial soils underlying the Development are of a varying permeability, so the effects of compaction could result in a significant increase in a runoff from existing conditions. The

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[25] The Scottish Government (2017) Peat Landslide Hazard and Risk Assessments - Best Practice Guide for Proposed Electricity Generation Developments Guidance [Online] Available at: http://www.gov.scot/Resource/0051/00517176.pdf (Accessed 12/07/2023)

total surface area affected by the footprint of the proposed layout equates to approximately 22.5 ha, just over 3.6% of the total PSA area.

Whilst the impact of change is a small loss of soils or peatland, or where soils will be disturbed, the site layout design has sought to avoid deep peat where possible and active peat as a priority, therefore any loss or compaction of peat soils will be low. Therefore, in the absence of mitigation, the significance of effects associated with the compaction of peat and soils is negligible and **not significant**, in accordance with the EIA Regulations.

9.5.1.5 Mining

Published mapping by the GSNI shows no indication of any mining activity within the PSA, there was also no visible evidence of historic mining noted during the site walkover survey in 2021.

9.5.2 Operational Phase

Potential effects from the operation of the Development include:

- Erosion and sedimentation from runoff from areas of hardstanding.

The nature of this event was discussed in relation to the decommissioning and construction phase. As there will be less activity during operation than during decommissioning and construction, minimal or no effects upon peat and soils during the operational phase will take place and significant effects are not likely.

9.5.3 Final Decommissioning Phase

During the final decommissioning phase at the end of the life of the Development, the turbine foundation bases will be broken out to 0.5 m below ground level. All cables will be cut off below ground level, de-energised, and left in the ground. Access tracks will be left for use by the landowner. No stone will be removed from the Site. The decommissioning works are estimated to take three months. This approach is less environmentally damaging than seeking to remove foundations, cables and roads entirely.

Therefore, decommissioning activities will be less intrusive with infrastructure in place for access meaning no or little requirement for further disturbance of peat, therefore **no significant** effects for geology and peat are likely.

9.6 Mitigation and Residual Effects

Mitigation in relation to peat disturbance is through embedded mitigation in design and adopting best practices during construction. Recommended mitigation measures in relation to peat slide risk are outlined in Table 9.8 below and in **Technical Appendix A9.1: PSRA**.

Mitigation proposed states that infrastructure associated with wind turbines which encroach deep peat could be microsited (if required) outwith these areas in order to reduce the overall effect on peat disturbance, stability and loss of soils. Micrositing limits are discussed in **Chapter 3: Development Description**.

Management of existing drainage will be undertaken, further details of which are provided in **Chapter 8: Hydrology and Hydrogeology**, **Technical Appendix A3.2: DHMEP** and in **Technical Appendix A3.1: oDCEMP**.

Intrusive site investigations will be undertaken prior to construction at turbine locations located within areas of peat.

Slope stability monitoring will occur during pre-construction and construction phases of work, including for both peat stability and non-peat related stability. These will focus on locations highlighted as being of risk in **Technical Appendix A9.1: PSRA**.

Best practice measures for managing excavated peat and peaty soils are detailed in **Technical Appendix A3.3: oPMP**.

The disturbance of peat as a receptor is minor and active peat has been avoided as a priority during the design process of the Development. With the implementation of habitat management measures outlined in the DHMEP to restore peatland and make improvements to drainage, the overall impact of the Development on the resource will be reduced.

Following incorporation of mitigation measures as outlined in Table 9.8, residual effects associated with peat stability and peat and soil losses will all be minor or negligible, and therefore **not significant** in terms of the EIA Regulations.

9.7 Cumulative Effect Assessment

A cumulative effect is an additional effect on peat and geology resources arising from the Development in addition to the combination of other developments likely to impact the peat and geological environment.

NIE have applied for a 33kV wooden-pole overhead power line (Planning Ref: LA11/2019/1000/F), which would be located within 29 m and 50 m of turbines T13 and T14, respectively. The 33kV power line involving both construction of above ground 33kV overhead line supported by wooden poles and underground 33kV cable laid below ground level in ducts, to serve Dalradian mine (currently under consideration Planning Ref: LA10/2017/1249/F). If consented, the aforementioned Development could result in potential cumulative effects to geology and peat in the vicinity of turbines T13 and T14. However, considering that infrastructure associated with the power line will be primarily above ground, these effects an anticipated to be **not significant**.

There are no other developments within the Study Area that would impact on peat and geology, therefore for the purposes of the assessment, the potential cumulative effect on geology and peat is **not significant**.

9.8 Summary of Effects

Table 9.8 provides a summary of the effects detailed within this chapter.

Table 9.8. Summary of Effects

Receptor	Potential Effect	Significance of Effect	Mitigation Proposed	Residual Effect
Construction Phase				
Soils	Compaction of Soil	Negligible	None	Negligible
Peat	Disturbance	Minor	Micrositing of wind turbines located in deep peat within micrositing buffer to reduce peat disturbance. Best Practice Measures for avoiding peat and the management of peat and peaty soils. Additional peatland restoration is proposed in the **Technical Appendix 3.2: DHMEP**.	Minor
Peat	Peat Stability	Moderate	Micrositing of wind turbines located in deep peat within micrositing buffer to further reduce peat disturbance and in turn lessen any risk of peat instability. Best Practice Measures for avoiding peat and	Minor

			the management of peat and peaty soils. Provision of a Geotechnical Risk Register to be maintained throughout the pre-construction, construction and operational phases of the Development. Details of these measures are included within **Technical Appendix A9.1: PSRA**. During construction, a specialist geotechnical engineer should be appointed to oversee visual inspections and monitoring in areas with potential for peat slide. Works at the Site should be postposed during and for a period after heavy rainfall events, the details of which should be confirmed prior to the beginning of construction.	
Operational Phase				
Peat	Disturbance	Negligible	None	Negligible
Peat	Peat Stability	Negligible	None	Negligible
Decommissioning Phase				
Soils	Compaction of Soil	Negligible	None	Negligible
Peat	Disturbance	Minor	Best Practice Measures for avoiding peat and the management of peat and peaty soils will be adopted throughout the decommissioning works.	Negligible
Peat	Peat Stability	Negligible	Best Practice Measures for avoiding peat and the management of peat and peaty soils will be adopted throughout the decommissioning works to lessen the risk of any potential destabilisation of peat.	Negligible

9.9 Statement of Significance

This Chapter has assessed the likely significance of effects relating to the Development on geology, and peat.

The Development was assessed to have the potential to result in an effect of moderate significance with regards to peat stability, in the absence of mitigation. However, by applying the mitigation measures outlined in Section 9.8 and detailed in **Technical Appendix A9.1: PSRA**, the potential effect of the Development on peat stability would reduce to one of minor significance. Therefore, the Development has been assessed as having the potential to result in effects of minor significance.

Given that only effects of moderate significance or greater are considered significant in terms of the EIA Regulations, the potential effects on geology, and soils are **not significant**.

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Norway
Panama
Peru
Poland
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Owenreagh-Craignapple Wind Farm

Environmental Statement - Chapter 10

Ecology

Ørsted Onshore Ireland Midco Limited

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Owenreagh-Craignapple Wind Farm

Environmental Statement- Chapter 10 Ecology

CONTENTS

10 ECOLOGY

10.1 INTRODUCTION

This Chapter of the Environmental Statement (ES) evaluates the effects of the proposed Owenreagh / Craignagapple Wind Farm ('the Development') within the context of the likely significant, direct, indirect and cumulative effects upon the habitats, flora and fauna (non-avian ecology) presently existing within the Ecological Study Area (ESA), and in the immediate environs. This Chapter should be considered in conjunction with other ecology chapters (Chapter 11: Ornithology). The chapter details the methods used to establish the terrestrial flora and fauna interest within the ESA and hinterland area and the process used to determine the nature conservation importance of the populations present. It then sets out the potential effects on terrestrial flora and fauna during the decommissioning (see **Chapter 3**, **section 3.5** of the ES) and construction, operation and final decommissioning phases and assesses the significance of these effects. Means to mitigate any significant effects are then proposed. As well as dealing with terrestrial flora and fauna, the chapter also considers effects on designated areas (other than those designated for birds).

The ecological assessment has the following aims:

- Establish the ecological baseline for the development or activity and determine the ecological value of the features identified;
- Provide an objective and transparent assessment of the ecological effects of the development or activity in terms of national, regional and local policies relevant to nature conservation;
- To make appropriate recommendations to the design team so that any significant adverse ecological effects identified could be avoided, minimised and remediated as far as possible through the design of the proposed development and / or the implementation of appropriate mitigation measures;
- Identify any residual effects of the development or activity post-mitigation; and
- Demonstrate that a development or activity will meet the legal requirements relating to habitats and species.

This assessment was undertaken by Woodrow APEM Group ('Woodrow').

This Chapter of the ES is supported by the following Technical Appendix documents provided in ES Volume 4: Technical Appendices:

- A10.1: Owenreagh / Craignagapple Ecological Impact Assessment (EcIA);
- A10.2: Shadow Habitats Regulation Assessment;
- A10.3: National Vegetation Classification (NVC) Assessment;
- A10.4: Active Peat Assessment (APA);
- A10.5: Confidential badger sett locations; and
- A3.2: Owenreagh / Craignagapple Habitat Management and Enhancement Pan (HMEP).

This Chapter of the ES is supported by the following Figure provided in Volume 3a:

- Figure A10.1.2: Ecological Study Area (ESA);

This Chapter includes the following elements:

- Guidance, Legislation and Information;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;

- Cumulative Effect Assessment;
- Summary of Effects;
- Statement of Significance; and
- Glossary.

10.2 GUIDANCE, LEGISLATION AND INFORMATION

This assessment has been prepared in accordance with the *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*[1], which is the primary resource used by members of the Chartered Institute of Ecology and Environmental Management (CIEEM).

The following legislation and information sources have been considered in carrying out this assessment:

- Bern and Bonn Convention[2];
- Conservation (Natural Habitats &c.) Regulations (NI) 1995 (as amended)[3];
- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of wild flora and fauna (the Habitats Directive)[4];
- DFI (2019) Best Practice Guidance to PPS 18 ' Renewable Energy'[5]:
- Environmental Impact Assessment Directive 85/337/EEC (as amended)[6];
- EU Birds Directive[7];
- EU Habitats Directive[8];
- JNCC (2012). UK Biodiversity Action Plan - Local Biodiversity Action Plans[9];
- NIEA (2010). Wind Energy Development in Northern Ireland's Landscapes
- Supplementary Planning Guidance to accompany Planning Policy Statement 18
- 'Renewable Energy'. NIEA Research and Development Series No 10/01, Belfast[10];
- Planning Policy Statement 18 (PPS 18)[11];
- Planning Policy Statement 2 (PPS 2) Planning & Nature Conservation[12];
- Planning Policy Statement 2 'Natural Heritage'[13];
- Strategic Planning Policy Statement for Northern Ireland (SPPS)[14];
- The Conservation (Natural Habitats, etc.) Regulations 1995 (as amended) which transposes the Habitats Directive into law in Northern Ireland (the Conservation Regulations)[15];
- The Environment (Northern Ireland) Order 2002 (as amended)[16];
- The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017[17],
- The Water Framework Directive[18];

1 CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester. Version 1.2. April 2022.

2 Convention on the conservation of European wildlife and natural habitats (Bern Convention) - Convention on the Conservation of European Wildlife and Natural Habitats (coe.int)

3 The Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 (legislation.gov.uk)

4 The Habitats Directive - Environment - European Commission (europa.eu)

5 https://www.infrastructure-ni.gov.uk/publications/best-practice-guidance-pps-18-renewable-energy

6 Environmental impact assessment (europa.eu)

7 The Birds Directive - Environment - European Commission (europa.eu)

8 The Habitats Directive - Environment - European Commission (europa.eu)

9 JNCC (2012). UK Biodiversity Action Plan - Local Biodiversity Action Plans www.biodiversityni.com

10 Northern Ireland Environment Agency (infrastructure-ni.gov.uk)

11 PPS 18 Planning policy statement 18 - renewable energy, Department of the Environment for Northern Ireland - Publication Index | NBS (thenbs.com)

12 PPS 2 Planning and nature conservation, Department of the Environment for Northern Ireland - Publication Index | NBS (thenbs.com)

13 Planning Policy Statement 2 ' Natural Heritage' (eplani.org)

14 The Strategic Planning Policy Statement | Department for Infrastructure (infrastructure-ni.gov.uk)

15 The Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 (legislation.gov.uk)

16 The Environment (Northern Ireland) Order 2002 (legislation.gov.uk)

17 The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 (legislation.gov.uk)

18 Water Framework Directive (europa.eu)

- The Wildlife & Natural Environment (Northern Ireland) Act 2011[19]; and
- The Wildlife (Northern Ireland) Order 1985 (as amended) (the Wildlife Order)[20].

10.3 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

10.3.1 Scoping Responses and Consultations

Since surveys generally only capture a "snapshot" of a habitat/species in question at any single point in time, in accordance with good practice, surveys were supported by consultations with the following bodies in order to obtain any additional information and to address any specific concerns during the impact assessment process. The responses as far as they addressed the ecological context are summarised below.

Consultation for this ES topic was undertaken with the organisations shown in **Table 10.1**

19 Wildlife and Natural Environment Act (Northern Ireland) 2011 (legislation.gov.uk)

20 The Wildlife (Northern Ireland) Order 1985 (legislation.gov.uk)

Table 10.1 Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Shared Environmental Services (SES)	Written consultation response 29/12/2021	Provided a pre-application scoping response. This is referenced in Chapter 2; Technical Appendix 2.1 Scoping report and Technical Appendix 2.2 Scoping Opinion. Consultation response included: • Potential hydrological connectivity to R Foyle and Tributaries SAC and R Faughan and Tributaries SAC. • Potential for infrastructure to be on flight path for migrating SPA features. • Requirement for HRA and Shadow HRA.	Assessment has been carried out for the species highlighted (particularly otter and salmon), the designated sites highlighted (SACs, SPAs and Ramsar sites). Full bird surveys undertaken to NatureScot standard, with results informing assessment in **Chapter 11 Ornithology**. These aspects have been appropriately considered within **Technical Appendix A10.1: EcIA**, the Shadow HRA and **Technical Appendix A10.2: HRA** (Woodrow, 2023) and within this ES Chapter.

Northern Ireland Environment Agency (NIEA) Natural Environment Division (NED)	Written consultation response 27/10/2022	NIEA (including NED and WMU) detailed scoping response. This is referenced in Chapter 2; Technical Appendix 2.1 Scoping report and Technical Appendix 2.2 Scoping Opinion. Consultation response included: • Adherence to CIEEM *Guidelines for Ecological Impact Assessment in the UK and Ireland*. • Specific approaches to scoping and surveying, including specific approaches for NI priority Habitats and Species, Birds and Bats. • Adherence to mitigation hierarchy. • Description required for criteria to establish magnitude and significance of impacts. • Consideration of certainty of mitigation measures. • Clear description of mitigation measures and arrangements for monitoring if appropriate. • Requirement for a Construction Environmental Management Plan. • Requirement for a Habitat Management and Enhancement Plan, including consideration of restoration and creation measures and long-term monitoring	Feedback from NIEA-NED has assisted with the preparation of the EcIA Survey Methodology Section 10.3.6, including specific survey methodologies. The assessment has been undertaken in adherence to CIEEM *Guidelines for Ecological Impact Assessment in the UK and Ireland*. A Habitat Management and Enhancement Plan and a Construction Environmental Management Plan have been produced (**Technical Appendix A3.2: HMEP** and **Technical Appendix A3.1: DCEMP**)

Northern Ireland Environment Agency (NIEA) Natural Environment Division (NED)	Meeting 21/10/2021	Results of initial surveys and scope of works for EIA submission discussed.	Feedback from NIEA-NED has assisted with the preparation of the EcIA Survey Methodology Section 10.3.6. NIEA were consulted regarding the scope of surveys and requirements for any repeat surveys following initial survey results as per the Table 10.2.
Northern Ireland Environment Agency (NIEA) Natural Environment Division (NED)	Meetings 24/10/2022	Draft HMEP and 'Active Peat' Discussions *Introductions & Current Project Progress* *Overview of Infrastructure Layout* *Blanket bog Restoration Methods currently being considered - EHA (Dr Ray Flynn)* *Questions & Discussion*	**Technical Appendix A10.4: APA** addresses concerns around impacts to Active Peat. This is also detailed within **Technical Appendix A10.1: EcIA** and this EIA Chapter. A detailed Habitat Management and Enhancement Plant (HMEP) for both habitats and species has been submitted to support this proposal (**Technical Appendix A3.2: HMEP**).
Dr Jon Lees NIEA Wildlife Officer	Email December 2018	Consultation re otter populations and necessity to deploy wildlife cameras at Legnahone Burn mammal trail location.	No licence was required. Wildlife camera confirmed presence of otter on this watercourse. Surveys undertaken as per the Table 10.2.
Loughs Agency	Email 16/08/2021	Loughs Agency provided information on local distribution of spawning habitats for salmonids.	Loughs Agency noted that the ESA lies *"very high up in the catchment"* however, fisheries assessment and electrofishing still undertaken by Woodrow following the precautionary approach as per the Table 10.2.

Loughs Agency	Written consultation response 06/01/2022	The Agency highlighted the potential for impacts from windfarms on fisheries interests.	This has been dealt with within Table 10.2 and Table 10.7. Impacts have been assessed in more detail within **Technical Appendix A10.1: EcIA** and mitigation to protect watercourses is embedded within the design and detailed within **Technical Appendix A3.1: DCEMP** and **Technical Appendix A8.5: Outline Drainage Strategy.**
Loughs Agency	Email 15/09/2022	Response regarding electrofishing queries	Licence obtained and electrofishing carried out within the ESA as per the Table 10.2.

10.3.2 Scope of Assessment

The assessment examines the potential direct and indirect effects on the Important Ecological Features (IEFs) (CIEEM, 2018)[21]. For ecological assessment in EIA, *"these Guidelines avoid and discourage use of the matrix approach and categorisation."*

The IEFs were scoped through to the assessment within **Technical Appendix A10.1: Ecological Impact Assessment (EcIA)**, based on the recorded status of Important Ecological Features, and their considered value, under the general categories of International, National, Regional, Local Importance (where relevant). In line with Ecological Impact Assessment guidance, features which are of Low Importance were not brought forward into the impact assessment.

All species of conservation importance recorded during the field-surveys, or previously recorded in its immediate vicinity (i.e., within a 2 km radius) and considered likely to occur within the ESA (see section 10.3.4), were included within the Ecological Impact Assessment. Also considered were designated sites that have biological or other connectivity with the ESA.

All species recorded within the ESA and wider area during the survey period (2017-2022) are presented in the EcIA, along with a justification of which species were carried through to the impact assessment stage. The IEFs are summarised in Section 10.4.5.

10.3.3 Elements Scoped Out of Assessment

Several ecological features that were considered as part of the EcIA have been scoped out of this assessment due to the potential for only Minor Significant Effects at the Local Level (see **Section 5 of the EcIA – Summary of Ecological Value of Features Occurring within the ESA**), whereby after appropriate mitigation by means of Offsetting, Avoidance and Design have been assessed as ***Not Significant***. The latter is as a result of embedded mitigation in the design, which is fully addressed in the **EcIA (Section 1.4)** and does not require further assessment within this ES Chapter.

21 CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester. Version 1.2. April 2022.

These include:

- Designated sites without hydrological connection and source-pathway-receptor linkages to the ESA, as assessed within the EcIA and HRA;
- Upland Grassland Habitats including Improved / Semi-Improved and Acid Grassland;
- Other Habitats including Drains, Dry Ditches and Coniferous Plantation;
- All terrestrial mammals other than bats and otter;
- Common frog and smooth newt;
- Marsh fritillary butterflies / any other protected or Northern Ireland (NI) priority invertebrates; and
- Direct effects on fisheries and other aquatic fauna including freshwater pearl mussel.

Potential ecological effects associated with works required on the haul route are not likely significant effects and are scoped out of the EIA as set out in **Technical Appendix A2.3: Abnormal Load Route Works (ALRW)** and further details are provided within **Appendix IV of the EcIA.**

10.3.4 Ecological Study Area Definition

For baseline desk study purposes, potential effects on designated sites of international importance (Natura 2000 sites) and national importance (Areas of Special Scientific Interest (ASSIs), and National Nature Reserves (NNRs) were primarily considered within a buffer of 15 km, measured from IGR H 42907 96658 (the approximate centre of the Development). It should be noted that 15 km is the distance within which the initial desktop search was undertaken and then the zone of influence was increased or reduced according to connectivity following professional judgement; in some cases, the zone of influence of a proposal may extend significantly beyond this distance, for example where there is direct hydrological connectivity or a source-pathway-receptor (S-P-R) link via a river network. The assessment has followed the S-P-R linkage approach and reviewed all potential environmental connections between the site and the relevant designated sites.

Potential indirect effects on Sites of Local Nature Conservation Importance (SLNCIs) were considered within a buffer of 5 km from the centre of the Development according to standard practice. Biological records from public databases (e.g., NI's Centre for Environmental Data and Recording (CEDAR) and the National Biodiversity Data Centre (NBDC)) were considered within a 10 km buffer from the centre of the Development. Once the zone of influence had been established based on more detailed design, the desk study information was then updated to ensure that all potential S-P-R linkages were considered within the information gathered.

For the purpose of the ecological surveys (non-avian ecology) the 'Ecological Study Area' encompasses the full extent of all ecological surveys for each type of Important Ecological Features, which were each assessed separately in line with their unique survey requirements according to best practice guidance as detailed within **Technical Appendix A10.1: Ecological Impact Assessment** (EcIA). The ESA includes the potential maximum development boundary at the time of EIA Scoping, and includes lands available for HMEP measures for example, and is illustrated in Figure A10.1.2. The ESA occupies an area of approximately 596 ha with a proposed infrastructure footprint of just over 22 ha.

10.3.5 Design Parameters

The details of the Development are included in Chapter 3 of the ES: Development Description.

10.3.6 Baseline Survey Methodology

Terrestrial ecology surveys were undertaken following specific guidelines for habitats and species as outlined in the following sections, and with reference to the legislation and policy outlined in Section 10.2. The importance of the habitats and species present is evaluated using the CIEEM, 2018 guidance document: *CIEEM (2018)*[22]*. Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester. Version 1.2. April 2022.* This document outlines an accepted approach for the evaluation of potential effects from such Developments.

The sections below describe the methods used to survey and identify Important Ecological Features and assess potential effects which may occur as a result of the proposal.

The Field Survey methodologies are provided in full within **Technical Appendix A10.1: Ecological Impact Assessment.** These are summarised below in Table 10.2.

10.3.6.1 Desk Study

An initial desk-based review of the ESA and wider area was compiled to determine the appropriate surveys required to inform any potential for ecological constraints.

The NPWS Designations Viewer[23] and NIEA Natural Environment Map Viewer[24] were used to identify any nearby designated sites and their respective Qualifying Interest (QI) species. Shapefiles and metadata for designated sites have been downloaded and are updated annually for use by Woodrow ecologists on local GIS. Flood Maps NI[25] (and EPA Maps[26]) was used to investigate hydrological connectivity to SACs/SPAs using the "River Flow Direction" tool.

A records request was made to the Centre for Environmental Data and Recording (CEDaR) for ecological records within the 10 km national grid square (H49) encompassing the ESA. The non-avian ecology records from this request were reviewed to investigate the target species potentially occurring within the ESA and wider area to inform survey design and identify any potential ecological constraints.

A desk-based review of habitat availability for bat species in the environs of the proposed development, and the available bat data was used to inform the scope to the bat surveys required. As recommended by both BCI (2012) and SNH *et al.* (2019) the area covered by the desk-based review was extended to 10 km surrounding the wind farm Development. The desk-based study included:

- Reviewing distances from closest UK National and European sites designated for bats (only bat SACs on the island of Ireland are for lesser horseshoe bat (*Rhinolophus hipposideros)* in RoI.) - the ESA of interest (Co. Tyrone, Northern Ireland) is outside the range for lesser horseshoe bat and there are no bat SAC sites near the Development;
- Examining aerial imagery and 6-inch maps to identify potential bat foraging and roosting habitats;
- Lundy *et al.* (2011)[27] provides a high-level assessment of potential habitat suitability for different species of bat occurring in Ireland; and,

22 CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester. Version 1.2. April 2022.

23 NPWS Designated Site Data. [Online] Available at: Designated site data | National Parks & Wildlife Service (npws.ie)

24 NIEA Natural Environment Map Viewer. [Online] Available at: NIEA Natural Environment Map Viewer (daera-ni.gov.uk)

25 Flood Maps NI. [Online] Available at: Flood Maps NI | Department for Infrastructure (infrastructure-ni.gov.uk)

26 EPA Map Viewer. [Online] Available at: EPA Maps

27 Lundy, M., Montgomery, I. and Russ, J. (2010) Climate change-linked range expansion of Nathusius' pipistrelle bat, Pipistrellus nathusii. 37 (12) 2232-2242

- Review of data received from Northern Ireland (NI) Bat Group within 10 km of the wind farm ESA and the results of Biodiversity Maps report for the 10-km squares covering the ESA (H39 & H49), including species recorded and known roosting sites.

A similar desk study was carried out to review existing records on salmonid fisheries, potential for freshwater pearl mussel populations, ecological status and water quality in relevant watercourses using information from the Northern Ireland Environment Agency and other sources. This information is available in **Technical Appendix A10.1: EcIA** within sections 2.3.1, 3.3, 3.4.3 and results are illustrated in Table A10.1.11 of that report.

10.3.6.2 Field Assessment

The full details of the desk study carried out are provided in **Technical Appendix A10.1: Ecological Impact Assessment.**

10.3.6.3 Peatland Assessment

10.3.6.3.1 Habitat Surveys and Active Peat Assessment

A Joint Nature Conservation Committee (JNCC) Phase 1 habitat survey was carried out across the entire ESA from 31 May – 21 October 2021, this provided an update on previous habitat surveys carried out within the ESA from August 2017 to September 2019. The habitat survey gave cognisance to the potential presence of any habitats which had the potential to correspond to Northern Ireland Priority Habitats and EU Habitats Directive Priority Habitats.

Post-survey analysis was then carried out by cross-referencing habitat and plant community types to Habitats Directive habitats and Northern Ireland Priority Habitats, using JNCC's correspondence rules (JNCC, 2010)[28], NIEA priority habitats guidance[29], Maddock (2008)[30] and Maddock (2011)[31]. The location of habitat types was noted, and, during the survey, consideration was given to identifying important or protected habitats and habitats that could be used by protected species.

In recognition of the high importance afforded to active peatland by the Department of the Environment's Planning Policy Statement 18: Renewable Energy (2009)[32], the Strategic Planning Policy Statement for Northern Ireland: Planning for Sustainable Development (2015)[33] and the Northern Ireland Habitat Action Plan for Blanket Bog DAERA (2003)[34] it was determined that an Active Peat Assessment (APA) would be required to determine the extent of areas of active peat and to ensure that the design would seek to avoid and minimise detrimental impact on areas of peat. This was undertaken during 20-21 July 2022 based upon the previous APA data gathered between May – October 2021.

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28 JNCC, (2010), Handbook for Phase 1 habitat survey – a technique for environmental audit, JNCC, Peterborough, ISBN 0 86139 636 7.

29 NIEA/DAERA Northern Ireland Priority Habitat Guides. [Online] Available at: Northern Ireland Priority Habitat Guides | Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk)

30 Maddock, A. (Ed.) (2008): UK Biodiversity Action Plan. Priority Habitat Descriptions. Upland Flushes, Fens and Swamps. Available online: https://data.jncc.gov.uk/data/6fe22f18-fff7-4974-b333-03b0ad819b88/UKBAP-BAPHabitats-59-UplandFlushesFensSwamps.pdf

31 Maddock, A. (Ed.) (2011): UK Biodiversity Action Plan. Priority Habitat Descriptions. Available online: https://data.jncc.gov.uk/data/2728792c-c8c6-4b8c-9ccd-a908cb0f1432/UKBAP-PriorityHabitatDescriptions-Rev-2011.pdf

32 Environment's Planning Policy Statement 18: Renewable Energy (2009). [Online] Available at: Best Practice Guidance to PPS 18 'Renewable Energy' | Department for Infrastructure (infrastructure-ni.gov.uk)

33 Strategic Planning Policy Statement for Northern Ireland: Planning for Sustainable Development (2015). [Online] Available at: Planning Policy Statement 18 'Renewable Energy' Best Practice Guidance (infrastructure-ni.gov.uk)

34 DAERA (2003) Northern Ireland Habitat Action Plan - Blanket Bog. [Online] Available at: https://www.daera-ni.gov.uk/sites/default/files/publications/doe/natural-plan-habitat-action-blanket-bog.pdf

The habitat assessment input for the APA was informed by the JNCC habitat walkover surveys undertaken during site visits during summer and autumn in 2018 and 2021, JNCC habitat classification was supplemented by the collation of peat status points during these walkovers, and then habitat classifications were verified and further detailed using quadrat information.

Peat status points were undertaken to provide fine-scale mapping of areas of 'active peat'. This assessment was based on the presence of indicator plant species, the depth of the underlying peat layer and the hydrological condition of the peatland unit (based on NIEA-NED Guidance note on Active Peat[35]).

Quadrats were carried out according to the National Vegetation Classification (NVC) Guidance[36] of 68 No. standard 2x2 m vegetation quadrats located across the full extent of the ESA during the period 26-28 October 2021 (the latter was also supplemented by quadrat data undertaken in October 2019 at 13 no. locations across the ESA).

Further details of the habitat and active peat assessments are provided in **Technical Appendix A10.3: National Vegetation Classification** Survey and **Technical Appendix A10.4: Active Peat Assessment**.

10.3.6.3.2 *National Vegetation Classification (NVC) Quadrat Survey*

National Vegetation Classification (NVC) Quadrat surveys were carried out on 26-28 October 2021 within the ESA to inform the design process. NVC communities were ascribed to each quadrat based on "JNCC NVC field guide to mires and heaths[37]" (Elkington *et al*. 2001) "British Bryological Society (2010) - *A Field Guide*"[38], Streeter *et al*, (2016)[39] and "British Plant Communities[40]" (Rodwell *et al*.1991). A total of 68 No. standard 2x2 m vegetation quadrats located within the ESA.

All vascular plants, bryophytes and lichens, and their respective percentage cover, was recorded for each quadrat. Other parameters were also recorded such as approximate peat depth, cover of bare peat, rocky outcrops and other abiotic factors such as slope and aspect.

The quadrat data was additionally supplemented by previous quadrat analysis undertaken in October 2019 at 13 no. locations across the ESA.

Results and illustrated maps of the NVC habitat assessment and quadrat locations are provided in **Technical Appendix A10.3: National Vegetation Classification Survey.**

10.3.6.4 *Active Peat Assessment (APA)*

Following the scoping and consultation exercises carried out during 2021 for the Development and in recognition of the high importance afforded to active peatland by the Department of the Environment's Planning Policy Statement 18: Renewable Energy (2009) and the Strategic Planning Policy Statement for Northern Ireland: Planning for Sustainable Development (2015), it was determined that an Active Peat Assessment (APA) would be required to determine the extent of areas of active peat and to ensure

35 NIEA (2012) Natural Heritage, Development Management Team Advice Note Active Peatland and PPS18. [Online] Available at: https://www.daera-ni.gov.uk/sites/default/files/publications/doe/natural-guidance-NIEA-natural-heritage-development-management-team-advice-note-2012.pdf

36 NVC Users Handbook (2006). [Online] Available at: NVC Users' Handbook | JNCC Resource Hub

37 Elkington et al. (2001). JNCC NVC field guide to mires and heaths. . [Online] Available at: https://data.jncc.gov.uk/data/1d0037bd-6c77-4677-8040-2f6e1d852eb1/JNCC-NVC-MiresHeaths-2002.pdf

38 British Bryological Society, 2010 (eds Atherton, I., Bosanquet, S., & Lawley, M.). Mosses and Liverworts of Britain and Ireland – a field guide. British Bryological Society, UK.

39 Streeter, C., Hart-Davies, C., Hardcastle, A., Cole, F. & Harper, L. (2016). The most complete guide to the wildflowers of Britain and Ireland, 2nd Edition. HarperCollins Publishers, ISBN10 000710621.

40 Rodwell, J.S. (2006) NVC Users' Handbook, JNCC, Peterborough, ISBN 978 1 86107 574 1

that the design would seek to avoid and minimise detrimental impact on areas of peat. This was undertaken during 20-21 July 2022 based upon the previous APA data gathered between May – October 2021.

The habitat assessment input for the APA was informed by the JNCC habitat walkover surveys undertaken during site visits during summer and autumn in 2018 and 2021.

Peat status points were undertaken to provide fine-scale mapping of areas of 'active peat'. This assessment was based on the presence of indicator plant species, the depth of the underlying peat layer and the hydrological condition of the peatland unit (based on NIEA-NED Guidance note on Active Peat[41]).

Active Peat Assessment was carried out with a particular focus within proposed infrastructure locations and utilised to determine 'Active Peat Constraints' as illustrated in Figure A10.4.1 of the **Technical Appendix A10.4: Active Peat Assessment.**

Results of the APA are provided within **Technical Appendix A10.4: Active Peat Assessment.**

41 NIEA (2012). Development Management Team Advice Note: Active Peatland and PPS18. [Online] Available at: natural-guidance-NIEA-natural-heritage-development-management-team-advice-note-2012.pdf (daera-ni.gov.uk) (Accessed July 2022)

Table 10.2: Overview of Field Investigations Undertaken (2017-2022)

Survey	Description	Coverage	Dates[42]
Habitat Surveys	Active peat assessment (APA) to inform project design within the ESA boundary an in consultation with Arcus team to inform design.	Conducted in accordance with NIEA Guidance note on Active Peat assessment[43]. ESA (see Figure A10.1.2) – the aim was to design the Development so that it would not impact directly on identified Active Peat (in accordance with NIEA Active Peat Assessment).	Jul 2022
	NVC Quadrat survey and active peat assessment (APA) within the ESA boundary focussing on areas likely to be affected by the footprint of the Development.	ESA – This NVC survey focused on the vicinity of the proposed footprint of the works.	Oct 2021
	Extended Phase 1 Habitat Survey (JNCC), concentrating on highlighting areas of conservation importance and initial active peat assessment (APA).	ESA	May – Oct 2021
	Preliminary Extended Phase 1 Habitat Surveys to JNCC specifications. (This included assessment of quadrats to NVC level at selected locations in 2019).	ESA	2017-2019
HMEP Surveys	Habitat enhancement potential surveys. Assessment of suitability for enhancements to maintain and encourage biodiversity within the ESA. Included detailed ecohydrological / peatland restoration surveys.	ESA and draft Habitat & Species Management and Enhancement Plan (Draft HMEP) ESA Landholdings	Jan 2023 Oct 2022 Nov 2021
Bat Surveys	Four years of active bat season surveys including: Seasonal static bat detector deployment at each turbine location over spring, summer and autumn (2018, 2019 and 2021);	ESA, haul route (see Figure A10.1.10) and potential bat roosts within 200 m of this area, the developable area (the area where turbines may be located). Note: The most recent guidelines (SNH *et al.*, 2021)[45] recommend that "*features that could support maternity roosts and significant hibernation and/or swarming sites (both of which may attract bats from numerous colonies from a large*	2022 2021 2019 2018

42 See Technical Appendix 10.1 – Ecological Impact Assessment for further details.

43 NIEA (2012) Natural Heritage, Development Management Team Advice Note Active Peatland and PPS18. [Online] Available at: https://www.daera-ni.gov.uk/sites/default/files/publications/doe/natural-guidance-NIEA-natural-heritage-development-management-team-advice-note-2012.pdf

45 Scottish Natural Heritage (SNH) (2021) Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation (Version: August 2021, updated within minor revisions). Scottish Natural Heritage, Natural England, Natural Resources Wales, Renewable UK, Scottish Power Renewables, Ecotricity Ltd, University of Exeter & Bat Conservation Trust. Bats and onshore wind turbines: Interim guidance, Jan 2009 (nature.scot)

	Static bat detector at height for comparative data (2021); Permanent static detector for comparative data (2018, 2019 and 2021); Bat Roost Assessment Surveys (April 2019) & Additional visit planned March 2023 for off-road haul route section); Building inspections under NIEA License (August 2019); Emergence and re-entry surveys on potential and confirmed bat roost buildings (August 2019 at four different locations; June - September 2021 at three different locations; and July 2022 at two different confirmed roost locations); Bat Transect Surveys (2018, 2019 and 2021); Haul route (encompassing Abnormal Load Route (ALR))[44] driven bat transect (2022); and Bat fatality monitoring at existing wind farm (July 2020, July and August 2021).	*catchment) within 200m plus rotor radius of the boundary of the proposed development should be subject to further investigation*". This survey guidance also aligns with Hundt L. (2012) Bat Surveys: Good Practice Guidelines, 2nd edition, Bat Conservation Trust[46] - Chapter 10 which informed the bat roost assessment surveys in 2018. All potential bat roost sites within the ESA and potentially within 200 m plus of the rotor swept area underwent a preliminary assessment (external survey) for their potential to support roosting bats in April 2019. Internal building inspections were conducted under NIEA license No. BDL/104/19 and Licensee No. 2423. Buildings considered to have the potential, or which were likely to support a bat roost were surveyed under license in August 2019. These (4 no. identified buildings) then underwent an emergence and re-entry survey on the evening of 19th August, and a pre-dawn re-entry survey on the morning of 20th August 2019 to confirm the likely presence of roosting bats. Emergence surveys were repeated at 2 no. confirmed bat roosts in July 2022. A bat roost was identified in a tree within the ESA on 26th August 2021. This underwent an additional dusk survey on 14th September 2021 and final update survey on 14th July 2022.	
Badger Surveys	Walkover and deployment of trip cams at identified active sett locations. Mammal walkover surveys.	Badger surveys were conducted in accordance with NIEA's survey specifications[47] . Surveys were conducted within the ESA and ensured that they encompassed the area within 50 m of the ESA Boundary. The surveys were also conducted along the potential Haul Routes.	Sept - Oct 2021 Overall badger surveys 2017-2022
Red Squirrel Surveys	Transect walks and drey counts within the coniferous plantations within the immediate vicinity of the ESA.	Surveys were conducted in accordance with Gurnell *et al.*, (2001)[48] and NIEA specifications[49], in the forestry plantations both within the ESA and within an area of mature plantation *c.* 200m outside the ESA.	April 2022

44 Full details regarding EIA scoping of the haul route (encompassing Abnormal Load Route (ALR)) are provided in **Technical Appendix A2.3: Abnormal Load Route Works (ALRW)** of the ES. Details regarding the ecological assessment of the haul route are available in **Appendix IV** of **Technical Appendix 10.1 – Ecological Impact Assessment (EcIA).**

46 Hundt, L. (2012) Bat Surveys: Good Practice Guidelines (2nd Edition). The Bat Conservation Trust, London.

47 DAERA (2017). NIEA Badger Survey Requirements. [Online] Available at: https://www.daera-ni.gov.uk/sites/default/files/publications/daera/badger-survey-specifications.pdf

48 Gurnell et al., (2001). Practical Techniques for Surveying and Monitoring Squirrels. [Online] Available at:https://treesforlife.org.uk/docs/079_360__practicaltechniquesforsurveyingandmonitoringsquirrels_1446049986.pdf

49 NIEA (2017) Red Squirrel Survey Specific Requirements. [Online] Available at: https://niopa.qub.ac.uk/bitstream/NIOPA/7182/1/red-squirrel-survey-specifications.pdf

	These surveys were conducted pre-design, applying the precautionary principle. It was later ascertained that no conifer plantation would be impacted by the Development.	Each survey period consisted of a repeated transect walk through the forestry plantation with predetermined 100 m stops along the route where at every stop all foraged pinecones were collected. Dreys were observed through binoculars and the locations were recorded using a GPS device. This survey transect was carried out 4 times over the course of a 2-week survey period during September/October 2019, October 2021 and April 2022.	October 2021 Sept - Oct 2019
Reptile Surveys	Repeated monitoring of artificial refugia (reptile mats) under licence from NIEA.	This survey included a combination of visual searching and searching 75 no. reptile mats (artificial refugia) which were temporarily placed in suitable habitat across the ESA during the survey periods, in agreement with the landowners and in accordance with NIEA specifications[50]. Surveys in 2019 were undertaken under Licence No. LRS/12/19 and Licensee No. 2696. Surveys in 2021 were undertaken under Licence No. LRS/30/21 and Licensee No. 2876. Surveys in 2022 were undertaken under License No. LRS/5/22, Licensee No. 3137 and License No. LRS/6/22, Licensee No. 3138.	April – May 2022 Sept – Oct 2021 Sept – Oct 2019
Otter Surveys	Walkover survey of suitable habitat for signs and deployment of trip cams	This survey was conducted within the ESA in accordance with NIEA specifications[51]. A visual survey up and downstream was conducted for 250 m at the Legnahone Burn which contained the only suitable riparian corridor identified within the ESA (Figure A10.1.23 in **Technical Appendix A10.1: EcIA**) . Streams at potential traffic crossing points were also surveyed within the ESA. Trip cameras were installed at the location where evidence of otter activity was noted during the surveys, placed under the bridge at Napple Rd; IG Ref: H 44086 97024 (following consultation with Dr Jon Lees NIEA Wildlife Officer, a license was not required to place a camera on this mammal trail).	May 2021 – updated look for signs Feb 2019 – trip cam December 2018 – trip cam
Marsh Fritillary Larval Web Survey	Walkover habitat condition assessment	A search following NIEA specifications[52] of all areas supporting devil's-bit scabious (*Succisa pratensis*) (DBS) within the ESA under License No. SBP/18/19; Licensee No – 2423 resulted in no evidence of Marsh Fritillary Butterfly being found. Repeat habitat assessment in September 2021 confirmed that the baseline remains the same.	Sept 2019 Sept 2021

50 NIEA (2017) Common Lizard Survey Specifications. [Online] Available at: https://www.daera-ni.gov.uk/publications/common-lizard-surveys-specifications

51 NIEA (2017) Otter Survey Specifications. [Online] Available at: https://www.daera-ni.gov.uk/publications/otter-surveys-specifications

52 NIEA (2017) Marsh Fritillary Butterfly Surveys – NIEA Specific Requirements. [Online] Available at: https://www.daera-ni.gov.uk/sites/default/files/publications/daera/marsh-fritillary-butterfly-survey-specifications.pdf

		Note: Plants of DBS were scattered, and the vegetation was considered to support sub-optimal habitat for this species within the ESA in 2019. Subsequently no further surveys for this species were considered necessary.	
Aquatic Surveys	Electrofishing survey	Within identified suitable watercourses in the ESA (Figure A10.1.3 **in Technical Appendix A10.1:EcIA**). Note: Freshwater pearl mussel (*Margaritifera margaritifera*) (FWPM) surveys were not commissioned due to the nature of the water features within the ESA. While applying the Precautionary Principle, the lower reaches of several streams were classified as having some low suitability for salmonids (salmonids are essential host species for FWPM and would be considered an indicator of FWPM suitability). While the potential to affect downstream FWPM is considered to be low due to the lack of suitable habitat and lack of salmonid species within the ESA, applying the Precautionary Principle, the potential for indirect effects on water quality to affect salmonids downstream of the ESA has still been considered further as part of the impact assessment to ensure there are no possible indirect effects on FWPM. This is also supported by **Chapter 8: Hydrology and Hydrogeology** of this ES, which illustrates that there is no potential for significant effects on water quality downstream of the Development. This assessment has also been supported by the results of the electrofishing surveys carried out by Woodrow in 2022.	Sept 2022
	Chemical aquatic surveys - grab samples for chemical analysis of water samples		Sept 2022
	Salmonid suitability survey.		Jul 2021
	Biological aquatic surveys (aquatic macroinvertebrate surveys with water quality parameters measured in-situ)		Jul 2021
Haul Route Surveys (encompassing Abnormal Load Route (ALR))	Habitat, Bat Roost Assessment Surveys, Ecological Constraint Surveys (including mammal survey) along the haul routes.	The locations of potential works along the haul route (see Figure A10.1.10). Target note survey of haul route options (driven 'on line' survey with targeted walkover surveys 'off road' where habitats / species has the potential to be affected). Off road section assessment (including Potential Roost Feature (PRF) surveys of trees and buildings along this section).	Aug 2022 Sept 2020 March 2023
Note: Given the acidic and 'flashy' nature of the watercourses within the ESA, following the ESA scoping surveys there are no suitable smooth newt (*Lissotriton vulgaris)* breeding ponds or ditches at the ESA or nearby which might be in any way affected by the Development. In addition, it is widely accepted in the literature that smooth newts on the island of Ireland tend to avoid boglands due to unsuitable pH related factors (Cooke & Frazer, 1976[53]; Yalden, 1986[54]; Denton, 1991[55], Marnell 1998[56]) therefore due to the lack of suitable breeding sites for this particular species, newt surveys were not deemed to be necessary within the ESA.			

53 Cooke, A. S. & Frazer, J. F. D. (1976). Characteristics of newt breeding sites. J. Zool. (Lond.) 178: 223– 236.

54 Yalden, D. W. (1986). The distribution of newts, Triturus spp., in the Peak District, England. Herpetol. J. 1: 97– 101.

55 Denton, J. S. (1991). Newts in Cumbria. Herpetol. J. 1: 549– 554.

56 Marnell, F. (1998). Discriminant analysis of the terrestrial and aquatic habitat determinants of the smooth newt (Triturus vulgaris) and the common frog (Rana temporaria) in Ireland. Journal of Zoology (1987), 244(1), 1–6. https://doi.org/10.1111/j.1469-7998.1998.tb00001.x

10.3.7 Methodology for the Assessment of Effects

The impact assessment methodology applied is from the CIEEM Guidance, as well as building on other recognised methodologies for specific faunal groups. The general approach is to identify and characterise potential effects, assess the magnitude / extent and probability of occurrence of each effect, and relate these factors to the value and sensitivity of the receptor / feature. **Sections 10.3.8-10.3.11** outline the assessment criteria for each stage.

10.3.8 Geographical Extent

The Guidelines for Ecological Impact Assessment (EcIA) (CIEEM, 2018) recommend categories of ornithological or nature conservation value that relate to a geographical framework (*e.g.,* international, through to local). The geographical framework corresponds with the sensitivity of ecological features / receptors as detailed in **Section 10.3.10**. The following geographical scales were used within the assessment:

- Local level (within the ESA or neighbouring areas);
- District level (Derry City & Strabane);
- Regional Level (Northern Ireland);
- National level (UK); and
- International level.

Those ecological features which occur within the Zone of Influence such as nature conservation sites, habitat or species are then evaluated in geographic hierarchy of importance. Depending on the receptor's status and its context in the wider area, its nature conservation value may be assigned one of the categories detailed in **Table 10.3.**

Approaches to attributing nature conservation value to species have been developed for some specific groups such as bats and birds. The approach outlined *in 'Valuing Bats in Ecological Impact Assessment'*[57] is summarised in **Table 10.4** (Note – guidance on attributing rarity and ascertaining what constitutes a 'small' or 'large' number exists within this text but is not reproduced here). **Table 10.5** and **Table 10.6** list the conservation status of individual Irish bat species.

57 Wray S, Wells D, Long E, Mitchell-Jones T (December 2010). Valuing Bats in Ecological Impact Assessment, IEEM In-Practice p 23-25

Table 10.3: Value of Ecological Resources
(Adapted using professional judgement from NRA 2009[58] and adhering to "the CIEEM Guidelines").

Importance	Criteria	Sensitivity of Receptor*
International Importance	• Sites, habitats and species populations of importance in a European wide context. • 'European Site / UK National Sites' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation. • Proposed Special Protection Area (pSPA). • Site that fulfils the criteria for designation as a 'European Site / UK National Site' (see Annex III of the Habitats Directive, as amended). • Features essential to maintaining the coherence of the Natura 2000 Network (including UK National Sites).59 • Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive. • Resident or regularly occurring populations (assessed to be important at the national level) of species of animal and plants listed in Annex II and/or IV of the Habitats Directive. • Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971). • Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979). • Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). • World Heritage Sites (implications for biodiversity value only). • Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).	Very High

National Importance	• Sites, habitats and species populations of importance in a national context.
	• Site designated as an Area of Special Scientific Interest (ASSI).
	• National Nature Reserve.
	• Undesignated site fulfilling the criteria for designation as an Area of Special Scientific Interest (ASSI) or National Nature Reserve.
	• Resident or regularly occurring populations (assessed to be important at the national level) of the following:
	  o Species protected under the Wildlife (Northern Ireland) Order 1985; and/or,
	  o Species listed on the relevant Red Data list.
	• Site containing 'viable areas'[60] of habitat types listed in Annex I of the Habitats Directive.
		High

Regional Importance (Northern Ireland)	• Area of Special Amenity. • Area subject to a Tree Preservation Order. • Area of High Amenity, or equivalent, designated under the County Development Plan. • Resident or regularly occurring populations (assessed to be important at the 'Regional' level) of the following: - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;	High

58 NRA (2009) Guidelines for Assessment of Ecological Impacts of National Roads Schemes, [Online] Available at: https://www.tii.ie/technical-services/environment/planning/Guidelines-for-Assessment-of-Ecological-Impacts-of-National-Road-Schemes.pdf (Accessed: May 2022).

59 See Articles 3 and 10 of the Habitats Directive

60 A 'viable area' is defined as an area of a habitat that, given the particular characteristics of that habitat, was of a sufficient size and shape, such that its integrity (in terms of species composition, and ecological processes and function) would be maintained in the face of stochastic change (for example, as a result of climatic variation).

Importance	Criteria	Sensitivity of Receptor*
	- Species protected under the Wildlife Acts Ireland); and/or - Species protected under the Wildlife (Northern Ireland) Order 1985; and/or - Species listed on the relevant Red Data list. • Regional important populations of species; or viable areas of semi-natural habitats; or natural heritage features identified in the National or Local BAP; if this has been prepared. • Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance. • Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the region. • Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level. • SLNCIs supporting county important populations of species, or viable areas of semi-natural habitats identified as Northern Ireland Priority Habitats.	
District level Importance (Derry City & Strabane)	• Resident or regularly occurring populations (assessed to be important at the 'District' level)[61] of the following: • Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; • Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; • Species protected under the Wildlife (Northern Ireland) Order 1985; and/or • Species listed on the relevant Red Data list. • Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance. • District important populations of species, or viable areas of semi-natural habitats or natural heritage features identified as Northern Ireland Priority Habitats or Species. • Sites containing semi-natural habitat types with high biodiversity in a district context and a high degree of naturalness, or populations of species that are uncommon within the district. • Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a regional level.	Medium
Local Importance (higher value)	• SLNCIs supporting locally important habitat assemblages and /or locally important populations of Northern Ireland Priority Species Sites, habitats and species populations of importance in a parish and district context, including Locally important populations of Northern Ireland Priority Species or Habitats. • Locally important populations of priority species or habitats or natural heritage features identified in the Local Biodiversity Action Plans, if this has been prepared. • Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality. • Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value. • Resident or regularly occurring populations (assessed to be important at the Local level) of the following: o Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;	Medium

[61] It is suggested that, in general, 1% of the District population of such species qualifies as a District important population. However, a smaller population may qualify as District important where the population forms a critical part of a wider population, or the species is at a critical phase of its life cycle.

Importance	Criteria	Sensitivity of Receptor*
	○ Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; ○ Species protected under the Wildlife (Northern Ireland) Order 1985; and/or, ○ Species listed on the relevant Red Data list.	
Local Importance (lower value)	• Habitats and species populations of less than local importance but of some value. • Sites or features containing non-native species that is of some importance in maintaining habitat links.	Low - Negligible

**Sensitivity of receptor is provided for context within the Ecological Impact Assessment Framework (CIEEM, 2018)*

Table 10.4: Scoring system for valuing commuting and foraging bats

Geographic Frame Reference	Score
Regional	31-40
County	21-30
District / Local / Parish	11-20
Not Important	1-10

Table 10.5: Methodology for valuing foraging areas (scoring in brackets)

Species	Number of Bats	Roosts / Potential Roosts Nearby	Foraging Habitat Characteristics
Common (2)	Individual bats (5)	None (1)	Industrial or other site without established vegetation (1)
		Small number (3)	Suburban areas or intensive arable land (2)
Rarer (5)	Small number of bats (10)	Moderate number / Not known (4)	Isolated woodland patches, less intensive arable and / or small towns and villages (3)
		Large number of roosts or close to NHA for species (5)	Larger or connected woodland blocks, mixed agriculture, and small villages (4)
Rarest (20)	Large number of bats (20)	Close to or within SAC for species (20)	Mosaic of pasture, woodlands and wetland areas (5)

Table 10.6: Conservation status of bat species in Ireland (Marnell et al. 2019)[62]

Species	Common Name	Overall conservation status in Ireland	Irish Red List status
Myotis daubentonii	Daubenton's bat	Favourable	Least Concern
Myotis mystacinus	Whiskered bat	Favourable	Least Concern
Myotis nattereri	Natterer's bat	Favourable	Least Concern
Nyctalus leisleri	Leisler's bat	Favourable	Least Concern
Pipistrellus nathusii	Nathusius' pipistrelle	Unknown	Least Concern
Pipistrellus	Common pipistrelle	Favourable	Least Concern
Pipistrellus pygmaeus	Soprano pipistrelle	Favourable	Least Concern
Plecotus auritus	Brown long-eared bat	Favourable	Least Concern

Important Ecological Features (IEFs) are those features which are within the Zone of Influence and are evaluated as being of Local Importance (Higher Value) or greater.

62 Marnell, F., Looney, D & Lawton, C. (2019). Ireland Red List No. 12: Terrestrial Mammals., National Parks and Wildlife Service, Department of Department of Culture, Heritage and the Gaeltacht, Dublin, Ireland.

10.3.9 Sensitivity of Receptors

The sensitivity of the baseline conditions, including the importance of environmental features on or near to the ESA or the sensitivity of potentially affected receptors, has been assessed in line with best practice guidance (CIEEM, 2018), legislation, statutory designations and / or professional judgement.

details the framework for determining the sensitivity of receptors.

Table 10.7: Framework for Determining Sensitivity of Receptors

Sensitivity of Receptor	Definition
Very High	• Species or habitats that form the cited interest of Special Conservation Areas (SACs) and other statutorily protected nature conservation areas. Cited means mentioned in the citation text for the site as a species or habitat for which the site is designated. • It is considered that this species or habitat has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance.
High	• Species or habitats that contribute to the integrity of a designated site, but which are not cited as species for which the site is designated. • It is considered that this species or habitat has low ability to absorb change without fundamentally altering its present character or population, is of high environmental value, or of national importance.
Medium	• A species or habitat that has moderate capacity to absorb change without significantly altering its present character or population, has some environmental value, or is of regional importance.
Low	• A species or habitat that is considered tolerant of change without detriment to its character or population, is low environmental value, or local importance.
Negligible	• A species or habitat that is considered resistant to change and is of little environmental value.

10.3.10 Magnitude of Effect

In terms of methods used to evaluate the magnitude of effects, an 'effect' is considered to be a change in the character or population of a given habitat or species present during (or beyond) the life of the Development. Where the effect on the character or population has varying degrees of likelihood, the probability of these differing outcomes needs to be considered. Effects can be adverse, neutral or favourable. The framework used for defining the magnitude of effect is shown in **Table 10.8.** The magnitude of change will be identified through consideration of the Development, the degree of change to baseline conditions predicted as a result of the Development, the duration and reversibility of an effect and professional judgement, best practice guidance and legislation.

Table 10.8: Framework for Determining Magnitude of Effects

Magnitude of Effects	**Definition**
High	A fundamental change to the baseline condition of the asset, leading to total loss or major alteration of character.
Medium	A material, partial loss or alteration of character.
Low	A slight, detectable, alteration of the baseline condition of the asset.
Negligible	A barely distinguishable change from baseline conditions.

10.3.11 Significance of Effect

Depending on the type of effect and the sensitivities of the important ecological feature, an effect on a receptor can be assessed as being 'significant'. Within the CIEEM guidelines *"A significant effect is simply an effect that is sufficiently important to require assessment and reporting so that the decision maker is adequately informed of the environmental consequences of permitting a project"*.

"In broad terms, significant effects encompass impacts on structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including their extent, abundance and distribution)."

For the purpose of EcIA [and this ES Chapter]*, a 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'Important Ecological Features', or for biodiversity in general"*. Where significant effects are identified, measures are then taken to avoid, minimise or compensate for any significant negative effects.

In line with CIEEM (2018)[63] guidance, where a feature of Local Importance (Higher) Value or greater is affected in any way by the development, taking the precautionary approach this is considered to be a potential 'significant' effect and requires further assessment, and potentially mitigation.

In the context of the EIA Regulations, 'significant effects' are considered to be those that are found to be of Local (Higher) importance or above, in the absence of mitigation. Therefore, anything assessed as being of Local Importance (Lower Value) has not been carried through into the ES, and is dealt with within the **EcIA, Technical Appendix A10.1.**

Post implementation of mitigation, significant effects are those which are considered to have a residual impact on an ecological receptor of Local (Higher) importance or greater. These are effects which either support or undermine biodiversity conservation objectives for 'Important Ecological Features' at a local (higher) or greater scale.

10.3.12 Assessment Limitations

Several minor assessment limitations have been detailed within the EcIA - **Technical Appendix A10.1**. However, all assessments were supported by survey data collected during the optimal seasons for relevant flora and fauna (on repeated surveys), it is therefore determined that the assessment does not have any significant limitations or information gaps.

63 CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.2. Chartered Institute of Ecology and Environmental Management, Winchester.

10.3.13 Embedded Mitigation

Habitats and 'active peat' were identified as Important Ecological Features at an early stage in the planning of the Development, with preliminary surveys drawing upon data for the previously consented Craignagapple Wind Farm to inform the design process.

The Development is the result of, and incorporates, significant embedded mitigation to inform the minimisation of potential effects during the design phase. This has included an initial design principle of maximising the extent of existing infrastructure to be re-used in the Development to minimise the extent of works impacting on important conservation habitats and prioritising the avoidance of areas of 'active peat'.

An appropriate buffer is required between turbines and features used by bats such as hedgerows, to minimise collision risk, based on the minimum requirements detailed in *Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation* (SNH 2021). This requires a minimum of 50m to be maintained between blade tip and the top of any foraging / commuting feature such as hedgerows or woodland edge. Required buffers, at a minimum, have therefore been calculated as a 72m offset of the turbine from hedgerows, and an 84m offset for treelines. These figures have been calculated on the basis of feature height, turbine height, blade length and consequent rotor-swept area, as described in the Natural England Technical Information Note TIN051 *Bats and Onshore Wind farms – Interim Guidance*[64]. In addition, NIEA recommends that buffers are based on a suitable assessment of bat use for each site to enable them to advise on site suitability and potential harm to bats (DAERA, 2017[65]). These requirements have been incorporated into embedded design where feasible during the iterative design process.

The following mitigation measures are embedded into the design and construction of the Development:

- The layout of the Development was altered to avoid effects upon a Leisler's bat tree roost (a turbine was dropped at this location during the detailed design in 2022;
- Turbine placement has resulted in offset buffer zones to potential bat foraging features as detailed above;
- Development has been designed avoiding impacts on all identified badger setts.
- 50 m watercourse buffers for construction works with the exception of watercourse crossings with the exception of a crane outpad and a section of access track, discussed in Section 8.5.1.1 of **Chapter 8: Hydrology and Hydrogeology**;
- Active peat has the potential to be impacted indirectly by the Development through changes in the water table caused by localised draw-down of water resulting from drainage or dewatering activities. To understand the potential extent of this, **Technical Appendix A8.3: Note on Indirect Effects of Dewatering** assesses the indirect effects of dewatering on groundwater and concludes that a buffer of 15 m should be used around turbine base excavations and a 5 m buffer should be used around access track infrastructure with drainage ditches. This buffer was implemented during the design phase to minimise the potential for indirect effects on active peat;
- Good practice methods and works for protection of hydrological receptors as outlined in **Technical Appendix A3.1: oDCEMP**; and
- The requirement for access tracks crossing watercourses has been minimised.

The oDCEMP comprises methods and works that are established and effective measures to which the Applicant will be committed through the development consent. Accordingly,

64 Natural England, 2009. Bats and Onshore Wind farms – Interim Guidance. Technical Information Note TIN051.

65 DAERA (2017) NED Standing Advice on Bats [Online] Available at: https://www.daera-ni.gov.uk/sites/default/files/publications/daera/DAERA%20Standing%20Advice%20-%20NED%20-%20%20Bats%20-%20November%202017.pdf (Accessed January 2023)

the assessment of significance of effects of the Development are considered with the inclusion of Technical Appendix A3.1 as standard mitigation procedure.

The oDCEMP describes water management measures to control surface water run-off and drain hardstandings and other structures during the construction and operation of the Development. This will form part of a Pollution Prevention Plan (PPP) to be implemented for the Development. Measures outlined in the oDCEMP are based on good construction practice. The DCEMP and PPP are to be agreed with relevant consultees prior to the construction phase.

This approach has withstood legal review on all hydrology EIA work undertaken by Arcus and has received positive comments from consultees for proposing appropriate embedded mitigation on a project specific basis.

The design of the Development has included the following with the intention of avoiding ecological sensitivities:

- Retention of all identified bat roost sites (including dropping of one turbine in the vicinity of T2 to avoid impacting upon a Leisler's bat tree roost);
- Maintaining preferential foraging corridors identified during the bat activity surveys where any potential for impacts were identified (e.g., avoiding removal of conifer plantations and mature vegetation, e.g. near T2,) wherever possible;
- Retain lines of mature vegetation, water features and areas of woodland as far as possible. This will be implemented, however as described above, it is recommended that a species-poor hedgerow which runs from a confirmed bat roost towards T13 be removed and replaced with new planting along the adjacent riparian buffer of the Legnahone Burn, using locally sourced, native species of woody shrubs and trees. This mitigation will remove the likelihood of impacts upon a small number of pipistrelle bats, and will provide an enhanced riparian wildlife corridor, creating additional dark areas for foraging bats;
- Ensure that lighting does not illuminate habitat features or any bat roosts in the area;
- Native species of trees and shrubs are to be planted within infrastructure screening, to provide foraging habitat and to help retain connections with the existing lines of trees and hedgerows in the surrounding area (See **Chapter 6: Landscape and Visual Impact Assessment** and **Chapter 16: Mitigation** of the ES).
- Grassland re-seeding will utilise locally sourced native seed.

10.4 BASELINE CONDITIONS

This section contains a summary of baseline conditions relevant to the impact assessment. A full description of baseline conditions following site surveys is provided in **Technical Appendix A10.1: EcIA**.

10.4.1 Existing and Future Ecohydrological Baseline at the site

Extensive surveys across the ESA have highlighted the degraded nature of peatland here. This is largely due to historic land management practices for peat cutting and land management. If no action is taken peatland degradation, and associated wider environmental impacts will continue.

These consist of the following (pers. comm. Dr Raymond Flynn, 2023):

1. Reduced water tables will lead to continued decomposition of peat, most notably above the water table, where presence of oxygen accelerates the decomposition rate.

This gives rise to increase emissions both in gaseous form (Evans *et al.* 2021[66]), and aquatic form. The latter is less well characterised, although Queens University Belfast are researching this further. Swenson *et al.* (2019[67]) examined this issue for raised bogs and noted that losses from aqueous pathways can be an important, and sometime dominant route for loss. The availability of data from blanket bogs is less common. The QUBBES report (Flynn *et al.* 2021[68]) illustrates some data which is consistent with Swenson's findings.

2. From an ecohydrological perspective, lowered water tables will prevent the re-establishment of peat accumulating plant communities, while the continued presence of drains will continue to affect the hydrology by keeping water tables low, leading to further loss of remaining active blanket bog, most notably in the vicinity of more recent drains (past 10-15 years), where the effects of consolidation may still prove significant (Best and Flynn, 2016[69]).

3. Reduced water levels will result in continued degraded peatland water quality, while restoration will result in improvements on the current baseline (Wilson *et al.* 2011[70]).

4. Increased flood risk/reduced baseflow. The sustained presence of drains will continue to remove water at a more rapid rate than would naturally occur. This affects the flow regime in receiving natural water bodies by increasing peat flows and reducing baseflow. The change in flow regime serves to make conditions more stressful for aquatic ecological receptors (Flynn *et al.,* 2022[71]). By contrast restoration measures serve to stabilise flow to conditions more closely resembling those encountered in areas not affected by artificial drainage.

5. Less variable water quality in aquatic receptors. Ongoing degradation of peatlands will result in less oligotrophic peatland water flowing to aquatic receptors during drier periods, leading to more mineralised water during low flow (as is apparent in the Iron-oxide rich stream within the eastern side of ESA, which is currently draining into the Legnahone Burn). By contrast flood waters will remain dominated by oligotrophic waters. Overall, this leads to greater variation in water quality than during natural conditions (again noted in Flynn *et al.,* 2022).

6. Consistent degradation of peatland can occur where drains have been infilled but not been blocked (Mackin *et al.,* 2017[72]), e.g., this has occurred at Clare Island Raised Bog SAC. Comparable responses would be anticipated on blanket bog (pers. comm. Dr Raymond Flynn, 2023).

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[66] Evans, C. D., Peacock, M., Baird, A. J., Artz, R. R. E., Burden, A., Callaghan, N., ... & Morrison, R. (2021). Overriding water table control on managed peatland greenhouse gas emissions. Nature, 593(7860), 548-552.
[67] Swenson, Michael M., Shane Regan, Dirk TH Bremmers, Jenna Lawless, Matthew Saunders, and Laurence W. Gill. "Carbon balance of a restored and cutover raised bog: implications for restoration and comparison to global trends." Biogeosciences 16, no. 3 (2019): 713-731.
[68] Flynn, Raymond, Francis Mackin, and Florence Renou-Wilson. Towards the quantification of blanket bog ecosystem services to water. No. 378. EPA Research Report, 2021.
[69] Best, A. Flynn, R. (2016) Modelling the Impact of Marginal Cutting on Raised Bog Topography and Conservation, Abstract A-092, 15th International Peat Congress, Pullman-Kuching Malaysia.
[70] Wilson, L., Wilson, J., Holden, J., Johnstone, I., Armstrong, A. and Morris, M., 2011. Ditch blocking, water chemistry and organic carbon flux: evidence that blanket bog restoration reduces erosion and fluvial carbon loss. Science of the total environment, 409(11), pp.2010-2018.
[71] Flynn, Raymond, Francis Mackin, Claire McVeigh, and Florence Renou-Wilson. "Impacts of a mature forestry plantation on blanket peatland runoff regime and water quality." Hydrological Processes 36, no. 2 (2022): e14494.
[72] Mackin, Francis, Raymond Flynn, Alan Barr, and Fernando Fernandez-Valverde. "Use of geographical information system-based hydrological modelling for development of a raised bog conservation and restoration programme." Ecological Engineering 106 (2017): 242-252.

10.4.2 Ecological Survey Area (ESA)

The ESA is located in the townlands of Craignagapple, Ballykeery, Knockinarvoe, Owenreagh, Ligfordrum and Lagavadder, Co. Tyrone, Northern Ireland. The ESA lies just over 5 km east of Strabane town, Co Tyrone. An existing regional road "Glenmornan Road" runs through the ESA with the wind turbines and associated infrastructure of the Operational Owenreagh I and II Wind Farms incorporated into the full ESA.

The ESA has a total area of approximately 596 ha and includes the Development and infrastructure, as described in **Chapter 3: Development Description**.

The approximate centre of the ESA can be found at Irish Grid Reference H 42907 96658 on Owenreagh Hill. Koram Road runs along the western boundary of the ESA, with Ballykeery Road the nearest road to the south, and Napple Road to the northeast.

The ESA lies within a rural area, approximately 5.7 km from the River Foyle, at an average altitude of 350 m above sea level. Owenreagh Hill is generally composed of cutover, drained and degraded upland blanket bog, acid grassland and more improved pasture with steep slopes and uneven terrain, underlain by a quartzite bedrock. The surrounding habitats include areas of coniferous plantation and farmland.

10.4.3 Designated Sites

The following two internationally designated sites were considered to have potential for hydrological connectivity and a source pathway receptor link vulnerable to effects upon water quality:

- River Foyle and Tributaries SAC; and,
- River Finn SAC;

Several nationally designated sites were considered to similarly have potential for hydrological connectivity and a source pathway receptor link vulnerable to effects upon water quality:

- Silverbrook Wood Area of Special Scientific Interest (ASSI);
- Lisnaragh Wood ASSI;
- Corbylin Wood ASSI; and,
- River Foyle ASSI.

Designated sites considered within the Zone Of Influence (ZOI) of the ESA are illustrated in **Technical Appendix 10.1 – Ecological Impact Assessment**, Figure A10.1.14 – Internationally Designated Sites and Figure A10.1.15 – Nationally Designated Sites.

10.4.4 Aquatic Ecology

The ESA lies within the Foyle hydrological catchment. The main watercourses within the ESA comprise small first order streams that form part of the Glenmornan and Burn Dennett Rivers, which flow into the Foyle estuary. As of 2018, the water quality status of these rivers was 'moderate' and 'good', respectively. Locally, there are also three first order streams situated to the south of the ESA on the opposite side of Owenreagh hill. These watercourses constitute part of the Douglas Burn River, which was also awarded 'good' water quality status in 2018. The Douglas Burn flows into the Mourne River, which eventually discharges into the River Finn at Lifford, Co. Donegal.

10.4.5 Habitats

The ESA is situated within moderate-steeply sloping landscape, rising to a maximum height of 400 m above sea level at the top of Owenreagh Hill. The ESA includes the operational Owenreagh I and II Wind Farms. The majority of the land at the ESA is mosaic in nature through historical land-use practices and comprises degraded, cutover

Upland Blanket Bog habitat with dry peat hags and species-poor flushing throughout, dominated by soft-rush (*Juncus effusus*). Several areas of improved pasture and coniferous plantation have similarly been included. The habitats that occur within the ESA have been illustrated in **Figure A10.1.2** and summarised in **Table 10.9** below.

Table 10.9 : Habitat types occurring within the ESA (JNCC, 2010)

Note: Those highlighted green are potentially affected 'Important Ecological Features' and will be considered within the assessment of potential effects going forward.

JNCC Habitat Code	JNCC Habitat Name	NVC Habitat Code	NVC title
E1.6.1	**Intact Blanket Bog**	**M19**	**M19 *Calluna vulgaris – Eriophorum vaginatum* blanket mire**
E1.6.1	**Recovering Blanket Bog**	**M19**	**M19 *Calluna vulgaris – Eriophorum vaginatum* blanket mire**
E1.8	**Dry Modified Bog**	**M19b / M20b ***	**M19b *Empetrum nigrum* ssp. *nigrum* sub-community (where *Calluna vulgaris* is the dominant species) / M20b *Eriophorum vaginatum* blanket mire, *Calluna vulgaris – Cladonia* spp. sub-community**
E1.7	**Wet Modified Bog**	**M20a**	**M20a *Eriophorum vaginatum* blanket and raised mire, species poor sub-community.**
E2.1	**Flush & Spring – species-poor acid/neutral flush**	**M6c**	**M6c *Carex echinata – Sphagnum recurvum/auriculatum* mire, *Juncus effusus* subcommunity**
B1.2 / E2.1 *	Acid Grassland / Flush	U2b / M6c *	Mosaic of M6c *Carex echinata – Sphagnum recurvum/auriculatum* mire, *Juncus effusus* subcommunity and U2b *Deschampsia flexuosa* grassland, *Vaccinium myrtillus* sub-community.
B4 / A2.2 *	Improved Grassland / Scrub	MG10	MG10 *Holcus lanatus – Juncus effusus* rush pasture grassland – now heavily grazed.
B4 / B2.2	Improved / poor semi-improved Grassland	MG10	MG10 *Holcus lanatus – Juncus effusus* rush pasture grassland – now heavily grazed.
J2.6 / E2.1 *	Dry Ditch / Flush & Spring - species-poor acid/neutral flush	-	-
A.1.2.2	Planted coniferous woodland	-	-
J2	Hedges	-	-
J3.6	Buildings	-	-

**** Denotes a mosaic habitat***

Initial surveys of the ESA indicated that the peatland habitat was in poor condition throughout with numerous drainage ditches and severely affected hydrology throughout much of the area (as supported by Section 10.4.1 in this Chapter, **ES Chapter 8: Hydrology and Hydrogeology** and **Chapter 9: Geology and Peat**), this is also discussed in further detail within **Technical Appendix A8.1: Hydrological Unit Assessment (HUA)** which informed APA. Further details of the habitat and active peat assessments are provided in **Technical Appendix A10.3: National Vegetation Classification** Survey and **Technical Appendix A10.4: Active Peat Assessment**.

Construction works on undeveloped land will inevitably result in habitat loss; however, the significance of ecological effects will vary in relation to the value of the habitats affected and whether or not they are Important Ecological Features. In this regard, the Development layout was designed in order to 'mitigate through design' by avoidance and minimisation any effects on habitats of ecological value, and in particular, areas of 'active peat' lie outside of the footprint of the works (however, there are indirect impacts likely to occur through dewatering given the nature of the site which are discussed further in the APA).

The required buffer between turbines and hedgerow features is 72m, while for treelines this figure is 84m. These figures have been calculated on the basis of feature height, turbine height, blade length and consequent rotor-swept area, as described in the Natural England Technical Information Note TIN051 Bats and Onshore Wind farms – Interim Guidance[41]. While any requirement for felling / removal has been minimised through design, where felling / removal is required, care will be taken to ensure any felling required is kept to the minimum required, and disturbance to adjacent retained habitats will be avoided.

10.4.6 Important Ecological Features (IEFs)

The footprint of Development due to turbines, turbine blades, nacelles, towers and/or ancillary windfarm infrastructure (e.g., tracks, substation, construction compounds) for the decommissioning and construction phase and operational phase, has the potential to lead to five types of effect on IEFs which have been listed below and further detailed in **Table 10.10** :

- Direct and indirect effects on active peat and Northern Ireland Priority Habitat during decommissioning and construction works;
- Direct and indirect effect on species-poor flush and spring habitat during decommissioning and construction works;
- Indirect effects on foraging / commuting bat species during the operational phase;
- Effects on water quality leading to potential indirect effects (via a source-pathway-receptor linkage) on European designated sites which may affect the aquatic fauna and qualifying interests (QIs) of these sites;
- and direct species mortality.

Table 10.10: Summary of IEFs with potential for significant effects

Important Ecological Feature	**Sensitivity of IEF**	**Summary of IEFs with potential for significant effects and justification**
Internationally or Nationally Designated Sites This is fully assessed within the Shadow HRA (Woodrow, 2023)	High	Best practice embedded construction measures outlined in **Technical Appendix A3.1: oDCEMP** will be in place to limit erosion and the release of sediment to surface watercourses and waterbodies and that this will provide sufficient embedded mitigation to prevent water quality deterioration and impact upon these designated sites. There is considered to be no potential for significant effects on these IEFs.
Watercourses and Associated Downstream Ecology	High	Best practice embedded construction measures outlined in **Technical Appendix A3.1: oDCEMP** will be in place to limit erosion and the release of sediment to surface watercourses and waterbodies and that this will provide sufficient embedded mitigation to prevent water quality deterioration and impact upon these designated sites. There is considered to be no potential for significant effects on these IEFs.
Terrestrial Habitats	High	**Peatland Habitats (Blanket Bog, Dry Modified Bog and Wet Modified Bog):** Potential direct effects (Habitat Loss): The Development is expected to result in the direct loss of *c.* 11.886 ha of peatland habitat, comprising 0.032 ha Blanket Bog, 0.101 ha Recovering Blanket Bog, 0.970 ha Wet Modified Bog (degraded) and 10.783 ha Dry Modified Bog. Potential indirect effects (Habitat degradation): The Development infrastructure and associated drainage ditches may disrupt local shallow groundwater levels and therefore may indirectly impact on groundwater flow/ supply to soils supporting Active Peat at the Development and risk their dewatering.
	Medium	***Acid Grassland and Species-Poor Flush and Spring:*** Potential direct effects (Habitat Loss): The Development is expected to result in the direct loss of 3.036ha of Species-Poor Flush and Spring. In addition, the loss of *c.* 5.304 ha of acid grassland has the potential to impact on NI Priority Bird Species.
	Low	***Hedgerows and Scrub:*** Potential direct effects (Habitat Loss): The Development is expected to result in the direct loss of 100m of species-poor hedgerow.

Non-Avian Fauna	Low / Medium	**Bats:** Potential direct effects: Potential direct mortality through barotrauma or contact with turbine blades during the operational phase, affecting soprano pipistrelle and common pipistrelle and Leisler's bat (Permanent impact on individual with temporary impact on the populations). Although bat roosts (pipistrelle species and Leisler's bat) were located within the ESA, only the pipistrelle roost is considered to be close enough to be potentially impacted during construction by disturbance. Potential indirect effects: Potential loss of foraging / commuting habitat for bat species during the initial decommissioning and construction phase.
	Low	**Reptiles:** Potential direct effects: Construction phase: potential direct mortality of common lizard is considered to be of Moderate Significance at the local scale.

10.5 ASSESSMENT OF POTENTIAL EFFECTS

Potential effects only on the IEFs are assessed, these have been summarised in a Table in Section 10.8. It is anticipated, particularly early on, that some level of residual impact cannot be avoided at the site, notably in the shorter term until habitat restoration is in place and functioning in ecological terms.

Direct and indirect effects are considered under the following headings:

- 'Do nothing' effects;
- Decommissioning and construction phase effects;
- Operational phase effects;
- Final decommissioning phase effects; and,
- Cumulative effects (in Section 10.7).

10.5.1 'Do nothing' effects

The ESA encompasses upland blanket bog and farmland habitat that is currently managed through grazing practices as well as the operational Owenreagh I and II Wind Farms and the associated site infrastructure. The area is considered likely to remain in agricultural use in the future with both cattle and sheep grazing carried out here.

In the 'Do-Nothing' scenario, the ESA would remain as an operational wind farm, as the consents for Owenreagh I and II Wind Farms do not have a limited operational period.

The habitats on site are notably degrading (see Draft HMEP for further information) due to existing land drainage, dewatering from significant historic peat cutting, grazing and poaching of ground from cattle, and occasional burning of heath in the area (although the latter is not permitted in the area, it is still occasionally occurring here). In the 'Do-Nothing' scenario, these adverse impacts are likely to continue at current levels. In addition, it is apparent that illegal shooting occasionally occurs at this site without the permission of the landowner – this is likely to continue to impact upon local wildlife through potential killing, injuring and disturbance of species such as mammals.

Intact blanket bog habitat (E1.6.1) is considered to be the most ecologically valuable habitat type within the ESA (along with rivers and streams which are an NI Priority Habitat type); however, the majority of the ESA has been subject to a range of historic management practices and land-use changes such as burning, drainage, turf cutting and/or grazing which has resulted in widespread habitat fragmentation and degradation. Fragments of relatively species-rich blanket bog habitat, considered to be of good ecological value remain and thus qualify as the Annex I habitat – "7130 Blanket bogs". These areas are likely to degrade further over time due to land management practices in addition to existing dewatering effects from land drainage already existing in the ESA.

During the surveys of the ESA which were conducted over several years, it was notable that significant surface water drainage and erosion is occurring in the ESA. This is strongly influenced by past land management practices (including historic peat cutting) which have resulted in undermined hydrological units across the entire ESA (further information is provided in **ES Chapter 8: Hydrology and Hydrogeology).** Features such as the Legnahone Burn notably had obvious iron rich pollutants which were particularly visible during low water conditions when they were allowed to accumulate. This can be typical within a peatland environment where naturally occurring, organic acids contribute significantly to water acidity in peatland catchments. However, this can be exacerbated by drainage which causes drying of the soil and which can increase oxidation of organic matter and generate carboxylate anions. In addition, peatland drainage can result in preferential flows being further enhanced, leading to faster transport of pollutants to streams. Degraded peatlands negatively impact water quality, and release nitrous oxide and CO_2 to the atmosphere, sediment and nutrients to water courses, and lead to a reduction in biodiversity (Pschenyckyj *et al.* 2021[73]).

It is noted in recent research in this area (such as Pschenyckyj *et al.* 2021) that *"Studies show concentrations of nitrogen, phosphorus, base cations, heavy metals, dissolved organic carbon (DOC) and particulate organic carbon (POC) are increased with drainage, although this depends on site-specific characteristics and management. However, rewetting results in long term decreases of inorganic nitrogen, base cations, suspended solids and DOC, as well as increasing biodiversity and the carbon sequestration potential. In addition, degraded peatlands may have significantly higher nitrous oxide emissions (a greenhouse gas), whilst rewetted organic soils have decreased emissions."*

In the 'Do-Nothing' scenario the existing peatlands within the ESA will continue to dry out over time due to land management practices and significant cut drains existing within the ESA, resulting in further shrinkage and continued degrading of peatland habitat at this site. Subsidence of peat and cracking increases the slope of the bog surface, and this increases the discharge of water. Dewatering eventually destroys the acrotelm, the upper layer of the blanket bog which contains the *Sphagnum* moss assemblage (and constitutes the peat forming community). Consequently, the bog loses its peat forming capacity over time. With continued loss of water, the vegetation changes from a *Sphagnum* dominated community to a vegetation type dominated by dryer bog species such as heather species. This can be seen to be occurring across much of the ESA within areas of 'Dry Modified Bog (E1.8)', where tall leggy heathers are present on dryer hags of peat, with little or no *Sphagnum* moss and regular signs of 'bleaching' and drying out within remnant moss hummocks.

Over time, continued surface water runoff within the ESA will lead to an exacerbation of peatland habitats drying out here, and causing further erosion to occur, with visible sediments and residues entering local watercourses.

10.5.2 Initial Decommissioning and Construction Phase

The initial decommissioning and construction phase will involve some disturbance to existing vegetation, largely in the form of clearing areas of dry modified bog, acid grassland mosaic and semi-improved grassland to facilitate the construction of access tracks, turbine bases and hardstand areas.

Potential sources of ecological effects during the decommissioning and construction phase encompass both direct effects and indirect effects, which are summarised as follows:

- Direct:
    - Clearance of vegetation, soil and rock including peatland habitat for access road, hardstand and turbine bases and the removal of a mature hawthorn hedgerow (notably within the vicinity of T13) where necessary.
    - Creation of temporary infrastructure such as construction compounds.
    - Placement of material arising from infrastructure works.
    - Access by construction equipment, including access away from the proposed infrastructure location (compaction and other damage).
- Indirect:
    - Stockpiling of materials on-site (run-off, erosion etc.).
    - Collection / drainage of surface water runoff.
    - Construction noise, vibration and increased visibility of construction activity which may result in disturbance to and/or avoidance by mammals within the ESA.

73 Pschenyckyj, Catharine & Riondato, Emily & Wilson, David & Flood, Kate & O'Driscoll, Connie & Renou-Wilson, Florence. (2021). Synthesis Report: Optimising Water Quality Returns from Peatland Management while Delivering Co-Benefits for Climate and Biodiversity. 10.13140/RG.2.2.13102.02881.

During the construction phase (and operation) illegal practices such as shooting and burning will cease at this site. This will be of benefit to the local ecology.

10.5.2.1 Direct Impacts

Impacts on Habitats

Due to the strongly mosaic nature of the habitats within the ESA and the degradation of peatland habitats here, it was not possible to definitively calculate habitat areas per habitat classification. Instead, these areas are classified by their primary habitat mosaics as per upland survey guidance. Estimates of the affected primary habitat mosaics (area in hectares) are provided below. This method has taken a precautionary approach, and due to its complexity, the 'peatland habitat loss' within the survey area should be considered a worst-case scenario (illustrated on Figures A10.1.17 and A10.1.18 within **Technical Appendix 10.1 – Ecological Impact Assessment**).

Full details on the potential impacts upon hydrology and soils are provided within **Chapter 8: Hydrology and Hydrogeology** and **Chapter 9: Geology and Peat** respectively.

The habitat loss assessment has been considered in terms of the potential for both direct and indirect effects as a result of the Development. It should be noted that the estimated total loss of individual habitats could potentially include some overlap given that these habitats occur within complex mosaics. Subsequently, best estimates of habitat area loss are provided within this assessment, taking the precautionary approach.

Across much of the operational Owenreagh I and II Wind Farm sites, acid grassland has formed on spoil heaps either side of the existing hardstanding and access tracks. Some of the habitat mosaics include areas of naturally occurring, non-Annex acid grassland and poor flush, however the majority of the ESA supports a highly modified 'inactive' derivative of Blanket Bog that has been classified as 'Dry Modified Bog' and is not considered to be of Annex I quality. There are areas where erosion is evident due to run-off and exposure. Some of this is likely to be naturally occurring, and some is more likely to be associated with existing land management practices (drainage, peat cutting, burning, and grazing) and potentially the aftereffects of the existing infrastructure being constructed within the ESA. It is difficult to be certain of the cause and effect of these impacts given the time period since the existing wind farm was first constructed and the significant land management and habitat degradation which has occurred in the area over the years.

Table 10.11 outlines the habitat features associated with the infrastructure and includes an estimate area measurement of habitat types directly and indirectly impacted on by the footprint of the works.

The term 'Footprint' is inclusive of:

- Construction Compounds;
- Site Access Tracks;
- Crane Hardstandings; and
- Substation.

Details in relation to infrastructure micrositing post-consent are detailed within **Chapter 3 - Development Description** of the ES. The surveys and assessment within the EcIA have taken into account the potential requirements for micrositing of infrastructure, with avoidance of active peat being a fundamental part of this work now, and during construction of the development.

Table 10.11 Habitat features estimated potential impact area calculation (ha/m) *(Habitats that are identified as being Important Ecological Feature for the purposes of this impact assessment are highlighted in green)*

JNCC Habitat Description	NVC	Important Ecological Feature	Total area directly affected (ha)	Total potential area indirectly affected (ha)	Total max potential area affected (ha)	Total area of habitat within the ESA (ha)
Intact Blanket Bog (E1.6.1)	M19	Y	0.032	0.022	0.054	22.467
Recovering Blanket Bog (E1.6.1)-Modified in past	M19	Y	0.101	0.072	0.173	188.119
Dry Modified Bog (E1.8)	M19b/M20b	Y	10.783	3.908	14.691	208.479
Wet Modified Bog (E1.7) - very degraded	M20a	Y	0.970	0.580	1.478	
Acid Grassland / Flush (B1.2 / E2.1)	U2b/M6c	N	5.304	1.952	7.256	19.356
Species-Poor Flush and Spring (E2.1)	M6c	Y	3.063	1.041	4.104	88.445
Improved Grassland / Poor Semi-Improved Grassland Mosaic (B4 / B2.2)	MG10	N	1.457	0.457	1.914	34.398
Hedgerows and Scrub (J2.2 / A2.2)		Y	100 m		100 m	24.763
Dry Ditch / Poor Flush (J2.6 / E2.1)	-	N	0.211	100 m	0.265	5.702
Coniferous Plantation (A1.2.2)	-	N	-	0.054	-	4.580

Peatland Habitats (Blanket Bog, Dry Modified Bog and Wet Modified Bog)

The National Vegetation Classification (NVC) study that was carried out on peatland habitats within the ESA has been provided in **Technical Appendix A10.3 - National Vegetation Classification.**
Although avoidance of peat has been a key consideration during the design process of the Development **(see Technical Appendix A10.4: Active Peat Assessment)**, it is acknowledged that due to the upland nature of the ESA, the construction phase of the Development is expected to result in the **direct loss** of *c.* 11.886 ha of peatland habitat. The majority of this peatland habitat is currently considered to be in a degraded and heavily modified state owing to practices of historic land use change including agricultural improvement, burning, turf cutting, drainage, and/or grazing (**See Section 10.4** for further details).

As illustrated in **Table 10.11**, a large proportion of the peatland habitat that will be directly impacted by the Development during construction has been classified as Dry

Modified Bog (E1.8) 10.783 ha and Wet Modified Bog (E1.7) 0.970 ha, respectively. These habitats are derived from blanket bog but are now considered to be in a state of such modification that they no longer retain the potential for 'Active Peat Formation'. For the purposes of this Assessment 'Active Peat' is a term used for blanket bog or heath which is considered to be capable of currently actively forming peat. It generally equates to blanket bog, which is in favourable condition, as per the Priority Habitat Guide – Blanket Bog (DAERA, 2020).

Areas of Intact Blanket Bog (E1.6.1) or Recovering Blanket Bog, have been identified as Important Ecological Features for the purpose of this assessment. These habitats are NI priority habitats and support a wide variety of flowering plant species. They are also likely to support a good diversity of invertebrates as well as providing a foraging, nesting and sheltering habitat for a range birds, amphibians, reptiles and mammals, a number of which are NI Priority Species. Consequently, these habitat types represent features of ***National*** and ***Regional level importance*** (respectively) at the ESA.

Careful consideration during the design phase of the Wind farm, has minimised the loss of any peatland habitat that may contain pockets of 'Active Peat' including loss within any blanket bog habitat that has been classified as 'Intact' or with 'Potential for Recovery' through natural regeneration. This consideration has minimised the direct loss of these peatland habitats to a total area *c.* 0.133 ha underneath the construction footprint including earthworks. Full details can be seen in **Technical Appendix A10.4: APA**. The design has avoided direct impacts on Active Peat (as detailed within **Technical Appendix A10.4: APA**).

Despite the highly modified and typically species-poor characteristics of the vast majority of peatland habitat within the ESA, they are still considered to be of high ecological value and likely support a high number of associated peatland flora and fauna of local value. These habitats are Northern Ireland priority habitats and continue to support NI Priority Species (as outlined in **Section 4.3**).

The heather-dominated peatland areas (Dry Modified Bog (E1.8) – 11.16 ha and Wet Modified Bog (E1.7)) continue to provide foraging habitat for Irish hare, badger and birds, and nesting habitat for ground-nesting birds such as meadow pipit, red grouse and skylark (however they will also continue to degrade under the 'do nothing' option). Therefore, these habitat types have been identified as Important Ecological Features of ***Local (Higher) importance*** for the purposes of this assessment.

From the outset, the Development design has aimed to avoid areas of peat as far as possible, and particularly habitat considered to be 'Active Peat'. Consequently, the total area of peatland habitat likely to be affected within the ESA is *c.* 11.886 ha within a proposed Development footprint of 22.334 ha.

When compared with the existing baseline this loss is considered to be significant and at a minimum is considered to be an impact of ***Medium*** magnitude on a feature that is of ***Medium*** importance (given that direct impacts to high or moderate 'Active Peat' constraint has been avoided through the design).

Although under the 'do-nothing' scenario, the existing peatlands within the ESA will continue to dry out over time, resulting in further shrinkage and continued degrading of peatland habitat at this site, the proposal will result in an enhanced level of impact in the absence of mitigation as a result of localised loss and indirect impact as a result of further drying out.

To this end, it is considered that without mitigation there is the potential for ***Significant Impacts*** upon peatland at the Development, and their associated local ecology (Important Ecological Features of ***Local (Higher) importance)***.

Impacts upon peatland are referred to in detail within **Technical Appendix A10.4: Active Peat Assessment.**

As outlined in **Section 10.2,** due cognisance has been given to Planning Policy Statement 2, under which Policy NH5 states 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"*.

Acid Grassland and Species-poor Flush and Spring (B1.2 / E2.1)

Several proposed turbines are located within areas of acid grassland / species-poor flush mosaic; T5, T8, T4 and T1 are the main examples. As such, the proposed works will result in the direct loss of *c.* 8.367 ha of these habitats during construction. These habitats are dominated by rushes, mainly soft-rush (*Juncus effusus*) with typically abundant Heath bedstraw (*Galium saxatile*), some wavy-haired grass (*Deschampsia flexuosa*) and a reduced bryophyte layer dominated by species such as little shaggy-moss (*Rhytidiadelphus loreus*), glittering wood-moss (*Hylocomiun splendens*) and some flat-topped bog-moss (*Sphagnum fallax*). Botanically, these are considered relatively species-poor habitats and do not fall into any Annex I habitat classification. It was evident that several of these areas are periodically grazed by cattle or sheep resulting in some poaching of the ground.

While these habitats may be botanically poor, it is likely that they are also used by feeding snipe in winter, as this species was recorded on several occasions in the ESA during winter surveys. Similarly, these grassland habitats provide foraging habitat for wildlife such as Irish hare, badger and countryside birds, as well as a potential nesting habitat for ground-nesting birds such as meadow pipit and skylark (see ES **Chapter 11: Ornithology** for further information). For these reasons this habitat is considered to be of ***Local (Higher)*** **importance**.

When compared to the existing baseline, the impacts of the proposed Development are considered to be a ***Medium*** impact on a feature of ***Low*** sensitivity.

Under a 'do-nothing' scenario, these grasslands are likely to remain in their current condition. Considering this and their likely value for associated mammal and bird species, it is considered that, in the absence of mitigation, the loss of this habitat could result in ***Significant Impacts*** upon the local ecology (Important Ecological Features of ***Local (Higher) importance).***

Boundary Features (Hedgerows with Trees and Scrub)

The construction phase of the Development is expected to result in the loss of a minimal section of boundary features. The extent of the boundary habitats within the ESA are limited to the vicinity of proposed T13 in the vicinity of a derelict farmstead. However, occasional isolated scrubby outcrops (A2.2) of willow (*Salix* spp.) or gorse (*Ulex europaeus*) were similarly noted along some fence lines and boundaries within the ESA. The total area of scrub and hedgerow (with trees) habitat identified within the ESA, amounts to *c.* 5.702 ha. The hedgerows within the vicinity of T13 are typically species poor hawthorn (*Crataegus monogyna*) hedgerow (J2.2) on low earth banks, containing varying quantities of mature and semi-mature trees, including horse chestnut (*Aesculus hippocastanum*), beech (*Fagus sylvatica*) holly (*Ilex aquifolium*) and sycamore (*Acer pseudoplatanus*).

Hedgerows and treelines support a wide range of invertebrate, bird and small mammal species, as well as providing foraging habitat for birds, bats and larger mammals. They also function as wildlife corridors, providing a continuum of habitat along which fauna may travel between different foraging and sheltering areas. These habitats support a good diversity of invertebrates, as well as providing a food source and shelter for small mammals and seed and berry eating birds such as finches. As such, they are considered to represent features of ***Local importance (Higher Value)*** in the ESA. Consequently, they are likely to be of local conservation value, albeit at this site, they are notably limited in their value by the exposed nature of the landscape and heavy management and grazing within the ESA[74]. Hedgerows are also listed as a Priority Habitat in Northern Ireland[75]. The Development is likely to result in the loss of *c.* 100m of species-poor hawthorn hedgerow (J2.2) habitat in the vicinity of T13.

The potential for significant effects on ecological receptors from works required along the Haul Route have been scoped out of the EIA, as documented in ES **Technical Appendix A2.3: Abnormal Load Route Works (ALRW)**, and hence are not included in this Chapter. However, any ecological survey and assessment aspects relevant to those works are included in **Technical Appendix A10.1: Ecological Impact Assessment (EcIA)** (See **Appendix IV – Haul Route Assessment**).

When compared to the existing baseline, the impacts of the proposed Development are considered to be a ***Low*** impact on a feature of ***Low*** sensitivity.

The area of linear features and scrub to be removed within the ESA has been kept to a minimum. These habitats enrich the biodiversity and provide valuable feeding, breeding and commuting habitat for local species in an area that is otherwise largely exposed and agricultural in character. Overall, it is considered that, without mitigation, the Development has the potential to result in in ***Significant Impacts*** upon the habitat (Important Ecological Feature of ***Local (Higher) importance***).

Reptiles

Survey results for reptiles at the Development site have confirmed the presence of a likely small population of common lizard within the area.
Potential direct impacts on common lizard are generally limited to direct mortality during vegetation clearance and excavation works on grassland and heath / bog habitats during the Initial Decommissioning and Construction Phase. A total of 3 no. common lizards were recorded at three locations within the ESA from 2019 – 2022 (1 reptile recorded per year over each survey period). Subsequently, the population of this protected species is considered likely to be of ***Local (Higher) Importance,*** with a moderate sensitivity to environmental change. The nature of the ESA means that they have the potential to occur immediately adjacent to the existing infrastructure.
Potential impacts on common lizards can vary depending on the time of year, with destruction of hibernacula (locations being used for winter hibernation) being a particular concern. Hibernacula need to be frost-free, humid and safe from predators and flooding (ARGUK, 2018). Such areas can include bunds and rocky areas, notably when these occur within slightly drier parts of the bog and it is likely that the existing infrastructure already provides suitable hibernacula areas for the species, suggesting that re-excavation of these areas may impact on the species in the absence of mitigation.

When compared to the existing baseline, the impacts of the proposed Development are considered to be a ***Low*** impact on a feature of ***Low*** sensitivity.

Subsequently, there is a risk of common lizard mortality during the Initial Decommissioning and Construction Phase. It is considered that in the absence of mitigation the vegetation removal could impact upon the reptile population within the

74 Ideally to enhance biodiversity hedgerows should be maintained to at least 2m wide, trimmed only every three years on one side (which is alternated during each trim), allowing a thick base and maintaining occasional mature trees.
75 NI Priority Habitats [Online] Available at: https://www.daera-ni.gov.uk/sites/default/files/publications/doe/ni_priority_habitats_april__10.pdf

ESA. Overall, it is considered that, without mitigation, the Development has the potential to result in impactsupon the species (Important Ecological Feature of ***Local (Higher) importance***).

10.5.2.2 Indirect Impacts

Impacts on Habitats

Peatland Habitats (Blanket Bog, Dry Modified Bog and Wet Modified Bog)

The wind farm infrastructure and associated drainage ditches may disrupt local shallow groundwater levels and therefore may indirectly impact on groundwater flow/ supply to soils supporting Active Peat at the Development and risk their dewatering. This impact was calculated using the most appropriate analytical solutions for the site conditions, see **Technical Appendix A8.3: Note on Indirect Effects on Dewatering**.
Table 10.8 outlines that *c.* 5.23 ha of peatland has the potential to be indirectly affected by dewatering. This is particularly relevant within Intact Blanket Bog (E1.6.1); Recovering Blanket Bog (E1.6.1)- Modified in past; and Wet Modified Bog (E1.7) - very degraded, and the effects are anticipated to be less within Dry Modified Bog (E1.8) which constitutes the greatest majority of peatland habitat indirectly effected within the ESA (*c.* 3.908 ha).

When compared to the existing baseline, the impacts of the proposed Development are considered to be a ***Medium*** impact on a feature of ***Medium*** sensitivity.
Under the 'do-nothing' scenario, the existing peatlands within the ESA will continue to dry out over time, the Development will be likely to result in further impact in this respect in the absence of mitigation.

It is therefore concluded that the potential effect of dewatering here within wetter peatland habitats (*c.* 1.322 ha) is considered to be ***significant***. Overall, it is considered that, without mitigation, the Development has the potential to result in in ***Significant Impacts*** upon the habitat (Important Ecological Feature of ***Local (Higher) importance***).

Impacts on Species

Bats

A Leisler's bat tree roost is located >300m from the nearest turbine (during the design phase, the proposed turbine near this roost was dropped to avoid impacts), and a common / soprano pipistrelle roost is c. 135m south of the proposed T13, directly connected by a hedgerow. The Leisler's bat roost is considered to be of ***Regional Importance*** while the common / soprano pipistrelle roost is considered to be of ***Local Importance (Higher Value)*** as per Wray *et al* 2010[76].

The targeted static detectors deployed at the latter roost identified the watercourse to the east as being the most frequently used route during the survey period, low levels of bats were recorded commuting along the hedgerow to the north, and towards the proposed T13 turbine location. Therefore, there is the potential for impacts on this roost resulting from bats being directed from the roost towards the turbine and facilitating a possible collision via this connectivity. In the absence of mitigation there is the potential for ***Negative Significant Impacts*** on this roost for the duration of the operation of the T13 turbine during the active bat seasons (generally late March until late October). This impact would be ***Reversible*** upon decommissioning of the turbine.

76 Wray, S., Wells, D., Long, E., and Mitchell-Jones, T (2010): Valuing Bats in Ecological Impact Assessment. In: In Practice No 70, December 2010. pp 23-25. Available online: https://cieem.net/wp-content/uploads/2019/01/InPractice70.pdf

When compared to the existing baseline, the impacts of the proposed Development are considered to be a ***Low*** impact on features of ***Low*** to ***Medium*** sensitivity.

Overall, it is considered that, without mitigation, the Development has the potential to result in in ***Significant Impacts*** on bat roosts (Important Ecological Feature of ***Local (Higher) importance***).

10.5.3 Operational Phase

Operational phase ecological effects of wind farms on non-avian ecology are largely limited to those on aquatic ecology and bat species. There is minimal potential for negative effects on other faunal species or habitats following the completion of the construction phase.

Modern wind turbines have a high level of inbuilt safety provision and are regularly serviced and maintained. As a result, it is unlikely that the Development could cause significant negative effects on ecology as a result of abnormal activities, such as a fire or chemical spillages. The Development design also incorporates embedded mitigation measures to prevent any significant impact caused to both terrestrial and aquatic ecology within the ESA (see Section 10.3.14). Therefore, the ecological effects as a result of abnormal activities during the Development's operation are assessed as being negligible to low.

Potential sources of direct effects during the operational phase include:

- Bat collisions with turbines; and,
- Land management impacts in the absence of mitigation (such as land drainage).

In the absence of mitigation, potential sources of indirect effects during the operational phase are limited to effects on nearby watercourses if site drainage and ameliorative measures in-built within the design are not monitored and maintained accordingly.

10.5.3.1 Direct Impacts

Impacts on Species

Bats

The potential impacts on the bat population at Craignagapple during the Operational phase of the wind farm needs to be considered for each individual species. Different bat species have different foraging behaviours and ecological requirements, infrastructure such as wind turbines may affect the species of bat which are found in the ESA in different ways. Each bat species recorded at the Proposed Development Site for which a potential significant effect has been identified is considered in the following sections (comprising common and soprano pipistrelle and Leisler's bat). It is important to note that the probability of impact is lower for those turbines located away from habitat features such as linear vegetation, watercourses, trees and scrub. Within more open habitat types (i.e., bog / grassland), the probability of significant impacts occurring to bat species is generally considered to be low and this is backed up by the results of the bat surveys carried out at the Development, including the carcass searches conducted across 2020 and 2021, during which no dead bats were identified at the ESA at turbines searched under the protocol agreed with NIEA. However, where turbines are located within closer proximity to foraging features such as hedgerows, treelines and watercourses, notably for T2, T8 and T13, there is more potential for a greater occurrence of bats within the rotor-swept area, resulting in increased potential for impacts to occur.

Common and Soprano Pipistrelle

Both common pipistrelle (*Pipistrellus pipistrellus*) and soprano pipistrelle (*Pipistrellus pygmaeus*) are considered to be of high risk of injury or mortality from turbines (NatureScot, 2021), resulting from either barotrauma (injuries to internal air cavities and blood vessels caused by sudden change in air pressure behind a moving blade) or collision, based on the behaviour and foraging techniques of this species. They typically show an affinity to habitat features that provide shelter, such as scrub, treelines and hedgerow habitat, as reflected in the static deployment results. Both common pipistrelle and soprano pipistrelle are widespread and common in Ireland, while common pipistrelle was the most commonly recorded species throughout the entire 2021 survey period.

Levels of activity were determined as High, Medium or Low, in line with Kepel *et al* 2011[77], and Ecobat percentile scores as per NatureScot 2021[78] (and detailed in **Tables A10.1.16** and **A10.1.17** of **Technical Appendix A10.1: EcIA**). High levels of common pipistrelle activity were recorded at D.01 in spring and D.01 and D.07 in summer, while high levels of soprano pipistrelle activity were recorded at D.01 and D.07 in summer only. D.01 was located in a forestry edge setting, likely to have resulted in the higher activity levels recorded. These two detectors, D.01 and D.07 (on the western side of the ESA) were located approximately 402m and 359m from T2, respectively. During the design process, a planned closer to these static detector locations (and a Leisler's bat tree roost in the vicinity) was dropped in order to avoid direct impacts on foraging bats. The locations of these static detectors in relation to proposed infrastructure is shown in Figure A10.1.21 of **Technical Appendix A10.1: EcIA.**

The foraging population of these species is considered to be of ***Local importance (Higher Value)*** as per Wray *et al* 2010. When compared to the existing baseline, the impacts of the proposed Development are considered to be a ***Low*** impact on a feature of ***Low*** sensitivity.

Overall, given the results of the bat surveys, the overall low numbers found to be using the site and due to the removal of Owenreagh I and II turbines, it is considered that there will be almost net zero change in the potential for impacts upon bats at this site. However, the potential for a significant impact on foraging / commuting pipistrelle species was identified at T13 due to its proximity to a mature (albeit defunct) hawthorn hedgerow along which these species were recorded in small numbers. As these bats are roosting (albeit in low numbers) in a derelict property nearby – the potential for the operation of T13 in the absence of mitigation could result in a ***Significant*** impact on a ***Local (Higher value)*** population of pipistrelle bats.

Leisler's Bat

Leisler's bats are considered as being at high risk of impact from wind turbines (SNH, 2021), based on species behaviour and foraging techniques, in terms of both the likelihood of barotrauma or collision. Leisler's bat is listed as Near Threatened on the Irish Red List of Terrestrial Mammals (Marnell *et al*. 2019).

Leisler's bat activity levels were low across the ESA in spring, with a marked increase during the summer recording period, declining slightly in autumn. This species was the second most commonly recorded after common pipistrelle, and in general, was more likely to be recorded flying over open habitat than common pipistrelle. Similarly, to common and soprano pipistrelle, 'High' levels of Leisler's bat activity was recorded at D.01 in summer, associated with the larger plantation woodland to the southwest of the ESA.

77 Kepel A, Ciechanowski M, Jaros R. (2011) Guidelines on the assessments of the impacts of wind power plants on bats - project (in Polish) Warszawa: General Directorate for Environmental Protection

78 NatureScot (2021) Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation

High activity levels were also recorded at D.08 in autumn, which, while being in open habitat, may be related to the watercourse *c.* 177m north of this detector. While a higher total number of Leisler's bat passes were recorded in summer, these were attributed mostly to one detector (D.07 in Figure A10.1.21 of **Technical Appendix 10.1 – EcIA**), however, in autumn, Leisler's bat passes increased across the ESA in both open habitat and along features. It is likely that such a pattern is consistent with intensive foraging by bats that then move to a different area, and also coincides with increased juveniles having left the roost. The foraging population of these species is considered to be of ***Local importance (Higher Value)*** as per Wray *et al* 2010.

The weather data for the autumn surveys suggests that overall, there was little to no rain and higher temperatures than would usually be expected in this season, with the exception of the night of 5th September 2021. This indicates that low wind speeds, higher night temperatures and a general lack of rain during the times of year when Leisler's bats are ranging more widely are likely to be the conditions that could result in a greater risk to Leisler's bats. However, during lower wind speeds, the turbines are likely to be rotating more slowly, or shutdown during such periods. Consequently, collision risk for Leisler's bat has been considered taking a precautionary approach given their higher risk of impact when compared to other bat species.

When compared to the existing baseline, the impacts of the proposed Development are considered to be a ***Negligible*** impact on a feature of ***Low*** to ***Medium*** sensitivity.

The turbine swept area is within a similar range to the average flying height of Leisler's bat (*c.* 30m – 100m). The potential impact risk level is likely to vary depending on weather conditions and whether or not juvenile bats are in flight.
As such, in the absence of mitigation, the potential impacts of the Operational phase upon Leisler's bat are considered to be ***Long-term negative*** impacts that are **Reversible** upon decommissioning of the turbines. However, it is worth noting that, given the results of the bat surveys, the overall low numbers found to be using the site and due to the removal of Owenreagh I and II turbines, it is considered that there would be a negligible change in the potential for impacts upon Leisler's bats at this site when considered in relation to the existing scenario here.

10.5.3.2 Indirect Impacts

There is considered to be no potential for Significant Indirect Impacts during the Operational Stage above the existing baseline. It is considered that the operation of the proposed Development could enhance the biodiversity of the existing baseline through detailed habitat management and enhancement measures, which are discussed in **Section 10.6.**

10.6 MITIGATION AND RESIDUAL EFFECTS

Planning Policy Statement 2: Natural Heritage, Policy NH 5 (Habitats, Species or Features of Natural Heritage Importance) states that:

"*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 stream 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."

In addition, it is noted that within Planning Policy Statement No.18, Renewable Energy, Policy RE1: Renewable Energy Development [excerpt] 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. This matter will need to be agreed before planning permission is granted. 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…*"

As discussed within Section 10.5 here (and within Section 6 of the associated EcIA (**Technical Appendix A10.1**), it is considered that, in the absence of mitigation, there is some potential for the current proposal to have both direct and indirect effects on protected habitats, species and features within the ESA and its environs.

10.6.1 General Mitigation Measures

10.6.1.1 Mitigation for Potential effects upon Peatland Habitats (Blanket Bog, Dry Modified Bog and Wet Modified Bog)

A peatland restoration plan has been proposed, which seeks to augment the peatland habitats within the ESA and in the environs of the Development during both the initial decommissioning and construction phase and the operational phase. It is considered that the site restoration and enhancement measures will serve to minimise effects arising from habitat loss consequent to construction of site infrastructure and associated access routes. The draft Habitat Management and Enhancement Plan (HMEP) is provided in **Technical Appendix A3.2**.

A summary of the mitigation and any predicted residual effects has been outlined in Section 10.8, **Table 10.12** below.

The HMEP aims to ensure that there is no net adverse impact on the Important Ecological Features (IEFs) identified in the ES, arising from the Development, and to ensure that recommended mitigation measures are implemented, and enhancement measures undertaken where feasible and appropriate, so as to provide an overall net biodiversity gain. IEFs identified at the site include habitat features such as blanket bog and upland flush, and protected species including snipe, red grouse, bats, badger and reptiles.

The HMEP sets out proposed management measures which aim to reduce or off-set adverse effects (predicted by worst-case assessment methods) and to enhance key ecological features of the site.

Individual habitats and species requiring particular management measures to ensure that mitigation is delivered effectively have been included within the HMEP, which sets out detailed strategies for the protection and/or enhancement of each feature. These include:

- Blanket Bog E1.6.1 – in particular, Active [peat-forming] Blanket Bog;
- Dry modified Bog E1.8;
- Wet modified bog E1.7;

- Acid grassland B2.1 / species-poor flush and spring E2.1;
- Defunct hedgerow – species-poor J2.2.2;
- Red grouse; and
- Breeding waders, in particular snipe.

Within the HMEP, specialist management plans have been provided with regard to peatland restoration, and habitat management for red grouse and breeding waders (Appendix I – III of the HMEP). With regard to peatland restoration, specialist input was provided by Dr Raymond Flynn of Queen's University Belfast, an Environmental Hydrologist and Ecohydrologist and leading authority on the hydrology and restoration of Irish peatlands, and who has undertaken extensive research in this field.

Although the HMEP focuses primarily upon the identified IEFs, the measures proposed to be implemented will have overarching benefits for a wide range of local flora and fauna, including invertebrates, amphibians and mammals.

Following a pre-construction walkover between the Site Engineer and the ECoW, the use of floating tracks will be considered by the Appointed Contractor where the ECoW identifies that significant de-watering is likely to occur within areas of peatland >1m deep (drying out of the substrate could result in modification of the peat and encourage acid grassland growth if not appropriately mitigated for).

Tracks and hard stands will be comprised of materials that are in-keeping with the surrounding environment i.e., acid rock rather than alkaline. This is to avoid unintended alterations to the pH of the substrates at the site which could encourage an atypical floral assemblage to grow (e.g., if limestone gravel is used for tracks this can encourage calcareous grassland / flush habitats which would not be typical of this upland site).

*10.6.1.2 Mitigation for Potential effects upon Acid Grassland and Species-***Poor** *Flush and Spring Habitats*

Proposed mitigation in respect of avoiding direct impacts on Species-Poor Flush and Spring is detailed within the outline **Technical Appendix A3.1: oCEMP**. This includes a requirement for flushes to be identified prior to access track and earthwork construction and ensuring site drainage design maintains hydrological integrity.

Technical Appendix A3.2: Draft HMEP includes a snipe Habitat Management Plan for the management of *c.* 60 ha of acid grassland / species-poor flush and spring dominated habitat for breeding waders including the creation of wader scrapes within two identified territories, with a focus on habitat enhancement for snipe and curlew. While the impacts on birds are dealt with specifically in **Chapter 11 – Ornithology**, these features will be of benefit to a variety of invertebrates, amphibians and plant life.

10.6.1.3 Mitigation for Potential effects upon Hedgerow and Scrub Habitats

Hedgerow removal has been minimised within the ESA to *c.* 100 m stretch of species-poor hawthorn hedge within the vicinity of the proposed T13, which is in itself mitigation for potential effects on bats.

Turbines have generally been placed within areas of open peatland and grassland habitat. Where hedgerows and treelines do occur, some will have to be removed to avoid impact on other species such as bats, as it will be necessary to maintain a minimum separation distance between the rotor tip and the nearest habitat feature (hedgerow or treeline). Within the ESA, this will necessitate the removal of *c.* 100 m of mature, but species poor, hawthorn hedgerow habitat within the vicinity of T13.

The haul route has been designed in a manner which aims to minimise impacts upon mature vegetation wherever possible. The following mitigation is being implemented to minimise impacts upon hedgerow and scrub (following Standing Advice Note: *"DAERA Environmental Advice for Planning Standing Advice Hedgerows"* (DAERA, 2020)[79]):

- A pre-construction site walkover will be carried out with the Appointed Contractor's Site Manager and the Appointed Ecologist to ensure the retention of habitat connectivity is paramount as far as possible, and to minimise the footprint for vegetation removal prior to haulage and construction works at this site.
- As detailed within Chapter 11 – Ornithology; site preparation works (vegetation removal) will be planned for outside of the breeding bird season as far as possible (prior to 1st March or after 31st August).
- Any required removal of woody/scrub vegetation within the Development will aim to replace 'like for like' or enhanced habitat when replanting. This will be updated during the pre-construction walkover.
- Species used for replanting will be native, locally sourced and in-keeping within the environs of the site. This is detailed within the **Technical Appendix A3.2: Draft HMEP**.
- Existing hedgerows which do not require removal shall be integrated into the Development as boundary features to ensure their long-term management and retention.
- New planting will aim to link to existing landscape features such as copses of trees and/or watercourses as far as possible e.g. by linking vegetation along the Legnahone Burn.
- Native tree and shrub planting in keeping with the surrounding area will be utilised in areas which require screening such as the proposed substation.

10.6.1.4 Mitigation for Potential effects upon Bats

Mitigation will incorporate the following measures to minimise impacts on bat species as a result of the decommissioning, construction and operation of the Development.

In addition to embedded mitigation to provide appropriate bat buffers to turbines, there will be the requirement for the removal of *c.* 100 m of mature, but species poor, hawthorn hedgerow located *c.* 42 m southwest of T13. This hedgerow provides a commuting and foraging habitat for a small number (<5 No. individuals) common and soprano pipistrelle bats. Removal of this species poor hedgerow is intended to discourage bats from commuting / foraging in the vicinity of T13.

Replacement native tree and shrub planting is proposed along the Legnahone Burn which runs to the south and east, which will provide additional cover and commuting / foraging opportunities for bats, particularly pipistrelle bats which are roosting nearby.
Details on native tree planting are provided in within **Technical Appendix A3.2: Draft HMEP** and illustrated in Figure A3.2.7.

10.6.1.5 Mitigation for Potential effects upon Reptiles

The mitigation below is devised to ensure that works are carried out when reptiles are less at risk of killing or injuring. Reptiles are particularly at-risk during hibernation from November to February.
Widescale habitat restoration and enhancement has been recommended and is described in detail within **Technical Appendix A3.2: Draft HMEP**. While the Development will result in direct impacts upon habitats used by reptiles, it will not result

79 DAERA 2020. Environmental Advice for Planning Standing Advice Hedgerows. [Online] Available at: https://www.daera-ni.gov.uk/sites/default/files/publications/daera/DAERA%20Hedgerows%20Template%20-Final%20February%202020.pdf (Accessed January 2023)

in an overall permanent loss of reptile habitat in the area. This will avoid long term impacts to the local reptile population.

Mitigation for this species can include conducting initial ground excavation during warmer weather (while reptiles are more active) in order to make areas unsuitable for them while they are active enough to move out of the working area. This is done under the supervision of an Ecological Clerk of Works (ECoW). However, it should be noted that such action can reduce the value of the turves for translocation and habitat restoration. Therefore, the following approach is proposed:

- Excavation of soils which abut existing infrastructure (where hibernacula are more likely to be found) will occur outside the core hibernation period (hibernation occurs from October to March inclusive) to afford active reptiles the opportunity to leave these working areas. The groundwork will be carried out under the guidance of an Appointed ECoW.
- Within suitable reptile habitat (as highlight by the Appointed ECoW) any clearance of vegetation will be done in a phased manner, with strimming to occur to 15cm initially moving out towards the surrounding environment, so as to allow reptiles to move out of working areas. A second strim will then be done immediately afterwards in order to take the vegetation to ground level.

10.6.2 Assessment of Residual Effects

Habitats

The impact of the proposal upon Active Peat has been outlined in detail within **Technical Appendix A10.4: Active Peat Assessment**. The proposed development has been explicitly designed in order to avoid any direct impacts upon active peat. Consequently, the majority of direct impacts exist within 'Dry modified bog'. No development is proposed on areas of High (red) Constraint (see Figure A.10.4.1 in Appendix I). A total area of *c.* 22m^2 of Moderate-High (orange) Constraint is directly impacted by the required embankments of the Development. These have been identified as edge habitats as shown in Figure A.10.4.1 of the APA. The Moderate-High (orange) Constraint areas do not constitute Active Peat as units, and where these areas are potentially affected by proposed infrastructure (following site-specific surveys of the vegetation at that time) the ECoW will seek to agree to microsite infrastructure with the aim of avoiding any peat-forming vegetation pockets within the wider unit of non-Active peat. **ES Chapter 4: Site Selection and Design** summarises the main design iterations and the environmental rationale and implications of each. Following review of the data sources, 'Active Peat' and other high-quality habitats (shown as red and orange on Figure A10.4.1 of the APA, corresponding to 'High' and 'Moderate-High' Constraint) is known to occupy a total area of 210.612 ha within the ESA.

The proposed habitat restoration is outlined in detail within **Technical Appendix A3.2: Draft HMEP** and will result in a total of *c.* 42.719 ha of peatland habitat, with the ultimate aim of restoring this to 'active peat' status. This will be monitored closely via the prescriptions in the HMEP to support the successful restoration of peatland to active peat status. The residual effect would be a net positive impact on the site of peat restoration and enhancement.

The residual impact post successful implementation of the HMEP is therefore considered to be a ***long-term*** likely ***positive impact*** on habitats which are of ***Regional*** to ***National*** importance.

The effect of dewatering on *c.* 4.10 ha of acid grassland / species-poor flush and spring habitat will result in a permanent ***'Medium'*** impact on a feature of ***local (higher) importance***. However, the proposed management on lands within the HMEP includes management of *c. 60 ha* of this habitat type, and as such there is likely to be a ***net***

positive effect on this habitat type within the management lands, dependent upon the successful implementation of the HMEP measures and its monitoring regime.

The scheme also affects *c.* 100m of hedgerow near T13 within the ESA, which constitutes a ***'Medium'*** impact on features of ***Local (Higher) importance.*** This is being replaced like for like elsewhere within the ESA in addition to native woodland planting along the Legnahone Burn riparian corridor. The residual impact is therefore ***long-term positive impact*** on habitats which are of ***Local (higher)*** value.

When compared with the current baseline, the overall residual impacts upon habitats are determined to be ***positive*** given the proposed implementation of a largescale Habitat Management and Enhancement Plan (which will undergo monitoring to support its success).

Species

There are no residual impacts upon bat roosts in the area, as these have been avoided within the design of the site. However, there is likely to be a short-term 'Medium' adverse impact on bat species which occur in low numbers at this site and are of ***Local (higher)*** to ***Regional*** importance. In addition, when compared with the existing baseline (as this is a wind farm repowering) and given the locations where bats are actively using in relation to the proposed Development, there is unlikely to be any perceptible impact on the local bat population above that of the existing baseline in the longer term. As such, any adverse impacts upon bats are considered to be short-term.

There is the potential that in the longer term, and with the successful establishment of replacement planting and habitat enhancements through land management and re-wetting – this would result in a ***net positive impact*** upon the local bat population.

Reptiles occur at the site in low numbers and are unlikely to be significantly impacted in the long-term as a result of the proposed Development. Any short-term impacts on this ***Local (higher)*** population will be negated by the extent of land which are to be managed for biodiversity as proposed within the HMEP (See **Technical Appendix A3.2: Draft HMEP**). This is likely to result in a ***net positive impact*** upon reptiles within the ESA and HMEP areas.

Further details on the residual impacts of the Development on species within the ESA are provided within **Technical Appendix 10.1 – Ecological Impact Assessment,** including appropriate mitigation which must be adhered to for species which were scoped out of the EIA in accordance with the EIA Regulations.

Full details on the residual impacts upon the local bird population are also provided within **Chapter 11 – Ornithology** and associated Technical Appendices.

10.7 CUMULATIVE EFFECT ASSESSMENT

The following wind farms have been identified within 10 km of the Development.

- Ballykeery Road (operational) approximately 1.5 km south of the Development, located within the Doulas Burn catchment;
- Ballykeery Road 2 (application) approximately 1.5 km south of the Development, located within the Douglas Burn catchment;
- Dunnyboe Road (application) approximately 3.0 km northeast of the Development, located within Burn Dennet River catchment;
- Curlyhill Road (consented) approximately 3.0 km west of the Development, located within the Glenmornan River catchment;
- Ballylaw Road (operational) approximately 4.5 km northwest of the Development, located within the Burn Dennet River catchment;

- Loughan Road (under construction) approximately 5.5 km north of the Development, located within the Altinaghrea Burn catchment;
- Carrickatane (operational) approximately 10.0 km north of the Development, located within the Sandville Burn catchment;
- Eglish Mountain (operational) approximately 9.0 km northeast of the Development, located within the Faughan River catchment; and
- Slieve Kirk (operational) approximately 10.0 km northeast of the Development, located within the Faughan River catchment.

As Ligford Road Wind Farm is located outside of the hydrological catchments of the Development, there is no potential for cumulative effects on downstream receptors from this project. Details regarding the potential for cumulative developments is provided within **Technical Appendix A2.4: Cumulative Developments**.

The proposed Dalradian Gold Mine grid connection application (planning ref. LA11/2019/1000/F) lies within the hydrological catchment of the Development. The proposed grid connection application supports the Curraghinalt mine application (LA10/2017/1249/F) which lies outside the hydrological catchment of the Development. Both applications are subject to public inquiry by the Planning Appeals Commission (PAC), and at the time of writing, the date for the public inquiry hearings have not been scheduled. As noted earlier in Section 7, direct impacts from the Development (on its own) on QI/SCI species as a result of killing or injuring through e.g. collision with overground infrastructure, or direct habitat loss due to the Development footprint, can be ruled out. As such, there is no potential for impacts arising from the Dalradian Gold Mine grid connection application in-combination with the Development.

It has been established that any potential for significant impacts related to European Sites is linked to hydrological connectivity of the Development to these Designated Sites. Outside of the projects listed and discussed above, there are limited planning applications that could have the potential to result in in-combination impacts with the Development. These may include the construction of single residential dwellings or agricultural buildings, or operational quarries that occur within the hydrological catchment of the Development, have the potential to have hydrological impacts on the receiving environment, and are either in construction or operation at the same time as the Development. While hydrological impacts arising from the Development have the potential to reach downstream European Sites, as described in Section 6.3 the impact on any downstream QI/SCI species and habitat has been assessed as low potential. Furthermore, any in-combination impacts are also considered to present a low potential impact due to the small scale of the projects, and the requirement of any planning application to be in compliance with Habitats Regulations Assessment/Appropriate Assessment.

It is anticipated that, in the absence of mitigation, the key cumulative effects upon ecology during the operation of the Development are largely as a result of augmentation of existing drainage within the ESA which could exacerbate peatland erosion within the vicinity of the proposed infrastructure, particularly if the current and future drainage scenarios are not maintained appropriately and in a sensitive manner, taking careful consideration of the peatland habitats here. This potential impact has been largely negated by the Outline Drainage Strategy which has been provided within **Technical Appendix A8.5** and through the implementation of **Technical Appendix A3.1: oDCEMP.** However, continued monitoring of the site will be required to ensure that in-built mitigation is successful and that any potential failures can be ameliorated at an early stage through site intervention. For peatlands, this has been incorporated into the scheme through the implementation of a regular monitoring regime through implementation of **Technical Appendix A3.2: Draft HMEP** whereby any potential effects can be evaluated over time.

If similar effects resulted from equivalent actions on other wind farms in the area, this could result in downstream aquatic impacts on the QIs/SCIs of European and Ramsar Sites. These impacts would be caused by factors such as sedimentation in watercourses, nutrient pollution and spillage/leakage of hydrocarbons or other chemicals. This is discussed in detail within **Technical Appendix A10.2: Habitats Regulations Assessment**.

Mitigation is required to negate such potential impacts and has been incorporated into the design. Proposed mitigation is discussed in **Section 10.6**.

In addition, the operation of the Development may result in loss of potential commuting and foraging areas for low numbers of bats in some instances (as described above, and within **Technical Appendix A10.1: Ecological Impact Assessment**).

Typically, cumulative impacts of wind farm proposals are connected to:

- Cumulative impact on bird populations as a result of bird strike, suitable habitat loss or displacement (covered under ES **Chapter 11: Ornithology**);
- Downstream aquatic impacts resulting in water quality within the catchment that, while small for the individual wind farm, result in a significant impact when viewed on a larger or catchment basis;
- Insignificant impacts on individual species (such as common lizard) or species groups (such as bats), during construction and operation, that may result in significant impacts when applied at a large scale. This is particularly relevant to species such as marsh fritillary butterfly that often require small 'stepping-stone' habitats for population survival;
- Cumulative loss of irreplaceable habitat, such as Active Blanket Bog.

In terms of downstream aquatic impacts, the proposal already includes significant embedded construction measures within the design approach as outlined in **Technical Appendix A3.1: oDCEMP**. It is concluded that not only will these not be significant, but the embedded measures will mean that there is no feasible contribution to a cumulative impact in this regard.

In terms of impacts on individual species, the species that occur at the site that may be impacted by the proposal (notably common lizard and bat species) are those that are likely to occur as fairly distinct populations with significant suitable habitat occurring in the wider area. Following the site assessments (full details of which are available in the EcIA, **Technical Appendix A10.1**), there are no species for which a wider population impact may be expected as a result of an impact within or adjacent to the Development (for example, species such as marsh fritillary which persist as 'meta-populations' and may rely on suitable habitat in future years).

In terms of impacts on bog habitats, these have been identified and will be addressed through the implementation of the **Technical Appendix A3.2: Draft HMEP**. This will result in an improvement of the wider area in terms of peat habitat quality and longevity.

In addition, given that this is a wind farm repowering project, is anticipated that the operation of the Development will not greatly increase the level of disturbance to local wildlife from that of the existing operational Owenreagh I and II wind farms (i.e., disturbance from the operation of the Development is anticipated to be akin to that of the existing baseline).

As a result of the above, it is considered that the potential for cumulative effects as a result of the operation of the Development is considered to be ***Low*** taking into consideration the potential for cumulative effects of other wind farm operations and other proposals in the vicinity of the ESA.

Associated/Connected developments in the case of the Development would include the turbine delivery haul route (which encompasses the Abnormal Load Route (ALR)) and the electrical grid connection associated with the Development. Any works associated with the haul route include minor works comprising vegetation removal along the existing road network. The haul route for the Development has been assessed within Technical Appendix A10.1: Ecological Impact Assessment (Appendix IV). Potential ecological effects associated with works required on the haul route are not likely significant effects and are scoped out of the EIA as set out in **Technical Appendix A2.3: Abnormal Load Route Works (ALRW).** For further details refer to **Technical Appendix A13.1: Abnormal Load Route Assessment**.

The grid connection associated with the Development will be subject to a separate planning application, which will be accompanied by its own ES. This will either be done by SONI (Northern Ireland's transmission system operator) or by the Applicant. In initial discussions with SONI, they identified two potential grid connection points: Strabane 110kV substation and Killymallaght 110kV substation. Once an application is made, SONI will conduct studies post consent to determine which is the best point of connection. The windfarm will connect to the substation via either an overhead line (OHL) or underground cable along the public road system. The substation building, for which the grid connection will connect to, is included in the Development planning application.

The substation which forms part of the Development has been assessed as part of the HRA. The grid connection impacts will be assessed as part of the separate planning application and will consider in-combination impacts with the Development. While regard has been given to the associated grid connection, at this stage given the details of the gird connection are unknown, it is not possible to fully consider these in any in-combination assessment for the Development.

As such, no associated/connected significant impacts have been identified as a result of additional/connected works or development activity.

10.8 SUMMARY OF EFFECTS

Table 10.12 below summarises the potential significant effects on Important Ecological Features identified within the ESA with predicted residual effects taking account of the proposed mitigation and the proposed restoration and site enhancements that are recommended within the draft HMEP (as appended to the ES in **Technical Appendix 3.2**).

Table 10.12: Summary of Effects

Ecological Receptor	Sensitivity of Receptor	Potential Significant Effect	Magnitude of Effect	Mitigation Proposed	Residual Effects
Peatland Habitats					
• 'Active Peat' - Blanket Bog (Includes 'Intact' and 'Recovering' Blanket Bog which corresponds with EU Annex I quality habitat	High	Habitat loss: Development infrastructure, hardstanding, access tracks, substation and construction compounds will all result in the direct loss of c. 11.886 ha of peatland habitats (of which c. 0.133 ha are EU Annex I habitats) within the ESA. Local hydrological dewatering effects which are likely to be significant at the local level and will likely affect a further c. 4.582 ha of peatland habitats (of which 0.094 ha are considered to be of EU Annex I habitat quality). Temporary disturbance of adjacent peatland habitats (e.g., through dust)	High	Embedded mitigation to avoid effects upon peatland habitats as far as feasibly possible, concentrating works within Grassland Habitats and on existing wind farm infrastructure. A **Draft Habitat Management and Enhancement Plan** has been provided (**Technical Appendix A3.2**) which includes restoration, management and enhancement of peatland habitat across the ESA.	Post mitigation, short-term construction related adverse impacts which are of a Medium magnitude when compared with the existing baseline. Potentially overall long-term positive impact dependent upon success of HMEP implementation and monitoring regime (See Table A3.2.4 Section 5 of HMEP). Total of *c.* 275ha will undergo HMEP management, including wet modified bog, dry modified bog, blanket bog, acid grassland / species-poor flush mosaic and semi-improved / grassland. Long-term residual impact will depend on the success of the enhancement measures. With successful mitigation, there is potential for a long-term impact of low to High significance on features of Regional-National Importance.
• Dry Modified Bog (NI priority Habitat; and • Wet Modified Bog (NI Priority Habitat)	Medium		Medium		

Ecological Receptor	Sensitivity of Receptor	Potential Significant Effect	Magnitude of Effect	Mitigation Proposed	Residual Effects
Grassland Habitats					
Species-poor Flush and Spring Grassland Habitat	Low	Direct removal and indirect dewatering totalling *c.* 4.10 ha of species-poor flush and spring habitat is considered to be a significant effect on an IEF within the ESA at the local level and is permanent.	Medium	Proposed mitigation is detailed within the outline DCEMP - Technical Appendix A3.1. The Draft Habitat Management and Enhancement Plan (Draft HMEP) includes a snipe Habitat Management Plan for the management of c. 60 ha of acid grassland / species-poor flush and spring dominated habitat for breeding waders including the creation of wader scrapes within two identified territories. A focus on habitat enhancement for snipe and curlew.	Post mitigation, there are likely to be short-term adverse construction related impacts to this habitat type, which are considered to be of a Medium magnitude upon a feature of Local importance. In the long-term when compared with the existing baseline, it is considered that there will be a likely positive impact on a feature of Local (Higher) value as a result of re-wetting, dependent upon success of HMEP implementation and monitoring regime.
Boundary Features					
Species-poor hedgerow habitat (NI Priority Habitat)	Low	Removal of *c.* 100 m of mature, species poor, hedgerow habitat at T13 within the ESA. This is considered to be a receptor of Moderate significance at the Local (Higher) level and is permanent.	Low	Proposed compensatory planting of *c.* 700 m of native trees as a riparian buffer within the vicinity of the removed hedgerow which will enhance an existing linear feature and enhance foraging and commuting habitat away from infrastructure.	Short-term adverse construction related impacts, long-term likely positive impact on a feature of Local (Higher) value, dependent upon the success of replanting and monitoring of this as part of the HMEP.
Bats					
Foraging / commuting - Leisler's and common pipistrelle bat	Low to Medium	Construction: Loss of habitat - Removal of linear features (treeline / hedgerow south of T13) which has the potential to cause	Low	Embedded mitigation: Retention of linear features where possible in the Development design.	Short-term negative, long-term low impact on a feature of Local to Regional Importance.

Ecological Receptor	Sensitivity of Receptor	Potential Significant Effect	Magnitude of Effect	Mitigation Proposed	Residual Effects
species within the ESA		disconnect of commuting lines and loss of potential foraging area, leading to reduced foraging success and possible decline of local bat populations considered to represent a population of Local (Higher) significance. Operation Turbine collision / barotrauma with the potential to cause direct mortality or serious injury of bats in flight leading to a possible decline of local bats considered to represent a population of Local (Higher) significance.		Compensatory planting of *c.* 700m native species along the riparian zone of watercourse south-east of T13. Post-construction monitoring, use of red lights on top of turbines, use of a buffer zone between any roosts / linear features and turbines to minimise chances of collision.	There is the potential that in the longer term, and with the successful establishment of replacement planting and habitat enhancements through land management and re-wetting as per **Technical Appendix A3.2: Draft Habitat Management and Enhancement Plan** and resulting improvements in local water quality (positively affecting invertebrate prey diversity), this would result in a net positive impact upon the local bat population.
Reptiles – Common lizard	Low	Construction works in areas holding common lizard have the potential to result in direct mortality and the Development can result in loss of foraging habitat or hibernacula. Direct mortality may occur from excavators tracking over vegetation during the active season or destroying hibernacula (which may occur within the existing infrastructure for example) during the hibernation period. The Development may result in a loss of foraging habitat but may simultaneously enhance areas in terms of hibernacula. Potential impact on common lizard, in terms of potential direct mortality are considered to be significant at the local scale, and temporary.	Negligible	Works in potential hibernacula areas (adjacent to existing infrastructure) will commence outside the core hibernation period (October to March inclusive). Where this is not feasible, works will be preceded by a programme of capture and translocation of common lizards, under license, this will be employed, in conjunction with the use of a reptile barrier to ensure non-return of individuals into the works area.	Short-term negative, long term negligible impact on a feature of Local (Higher) value. There is the potential that in the longer term, and with the successful establishment of suitable peatland habitat enhancements as per **Technical Appendix A3.2: Draft Habitat Management and Enhancement Plan** through land management – this would result in a net positive impact upon the local reptile population.

10.9 STATEMENT OF SIGNIFICANCE

It is considered that the proposed mitigation, including the successful restoration of habitats (where this is found to be effective following a monitoring programme) would result in an overall positive residual effect upon the Important Ecological Features when compared to the existing baseline.

Within this EIA Chapter, this refers to the following identified IEFs:

- 'Active Peat' - Blanket Bog (Includes 'Intact' and 'Recovering' Blanket Bog which corresponds with EU Annex I quality habitat *(Indirectly affected through dewatering – a key consideration within the HMEP).*
- Dry Modified Bog (NI priority Habitat *(Directly and Indirectly affected through habitat loss and dewatering respectively – and a key consideration within the HMEP).*
- Wet Modified Bog (NI Priority Habitat) *(Indirectly affected through dewatering – a key consideration within the HMEP).*
- Species-poor Flush and Spring Grassland Habitat *(Directly and Indirectly affected through habitat loss and dewatering – a key consideration within the HMEP).*
- Species-poor hedgerow habitat (NI Priority Habitat) *(Directly affected through habitat loss – Mitigated for within the HMEP and replanting specification).*
- Foraging / commuting - Leisler's and common pipistrelle bat species *(Directly affected through habitat loss – Mitigated for within the design and the HMEP*).
- Reptiles – Common lizard *(Directly affected through habitat removal – Mitigated for within the HMEP*).

Successful peatland restoration and enhancement outlined within **Technical Appendix A3.2: Draft HMEP** will result in positive impacts for the wider peatland habitat at the ESA and will encourage Active Peat formation.

The impact of the proposed wind farm design is not considered to have overall significant adverse effects on the ecology of the area in the long-term. Successful implementation of the Draft HMEP, outline DCEMP and monitoring of the site would encourage positive effects on the ecology of the ESA in the long-term when compared with the current baseline.

10.10 GLOSSARY

ALRW	Abnormal Load Route Works
APA	Active Peat Assessment
CIEEM	Chartered Institute of Ecology and Environmental Management
EcIA	Ecological Impact Assessment
ESA	Ecological Study Area
HMEP	Habitat Management Plan
IEFs	Important Ecological Features
JNCC	Joint Nature Conservation Committee
NTS	Non-Technical Summary
NVC	National Vegetation Classification
oDCEMP	Outline Draft Construction Environmental Management Plan

10.11 NTS TEXT

Chapter 10 of the EIAR assesses the potential impact of the Development on terrestrial and aquatic ecology (Chapter 11 deals with Ornithology, and birds are not discussed here).

Surveys were undertaken within and surrounding the Ecological Study Area (ESA), in order to ascertain the status of ecological features, including habitats and protected species (mammals, bats, fish, molluscs and invertebrates, such as marsh fritillary butterfly *(Euphydryas aurinia)* and other local lepidoptera species). The Development lies within and adjacent to the Sperrins Area of Outstanding Natural Beauty (AONB), as well as upstream of internationally and nationally designated sites, including River Foyle and Tributaries SAC and River Foyle and Tributaries ASSI.

In the absence of any mitigation, the main potential impacts of the initial decommissioning, construction, and operational phases of the Development on ecological receptors which have been assessed within this ES are:

- Indirect impacts on the following designated sites:
  - River Foyle and Tributaries SAC;
  - River Finn SAC;
  - River Foyle and Tributaries ASSI;
  - Silverbrook Wood ASSI;
  - Corbylin Wood ASSI; and,
  - Lisnaragh ASSI.
- Direct loss of non-Annex I peatland habitats;
- Indirect impacts on habitats through dewatering including EU Annex I habitat;
- Degradation of habitats;
- Degradation of aquatic habitat (watercourses) and potential downstream ecological impacts;
- Disturbance of protected species and loss of habitat; and,
- Bat collision with turbines or barotrauma.

Habitat surveys included habitat classification mapping and National Vegetation Classification (NVC) quadrat surveys, aimed at identifying important habitat types, including EU Habitats Directive Annex 1 habitats, either likely to fall under the footprint of the Development or with potential to be affected by it. Habitat (and species) surveys also facilitated the creation of a Habitat Management and Enhancement Plan (HMEP) for the Development Site. The results of the survey highlighted that there is 0.133 ha of Annex I habitats occurring close to, or immediately adjacent to the proposed infrastructure, which will be lost to facilitate construction.

A freshwater pearl mussel *(Margaritifera margaritifera)* suitability survey was undertaken along watercourses within the ESA. The survey found that the ESA and surrounding watercourses are unsuitable for this species. Features in-built into the design of this site will prevent the proposal having any significant effect on local watercourses – and is likely to improve on the existing water quality baseline within the ESA through effective drainage management at the site. Similarly, electrofishing was undertaken along watercourses within the ESA, however, no evidence of salmon *(Salmo salar)* or brown trout *(Salmo trutta)* were recorded and subsequently, due to the design of the site and the lack of these species occurring nearby, they are unlikely to be affected by the proposed Development.

Bat surveys were undertaken using transects, roost surveys and, primarily, static bat detectors, with 3 deployments of a minimum 14 no. static detectors at the site during 2019 and 2021, and 6 deployments of 4 no. static detectors in 2018 (the latter was part of the scoping exercise). Permanent, context detectors were also deployed along with a weather station to monitor conditions throughout deployment periods. Results showed that the site is used by bats only to a limited extent, and that bat barotrauma risk is not significant at the site. Mitigation proposed as part of the scheme includes removal of a mature, but defunct Hawthorn hedgerow which runs towards T13. This feature is utilised by small numbers of soprano pipistrelle *(Pipistrellus* *pygmaeus)* and common pipistrelle *(Pipistrellus pipistrellus)* for foraging and commuting, as they are known to be roosting nearby. Subsequently, an area of native woodland trees (in-keeping with the environs of the site) will be included as replacement habitat. This is likely to offer increased foraging and commuting habitat, as well as surface water filtering, as the proposed planting area is part of a wider riparian corridor.

Surveys for protected mammals such as badgers *(Meles meles)* and otter *(Lutra lutra)* found that, although badger occurred on the Site, they were unlikely to be significantly affected by the Development, with no badger setts within 300 m of the proposed infrastructure or working corridor. Otter, on the other hand, were observed using the ESA and were considered further for impacts based on their Annex IV and Priority Species status in NI. Other mammals surveyed for included red squirrel *(Sciurus vulgaris)*, a species on which it was deemed there would be no significant impacts, and Irish hare *(Lepus timidus)*, which were observed using the ESA and included as a potential receptor of significant impacts based on their Priority Species status in Northern Ireland. Finally, pine marten *(Martes martes)* was not observed using the ESA but are assumed to inhabit the coniferous woodland patches adjacent, but outside of, the ESA – and have the potential to forage within the ESA. This species' Annex V classification, Priority Species status and abundance in Northern Ireland has led to it being brought forward for further assessment within the EIAR chapter, precautionarily.

Reptile surveys at the site comprising the use of reptile mats (refugia) found that the ESA holds a small population of common lizard *(Zootoca vivipara)*, as three individuals were observed using the Site. As this species is a Priority Species in NI, and bog is an important habitat for common lizard, in the absence of appropriate mitigation, there is the potential to affect the local, albeit small, population through removal of suitable habitat.

Surveys for marsh fritillary *(Euphydryas aurinia)* identified the foodplant devil's-bit scabious just outside the ESA. No evidence of marsh fritillary was identified during surveys. There is no suitable habitat for this species within the footprint of the works, and they will not be affected by the Development. NI Priority Species' the large heath butterfly *(Coenonympha tullia)*, the small heath butterfly *(Coenonympha pamphilus)* and the argent & sable moth *(Rheumaptera hastata)* were identified as using the site and are considered further in the EIAR chapter for enhancement measures as part of the HMEP.

Standard best practice design has been incorporated into the Development, including a proposed Drainage Strategy for the site, which includes measures to avoid downstream pollution. A number of mitigation measures are also proposed that include, minimisation of the works footprint (embedded design-stage mitigation), seasonal restrictions on certain works to avoid disturbance or potential direct mortality of species (such as bats, common lizard and/or otter), removal of a 100m stretch of hedgerow near T13 to prevent use by bats. Additionally, habitat restoration and enhancement measures have been designed in depth as per the HMEP.

Important documents to ensure the successful delivery of these measures include the Outline Draft Construction Environmental Management Plan (DCEMP), which sets out work approaches and requirements during construction and the Draft Habitat Management and Enhancement Plan (which notably commits to significant peatland habitat restoration and enhancement measures).

It is considered that the ecological impacts of the proposed Development can be fully negated in time with the successful implantation of these plans, and the monitoring regime outlined therein.

It is anticipated, particularly early on, that some level of residual impact cannot be avoided at the site, notably in the shorter term until habitat restoration is in place and functioning in ecological terms. However, the combination of the use of the existing infrastructure, and the provision of habitat restoration and enhancement measures in the form of a HMEP means that residual impacts on the Annex I habitats can be reduced as far as possible, and an overall positive impact on the site could be achieved in the longer term subject to successful mitigation / compensation in the form of habitat restoration, sensitive habitat and site management and continued monitoring to rapidly ameliorate any residual impacts if these are noted to arise. Positive interventions are intended to occur across *c.* 275ha of designated Habitat Management and Enhancement lands as part of **Technical Appendix A3.2: HMEP.**

Owenreagh-Craignapple Wind Farm

Environmental Statement - Chapter 11

Ornithology

Ørsted Onshore Ireland Midco Limited

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Owenreagh-Craignapple Wind Farm

Environmental Statement- Chapter 11 Ornithology

CONTENTS

11 ORNITHOLOGY

11.1 INTRODUCTION

This Chapter of the Environmental Statement (ES) evaluates the likely significant effects of the proposed Owenreagh/Craignagapple Wind Farm ('the Development') on the ornithology resource. This assessment was undertaken by Woodrow APEM Group.

This Chapter of the ES is supported by the following Technical Appendix documents provided in Volume 4 ES Technical Appendices:

- 3.2: Draft Habitat Management and Enhancement Plan (HMEP);
- 11.1: Ornithology; and
- 11.2: Avian Collision Risk Modelling (CRM).

This Chapter includes the following elements:

- Guidance, Legislation and Information;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects;
- Statement of Significance; and
- Glossary.

11.2 GUIDANCE, LEGISLATION AND INFORMATION

The following guidance, legislation and information sources have been considered in carrying out this assessment:

- The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017[1] (and amendments);
- The Conservation (Natural Habitats, etc.) Regulations 1995 (as amended) which transposes the Habitats Directive into law in Northern Ireland (the Conservation Regulations);
- The Wildlife (Northern Ireland) Order 1985 (as amended) (the Wildlife Order);
- The Wildlife & Natural Environment (Northern Ireland) Act 2011;
- Planning Policy Statement 2 (PPS 2) Planning & Nature Conservation;
- Planning Policy Statement 18 (PPS 18);
- JNCC (2012). UK Biodiversity Action Plan;
- Local Biodiversity Action Plans (www.biodiversityni.com);
- Balmer *et al.* (2013). Bird Atlas 2007-11: The breeding and wintering birds of Britain and Ireland. British Trust for Ornithology;
- Gilbert *et al.* (2021). Birds of conservation concern in Ireland 2020 – 2026;
- CIEEM (2016). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition;
- DOE (2015). DOE Planning & Environment: Standing advice for planning officers and applicants seeking planning Permission for land which may impact on wild birds;
- Stanbury *et al.* (2021). Birds of Conservation Concern 5: the population status of birds in the UK, Channel Islands and Isle of Man;

[1] Northern Ireland Assembly (2017). *The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017* [Online] Available at: https://www.legislation.gov.uk/nisr/2017/83/made (Accessed 28/11/2022).

- NIEA (2010). Wind Energy Development in Northern Ireland's Landscapes: Supplementary Planning Guidance to accompany Planning Policy Statement 18 'Renewable Energy'. NIEA Research and Development Series No 10/01, Belfast;
- Ruddock & Reid (2010). Review of windfarms and their impact on biodiversity: Guidance for developments in Northern Ireland. Report by the Natural Heritage Research Partnership, Quercus for the Northern Ireland Environment Agency, Northern Ireland, UK;
- Percival (2001; 2003) Birds and windfarms: a review of potential issues and impact assessment. Ecology Consulting 25pp
- Tosh *et al.* (2014). A review of the impacts of wind energy developments on biodiversity. Report prepared by the Natural Heritage Research Partnership (NHRP) between Quercus, Queen's University Belfast and the Northern Ireland Environment Agency (NIEA) for the Research and Development Series No. 14/02;
- SNH (2000). Windfarms and birds: calculating a theoretical collision risk assuming no avoiding action, Scottish Natural Heritage;
- SNH (2005). Survey methods for use in assessing the impacts of onshore windfarm on bird communities. Scottish Natural Heritage;
- SNH (2006). Assessing significance of impacts from onshore windfarms on birds' out-with designated areas. July 2006. Scottish Natural Heritage;
- SNH (2009). Guidance on methods for monitoring bird populations at onshore wind farms. Guidance Note, January 2009. Scottish Natural Heritage;
- SNH (2010a). Survey methods for use in assessing the impacts of onshore windfarms on bird communities. November 2005 (revised December 2010), Scottish Natural Heritage;
- SNH (2010b). Use of avoidance rates in the SNH wind farm collision risk model. Scottish Natural Heritage;
- SNH (2011). Guidance on assessing connectivity with Special Protection Areas (SPAs). Scottish Natural Heritage;
- SNH (2012). Assessing the cumulative impact of onshore wind energy developments. Scottish Natural Heritage;
- SNH (2014a). Assessing the impact of small-scale wind energy proposals on the natural heritage. Version 2 June 2014. Scottish Natural Heritage;
- SNH (2014b). Flight speeds and biometrics for collision risk modelling. October 2014. Scottish Natural Heritage;
- SNH (2014c). Guidance on repowering wind farms: bird survey requirements. November 2014. Scottish Natural Heritage;
- SNH (2015a). Good practice during wind farm construction. Scottish Natural Heritage. Version 3;
- SNH (2015b). Spatial planning for onshore wind turbines – natural heritage considerations. Scottish Natural Heritage;
- SNH (2016). Assessing Connectivity with Special Protection Areas (SPAs). Scottish Natural Heritage;
- SNH (2017). Recommended bird survey methods to inform impact assessment of onshore wind farms. Scottish Natural Heritage (the "SNH guidelines");
- SNH (2018a) Avoidance rate information & guidance note: Use of avoidance rates in the SNH wind farm collision risk model. Scottish Natural Heritage;
- SNH (2018b). Assessing the cumulative impact of inshore wind farms on birds. Scottish Natural Heritage; and
- SNH (2018c). Assessing significance of impacts from onshore windfarms on birds out-with designated areas. Scottish Natural Heritage.

11.3 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

11.3.1 Scoping Responses and Consultations

Consultation for this ES topic was undertaken with the organisations shown in Table 11.1.

Table 11.1: Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Shared Environmental Services (SES)	28/03/2022	Raised a concern over potentially the application site and related infrastructure being on the flight path of migrating bird species of Special Protection Areas (SPAs).	Target species during surveys included all Annex I species and waterbirds, ensuring that any potential SPA species would be recorded and impact on them assessed. Collision Risk Modelling was carried out for species (golden plover) with sufficient flight time within the 500 m turbine buffer.
NIEA-NED	Written 27/10/2022	Requested addressing habitat fragmentation for red grouse. Ensuring that 800 m buffer was covered for breeding curlew. Ensuring that collision risk modelling is carried out for all raptor species with sufficient data for meaningful analysis. Confirmed approach to bird surveys was appropriate.	Potential effects on red grouse, including habitat fragmentation, are assessed in Section 11.5.3.1 of this chapter. Collision Risk Modelling was carried out for all raptor species with sufficient flight time within the 500 m turbine buffer.
NIEA-NED	Meeting 24/10/2022	Draft HMEP and 'Active Peat' Discussions Discussions on red grouse and snipe habitat management	Mitigation for red grouse is assessed in Section 11.6 of this chapter. HMEP is provided in Technical Appendix 3.2.
RSPB	19/08/2021	**In-Perpetuity Consent** "With regards to the applicant's proposal to seek an in-perpetuity consent for the development, given the uncertainty around a lot of predictions and the potential changes in climate, bird populations, technology, knowledge on impacts etc., we do not think an in-perpetuity consent is appropriate. Thus, we strongly advise that any permission for wind farm development is granted on a temporary basis as this will allow for review of the impacts of the proposal in light of the information available at the time." **EIA Recommendations- Advice provided in respect of:** Sections one and two detail the survey work and analysis the RSPB feels are necessary to satisfy the requirements of the EIA Regulations, while section three	A 40-year operational period has been assessed for the Development. Survey methodologies and mitigation were cognisant of recommendations from the RSPB. A decommissioning plan is provided in **Chapter 3 Development Description**.

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
		considers the mitigation and enhancement options which could be provided. **Decommissioning** We recommend that a full decommissioning plan should be included within the EIA. This should include an assessment of the decommissioning of the existing Owenreagh I&II wind farms as well as the future decommissioning of the proposed development should it be approved. **Mitigation, enhancement and monitoring** The broad headings under which the RSPB would be keen to discuss mitigation (without prejudice) would be: • institution of agricultural management and access regimes which favour important bird species through habitat management and possibly habitat creation, • time-related restrictions on construction in relation to nesting periods, and • precise location and orientation of built development within the development site.	

11.3.2 Scope of Assessment

The assessment examines the potential direct and indirect effects on the Key Ornithological Receptors (KORs). The KORs were scoped through to the assessment within **Technical Appendix 11.1: Ornithology**, based on their breeding status and usage of the Ornithological Study Area (OSA) and wider area (as defined in Section 11.3.4). All species recorded within the OSA and wider area during the survey period (2018-2022) are presented in **Technical Appendix 11.1: Ornithology**, along with a justification on which species were carried through to the impact assessment stage.

The footprint of the Development due to turbines, turbine blades, nacelles, towers and/or ancillary windfarm infrastructure (*e.g.* sub-station, energy storage, power-lines, meteorological masts) for the decommissioning/construction and operational phases, has the potential to lead to three main adverse effects on birds:

- Direct loss of breeding, wintering and foraging habitat;
- Direct mortality due to collision;
- Displacement of birds as a result of increased disturbance or decreased suitability of breeding, wintering and foraging habitats.

Positive effects on birds are considered to result from the implementation of a Draft Habitat Management and Enhancement Plant (HMEP) (See **Technical Appendix 3.2**) which is to result in *c.* 155 ha of habitat enhancement which will benefit a wide range of species associated with upland habitats including red grouse, breeding waders, snipe and curlew.

11.3.3 Elements Scoped Out of Assessment

Species which were observed to have a very low usage of the OSA and wider area (defined in Section 11.3.4) were scoped out of the assessment, as there was considered to be no potential for significant effects as a result of the Development.

Despite a historic presence within the OSA and wider area, direct effects on curlew territories were scoped out due to their abandonment of the OSA in recent years. Curlew have not been recorded as breeding within the OSA since 2009/10 and in the wider area since 2017. The existing wind farm has been in operation during previous successful breeding years and the cause of the abandonment of the site by breeding curlew is likely as a result of the surrounding land being drained for agricultural purposes, as well as a countrywide population crash (Colhoun *et al.*, 2022)[2]. As such, effects on breeding curlew are not anticipated as a result of the Development and curlew was scoped out of the assessment.

The following other species, although recorded during baseline surveys, were scoped out of the assessment due to low usage of the OSA:

- Wildfowl species;
- Gull species;
- Lapwing;
- Woodcock;
- Hen harrier;
- Peregrine falcon;
- Swift; and
- Wintering red-listed passerines.

All species recorded within the OSA and wider area during the survey period (2018-2022) are presented in **Technical Appendix 11.1: Ornithology**, along with a justification on which species were carried through to the impact assessment stage.

11.3.4 Study Area/Survey Area

For the purpose of the ornithological surveys, the "Ornithological Study Area" (OSA) was defined as the 500 m buffer of the proposed turbine locations, in line with the SNH (2017) guidelines, see Figure A11.1.1 in **Technical Appendix 11.1: Ornithology**.

Curlew have been reported to be particularly sensitive to impacts from wind farms (Pearce-Higgins *et al.*, 2009; 2012)[3] and, in line with NIEA recommendations, the search area was extended to an 800 m turbine buffer for breeding curlew ("800 m Study Area"), see Figure A11.1.2 in **Technical Appendix 11.1: Ornithology**.

Wider area breeding raptor surveys were carried out within a 2 km turbine buffer ("2 km Study Area") and wider area wintering waterbird surveys covered suitable habitat within a 5 km turbine buffer ("5 km Study Area"), see Figure A11.1.3 and Figure A11.1.4 in **Technical Appendix A11.1: Ornithology Report**.

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[2] Colhoun, K., Flannelly, F., O'Neill, J., Phelan, E., Servignat, H., O'Donoghue, B. & Kelly, S. (2022) Status and distribution of breeding Eurasian Curlew in Ireland 2021. *Irish Wildlife Manuals*, No. 138. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

[3] Pearce-Higgins, J. W., Stephen, L., Langston, R. H. W., Bainbridge, I. P., and Bullman, R. (2009). The Distribution of Breeding Birds around Upland Wind Farms. *Journal of Applied Ecology*, 46(6), 1323-1331; Pearce-Higgins, J. W., Stephen, L., Douse, A. and Langston, R. H. W. (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, 386-394.

11.3.5 Design Parameters

The details of the Development are included in **Chapter 3: Development Description**.

11.3.6 Baseline Survey Methodology

In the absence of relevant national best practice guidelines, the SNH (2017) guidelines, which recommended survey methodologies for the assessment of avian populations within and adjacent to proposed onshore windfarms, have been employed. These guidelines are considered to be industry best practice for wind farms in Ireland and have been agreed within the scoping of project. The survey methodologies utilised for the various field ornithological surveys are outlined in the following sections and adhere to the relevant SNH guidance. **Technical Appendix 11.1: Ornithology** provides further detail on ornithological surveys carried out within the OSA and wider area including survey dates, duration and weather conditions.

Two years of ornithological surveys are recommended by the SNH (2017) guidelines, unless it can be clearly demonstrated that a single year of data is sufficiently robust and appropriate for assessing the potential impacts of the proposal. Six full seasons of surveys were carried out along with an additional season of targeted breeding merlin and snipe surveys. As such, ornithological surveys are considered to comply fully with the SNH (2017) guidelines.

The Key Ornithological Receptors (KORs) are defined as species occurring within the Zone of Influence (ZoI) of the Development upon which likely significant effects are anticipated. The ZoI for individual ornithological receptors refers to the area within which potential effects are anticipated. The methodology for assessment applied a precautionary approach with regard to the identification of KORs. KORs were identified within **Technical Appendix 11.1: Ornithology** and, as such, this chapter only addresses KORs.

11.3.6.1 Desk Study

An initial desk-based review of the OSA and wider area was compiled to determine the appropriate surveys required to inform any potential for ornithological constraints. A preliminary assessment of avian habitat suitability and availability was undertaken using ortho-imagery and 6-inch mapping. This was further informed by scoping visits to the area.

The NPWS Designations Viewer[4] and NIEA Natural Environment Map Viewer[5] were used to identify any nearby Special Protection Areas (SPAs) and their respective Special Conservation Interest (SCI) species. Flood Maps (NI)[6] (and EPA Maps[7]) was used to investigate hydrological connectivity to SPAs using the "River Flow Direction" tool.

A records request was made to the Centre for Environmental Data and Recording (CEDaR) for ecological records within the 10 km national grid square (H49) encompassing the OSA. The ornithological records from this request were reviewed to investigate the target species potentially occurring within the OSA and wider area[8] to inform survey design and identify any potential ornithological constraints.

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[4] NPWS (n.d.). *NPWS Designations Viewer*. https://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=8f7060450de3485fa1c1085536d477ba
[5] DEARA (n.d.). *Natural Natural Environment Map Viewer.* https://gis.daera-ni.gov.uk/arcgis/apps/webappviewer/index.html?id=bb721449cb8949e7a4f90c722bd2d80b
[6] DFI (n.d.). *Flood Maps (NI).* https://dfi-ni.maps.arcgis.com/apps/webappviewer/index.html?id=fd6c0a01b07840269a50a2f596b3daf6
[7] EPA (n.d.). *EPA Maps.* https://gis.epa.ie/EPAMaps/
[8] *Appropriate buffers were reviewed for the ornithological desk study: for instance, a review was carried out for the nearest swan flocks (>6km); nearest SPAs for raptors (42 km) and CeDAR/Breeding bird atlas (10 km).*

The most recent Bird Atlas 2007-11 was also interrogated for ornithological records within the 10 km national grid square H49 (Balmer *et al.*, 2013)[9]. Sharrock (1976)[10] was used to investigate historic records and changes in breeding ranges of species. Additionally, previous surveys carried out at Owenreagh/Craignagapple Wind Farm were consulted (Biosphere Environmental Services, 2014; Woodrow 2017)[11].

Based on the SNH (2017) guidelines, migratory populations of wintering geese and swans are considered as species notably sensitive to wind farm developments. To characterise the distribution of these, population data from recent population monitoring have been reviewed, including:

- Frost *et al.* (2021)[12] for Wetland Bird Survey (WeBS) counts;
- Boland & Crowe (2008)[13] for greylag goose distribution;
- Burke *et al.* (2021)[14] for whooper swan distribution; and
- Fox *et al.* (2021)[15] for Greenland white-fronted goose distribution.

The details of the desk study carried out are provided in **Technical Appendix 11.1: Ornithology**.

11.3.6.2 Field Survey Methodologies

A detailed description of all field surveys undertaken during the survey period is provided in Section 3 of **Technical Appendix 11.1: Ornithology.** All field survey methodologies are cognisant of the SNH (2017) guidelines.

11.3.7 Methodology for the Assessment of Effects

The ornithological impact assessment follows Percival (2003)[16], which requires that an evaluation is undertaken of the population status and trends for each bird species. These guidelines, with modifications made for species recently introduced to Ireland such as golden eagle and red kite, are considered to be industry standard and are specifically designed for wind farm assessments within an Irish context. This methodology has been applied to assess the sensitivity of the KORs, the magnitude of effect and the significance of effect. Sections 11.3.8-11.3.11 outline the assessment criteria for each stage.

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[9] Balmer, D. E., Gillings, S., Caffrey, B. J., Swann, R. L., Downie, I. S. & Fuller, R. J. (2013) *Bird Atlas 2007-11: The breeding and wintering birds of Britain and Ireland*. BTO Books, Thetford.
[10] Sharrock, J. T. R. (1976). *The Atlas of Breeding Birds in Britain and Ireland*. Calton, England: T. & A. D. Poyser.
[11] Biosphere Environmental Services (2014). *Habitat and Species Management Plan, Craignagapple Wind Farm*. Unpublished report; Woodrow (2017). *Habitat Management and Enhancement Plan for Craignagapple Wind Farm*. Unpublished report.
[12] Frost, T. M., Calbrade, N. A., Birtles, G. A., Hall, C., Robinson, A. E., Wotton, S. R., Balmer, D. E. & Austin, G. E. (2021). *Waterbirds in the UK 2019/20: The Wetland Bird Survey*. BTO, RSPB and JNCC, in association with WWT. British Trust for Ornithology, Thetford.
[13] Boland, H. & Crowe, O. (2008). *An assessment of the distribution range of Greylag (Icelandic-breeding & feral populations) in Ireland*. Final BWI report to the NPWS and the NIEA.
[14] Burke, B., McElwaine, J. G., Fitzgerald, N., Kelly, S. B. A., McCulloch, N., Walsh, A. J. & Lewis, L.J. (2021). Population size, breeding success and habitat use of Whooper Swan *Cygnus cygnus* and Bewick's Swan *Cygnus columbianus bewickii* in Ireland: results of the 2020 International Swan Census. Irish Birds, 45, 57-70.
[15] Fox, T., Francis, I., Norriss, D. & Walsh, A. (2021). *Report of the 2019/20 International census of Greenland white-fronted geese*. Greenland White-fronted Goose Study, Rønde, Denmark and Wexford, Ireland.
[16] Percival, S. M. (2003). *Birds and wind farms in Ireland: A review of potential issues and impact assessment*. Ecology Consulting, Coxhoe, Durham.

11.3.8 Geographical Extent

The Guidelines for Ecological Impact Assessment (EcIA) (CIEEM 2018)[17] recommend categories of ornithological or nature conservation value that relate to a geographical framework (*e.g.* international, through to local). The following geographical scales were used within the assessment:

- Local level (on site or neighbouring site);
- District level (Derry City & Strabane);
- Regional level (Northern Ireland);
- National level (UK); and
- International level.

11.3.9 Sensitivity of Receptors

Table 11.2, which has been transposed from Percival (2003), details the framework for determining the sensitivity, or nature conservation importance, of the KORs.

Table 11.2: Framework for Determining Sensitivity of Receptors

Sensitivity of Receptor	Definition
Very High	• Species that form the cited interest of Special Protection Areas (SPAs) & other statutorily protected nature conservation areas. Cited means mentioned in the citation text for the site as a species for which the site is designated.
High	• Species that contribute to the integrity of an SPA, but which are not cited as species for which the site is designated. • Ecologically sensitive species including divers, common scoter, hen harrier, golden eagle, red-necked phalarope, roseate tern & chough.* • Species present in nationally (>1% of UK population) or all-Ireland (>1% of all Ireland population) important numbers.
Medium	• Species on Annex 1 of the EC Birds Directive. • Species present in regionally important numbers (>1% regional (NI) population). • Other species on the BirdWatch Ireland's red list of Birds of Conservation Concern (that are not already included in a category above). ***
Low	• Any other species of conservation interest, including species on Birdwatch Ireland's amber list of Birds of Conservation Concern on the island of Ireland (BoCCI) not covered above. **

*Note that since Percival (2003), other species such as white-tailed eagle, golden eagle, common crane, marsh harrier and red kite are recolonising/expanding their range across Ireland and Northern Ireland or have been reintroduced and may have to be considered under the "High" sensitivity category.
**Includes BTO's Birds of Conservation Concern (BoCC5) and NI Priority List species for the purpose of this assessment. In the case that a species is red-listed in Ireland and not in the UK, or vice versa, the highest conservation status will be assigned as a precautionary measure.

11.3.10 Magnitude of Effect

In terms of methods used to evaluate the magnitude of effects, 'Effect' is considered to be a change in the population of a given bird species present during (or beyond) the life of the Development. Where the effect on a population has varying degrees of likelihood, the probability of these differing outcomes needs to be considered. Effects

[17] CIEEM (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*. Chartered Institute of Ecology and Environmental Management, Winchester. Version 1.2. April 2022.

can be adverse, neutral or favourable. The framework used for defining the magnitude of effect is shown in Table 11.3.

Table 11.3: Framework for defining the magnitude of effect (Percival, 2003)

Magnitude of Effects	Definition
Very high	Total or near total loss of a bird population due to mortality or displacement or reduced productivity in a bird population due to disturbance. Guide: >80% of population affected
High	Major reduction in the size or productivity of a bird population due to mortality, displacement or disturbance. Guide: 21-80% of population affected
Medium	Partial reduction in the size or productivity of a bird population due to mortality, displacement or disturbance. Guide: 6-20% of population affected
Low	Small but discernible reduction in the size or productivity of a bird population due to mortality, displacement or disturbance. Guide: 1-5% of population affected
Negligible	Very slight reduction in the size or productivity of a bird population due to mortality or displacement or disturbance. Reduction barely discernible, approximating to the "no change" situation. Guide: < 1% population affected

11.3.11 Significance of Effect

The significance of potential effects on a given bird population is evaluated by using reasoned argument to integrate the scales of sensitivity of receptors (Table 11.2) and the predicted magnitude of effect (Table 11.3). In making judgements on significance, consideration is given to the population status, trends and distribution of the potentially affected species.

Inputting a combination of the bird species importance (population sensitivity) and the estimated magnitude of impact into the matrix in Table 11.4 allows for the assessment of the overall impact significance on bird species.

Table 11.4: Framework for Assessment of the Significance of Effects (Percival, 2003)

Significance		Sensitivity of Resource or Receptor			
		Very High	**High**	**Medium**	**Low**
Magnitude	**Very High**	Very High	Very High	High	Medium
	High	Very High	Very High	Medium	Low
	Moderate	Very High	High	Low	Very low
	Low	Medium	Low	Low	Very low
	Negligible	Low	Very low	Very low	Very low

Percival (2003)[18] suggests the following in interpreting significance ratings:

- **Not significant** is considered *de minimis* or inconsequential;

[18] Percival, S. M. (2003). *Birds and wind farms in Ireland: A review of potential issues and impact assessment*. Ecology Consulting, Coxhoe, Durham.

- **Very low significance** and **low significance** should not normally be of concern, though normal design care should be exercised to minimise impacts;
- **Medium significance** represents a potentially significant effect that requires careful individual assessment; and
- **Very high significance** and **high significance** represents a highly significant impact effect on bird populations or habitats.

11.3.12 Statement of Significance in the Context of the EIA Regulations

The likelihood of significant effects has been determined through a standard method of ornithological assessment (Percival, 2003) based on the survey results, data analysis and professional judgement. This considers both sensitivity, geographic scale and magnitude of change as detailed above in sections 11.3.9 and 11.3.10.

Effects predicted to be of very high, high or medium significance, as per Percival (2003) are generally considered to be 'significant' in the context of the EIA Regulations. Professional judgement will be used by the authors for effects assessed as low or very low, as per Percival (2003) and are often considered to result in likely significant effects within the context of the EIA Regulations. Potential effects which were considered to be **not significant** were scoped out of the assessment within **Technical Appendix 11.1: Ornithology**, and are not included within this report.

11.3.13 Collision Risk Modelling

VP watches are conducted to collect flight line data which can then be used to model collision risk. For target species generating sufficient levels of flight time within the Collision Risk Zone (CRZ) (defined as within the 500 m turbine buffer at a height of 20–160 m, a precautionary range based on the Vestas V136 and Nordex N133 turbine models), data sets are run through a CRM, as detailed in SNH (2000)[19] and Band *et al.* (2007)[20], employing avoidance rates as given in SNH (2018)[21]. This provides estimates of the number of collisions per annum and for the lifetime of the proposed wind turbines.

The CRM was run for both the operational wind farm (baseline) and proposed wind farm (Development), to provide a comparison between the two scenarios. It should be noted that the operational Owenreagh I and II Wind Farms consist of an original array (Zond Z-40) and an extension (Vestas V52). To address both turbine types, the baseline model was run twice, once with the Z-40 dimensions and once with the V52 dimensions. As such, a collision risk range is provided for the baseline. As the application is for a 40-year consent period, the collision risk over the 40-year life span of the Development was also assessed.

A detailed methodology, along with results, is provided in **Technical Appendix 11.2: Avian Collision Risk Modelling**.

11.3.14 Assessment Limitations

Assessment limitations included:

[19] Scottish Natural Heritage (2000). *Windfarms and Birds - Calculating a theoretical collision risk assuming no avoiding action*. SNH Guidance Note.
[20] Band, W., Madders, M., & Whitfield, D. P. (2007). *Developing Field and Analytical Methods to Assess Avian Collision Risk at Wind Farm Sites*. In: de Lucas, M., Janss, G. & Ferrer, M. (Eds) 2007. Birds and Wind Farms – Risk Assessment and Mitigation. Quercus Editions, Madrid, 259-279.
[21] Scottish Natural Heritage (2018). *Avoidance rates for the onshore SNH wind farm collision risk model*. Version 2. SNH Guidance Note.

- Upon commencing VP watches in summer 2018, due to access restrictions, an alternative VP4 (VP4b) had to be used in April. Access was restored in May 2018 and viewsheds were considered comparable for both VPs.
- Two VPs received less than 36 hours of watches during the survey period. However, as there were 6 seasons of surveys carried out as opposed to the recommended 4 seasons, and some VPs received in excess of 36 hours, it is considered that the flightline data collected is sufficient. In addition, there is overlap in the viewsheds of the VPs, which means part of the 500m turbine buffer received additional coverage that is controlled for in the collision risk modelling.
- Due to access restrictions, in summer 2018 and 2019, only two upland breeding bird surveys were carried out as opposed to the recommended four visits. Due to low observed usage of the OSA by breeding waders, and four seasons of surveys were carried out as opposed to the recommended two seasons, the surveys were determined to be sufficient.
- Three upland breeding bird surveys were carried out in summer 2021, as opposed to the recommended four visits. This was considered appropriate as no breeding waders (apart from snipe) were recorded during the first two visits and the third visit covered the fledging period.

Considering an additional three seasons of surveys (two complete seasons and one season of targeted surveys) were carried out, it is considered that the survey period provides an extensive data set to sufficiently inform the ornithological baseline and undertake a robust ornithological impact assessment for the Development.

11.3.15 Embedded Mitigation

While the results of the desk study and field surveys identified that no specific 'embedded (design-stage) mitigation' was required in relation to birds, it should be noted that the requirement to drop turbines from the highest ridge on the site (as part of the Landscape Impact Assessment) has resulted in some positive outcomes for ornithological features here. This includes for golden plover, for which activity largely occurred in the southern parts of the OSA, and merlin, for which the Development is located further from the 2021/2022 nest site than the operational Owenreagh I and II Wind Farms. In addition, recommendations within **Chapter 10: Ecology** and **Technical Appendix 3.2: Draft HMEP** include avoiding the installation of new fencing in certain parts of the site and the use of wildlife-friendly/high visibility fencing, where fencing is needed. This has been taken into consideration for breeding red grouse and merlin, which are at particular risk of collision with fencing (see Sections 11.5.3.1 and 11.5.3.4, respectively).

11.4 BASELINE CONDITIONS

11.4.1 General Site Description

The OSA is located in the townlands of Craignagapple, Ballykeery, Knockinarvoe, Owenreagh, Ligfordrum and Lagavadder, Co. Tyrone and lies approximately 5 km east of Strabane, Co. Tyrone. The River Foyle flows in a northerly direction approximately 7.5 km west of the OSA and is hydrologically connected via the Glenmornan River and the Owenreagh Burn. The OSA includes the operational Owenreagh I and II Wind Farms, with the operational site access point located at National Grid Reference: H 42364 97232.

The OSA lies within a rural area, at an average altitude of 350 m above sea level. Owenreagh Hill is generally composed of cutover, drained and degraded upland blanket bog, acid grassland and more improved pasture with steep slopes and uneven terrain, underlain by a quartzite bedrock. The surrounding habitats include areas of coniferous plantation and farmland.

11.4.2 Designated Sites

The potential for significant effects on the integrity of internationally designated sites is assessed fully within the Habitats Regulations Assessment (HRA) report which accompanies this application. This chapter will therefore only incorporate the key findings of the HRA.

The area extending 15 km from the Development was taken as the distance within which the initial desktop search was undertaken, based on DoEHLG (2010)[22] and Scott Wilson *et al*. (2006)[23]. In some cases, the zone of influence of a proposal may be much shorter depending on the ecological feature being considered, or it could occasionally extend significantly beyond this distance, for example where there is hydrological connectivity to a designated site via a river network.

There are no SPAs or Ramsar sites within 15 km of the proposed wind turbine locations. There is, however, a downstream hydrological connection to the River Foyle SPA and Ramsar site, which is designated for a number of wetland and waterbirds, see Table 11.5 and Figure A11.1.5 in **Technical Appendix 11.1: Ornithology**. This connection is via the Glenmornan River (river segment code: GBNI0102203)[24] in the north and the Owenreagh Burn (river segment code: GBNI0102202) in the west of the OSA. Both rivers meet *c.* 3 km north-west of the OSA and eventually flow into the River Foyle and, subsequently, Lough Foyle.

SNH guidelines recommend that core foraging ranges of species should be examined to assess connectivity between the site and surrounding SPAs (SNH, 2016; 2017)[25]. As detailed in Table 11.5, the closest SPA to the OSA is Lough Foyle SPA, which lies *c.* 22.9 km north-west. As such, the OSA lies outside of any reported core or maximum foraging ranges for the species that are Qualifying Interests of this SPA (SNH, 2016).

Table 11.5: SPAs within 15 km of or with a hydrological connection to the Development

SPA	Distance to 500 m turbine buffer	Special Conservation Interests (SCIs)
Lough Foyle SPA Co. Derry Site code: UK9020031	*c.* 22.9 km north-west and 40 km via watercourse	• In winter regularly supports internationally important numbers of whooper swan, light-bellied brent goose and bar-tailed godwit. • Supports over 20,000 internationally and nationally important migratory waterfowl including whooper swan, light-bellied brent goose, bar-tailed godwit, red-throated diver, great crested grebe, mute swan, Bewick's swan, greylag geese, shelduck, teal, mallard, wigeon, eider, red-breasted merganser, oystercatcher, golden plover, grey plover, lapwing, knot, dunlin, curlew, redshank and greenshank. Also supports a small wintering population of Slavonian grebe.
Lough Foyle Ramsar site Site No: 974	*c.* 23.7 km north-west and 40 km via watercourse	• Ramsar criterion 1: this is a particularly good representative example of a wetland complex including intertidal sand and mudflats with extensive seagrass

22 Department of Environment, Heritage and Local Government (2010). *Appropriate Assessment of Plans and Projects in Ireland – Guidance for Local Authorities*.
23 Scott Wilson, Levett-Therivel Sustainability Consultants, Treweek Environmental Consultants and Land Use Consultants (2006). *Appropriate Assessment of plans*.
24 NI Rivers Map Viewer- WFD. Available at: Interactive Web Map of Northern Ireland Rivers (azimap.com) (Accessed December 2022)
25 Scottish National Heritage, now NatureScot - SNH (2016). *Assessing Connectivity with Special Protection Areas (SPAs)*. SNH Guidance Note; Scottish Natural Heritage, now NatureScot - SNH (2017). *Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms*. SNH Guidance Note. Version 2.

SPA	Distance to 500 m turbine buffer	Special Conservation Interests (SCIs)
		beds, saltmarsh, estuaries and associated brackish ditches and 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. • Ramsar criterion 2: the site supports an appreciable assemblage of rare, vulnerable or endangered species or sub-species of plant and animal. • Ramsar criterion 3: the site supports a diverse assemblage of wintering waterfowl which are indicative of wetland values, productivity and diversity. These include internationally important populations of whooper swan, light-bellied brent goose and bar-tailed godwit. Additional wildfowl species which are nationally important in an all-Ireland context are red-throated diver, great crested grebe, mute swan, Bewick's Swan, greylag geese, shelduck, teal, mallard, wigeon, eider, and redbreasted merganser. Nationally important wader species are oystercatcher. golden plover, grey plover, lapwing, knot, dunlin, curlew, redshank and greenshank. • Ramsar criterion 5: the site supports about 29000 migrating birds. • Ramsar criterion 6: species/populations occurring at levels of international importance
Lough Foyle SPA Co. Donegal Site code: 004087	*c.* 26.7 km north-west and 40 km via watercourse	• Red-throated Diver *(Gavia stellata)* [A001] • Great Crested Grebe *(Podiceps cristatus)* [A005] • Bewick's Swan *(Cygnus columbianus bewickii)* [A037] • Whooper Swan *(Cygnus cygnus)* [A038] • Greylag Goose *(Anser anser)* [A043] • Light-bellied Brent Goose *(Branta bernicla hrota)* [A046] • Shelduck *(Tadorna tadorna)* [A048] • Wigeon *(Anas penelope)* [A050] • Teal *(Anas crecca)* [A052] • Mallard *(Anas platyrhynchos)* [A053] • Eider *(Somateria mollissima)* [A063] • Red-breasted Merganser *(Mergus serrator)* [A069] • Oystercatcher *(Haematopus ostralegus)* [A130] • Golden Plover *(Pluvialis apricaria)* [A140] • Lapwing *(Vanellus vanellus)* [A142] • Knot *(Calidris canutus)* [A143] • Dunlin *(Calidris alpina)* [A149] • Bar-tailed Godwit *(Limosa lapponica)* [A157] • Curlew *(Numenius arquata)* [A160] • Redshank *(Tringa totanus)* [A162] • Black-headed Gull *(Chroicocephalus ridibundus)* [A179] • Common Gull *(Larus canus)* [A182] • Herring Gull *(Larus argentatus)* [A184] • Wetland and Waterbirds [A999]

11.4.3 Existing Ornithological Records

A detailed description of the existing ornithological records within the OSA and wider area can be found in Section 2 of **Technical Appendix 11.1: Ornithology**.

11.4.4 Field Survey Results

The results of the field surveys undertaken within the OSA and wider area can be found in Section 4 of **Technical Appendix 11.1: Ornithology** and a comprehensive list of all bird species recorded during the survey period can be found in Table A11.1.6.1. The target species described in the following sections are those which are considered to have potential for significant effects as a result of the Development (KORs). Species which were scoped out of the assessment are listed in Section 11.3.3 of **Technical Appendix 11.1: Ornithology**.

KORs which are being considered as part of the impact assessment process are listed in Table 11.6, along with their conservation status (Birds of Conservation Concern in Ireland (BoCCI4) for the ROI and NI and Birds of Conservation Concern 5 (BoCC5) for the UK (Stanbury *et al.*, 2021; Gilbert *et al.*, 2021)[26]). KORs are listed by species group (game birds, waders, raptors, riverine species, passerines) and in order of their conservation importance within their respective groups.

Table 11.6: Key Ornithological Receptors

BTO code	Species	Annex I EU Birds Directive	NI Priority List (2023)	BoCCI4 (RoI & NI)	BoCC5 (UK)
RG	Red grouse	N	Y	Red Br	Green
GP	Golden plover	Y	Y Br & Win	Red Br & Win	Green
SN	Snipe	N	Y Br	Red Br & Win	Amber
ML	Merlin	Y	Y	Amber Br	Red
K	Kestrel	N	Y	Red Br	Amber
SH	Sparrowhawk	N	N	Green	Amber
BZ	Buzzard	N	N	Green	Green
N/A	Riverine species	N	Y	N/A	N/A
N/A	Ground nesting red-listed passerines	N	Y	Red Br	Red
N/A	Other breeding red-listed passerines	N	Y	Red Br	Red

11.4.4.1 Red grouse

Based on walkover data and birds heard calling during VP watches, there is potential for three to four pairs of red grouse to occur within the Study Area. The southern part of the OSA had the highest levels of red grouse activity during the survey period, with birds regularly flushed, droppings found, and birds heard calling on multiple occasions from VP3 and on one occasion from VP4. The majority of records were in the vicinity of VP3 and the existing substation, which correlates with some of the denser areas of heather within the OSA. It was noted in the early stages of the survey period (2018/2019) that low incidences of grouse in the area surrounding VP4 may be due to

[26] Stanbury, A., Eaton, M., Aebischer, N., Balmer, D., Brown, A., Douse, A., Lindley, P., McCulloch, N., Noble, D., and Win, I. (2021). The status of our bird populations: the fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. *British Birds*, 114, 723-747; Gilbert, G., Stanbury, A., & Lewis, L. (2021). Birds of Conservation Concern in Ireland 2020 – 2026. *Irish Birds*, 43, 1–22.

significant sections of the northern slopes of Owenreagh being burnt just prior to this period, adversely affecting the amount of cover for nesting grouse. In March 2021, droppings were also recorded north of the Glenmornan Road and a bird was recorded calling twice from this location in December 2021 from VP1. This correlates with a breeding territory identified in the north of the OSA in 2009 and 2010 (BioSphere Environmental Services, 2014)[27]. Estimated breeding territories for red grouse are presented in Figure A11.1.7.1 of **Technical Appendix 11.1: Ornithology**.

Relatively low breeding densities are typical for the northwest of Ireland and the OSA would not be expected to support more than three to four pairs in its current condition. It has also been reported that red grouse are actively hunted in parts of the OSA, which may explain the relatively low levels of abundance recorded out of the breeding season.

Over the study period, only one flight was observed for red grouse (short flight at 1 m) and all other records during VP watches were of flushed, calling birds or birds feeding on the ground. No red grouse were observed within the CRZ (above 20 m).

11.4.4.2 Golden plover

Golden plover were recorded during all six survey seasons, with the majority of records occurring in the southern part of the OSA between VP3 and VP4 (see Figure A11.1.3.2-Figure A11.1.3.7 of **Technical Appendix 11.1: Ornithology**). Golden plover were the most frequently recorded target species recorded during the VP watches with an aggregated flight time of 314,278 seconds within the CRZ. Most of the observations (n = 101) were wintering records, where flocks of up to 160 birds (mean flock size of 28 birds recorded within the OSA) were recorded flying/circling within and adjacent to the OSA. Flightlines regularly passed through the existing array of turbines and birds were also observed showing turbine avoidance behaviour. Based on flightline and walkover data capturing birds foraging/roosting on the ground, the operational wind turbines appear to overlap somewhat with core golden plover foraging areas. Flocks appeared to be attracted to the ridge of Owenreagh and Craignagapple, often concentrating in areas with bare peat and small bog hags.

Flights during the breeding seasons were mostly birds on passage in March and April, though there were two records of birds calling during the 2021 breeding season:

- On 18 June 2021 a bird was heard calling from the west of the OSA, *c*. 300 m south of Napple Road, during a walkover survey; and
- On 24 July 2021 a bird was heard calling from VP4 on 5 occasions between 16:41 and 17:57 on the southern slopes of Owenreagh Hill, north of VP4.

Golden plover are a species which aggressively defend nest sites and perform distinct display and distraction flights when breeding (Ratchliffe, 1976)[28]. Despite these two incidences of calling birds during the breeding season, no territorial or display behaviour was seen and no breeding attempts were detected. As such, the two calling birds may have been breeding birds visiting the OSA to forage or failed breeding birds. The habitat quality beyond the existing array of turbines was considered of moderate to low quality for this species – being relatively rank or dense heather. There is some limited potential for this species to breed within the OSA, though there are no historic breeding records (Sharrock, 1976)[29].

[27] Biosphere Environmental Services (2014). *Habitat and Species Management Plan, Craignagapple Wind Farm*. Unpublished report.
[28] Ratchliffe, D. A. (1976). Observations on the Breeding of the Golden Plover in Great Britain. *Bird Study*, 23(2), 63-116.
[29] Sharrock, J. T. R. (1976). *The Atlas of Breeding Birds in Britain and Ireland*. Calton, England: T. & A. D. Poyser.

11.4.4.3 Snipe

Aggregated flight time for snipe within the OSA was relatively low (195 seconds, 181 of which were in the CRZ). However, as flight activity for this species is largely crepuscular (active at dawn and dusk) and VP surveys are carried out during daylight hours, VP surveys are not always an effective method of estimating snipe flight activity. As such, flight time within the OSA is likely underestimated. Flights were mostly concentrated within the core breeding areas identified in Technical Appendix 11.1 (see Figure A11.1.3.8 and Figure A11.1.7.2 of **Technical Appendix 11.1: Ornithology**).

Snipe were the only wader species breeding within the OSA and territorial birds (drumming and chipping) were recorded from the wetter areas adjacent to VP1, VP3 and VP4 during the 2018, 2019 and 2021 breeding wader surveys, with the eastern part of the OSA between the existing substation and Napple Road holding the highest densities (see Figure A11.1.7.2 of **Technical Appendix 11.1: Ornithology**). Across the OSA as a whole, breeding densities were relatively low (max 3-4 pairs in 2019), reflecting the predominately free draining nature of the OSA resulting in a patchy breeding distribution for this species, which selects wetter breeding sites. In 2018, it was noted that drought conditions were experienced which may have caused snipe to abandon breeding attempts due to wetter areas drying out. Numbers of chipping/drumming birds increased in 2019 and 2021 but in summer 2022, no snipe were flushed or heard during the breeding season. It should be noted that this may have been as a result of a surge in avian influenza at this time. Alternatively, weather conditions may have resulted in a drier spring, reducing the overall suitability of the OSA for breeding snipe.

Snipe over winter within the OSA in higher numbers and were regularly flushed on walkovers.

11.4.4.4 Merlin

Merlin observations within the CRZ during the VP watches were relatively low (180 seconds), though it is acknowledged that VP surveys are not always an appropriate methodology for this species (Madders & Whitfield, 2006)[30]. This is due to the low detectability of merlin (size, plumage and behaviour) and their sensitivity to disturbance from observers. Though flight time within the CRZ was likely underestimated, it should also be noted that most of the flight time for merlin (898 seconds) was recorded at <20 m. This reflects their low flight behaviour. Merlin flightlines are shown in Figure A11.1.3.11 of **Technical Appendix 11.1: Ornithology**.

There is a longstanding merlin territory within the conifer plantation in the south-west of the OSA (see Figure A11.1.7.3 of **Technical Appendix A11.1: Ornithology**), which was picked up during the first survey season when a male merlin was seen exhibiting territorial behaviour over this area in May 2018. Following this, extra survey effort was allocated to monitoring and tracking the success of this pair. Though nest locations can vary between years (in particular for tree-nesting merlin, as they do not maintain nest sites), merlin are site faithful, and territories can be occupied from year to year. Territories can also be used by successive generations with some studies finding birds occupying territories for over 70 years (Newton *et al.*, 1978)[31].

Surveys carried out in 2019 also found merlin attempting to breed in this area, though a nest was not pinned down at this point. In 2021, breeding was confirmed in the south-western point of the forestry by the presence of two fledglings. Merlin were again confirmed to be breeding at this same location in 2022, though it was noted by a

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[30] Madders, M. & Whitfield, P. (2006). Upland raptors and the assessment of wind farm impacts. *IBIS*, 148(1), 43-56.

[31] Newton, I., Meek, E. R. & Little, B. (1978). Breeding ecology of the Merlin in Northumberland. *British Birds*, 71, 376–398.

surveyor that the pair failed later in the breeding season, likely due to the nest being predated.

11.4.4.5 Kestrel

After buzzards, kestrels were the most regularly recorded raptor species within the OSA with 3,839 flight seconds recorded within the CRZ over the study period. As shown in Figure A11.1.3.14 of **Technical Appendix 11.1: Ornithology**, kestrels regularly foraged through the OSA over both the winter and breeding seasons.

A male kestrel may have been prospecting for a nest site in a shelter belt near VP1 in summer 2018 however, the site was not occupied. This was suspected to be as a result of a high number of corvid species in the area. On 17 May 2018, a kestrel was also seen mobbing a peregrine along the Ballykeery Rd, south-west of VP3. No other breeding/territorial behaviour was noted within the 2 km Study Area during the survey period and no nest sites were identified. However, based on the usage observed, it is likely that there is at least one pair of breeding kestrel in the wider area and that the foraging range of this pair overlaps with the OSA.

11.4.4.6 Sparrowhawk

A relatively small number of sparrowhawk flightlines (n=10) were recorded within the OSA over the survey period – see Figure A11.1.3.15 of **Technical Appendix 11.1: Ornithology**. These were largely of flying and hunting birds, and no breeding/territorial behaviour was identified within the OSA. As is the case with merlin, relying on VP watch data and the resultant CRMs may not be an appropriate methodology for assessment of collision risk in a small, more elusive raptor species like sparrowhawk (Madder & Whitfield, 2006)[32]. Though flight times from VP watches have the potential to be underestimated, it should also be noted that the open nature of the OSA and the limited occurrence of woodland habitats is likely to contribute to the low number of observations. This can be seen in Figure A11.1.3.15 of **Technical Appendix 11.1: Ornithology**, which shows that flightlines were largely associated with areas of woodland/scrub and forestry.

In terms of the 2 km Study Area, in summer 2021, a pair was seen circling together on two occasions over a woodland area *c.* 350 m north of VP1. This behaviour was picked up once on a wider area breeding raptor survey on 26 March 2021 and again from VP1 on 03 April 2021. Subsequently, in July 2021, two suspected juvenile sparrowhawks were seen hunting together and chasing one another on Owenreagh Hill adjacent to the existing wind turbine array. An immature male was also seen hunting directly adjacent to the suspected breeding territory on 28 January 2022 during the wider area wintering waterbird surveys. Consequently, it is considered that there is at least one sparrowhawk breeding territory within the 2 km buffer (see Figure A11.1.7.3 of **Technical Appendix 11.1: Ornithology**), and that parts of the OSA are used occasionally by this pair for hunting and commuting.

11.4.4.7 Buzzard

Buzzards were the most commonly recorded raptor, with 144 observations recorded within the OSA during the VP watches (see Figures A11.1.3.16-19 of **Technical Appendix 11.1: Ornithology**). Buzzard observations generated the highest number of raptor flight seconds within the CRZ (66,672 seconds) over the 6 seasons. No breeding sites were detected within the OSA over the survey period and the availability of suitable nesting habitat (woodland) is limited to a small number of wooded areas and forestry blocks.

[32] Madders, M. & Whitfield, P. (2006). Upland raptors and the assessment of wind farm impacts. *IBIS*, 148(1), 43-56.

Due to the late start of the breeding season surveys in summer 2018, no nest sites were identified in the hinterland, however, it was suspected that two pairs were holding territories in the vicinity of the OSA and, based on a relatively high frequency of visits by buzzards, a possible nest site was identified in a small plantation south of VP4. In summer 2019, a likely changeover was observed between a male and female buzzard in a small area of trees surrounding an old farmhouse off Napple Road, 200 m east of VP1, indicating a probable nest site here. This correlated with the highest number of buzzard flightlines, including a pair observed displaying, being from VP1 in summer 2019. In summer 2021, a family of buzzards (2 adults and 3 juveniles) was seen in August from VP1, which suggested that this nest site was occupied again.

A bird was also seen carrying prey (provisioning) at Glenmornan, north-east of the 2 km buffer on 26 March 2021 and it was noted by a surveyor that birds were regularly seen in this area in summer 2021. Another breeding territory was identified at Lough Ash during the wider area wintering waterbird surveys carried out in winter 2021-22, though this pair are outside of the zone of influence of the development (*c.* 5.1 km from the nearest proposed turbine location). Buzzard territories identified within the 2 km Study Area throughout the study period are shown in Figure A11.1.7.3 of **Technical Appendix 11.1: Ornithology**.

Based on activity within the OSA and environs, it is likely that up to two buzzard pairs hold territories within the 2 km turbine buffer. Though no breeding territories were identified within the OSA during the survey period, there is potential for buzzard to utilise the small areas of mature trees south of T13 and east of T2 in subsequent years. These areas are being retained within the Development.

A buzzard corpse was recovered near the hardstand of the existing T14 on 12 July 2020 during the bat carcass searches carried out (see **Chapter 10: Ecology**). Due to the decomposition, it was not determined whether this was an adult or juvenile bird.

11.4.4.8 Riverine Species

Riverine bird species require good water quality to support the prey species they forage on. Two species associated with riverine habitats hydrologically connected to the OSA were recorded during surveys, namely grey wagtail and dipper.

Grey wagtails were observed along both the Legnahone Burn (within the OSA) and Owenreagh Burn (immediately adjacent to the OSA) and were recorded during summer 2018, 2019 and 2021. Though no nest sites were identified during the walkover surveys, this red-listed passerine species is considered as possibly breeding within the OSA.

Dipper were recorded within the OSA during the otter surveys carried out in 2019. On 06 February 2019, a dipper was seen foraging at the road bridge over the Legnahone Burn along Napple Road, indicating that this river segment may form part of a breeding territory. No nests were observed at this bridge during the survey period.

Dipper were also recorded during the wider area wintering waterbird surveys carried out in winter 2021-22. Single birds were recorded on two occasions at Jack's Bridge along the Burn Dennett, 3.5 km north-east of the nearest proposed turbine location. On one occasion, a bird was flushed by the surveyor from underneath the bridge. On the next occasion, a bird was recorded exhibiting territorial (singing) behaviour (Magoolagan & Sharp, 2018)[33] along the banks of the river, indicating a territory along this stretch of the river (typical home range 0.5-2.5 km (Tyler *et al.*, 1990)[34]). Though a

[33] Magoolagan, L. & Sharp S. P. (2018). Song function and territoriality in male and female White-throated Dippers *Cinclus cinclus. Bird Study*, 65(3), 396-403.
[34] Tyler, S. J., Ormerod, S. J. & Lewis, J. M. S. (1990). The post-natal and breeding dispersal of Welsh Dippers *Cinclus cinclus* . *Bird Study*, 37(1), 18-22.

nest-site was not observed at Jack's Bridge during the survey period, bridges are often used by nesting dipper. It should be noted that this pair occur upstream of the proposed works.

11.4.4.9 Red-listed Passerine Species

11.4.4.9.1 Ground nesting red-listed passerines

The red-listed ground-nesting passerine species meadow pipit and skylark were recorded as breeding within the OSA, with the footprint of the Development overlapping with confirmed breeding territories. Cuckoo were also included in the assessment as they are brood parasites and meadow pipit, which were recorded frequently throughout the OSA, are one of the most commonly used host species. Both skylark and meadow pipit were distributed throughout the entirety of the OSA. Cuckoo were recorded less frequently and were largely associated with the agricultural habitats in the north-east of the OSA.

11.4.4.9.2 Other red-listed breeding passerines

Other red-listed breeding species occurring within the OSA included lesser redpoll, house sparrow, mistle thrush, linnet and starling. Lesser redpoll are considered to be breeding within the conifer plantation habitats within the OSA. Linnet were recorded on four occasions within the OSA, and were mostly associated with the area north-west of the OSA boundary, where they are most likely to be breeding within areas of scrub and gorse. Though no breeding/territorial behaviour was noted within the OSA, linnet were included on a precautionary basis as possible breeding. Mistle thrush and song thrush were recorded singing from areas of forestry plantation and treelines, including the trees around the derelict farm building in the north-east of the OSA.

House sparrow were found to be breeding within a farm building off the Glenmornan Road in the north-west of the OSA. Usage of the OSA by house sparrow was limited to this farm building, as this species tends to favour areas associated with human occupation. Starlings were also recorded as nesting in this farm building, along with the derelict farm building in the north-east of the OSA, and the operational Owenreagh I and II Wind Farms substation.

11.4.5 Sensitivity and Geographic Evaluation of Key Ornithological Receptors

The desk-based study and six seasons of ornithological surveys, with an additional season of targeted breeding merlin and snipe surveys, have identified a number of KORs. Based on the criteria listed in Table 11.2 (Percival, 2003)[35] for assessing sensitivity of avian populations, no KORs were assessed as having very high or high sensitivity. The sensitivity of each KOR, along with the geographic evaluation, is presented in Table 11.7.

Table 11.7: Sensitivity (Percival, 2003) and geographic evaluation of KORs

Species	**Rational for inclusion as a KOR**	**Sensitivity** (Percival, 2003)	**Population numbers**	**Highest geographic evaluation** (CIEEM 2018)[36]
Red grouse	• Red-listed in BoCCI4 • NI priority species	Medium	• 202-221 pairs (NI)[37]	Regional

[35] Percival, S. M. (2003). *Birds and wind farms in Ireland: A review of potential issues and impact assessment*. Ecology Consulting, Coxhoe, Durham.
[36] CIEEM (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*. Chartered Institute of Ecology and Environmental Management, Winchester. Version 1.2. April 2022.
[37] Allen, D., Mellon, C., Mawhinney, K., Looney, D. & Milburne, J. (2005). The Status of Red Grouse *Lagopus lagopus* in Northern Ireland 2004. *Irish Birds*, 7, 449-460.

Species	**Rational for inclusion as a KOR**	**Sensitivity** (Percival, 2003)	**Population numbers**	**Highest geographic evaluation** (CIEEM 2018)[36]
	• Up to 3-4 pairs breeding within the OSA.		• 265,000 pairs (UK)[38]	
Golden plover	• Annex I species • Red-listed in BoCCI4 • NI priority species. • OSA supports wintering flocks (max 160, mean 28 birds).	Medium	• 10,000-20,000 wintering birds (NI)[39] • 400,000 wintering birds (UK)[40]	District
Snipe	• Red-listed in BoCCI4 • NI priority species • Up to 3-4 pairs breeding in some years within the OSA.	Medium	• 1,123 pairs (NI)[40] • 64,500 pairs (UK)[40]	Local
Merlin	• Annex I species • Red-listed in BoCC5 • NI priority species • One pair confirmed breeding within the OSA.	Medium	• 32 pairs (NI) [41] • 1,162 pairs(UK)[43]	Regional
Kestrel	• Red-listed in BoCCI4 • NI priority species • High levels of foraging activity within the OSA • Up to one pair breeding within the 2 km Study Area.	Medium	• 1,000 pairs (NI)[40] • 30,000 pairs (UK)[40]	Local
Sparrowhawk	• Amber-listed in BoCC5 • Up to one breeding pair within the 2 km Study Area	Low	• 2,000 pairs (NI)[42] • 28,500 pairs (UK)[44]	Local
Buzzard	• High levels of foraging activity within the OSA • Up to two breeding pairs within the 2 km Study Area • High susceptibility to collisions and carcass found during turbine searches.	Low	• 1,500-2,500 pairs (NI)[44] • 61,500–85,000 pairs (UK)[44]	Local
Riverine species	• Grey wagtail red-listed in BoCCI4, NI priority species • Dipper amber-listed in BoCC5	Low-Medium	N/A	Local

[38] Woodward, I., Aebischer, N., Burnell, D., Eaton, M., Frost, T., Hall, C., Stroud, D. A. & Noble, D. (2020). Population estimates of birds in Great Britain and the United Kingdom. *British Birds*, 113, 69–104.
[39] Musgrove et al. (2013). Population estimates of birds in Great Britain and the United Kingdom. *British Birds*, 106, 64–100; Woodward, I., Aebischer, N., Burnell, D., Eaton, M., Frost, T., Hall, C., Stroud, D. A. & Noble, D. (2020). Population estimates of birds in Great Britain and the United Kingdom. *British Birds*, 113, 69–104.
[40] Colhoun, K., Mawhinney, K. & Peach, W. (2015). Population estimates and changes in abundance of breeding waders in Northern Ireland up to 2013. *Bird Study*, 62.
[41] Ewing, S. R., Rebecca, G. W., Heavisides, A., Court, I., Lindley, P., Ruddock, M., Cohen, S. & Eaton, M. A. (2011). Breeding status of the Merlin *Falco columbarius* in the UK in 2008. *Bird Study*, 58, 379–389.
[42] Woodward, I., Aebischer, N., Burnell, D., Eaton, M., Frost, T., Hall, C., Stroud, D. A. & Noble, D. (2020). Population estimates of birds in Great Britain and the United Kingdom. *British Birds*, 113, 69–104.

Species	Rational for inclusion as a KOR	Sensitivity (Percival, 2003)	Population numbers	Highest geographic evaluation (CIEEM 2018)[36]
	• Possible breeding within the OSA • Sensitivity to water quality impacts.			
Ground-nesting red-listed passerines	• Red-listed in BoCCI4 or BoCC5 • NI priority species • Meadow pipit, skylark and cuckoo confirmed breeding within the OSA.	Medium	N/A	Local
Other breeding red-listed passerines	• Red-listed in BoCCI4 or BoCC5 • NI priority species. • Linnet, mistle thrush, starling, house sparrow and lesser redpoll possible breeding within the OSA.	Medium	N/A	Local

11.5 ASSESSMENT OF POTENTIAL SIGNIFICANT EFFECTS

This section assesses the potential significant effects of the Development on designated sites and KORs, as outlined in Table 11.5 and Table 11.6. Decommissioning and construction, operational and final decommissioning effects are considered under the headings of each KOR.

11.5.1 'Do nothing' Effects

The OSA comprises upland blanket bog and farmland habitat that is currently managed through grazing practices as well as the operational Owenreagh I and Owenreagh II Wind Farms and the associated site infrastructure. The area is considered likely to remain in agricultural use in the future with both cattle and sheep grazing carried out. In the 'Do-Nothing' scenario, the site would remain as an operational wind farm, at which point the wind farm may be either decommissioned or repowered.

The habitats on site are notably degrading (as described in **Technical Appendix 3.2: Draft HMEP**) due to existing land drainage, dewatering from significant historic peat cutting, grazing and poaching of ground from cattle, and occasional burning of heath in the area. In the 'Do-Nothing' scenario, these adverse impacts are likely to continue at current levels. This may mean that numbers of breeding snipe could continue to decline (3-4 pairs in 2019 vs no pairs in 2022) and that breeding curlew are unlikely to return to the area.

During the surveys of the site which were conducted over several years, it was notable that significant surface water drainage and erosion is occurring in the OSA. This is strongly influenced by past land management practices (including historic peat cutting) which have resulted in undermined hydrological units across the entire OSA (further information is provided in **Chapter 8: Hydrology and Hydrogeology**). Features such as the Legnahone Burn, which have been recorded to support riverine species such as grey wagtail and dipper notably had obvious iron rich pollutants which were particularly visible during low water conditions when they were allowed to accumulate. As such, in the 'Do nothing' scenario, water quality conditions may continue to degrade over time, impacting water dependent species such as riverine species and snipe.

11.5.2 Potential Effects on Designated Sites

A shadow Habitats Regulations Assessment (sHRA) has been carried out as part of this Application and, as such, potential effects on designated sites are not addressed in detail within this chapter. As detailed in Table 11.5, the closest designated site to the OSA is Lough Foyle SPA and Ramsar Site, which lies *c.* 22.9 km north-west. The OSA therefore lies outside of any reported core or maximum foraging ranges for the SCI species of this SPA, in accordance with SNH (2016)[43].

The OSA is also hydrologically connected to Lough Foyle SPA and Ramsar site and a construction related pollution incident or sedimentation (*e.g.* accidental spillage of hydrocarbons, cement/concrete entering the water course or a peat slippage) therefore has some limited potential to cause impacts to SCI species. As assessed in **Chapter 8: Hydrology and Hydrogeology**, residual effects on water quality immediately downstream of the OSA are assessed as being not significant. Such effects would be further reduced by substantial dilution prior to reaching the SPA. In addition, there will be a strict requirement for appropriate water quality mitigation to be in place during construction (see **Technical Appendix 3.1: Decommissioning and Construction Environmental Management Plan** (DCEMP)). Potential effects on the SCI species of Lough Foyle SPA and Ramsar Site are therefore assessed as negligible, and not significant in terms of the EIA Regulations.

11.5.3 Potential Effects on Key Ornithological Receptors

11.5.3.1 Red Grouse

11.5.3.1.1 Decommissioning and Construction Phase

As a red-listed species (Gilbert *et al.*, 2021)[44], red grouse are classified as <u>medium</u> sensitivity, in accordance with Percival (2003)[45]. Due to the sedentary nature of red grouse, population effects are more acute at the local level as red grouse remain within close proximity to natal sites (Warren & Baines, 2007)[46]. It is therefore considered more appropriate to assess population impacts at the regional (NI) level rather than the national (UK) level.

As can be seen in Figure A11.1.7.1 of **Technical Appendix 11.1: Ornithology**, the proposed turbines T10, T11 and T12 and associated infrastructure overlap with a red grouse breeding area. In the absence of mitigation, inappropriately timed works therefore have the potential to result in direct effects such as nest destruction and chick mortality. The sedentary nature of red grouse, and patchy distribution of suitable habitat in the wider area, may also mean that local populations could be susceptible to localised extinctions in the absence of mitigation. In the short-term, unmitigated works therefore have the potential to result in direct effects on up to 3 to 4 pairs of red grouse nesting within the OSA. This is equivalent to 1.4-2% of the regional (NI) population of 202-221 pairs (Allen *et al.*, 2005)[47], resulting in a <u>low</u> magnitude of effect (1-5% population effect). The significance of effect is therefore assessed to be **low** on the regional level.

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[43] Scottish National Heritage, now NatureScot - SNH (2016). *Assessing Connectivity with Special Protection Areas (SPAs)*. SNH Guidance Note.
[44] Gilbert, G., Stanbury, A., & Lewis, L. (2021). Birds of Conservation Concern in Ireland 2020 – 2026. *Irish Birds*, 43, 1–22.
[45] Percival, S. M. (2003). *Birds and wind farms in Ireland: A review of potential issues and impact assessment*. Ecology Consulting, Coxhoe, Durham.
[46]
[47] Allen, D., Mellon, C., Mawhinney, K., Looney, D. & Milburne, J. (2005). The Status of Red Grouse *Lagopus lagopus* in Northern Ireland 2004. *Irish Birds* , 7, 449-460.

In terms of indirect effects, red grouse densities have been reported to decline on wind farms during construction (Pearce-Higgins *et al.*, 2012)[48] and some disturbance/displacement is therefore expected during the decommissioning and construction phase, which may cause the local population to be depressed temporarily. Overall, this species is reported to be relatively insensitive to wind farm infrastructure and breeding densities have been found to recover post-construction (Pearce-Higgins *et al.*, 2009; 2012)[49], although population densities in Scotland, where this study was carried out, are generally much higher than in Ireland. Thus, recovery post-construction will be dependent on the availability of suitable habitat in the wider area to support displaced birds. McGuinness *et al.* (2015)[50] report a 500 m 'zone of sensitivity' to wind farms for red grouse and, in the case of the Development, there is considered to be enough suitable habitat beyond this to support displaced birds. Additionally, red grouse have a high fecundity, capable of producing broods of up to 14 young (Martínez-Padilla *et al.*, 2013)[51], which further contributes to the ability of the local population to recover from temporary works.

Based on red grouse's apparent tolerance to wind farm infrastructure, high fecundity, and the short-term nature of the works, the magnitude of effect of indirect effects to red grouse was determined to be negligible at the regional level, resulting in a **very low significance** of effect.

11.5.3.1.2 Operational Phase

The overlap of turbine infrastructure with a red grouse breeding area will result in some, albeit limited, long-term indirect effects in the form of loss of breeding/foraging habitat. Additionally, wind farm infrastructure, such as inappropriately designed drains and fencing, can act as a barrier to flightless chicks, which can become trapped. There is therefore potential for indirect effects due to habitat loss and fragmentation, in the absence of mitigation. **Chapter 3 Development Description** outlines the decommissioning phase of the project.

Red grouse are currently successfully breeding at low densities within the operational Owenreagh I and II Wind Farms and it is considered that this species has become habituated to the existing turbine array. As such, during the operational phase of the Development, breeding densities of red grouse are expected to recover (Pearce-Higgins *et al.*, 2012)[52], and birds are likely to become habituated to the Development. In some instances, red grouse have been found to have a positive association with wind farm infrastructure, in particular wind farm tracks which are thought to be potentially used as a source of grit to aid digestion (Douglas *et al.*, 2011)[53]. Additionally, Pearce-Higgins *et al.* (2009)[54] found no evidence of turbine avoidance in red grouse.

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[48] Pearce-Higgins, J. W., Stephen, L., Douse, A. and Langston, R. H. W. (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, 386-394.

[49] Pearce-Higgins, J. W., Stephen, L., Langston, R. H. W., Bainbridge, I. P., and Bullman, R. (2009). The Distribution of Breeding Birds around Upland Wind Farms. *Journal of Applied Ecology*, 46(6), 1323-1331.

[50] Mc Guinness, S., Muldoon, C., Tierney, N., Cummins, S., Murray, A., Egan, S. & Crowe, O. (2015). *Bird Sensitivity Mapping for Wind Energy Developments and Associated Infrastructure in the Republic of Ireland*. BirdWatch Ireland, Kilcoole, Wicklow.

[51] Martínez-Padilla, J., Redpath, S. M., Zeineddine, M., & Mougeot, F. (2013). Insights into population ecology from long-term studies of red grouse *Lagopus lagopus scoticus*. *Journal of Animal Ecology*, 83(1), 85–98.

[52] Pearce-Higgins, J. W., Stephen, L., Douse, A. and Langston, R. H. W. (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, 386-394.

[53] Douglas, D. J. T., Bellamy, P. E. & Pearce-Higgins, J. W. (2011). Changes in the abundance and distribution of upland breeding birds at an operational wind farm. *Bird Study*, 58(1), 37-43,

[54] Pearce-Higgins, J. W., Stephen, L., Douse, A. and Langston, R. H. W. (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, 386-394.

As previously mentioned, studies on red grouse and wind farm development such as Pearce-Higgins *et al.* (2009; 2012) and Douglas *et al.* (2011) are from Scotland, where red grouse densities are much higher than in Ireland and Northern Ireland. The OSA currently supports up to 2% of the NI red grouse population. Low population densities, combined with a sedentary nature, means that this species is particularly vulnerable to habitat loss, fragmentation and changes in habitat quality (McGuinness *et al.*, 2015)[55]. As such, on a precautionary basis, the magnitude of effect is considered to be low, resulting in a **low significance** of effect at the regional level, in the absence of mitigation.

Collision Risk

Red grouse flights when observed (usually flushed birds) are typically low (<20 m above ground level) and, as such, red grouse are not generally considered to be at risk of collision with turbine blades. The current proposed turbine model is for a minimum swept height of 20 m and during the VP surveys no birds were recorded entering the CRZ, with the highest flight being a short flight from a flushed bird reaching 10 m. Though collision with rotor blades is considered unlikely, grouse species have been shown to be prone to collision mortality with other man-made structures such as fencing and power lines (Drewitt & Langston, 2008)[56] and have been reported to be more likely to collide with turbine towers rather than rotor blades (Coppes *et al.*, 2020; Stokke *et al.*, 2020; Bioscan, 2001)[57]. This is due to their poor vision and flight manoeuvrability. Thus, collisions with wind farm infrastructure may occur during the life span of the wind farm and may be heightened due to inappropriately placed or designed infrastructure such as fencing. It should be noted that a high fecundity and apparent tolerance to wind farm infrastructure means that this is unlikely to cause significant effects to the local population once suitable breeding habitat remains available. However, on a precautionary basis, in the absence of mitigation, the magnitude of effect is assessed as low, resulting in a **low significance** of effect.

11.5.3.1.3 Final Decommissioning Phase

As discussed in Section 11.5.3.1.1, temporary displacement and local population depression may occur during the final decommissioning phase. As such, the significance of effect is considered to be **low significance** at the regional level.

11.5.3.2 Golden plover

11.5.3.2.1 Decommissioning and Construction Phase

Golden plover are listed on Annex I of the EU birds directive and are red-listed in Ireland (Gilbert *et al.*, 2021)[58]. As such, based on Percival (2003)[59], golden plover are classed as having a medium sensitivity.

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[55] Mc Guinness, S., Muldoon, C., Tierney, N., Cummins, S., Murray, A., Egan, S. & Crowe, O. (2015). *Bird Sensitivity Mapping for Wind Energy Developments and Associated Infrastructure in the Republic of Ireland*. BirdWatch Ireland, Kilcoole, Wicklow.

[56] Drewitt, A. L., & Langston, R. H. W. (2008). Collision Effects of Wind-power Generators and Other Obstacles on Birds. *Annals of the New York Academy of Sciences*, 1134(1), 233–266.

[57] Coppes, J., Braunisch, V., Bollmann, K., Storch, I., Mollet, P., Grünschachner-Berger, V., Nopp-Mayr, U. (2020). The impact of wind energy facilities on grouse: A systematic review. *Journal of Ornithology*, 161(1), 1-15; Stokke, B. G., Nygård, T., Falkdalen, U., Pedersen, H. C., & May, R. (2020). Effect of tower base painting on willow ptarmigan collision rates with wind turbines. *Ecology and Evolution*, 10(12), 5670–5679; Bioscan (UK) Ltd (2001). *Novar Windfarm Ltd Ornithological Monitoring Studies - Breeding bird and birdstrike monitoring 2001 results and 5-year review*. Report to National Wind Power Ltd.

[58] Gilbert, G., Stanbury, A., & Lewis, L. (2021). Birds of Conservation Concern in Ireland 2020 – 2026. *Irish Birds*, 43, 1–22.

[59] Percival, S. M. (2003). *Birds and wind farms in Ireland: A review of potential issues and impact assessment*. Ecology Consulting, Coxhoe, Durham.

Golden plover is a species which aggressively defend nest sites and perform distinct display and distraction flights when breeding (Ratchliffe, 1976)[60]. Despite two incidences of calling birds during the breeding season, no breeding attempts for golden plover were observed during the survey period (encompassing four breeding seasons). There is some limited potential for this species to breed within the environs of the OSA, though the habitat quality is considered to be of moderate to low quality – being relatively rank or dense heather. As such, the Development will not result in direct impacts such as nest destruction/chick mortality.

In terms of disturbance and displacement effects during the decommissioning and construction phase, Goodship & Furness (2020)[61] suggest a buffer of 200-500 m ('zone of sensitivity') during the non-breeding season. Based on a relatively high flight time within the OSA (314,278 seconds), some disturbance and displacement impacts are expected to foraging/roosting winter and passage flocks. Due to activity being largely concentrated in the southern parts of the OSA, these impacts will be mostly associated with the decommissioning phase of the existing wind farms. Disturbance during the construction phase will be limited to small wintering and passage flocks (max 160 birds, mean 28 birds) periodically using the OSA.

Taking into account the ample suitable foraging habitat outside of this 'zone of sensitivity', the small flock sizes observed, and the short-term nature of the works, the magnitude of effect is negligible at the national (UK) level (<<1% population effect based on 400,000 wintering birds (Woodward *et al.*, 2020)[62]).

Taking a regional (NI) population estimate of 10,000-20,000 wintering birds (based on Musgrave *et al.* (2013) and Woodward *et al.*, (2020)[63]), the magnitude of effect is low (0.8-1.6% population effect based on a max foraging flock of 160 birds). However, flocks of over 100 birds were rarely recorded (n=4 different survey dates), with a mean flock size of 28 within the OSA. Based on the mean flock size, the magnitude of effect would be classed as negligible. Additionally, the fact that small, highly variable flock sizes were recorded indicates that the local population are not exclusively reliant on the OSA.

The significance of effect of disturbance/displacement was therefore determined to be **very low significance** at the national level and **very low significance** at the regional level.

11.5.3.2.2 Operational Phase

Based on flightline and walkover data capturing birds foraging/roosting on the ground, the existing turbines appear to overlap more with core golden plover foraging areas than the proposed turbines (T5, T12, T11, T10), being *c.* 500 m north (see flightline maps in **Technical Appendix 11.1: Ornithology**). Flocks appeared to be attracted to the ridge of Owenreagh and Craignagapple, often concentrating in areas with bare peat and small bog hags. Therefore, though the Development will result in the long-term effect of a loss of a small amount of foraging habitat, the footprint is not considered to overlap with *core* golden plover foraging/roosting habitat. The magnitude of effect of this habitat loss is therefore considered to be negligible, resulting in a **very low significance** of effect at both the national and regional population level.

[60] Ratchliffe, D. A. (1976). Observations on the Breeding of the Golden Plover in Great Britain. *Bird Study*, 23(2), 63-116.
[61] Goodship, N. M. and Furness, R. W. (2022). *Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species*. NatureScot Research Report 1283.
[62] Woodward, I., Aebischer, N., Burnell, D., Eaton, M., Frost, T., Hall, C., Stroud, D. A. & Noble, D. (2020). Population estimates of birds in Great Britain and the United Kingdom. *British Birds*, 113, 69–104.
[63] Musgrove et al. (2013). Population estimates of birds in Great Britain and the United Kingdom. *British Birds*, 106, 64–100.

While there is evidence to suggest displacement of breeding golden plover at operational wind farms (Pearce-Higgins *et al.*, 2009; Sansom *et al.*, 2016)[64], effects may not be as acute for wintering golden plover. A review of wind farm impacts in Germany by Hötker *et al.* (2006)[65] found turbine avoidance distances of 50-850 m (median 135 m) for wintering golden plover. The large variation in range was explained by habitat availability on a site-by-site basis. This indicated that displaced non-breeding birds move to the nearest suitable habitat patch; and therefore, as was the case for the site with the 850 m displacement effect, if the wind farm occupies a significant proposition of the suitable habitat, then birds are likely to be displaced to suitable areas further afield. Hötker *et al.* (2006) also noted that at three out of four study sites, golden plover demonstrated increasing habituation to turbines over time. This is consistent with the field survey results, which observed wintering golden plover utilising the operational Owenreagh I and II Wind Farms regularly (aggregated flight time of 430,958 seconds recorded within the 500 m buffer of the operational wind farms).

In terms of repowering, Hötker (2006)[66] found that golden plover showed greater avoidance distances with increased turbine size. Given that core foraging/roosting areas for golden plover are largely concentrated in the southern part of the OSA, it is considered unlikely that disturbance/displacement will have significant long-term effects on golden plover utilising the OSA and environs. Based on observed habituation behaviour within the existing Owenreagh I and II Wind Farms, golden plover are also expected to habituate to the Development over time.

Based on observed habituation within the operational wind farm, a mean flock size of 28 birds, and ample suitable habitat in the wider area, the magnitude of effect of the operational wind farm on wintering golden plover is assessed as negligible and the significance of effect is therefore **very low significance**, at both the national and regional population level.

Collision Risk

Based on observed flight time within the CRZ (314,278 seconds), the CRM predicted 5.04 annual collisions, amounting to 151.11 birds in the 40-year lifespan of the wind farm (see **Technical Appendix 11.2: Avian Collision Risk Modelling**). This represents 0.001% of the annual national (UK) wintering golden plover population of 400,000 birds. Applying an annual adult survival rate of 0.73 (as cited in BTO BirdFacts)[67], it is estimated that the number of collisions required to produce a 1% increase over baseline mortality would be 1,080 collisions/annum. As such, the additional mortality on the national wintering population is estimated to have a negligible effect (<<1% of the background mortality rate, as per Percival (2003)[68]).

At the regional (NI) level, the predicted annual collision risk represents 0.02-0.05% of the NI wintering population of 10,000-20,000 birds (Musgrave *et al.*, 2013; Woodward

[64] Pearce-Higgins, J. W., Stephen, L., Langston, R. H. W., Bainbridge, I. P., and Bullman, R. (2009). The Distribution of Breeding Birds around Upland Wind Farms. *Journal of Applied Ecology*, 46(6), 1323-1331; Sansom, A., Pearce-Higgins, J. W., & Douglas, D. J. T. (2016). Negative impact of wind energy development on a breeding shorebird assessed with a BACI study design. *Ibis*, 158(3), 541–555.
[65] Hötker, H., Thomsen, K. M. & Jeromin, H. (2006). *Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats - facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation*. Michael-Otto-Institut im NABU, Bergenhusen
[66] Hötker, H. (2006). *The impact of repowering of wind farms on birds and bats*. Nature and Biodiversity Conservation Union.
[67] Available at: https://app.bto.org/birdfacts/results/bob4850.htm (Accessed: January 2023)
[68] Percival, S. M. (2003). *Birds and wind farms in Ireland: A review of potential issues and impact assessment*. Ecology Consulting, Coxhoe, Durham.

et al., 2020)[69]. Applying an annual adult survival rate of 0.73, it is estimated that the number of collisions required to produce a 1% increase over baseline mortality would be 27-54 collisions/annum. As such, the additional mortality on the regional wintering population is estimated to have a negligible effect (<1% of the background mortality rate, as per Percival (2003)).

In comparing the collision risk of the proposed turbines to the current baseline, the baseline generated 1.55-1.65 predicted collisions per annum while the Development generated 5.04 predicted collisions/annum for the V136 and 4.83 collisions/annum for the N133. Though there are notably high levels of activity within the existing wind farms, the proposed turbines have a larger collision risk height range (20-160 m, as opposed to 20-60 m for the Z-40 and 14-66 m for the V52) which results in more golden plover flight time being placed within the CRZ. It should be noted, however, that the distribution of flights across the OSA suggests a more concentrated use of the area between VP3 and VP4. This is not accounted for within the model which assumes a random, equal distribution across the 500 m turbine buffer. As such, the predicted collisions/annum for the Development may be higher than what would be expected in reality.

A species-specific avoidance rate is not provided for golden plover and therefore the default 98% rate was applied, as per the SNH (2018)[70] guidelines. It has been suggested that the default rate may be appropriate for breeding populations, however, may not be applicable to wintering populations due to differences in behaviour and ecology. Post-construction monitoring studies from the UK indicate that higher avoidance rates could be applied for non-breeding golden plovers and rates of 99.8% may generate more realistic modelled outputs, which are in line with avoidance rates applied for wintering geese (SNH, 2018)[71]. Applying an avoidance rate of 99.8% generates a predicted 0.5 (V136) and 0.48 (N133) collisions/annum for the Development and 0.16 predicted collisions per annum for the baseline. In terms of recorded turbine mediated mortality, Hötker *et al.* (2006), assessing 127 wind farms across Europe, only cites four golden plover collisions. However, this review does not control for survey effort, scavenging rates or surveyor detection rates. Additionally, collision risk for wader species, including golden plovers, is generally considered to be low due to manoeuvrability in flight (McGuinness *et al.*, 2015)[72].

The significance of effect for collision risk is therefore assessed as **very low significance** at both the national and regional levels.

11.5.3.2.3 Final Decommissioning Phase

As discussed in Section 11.5.3.2.1, temporary disturbance and displacement may occur during the final decommissioning phase. However, based on small mean flock sizes and ample suitable habitat on the wider area, populations are expected to habituate. As such, the significance of effect is considered to be **very low significance** at the national and regional levels.

[69] Musgrove, A., Aebischer, N., Eaton, M., Hearn, R., Newson, S., Noble, D., Parsons, M., Risely, K. & Stroud, D. (2013). Population estimates of birds in Great Britain and the United Kingdom. *British Birds*, 106, 64–100; Woodward, I., Aebischer, N., Burnell, D., Eaton, M., Frost, T., Hall, C., Stroud, D. A. & Noble, D. (2020). Population estimates of birds in Great Britain and the United Kingdom. *British Birds*, 113, 69–104.
[70] Scottish Natural Heritage (2018). *Avoidance rates for the onshore SNH wind farm collision risk model*. Version 2. SNH guidance document.
[71] Scottish Natural Heritage (2018). *Avoidance rates for the onshore SNH wind farm collision risk model*. Version 2. SNH guidance document.
[72] Mc Guinness, S., Muldoon, C., Tierney, N., Cummins, S., Murray, A., Egan, S. & Crowe, O. (2015). *Bird Sensitivity Mapping for Wind Energy Developments and Associated Infrastructure in the Republic of Ireland*. BirdWatch Ireland, Kilcoole, Wicklow.

11.5.3.3 Snipe

11.5.3.3.1 Decommissioning and Construction Phase

As a red-listed species (Gilbert *et al.*, 2021)[73], snipe are classified as medium sensitivity, in accordance with Percival (2003)[74].

Snipe have been confirmed to breed in relatively low densities (max 3-4 pairs in 2019) within the OSA, though were not recorded in summer 2022. The density of use over the winter seasons was also considered relatively low, reflecting the historic drainage of the site for agricultural purposes. As can be seen in Figure A11.1.7.2 in **Technical Appendix 11.1: Ornithology**, the proposed location for turbines T7, T9, T10, T14 and associated infrastructure overlap with areas where breeding/territorial snipe were recorded during the survey period. In the absence of mitigation, inappropriately timed works have the potential to result in direct effects such as nest destruction and chick mortality to this ground-nesting species. Based on potential direct effects on up to 4 pairs, the magnitude of effect is assessed as negligible (<1% population effect) at the national level (64,500 breeding pairs as per Woodward *et al.* (2020)[75]) and regional level (1,123 breeding pairs as per Colhoun *et al.* (2015)[76]). This results in a **very low significance** of effect.

There is also potential for disturbance/displacement effects on breeding/wintering populations during construction. Pearce-Higgins *et al.* (2009; 2012)[77] found that densities of snipe were significantly reduced (up to 53%) at wind farms during construction. Considering a maximum of 3-4 pairs occurring within the OSA, this could result in 1-2 pairs being displaced during construction. However, it should be noted that the OSA is considered to be sub-optimal snipe habitat as a baseline, and the results of this study may be less applicable in this case. In addition, 3-4 pairs reflect the breeding season with the highest levels of drumming/chipping snipe recorded, with subsequent years recording even lower (or no activity) during the breeding season.

As snipe inhabit wetter areas, changes in water levels due to construction activities could also result in indirect effects on distribution, density and breeding success in the absence of mitigation. Water management practices during construction are detailed within **Technical Appendix 3.1: Decommissioning and Construction Environmental Management Plan** (DCEMP). In relation to drainage for any earthworks on the site prior to temporary access track and earthwork construction, site operatives will identify flush areas, depressions or zones which may concentrate water flow so that site drainage design will maintain hydrological connectivity. Detailed site drainage design will be produced in advance of construction. **Chapter 8: Hydrology and Hydrogeology** of the ES provides additional details regarding flush areas, drainage design, and hydrological connectivity. However, it is considered that ample snipe habitat is present across the OSA, outside of the footprint of the works and in the wider environs outside of the site to maintain the local population.

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[73] Gilbert, G., Stanbury, A., & Lewis, L. (2021). Birds of Conservation Concern in Ireland 2020 – 2026. *Irish Birds*, 43, 1–22.

[74] Percival, S. M. (2003). *Birds and wind farms in Ireland: A review of potential issues and impact assessment*. Ecology Consulting, Coxhoe, Durham.

[75] Woodward, I., Aebischer, N., Burnell, D., Eaton, M., Frost, T., Hall, C., Stroud, D. A. & Noble, D. (2020). Population estimates of birds in Great Britain and the United Kingdom. *British Birds*, 113, 69–104.

[76] Colhoun, K., Mawhinney, K. & Peach, W. (2015). Population estimates and changes in abundance of breeding waders in Northern Ireland up to 2013. *Bird Study*, 62.

[77] Pearce-Higgins, J. W., Stephen, L., Langston, R. H. W., Bainbridge, I. P., and Bullman, R. (2009). The Distribution of Breeding Birds around Upland Wind Farms. *Journal of Applied Ecology*, 46(6), 1323-1331; Pearce-Higgins, J. W., Stephen, L., Douse, A. and Langston, R. H. W. (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, 386-394.

Given the relatively low numbers of pairs and wintering birds present, as well as the short-term nature of the works, it is considered that the magnitude of effect of indirect effects to snipe is negligible, resulting in a **very low significance** of effect at the national and regional levels.

11.5.3.3.2 Operational Phase

As some of the proposed turbine infrastructure (T7, T10, T9 and T14) overlap with breeding/territorial snipe records within the OSA (see Figure A11.1.7.2 in **Technical Appendix 11.1: Ornithology Report**), in the absence of mitigation, there is the potential for long-term effects in the form of loss and fragmentation of potential snipe breeding habitat. As well as changes during the construction phase, long-term changes to water levels as a result of the Development have the potential to result in effects to snipe density, distribution and breeding success during the operational phase.

Snipe are noted in Pearce-Higgins *et al.* (2009; 2012)[78] to be particularly sensitive to disturbance and displacement from wind farms, showing a strong avoidance of turbines (up to 400 m). Snipe abundances were also found to not recover post-construction, based on three years of post-construction monitoring. Despite this finding for other wind farm sites, chipping (breeding/territorial) snipe were recorded <400 m from the operational Owenreagh I and II Wind Farm turbines on a number of occasions, which indicates a level of habituation to the existing array. As the last extension (Owenreagh II) was carried out in 2008, this may mean that snipe densities may take longer than three years to habituate. It should be noted, however, that data is not available on snipe breeding densities prior to the operational Owenreagh I and II Wind Farms and therefore the current population may be depressed compared to pre-construction levels. In terms of repowering, Hötker (2006)[79], found no relationship between increasing hub height and negative impacts on snipe.

Based on some observed habituation to pairs breeding within the operational Owenreagh I and II Wind Farms, it is considered that suitable habitat is a greater factor limiting breeding success for snipe within the OSA, rather than the presence of turbine structures. Due to low densities present, the magnitude of effect of the operational phase was considered to be negligible and operational indirect effects are assessed as **very low significance** at both the national and regional levels, based on Percival (2003)[80].

Collision Risk

Aggregated flight time for snipe within the CRZ was relatively low (181 seconds). However, as flight activity for this species is largely crepuscular and VP surveys are carried out during daylight hours, VP surveys are not always an effective method of estimating snipe flight activity. As such, flight time within the OSA is likely underestimated. A correction factor of 25% is sometimes applied to account for nocturnal flight times. This would result in 227 seconds in the CRZ, which would still result in less than 0.1 predicted collisions in the 40-year life span of the wind farm. Snipe were not included in the CRM for this reason, though it is acknowledged that fatalities due to collision with turbines are known to occur (Hötker *et al.*, 2006;

[78] Pearce-Higgins, J. W., Stephen, L., Langston, R. H. W., Bainbridge, I. P., and Bullman, R. (2009). The Distribution of Breeding Birds around Upland Wind Farms. *Journal of Applied Ecology*, 46(6), 1323-1331; Pearce-Higgins, J. W., Stephen, L., Douse, A. and Langston, R. H. W. (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, 386-394.
[79] Hötker, H. (2006). *The impact of repowering of wind farms on birds and bats*. Nature and Biodiversity Conservation Union.
[80] Percival, S. M. (2003). *Birds and wind farms in Ireland: A review of potential issues and impact assessment*. Ecology Consulting, Coxhoe, Durham.

Fennelly, 2015)[81] and that snipe may be at particular risk of collision due to aerial display flights (drumming).

The low number of pairs utilising the OSA (likely maximum 3-4 pairs in 2019) and low recorded flight activity (227 seconds, applying a 25% correction factor for nocturnal flights) means that the magnitude of effect of collision risk is considered to be negligible (<1% population effect) on a national (UK) level (64,500 breeding pairs) and a regional (NI) level (1,123 breeding pairs). The significance of effect was therefore assessed as **very low significance** at both the national and regional population levels.

11.5.3.3.3 Final Decommissioning Phase

As in Section 11.5.3.3.1, there is some potential for indirect effects due to decommissioning. Based on the low densities of breeding/wintering snipe and the short-term nature of the works, the magnitude of effect is assessed as negligible resulting in a **very low significance** of effect.

11.5.3.4 Merlin

11.5.3.4.1 Decommissioning/Construction Phase

As an Annex I, red-listed and NI priority species, merlin are classed as medium sensitivity, in accordance with Percival (2003).

There is no suitable nesting habitat within the footprint of the operational Owenreagh I and II Wind Farms or the Development, therefore there is no potential for direct effects during works associated with the decommissioning and construction phase.

While the confirmed 2021/2022 merlin nest site is located outside of the OSA (*c.* 950 m from the nearest proposed turbine infrastructure) and outside of the recommended disturbance buffer zone for nesting merlin of 300-500 m (Goodship & Furness, 2022)[82], the forestry block where the nest is located overlaps with the OSA. As such, there is potential nesting habitat within the OSA. The closest proposed turbine to the edge of the forestry block (potential nest site) is T2, *c.* 220 m south. The closest decommissioning works to the edge of the forestry block are *c.* 200 m west. Merlin do not build or maintain nests and tree nesting pairs are reliant on the nests of other species, especially those of corvids. Therefore, tree nesting pairs must regularly shift breeding sites to occupy newer nests, with the distance moved being considerable in some instances. Hooded crow, a species whose nest sites are often used by merlin were recorded frequently throughout the OSA. Should birds relocate to a new nest site during the decommissioning and construction phase there is potential for inappropriately monitored/phased works to result in indirect disturbance of a merlin nest.

Based on one confirmed breeding pair, the magnitude of effect is assessed as negligible on the national level (1,162 pairs (Ewing *et al.*, 2011)[83]) and low at the regional level (32 pairs (Ewing *et al.*, 2011)). This results in a **very low significance** of effect at the national (UK) level and a **low significance** of effect at the regional (NI) level.

Construction of access tracks and bases for turbines are understood to represent the construction related activities that will generate the highest levels of noise pollution and most on-site human activity likely to result in potential disturbance events for breeding merlin. The 2021/2022 nest site is not located along any roads which will be used for access to the wind farm, or where cable routes will be laid. Overall, no works will be

[81] Hötker, H., Thomsen, K. M. & Jeromin, H. (2006). *Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats - facts, gaps in knowledge, demands for further research, and*
[82] Goodship, N. M. and Furness, R. W. (2022). *Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species*. NatureScot Research Report 1283.
[83] Ewing, S. R., Rebecca, G. W., Heavisides, A., Court, I., Lindley, P., Ruddock, M., Cohen, S. & Eaton, M. A. (2011). Breeding status of the Merlin *Falco columbarius* in the UK in 2008. *Bird Study*, 58, 379–389.

carried out within the reported 'zone of sensitivity' of merlin (Goodship & Furness, 2020) with the closest decommissioning or construction works being *c.* 900 m from the 2021/2022 nest site.

The works corridor for the Development is within the foraging range of the merlin breeding area and it can therefore be assumed that there will be a level of disturbance during this phase that may result in the displacement of foraging birds to another area. Another potential indirect effect during the decommissioning and construction phase is the displacement of prey species such as skylark and meadow pipit, resulting in a reduced prey availability for merlin. However, the size of the works corridor relative to foraging habitat available in the wider area means that any potential displacement effects on foraging birds caused by disturbance during construction are considered to be negligible. Therefore, in view of the temporary – short term nature of the works, potential indirect impacts on foraging merlin are classed as **very low significance** at both the national and regional levels.

11.5.3.4.2 Operational Phase

For merlin, tolerance to operational turbines is likely to be determined to some extent by individual traits and habituation over time. As this pair are successfully breeding adjacent to the operational Owenreagh I and II Wind Farms, it is expected that the pair and future generations occupying the territory will also habituate to the Development. The proposed wind turbines are also located further away from the 2021/2022 nest site, which is outside of the reported 300-500 m 'zone of sensitivity' (Goodship & Furness, 2022)[84].

In addition to successfully breeding in relatively close proximity to the wind turbines, this pair have also been noted to exhibit behaviour which suggests habituation to foraging within the operational wind farm. This includes a record of a merlin using a wind farm track to hunt down a meadow pipit, directly beneath the turbines.

Based on the observed habituation of this pair to the existing wind farm infrastructure, the magnitude of effect of disturbance/displacement during the operational phase was assessed to be of negligible effect, resulting in a **very low significance** of effect

Collision Risk

Merlin observations within the CRZ during the VP watches were too low (180 seconds) to draw any significant conclusions from the CRM (<0.1 collisions in the 40-year lifespan of the wind farm). It is, however, acknowledged that VP surveys are not considered to be an appropriate methodology for this species (Madders & Whitfield, 2006)[85]. This is due to the low detectability of merlin (size, plumage and behaviour) and sensitivity to disturbance from observers. Though flight time within the CRZ was likely underestimated, it should also be noted that most of the flight time for merlin (898 seconds) was recorded at <20 m above ground level. This reflects the species low flight behaviour, which reduces the collision risk overall. Wind turbine collisions have been recorded, though in notably low numbers in comparison with other raptor species (Hötker *et al.*, 2006; Fennelly, 2015)[86]. Though their low flight behaviour may reduce collision risk with turbines, collisions can occur with other man-made infrastructure such as fencing, in particular when birds are in pursuit of prey. Due to the proximity of the

[84] Goodship, N. M. and Furness, R. W. (2022). *Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species*. NatureScot Research Report 1283.
[85] Madders, M. & Whitfield, P. (2006). Upland raptors and the assessment of wind farm impacts. *IBIS*, 148(1), 43-56.
[86] Hötker, H., Thomsen, K. M. & Jeromin, H. (2006). *Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats - facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation*. Michael-Otto-Institut im NABU, Bergenhusen; Fennelly, R. F. (2015). *A Review of Bird Strike Mortality at Irish Onshore Windfarms*. CIEEM in-practice Issue 88 June 2015

natal site to the operational Owenreagh I and II Wind Farms, while adult merlin may be habituated to practising turbine avoidance, fledgling birds learning to fly will be particularly vulnerable to collisions. The proximity of the Development to a breeding territory also means that merlin will be exhibiting courtship/display flights at certain times of year, which will be more likely to place them in the CRZ than hunting/commuting behaviour. Based on suitable habitat within the OSA (forestry plantations), displaying could occur within 175 m of turbines (forestry block east of T8).

At the national (UK) level, the magnitude of effect was assessed to be negligible, based on 1,162 pairs (Ewing *et al.*, 2011)[87]. Based on an annual adult survival rate of 0.620 ±0.11 (BTO bird facts)[88], it is estimated that the number of collisions/annum required to produce a 1% increase over baseline mortality would be 6.27-11.39 collisions/annum. This level of collision would not be possible with the current low density of merlin (1 pair) occurring within the OSA and wider area. As such, the magnitude of effect was assessed to be negligible, resulting in a **very low significance** of effect.

At the regional (NI) level (32 pairs (Ewing *et al.*, 2011)), the number of collisions required to produce a 1% increase over baseline mortality would be 0.17-0.31 collisions/annum, amounting to 1 collision every 3-5 years, which is significantly higher than the predicted 0.003 collisions/annum. However, as VP surveys are likely to underestimate merlin flight time within the CRZ and, based on the OSA overlapping with a breeding territory, taking a precautionary approach, the magnitude of effect was assessed as low, resulting in a **low significance** of effect at the regional population level.

11.5.3.4.3 Final Decommissioning Phase

As assessed in Section 11.5.3.4.1, final decommissioning works have the potential to result in indirect disturbance to breeding and foraging merlin, in the absence of mitigation. This is classed as **very low significance** at the national level and **low significance** at the regional level.

11.5.3.5 Kestrel

11.5.3.5.1 Decommissioning and Construction Phase

As a red-listed and NI priority species, kestrel are classed as medium sensitivity, in accordance with Percival (2003).

There is no suitable nesting habitat within the footprint of the operational Owenreagh I and II Wind Farms or the Development, therefore there is no potential for direct effects during works associated with the decommissioning and construction phases.

While no nest sites were identified during the survey period, and no breeding/territorial behaviour was observed within the OSA, there is some limited potential nesting habitat within the OSA in the form of disused corvid nests. Therefore, if the resident pair were to relocate to a new nest site during this phase, there is potential for inappropriately monitored/phased construction works to result in indirect disturbance of a kestrel nest. Based on 30,000 pairs in the UK and 1,000 pairs in NI (Woodward *et al.*, 2020)[89], the magnitude of effect on one pair is assessed as negligible (<1% population effect), resulting in a **very low significance** of effect at both the national and regional levels.

Kestrels are regarded as a human-tolerant species, occurring in a variety of human-dominated environments and environments which are high in disturbance (Goodship &

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[87] Ewing, S. R., Rebecca, G. W., Heavisides, A., Court, I., Lindley, P., Ruddock, M., Cohen, S. & Eaton, M. A. (2011). Breeding status of the Merlin *Falco columbarius* in the UK in 2008. *Bird Study*, 58, 379–389.
[88] Available at: https://app.bto.org/birdfacts/results/bob3090.htm (Accessed: January 2023)
[89] Woodward, I., Aebischer, N., Burnell, D., Eaton, M., Frost, T., Hall, C., Stroud, D. A. & Noble, D. (2020). Population estimates of birds in Great Britain and the United Kingdom. *British Birds*, 113, 69–104.

Furness, 2020)[90], for example regularly nesting in active quarries. There is some evidence to suggest that, though birds are willing to nest in disturbed environments, these pairs are more likely to fail due to stress (Goodship & Furness, 2020). However, unless the existing nest site shifts significantly closer to the works corridor, it is considered unlikely that there will be indirect disturbance to breeding kestrels during construction.

As kestrels were regularly recorded foraging and flying through the OSA (total flight time of 4,884 seconds) during the survey period, decommissioning/construction activities may have a localised effect, displacing individuals foraging though the area. However, in consideration of the relatively tolerant nature of kestrels to human disturbance, the availability of alternative foraging areas, and the temporary – short term nature of the works, potential indirect impacts on foraging kestrels are considered of negligible magnitude, resulting in a **very low significance** of effect.

11.5.3.5.2 Operational Phase

Pearce-Higgins *et al.* (2009)[91] found some weak avoidance of turbines but noted that kestrels often continued to forage in close proximity to turbines, which may increase collision risk for the species. In terms of repowering, kestrel are regarded as a species which are not greatly displaced by turbines and, though repowering can have a greater negative effect, disturbance areas are still considered small for larger turbines (Hötker, 2006)[92]. Hötker *et al.* (2006)[93] also indicates that the overall population effect of wind turbines on kestrel is emerging as not significant, though it should be noted that this is a European study and kestrel populations are observing a recent decline in the UK and Ireland (Stanbury *et al.*, 2021; Gilbert *et al.*, 2021)[94].

Within the 500 m buffer of the operational Owenreagh I and II Wind Farms, kestrel activity was relatively high in comparison to other species with 1,832 seconds recorded. Flights were also recorded through and around the existing wind turbine array (see Figure A11.1.3.14 in **Technical Appendix 11.1: Ornithology**). These records were of hunting birds, showing a level of habituation of the pair resident in the wider area to foraging within the operational Owenreagh I and II Wind Farms.

Based on a relatively small resident population (estimated 1 pair within the 2 km Study Area) and the highly adaptable nature of kestrels to human environments, as well as the current habituation of the pair to the operational turbines, the magnitude of effect is considered to be negligible resulting in a **very low significance** of effect.

Collision Risk

Limited displacement effects caused by turbines and flight behaviour means kestrels are a species emerging as notably susceptible to collision with turbines and this is acknowledged within the collision risk model, which is run with a lowered avoidance

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[90] Goodship, N. M. and Furness, R. W. (2022). *Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species*. NatureScot Research Report 1283.

[91] Pearce-Higgins, J. W., Stephen, L., Langston, R. H. W., Bainbridge, I.P. & Bullman, R. (2009). The distribution of breeding birds around upland wind farms. *Journal of Applied Ecology*, 46, 1323–1331.

[92] Hötker, H. (2006). *The impact of repowering of wind farms on birds and bats*. Nature and Biodiversity Conservation Union.

[93] Hötker, H., Thomsen, K. M. & Jeromin, H. (2006). *Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats - facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation*. Michael-Otto-Institut im NABU, Bergenhusen

[94] Stanbury, A., Eaton, M., Aebischer, N., Balmer, D., Brown, A., Douse, A., Lindley, P., McCulloch, N., Noble, D., and Win, I. (2021). The status of our bird populations: the fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. *British Birds*, 114, 723-747; Gilbert, G., Stanbury, A., & Lewis, L. (2021). Birds of Conservation Concern in Ireland 2020 – 2026. *Irish Birds*, 43, 1–22.

rate (95%) (SNH, 2018)[95]. Based on observed flight activity within the OSA, a predicted 0.16 collisions/annum (6.50 collisions over the 40-year lifespan of the wind farm) for the V136 and 0.15 collisions/annum (6.18 collisions over the 40-year lifespan of the wind farm) for the N133 and was calculated. This is equivalent to 1 bird every 6.15 years for the V136 and 1 bird every 6.47 years for the N133.

In comparison, the baseline collision risk was calculated as 0.04-0.07 predicted collisions/annum. As such, the Development is predicted to result in a higher overall collision risk for kestrel. In terms of the baseline, the V52 turbine (14-66 m collision risk height) resulted in a higher predicted collisions/annum than the Z40 (20-60 m collision risk height). This is reflective of the larger rotor swept area of the Z40. The proposed V136 and N133 turbines have a collision risk height of 20-160 m and will therefore result in the highest time spent in the CRZ for kestrel.

Kestrels are red-listed, however despite declining numbers, they remain a common and widespread raptor in Ireland (30,000 pairs in the UK and 1,000 pairs in NI (Woodward *et al.*, 2020)). As such, the magnitude of effect on the national population is assessed as negligible, based on a 0.001% increase in annual background mortality.

At the regional (NI) level, based on an annual survival rate of 0.69 (BTO bird facts)[96], it is estimated that the number of collisions required to produce a 1% increase over baseline mortality would be 6.2. The predicted collisions/annum for the Development (worst-case scenario – V136) represents 0.03% of the annual background mortality for kestrel. As such, the magnitude of effect would be assessed as negligible, resulting in a **very low significance** of effect at the regional level.

11.5.3.5.3 Final Decommissioning Phase

As assessed in Section 11.5.3.5.1, final decommissioning works have the potential to result in indirect disturbance to breeding and foraging kestrel, in the absence of mitigation, classed as having a **very low significance** of effect at both the national and regional levels.

11.5.3.6 Sparrowhawk

11.5.3.6.1 Decommissioning and Construction Phase

As an amber-listed species, sparrowhawk are classed as low sensitivity, in accordance with Percival (2003)[97].

There is no suitable kestrel nesting habitat within the footprint of the operational Owenreagh I and II Wind Farms or the Development and therefore no potential for direct effects during works associated with the decommissioning and construction phases.

The results of the baseline surveys estimated that there is one pair of breeding sparrowhawk within the 2 km Study Area (see Figure A11.1.7.3 in **Technical Appendix 11.1: Ornithology Report**). No nest sites were recorded within the OSA during the survey period, with the closest breeding territory being more than 1 km from the nearest proposed wind turbine. However, there is some limited nesting habitat within the OSA and, should a pair choose to relocate nest sites, there is some potential for indirect disturbance to a sparrowhawk nest. It is understood that sparrowhawks, which often nest in commercial forestry plantations, are relatively tolerant of relocating, provided the displacement does not occur within the breeding season. Based on 28,500

[95] Scottish Natural Heritage, now NatureScot – SNH (2018). *Avoidance rates for the onshore SNH Wind Farm Collision Risk Model*. Version 2.
[96] Available at: https://app.bto.org/birdfacts/results/bob3040.htm (Accessed January 2023)
[97] Percival, S. M. (2003). *Birds and wind farms in Ireland: A review of potential issues and impact assessment*. Ecology Consulting, Coxhoe, Durham.

pairs in the UK and 2,000 pairs in Northern Ireland (Woodward, *et al.*, 2021)[98], the magnitude of effect of the disturbance/displacement of this pair is assessed as negligible, resulting in a **very low significance** of effect at both the national and regional levels.

Goodship & Furness (2020)[99] do not report a 'zone of sensitivity' for this species, though it is accepted that sparrowhawk are relatively tolerant of human disturbance, often nesting in urban and suburban areas such as parkland and areas subject to human disturbance such as commercial forestry plantations. As such, birds may not be as readily displaced by disturbance due to decommissioning/construction works. Additionally, due to ample suitable foraging habitat in the wider area, foraging birds are unlikely to be impacted by temporary displacement from the works corridor.

Sparrowhawk were rarely recorded to be utilising the operational Owenreagh I and II Wind Farms, with just 317 seconds recorded in total within the OSA. Flightlines appeared to be more associated with the north-east of the OSA with some flights also observed over the conifer plantation in the south-west. This corresponds with areas of woodland/scrub cover, as sparrowhawk spend a high proportion of the time utilising cover, typically employing low hunting flight behaviour to ambush prey. As such, the majority of the OSA (open bog habitat) may therefore not be preferable to this species. Indirect disturbance to foraging birds is therefore mostly likely to occur during works associated with the proposed wind turbines in the north-east of the OSA (T7 and T13) and works corridor north of the Glenmornan Road.

Based on a low flight time within the OSA and relatively low suitable habitat, the magnitude of effect on foraging birds is assessed to be negligible, resulting in a **very low significance** of effect at both the national and regional levels.

11.5.3.6.2 Operational Phase

Due to sparrowhawk's low level of usage of a large part of the OSA, operational displacement/disturbance effects are considered to be limited to the wind turbines in the north-east. This area may observe a lowered usage by sparrowhawk during the initial part of the operational phase. Hötker *et al.* (2006)[100] found that sparrowhawk, like buzzard and kestrel, were less likely to avoid wind farms or change their commuting routes based on the presence of a wind farm and were overall less influenced by wind farms. It is therefore considered that habituation will occur over time. The highly adaptive nature of sparrowhawks and the species' apparent tolerance to human disturbance means that the effects of disturbance/displacement on sparrowhawk during the operational phase is assessed as **not significant**.

Collision Risk

A total of 616 flight seconds were recorded within the OSA, of which 530 seconds were determined to be within collision risk height (20–160 m). This amounted to 0.32 (V136) and 0.34 (N133) predicted collisions in the 40-year lifespan of the wind farm and, as such, sparrowhawk were not included within the CRM, as flight seconds were too low to draw any significant conclusions. As is the case with merlin, relying on VP watch data and the resultant CRMs may not be an appropriate methodology for the assessment of collision risk in a small, more elusive raptor species like sparrowhawk, as these species

[98] Woodward, I., Aebischer, N., Burnell, D., Eaton, M., Frost, T., Hall, C., Stroud, D. A. & Noble, D. (2020). Population estimates of birds in Great Britain and the United Kingdom. *British Birds*, 113, 69–104.
[99] Goodship, N. M. and Furness, R. W. (2022). *Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species*. NatureScot Research Report 1283.
[100] Hötker, H., Thomsen, K. M. & Jeromin, H. (2006). *Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats - facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation*. Michael-Otto-Institut im NABU, Bergenhusen

can be difficult to detect over the full extent of the viewsheds for VPs due diminutive size, cryptic nature and/or flight behaviour (Madders & Whitfield, 2006)[101].

Sparrowhawks tend to fly relatively low (below rotor swept height), especially when hunting, which may reduce collision risk for this species. However, display flights and commuting long distances can result in higher flight time within the CRZ. Fatalities have been reported from Irish wind farm sites (Cullen & Williams, 2010)[102] and, in particular, the presence of suspected juvenile sparrowhawks utilising the OSA for practising hunting and flying may increase collision risk for this species. It should be noted that, though the Development will result in turbines being closer to suitable sparrowhawk habitat, the majority of the OSA consists of open habitat, which will result in minimal flight time through the CRZ.

Sparrowhawks are a common and widespread raptor in Ireland and are currently green-listed in Ireland and amber listed in the UK (Stanbury *et al.*, 2021; Gilbert *et al.*, 2021)[103]. On a national (UK) level, the magnitude of effect would be assessed as <u>negligible</u>, based on 28,500 pairs (Woodward, *et al.*, 2021)[104]. The significance of effect would therefore be **very low significance**.

Based on an annual adult survival rate of 0.690 (BTO BirdFacts)[105], it is estimated that the number of collisions/annum required to produce a 1% increase over background mortality for the regional (NI) population (2,000 pairs based on Woodward *et al.* (2020)) would be 12.4. Based on an estimated 1 breeding pair within the 2 km Study Area, the magnitude of effect of a potential collision would be assessed as <u>negligible</u>, resulting in a **very low significance** of effect.

11.5.3.6.3 Final Decommissioning Phase

As assessed in Section 11.5.3.6.1, final decommissioning works have the potential to result in indirect disturbance to breeding and foraging sparrowhawk, in the absence of mitigation, which is classed as having a **very low significance** of effect.

11.5.3.7 Buzzard

11.5.3.7.1 Decommissioning and Construction Phases

As a green-listed species, buzzard are classed as <u>low</u> sensitivity, in accordance with Percival (2003)[106].

There is no suitable nesting habitat within the footprint of the operational Owenreagh I and II Wind Farms or the Development, therefore there is no potential for direct effects during works associated with the decommissioning and construction phases.

Though it should be noted that pairs alternate between nest sites from year to year, no pairs were observed to be breeding within the OSA during the survey period. The OSA also has limited suitable buzzard breeding habitat, being largely open bog habitat with limited woodland. However, should a pair choose to relocate nest sites, there is some

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[101] Madders, M. & Whitfield, P. (2006). Upland raptors and the assessment of wind farm impacts. *IBIS*, 148(1), 43-56.
[102] Cullen, C. & Williams, H. (2010). Sparrowhawk *Accipiter nisus* mortality at a wind farm in Ireland. *Irish Birds*, 9, 125-126.
[103] Stanbury, A., Eaton, M., Aebischer, N., Balmer, D., Brown, A., Douse, A., Lindley, P., McCulloch, N., Noble, D., and Win, I. (2021). The status of our bird populations: the fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. *British Birds*, 114, 723-747; Gilbert, G., Stanbury, A., & Lewis, L. (2021). Birds of Conservation Concern in Ireland 2020 – 2026. *Irish Birds*, 43, 1–22.
[104] Woodward, I., Aebischer, N., Burnell, D., Eaton, M., Frost, T., Hall, C., Stroud, D. A. & Noble, D. (2020). Population estimates of birds in Great Britain and the United Kingdom. *British Birds*, 113, 69–104.
[105] Available at: https://app.bto.org/birdfacts/results/bob2690.htm (Accessed January 2023)
[106] Percival, S. M. (2003). *Birds and wind farms in Ireland: A review of potential issues and impact assessment*. Ecology Consulting, Coxhoe, Durham.

potential for indirect disturbance to a buzzard nest. Based on 61,500–85,000 pairs in the UK and 1,500 to 2,500 pairs in NI (Woodward *et al.*, 2020)[107], magnitude of effect is assessed as negligible, resulting in in a **very low significance** of effect.

Based on observed flight activity within the 500 m turbine buffer, it can be assumed that there will be a level of disturbance from construction works and it is possible that this may result in the displacement of foraging birds to another area. Goodship & Furness (2022)[108] recommended buffer zone of 100-200 m during the breeding and non-breeding seasons is reported. No construction works will take place within 100-200 m of any of the nest sites identified within the study period (see Figure A11.1.7.3 in **Technical Appendix 11.1: Ornithology**) and, as such, disturbance impacts will be limited to foraging birds. Based on buzzards' ability to exploit numerous food sources, ranging from carrion, worms and larger more mobile prey items like rabbits, they are unlikely to be impacted by a temporary limitation to foraging opportunities in the OSA. Based on this, and the low sensitivity of the species, the magnitude of effect of disturbance/displacement to buzzard during decommissioning and construction phases is assessed as negligible, resulting in a **very low significance** of effect.

11.5.3.7.2 Operational Phase

Pearce-Higgins *et al.* (2009)[109] suggest that buzzards show reduced flight activity and avoid an area of 500 m around turbines (three-year post-construction monitoring study). This displacement effect may be more pronounced immediately after construction and in the first few years of the operational phase, which may result in a bias in post-construction monitoring surveys. This is further supported by a relatively high flight time (55,213 seconds) recorded within the 500 m turbine buffer of the operational Owenreagh I and II Wind Farms, showing that the resident population has habituated to the existing array. Hötker (2006)[110] found that, though increasing turbine sizes can have greater negative effects, buzzard is a species which is not greatly displaced by wind turbines. As such, the disturbance area is not considered to be significantly altered following repowering.

The buzzard population in Ireland has increased exponentially over the last 20 years and is still expanding into new areas; seemingly only limited by the availability of nesting habitat, typically in trees (Lusby, 2011; Balmer *et al.*, 2013)[111]. The success of buzzards in Ireland can be attributed to having notably high fecundity for a raptor (capable of fledging broods of 6 young) and the species' ability to exploit numerous food sources. Buzzards also employ a variety of foraging techniques (*e.g.* sitting in tree or active hunting flights), depending on habitat, seasonality and prey types. This has allowed them to expand into a wider range of ecological niches when compared to other raptors. As indicated by the BoCC5 and BoCCI4 green status (Stanbury *et al.*, 2021; Gilbert *et al.*, 2021)[112] the species is now a common and widespread raptor in Britain and Ireland.

[107] Woodward, I., Aebischer, N., Burnell, D., Eaton, M., Frost, T., Hall, C., Stroud, D. A. & Noble, D. (2020). Population estimates of birds in Great Britain and the United Kingdom. *British Birds*, 113, 69–104.
[108] Goodship, N. M. and Furness, R. W. (2022). *Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species*. NatureScot Research Report 1283.
109 Pearce-Higgins, J. W., Stephen, L., Langston, R. H. W., Bainbridge, I.P. & Bullman, R. (2009). The distribution of breeding birds around upland wind farms. *Journal of Applied Ecology*, 46, 1323–1331.
[110] Hötker, H. (2006). *The impact of repowering of wind farms on birds and bats*. Nature and Biodiversity Conservation Union.
[111] Balmer, D. E., Gillings, S., Caffrey, B. J., Swann, R. L., Downie, I. S. & Fuller, R. J. (2013) *Bird Atlas 2007-11: The breeding and wintering birds of Britain and Ireland*. BTO Books, Thetford; Lusby, J. (2011). Species Focus: Buzzard comeback – Numbers continue to soar. *Wings*, Spring 2011, BirdWatch Ireland publication.
[112] Stanbury, A., Eaton, M., Aebischer, N., Balmer, D., Brown, A., Douse, A., Lindley, P., McCulloch, N., Noble, D., and Win, I. (2021). The status of our bird populations: the fifth Birds of Conservation Concern in the United

Taking this into account, the effect of disturbance/displacement to buzzard during the operational phase was assessed as **very low significance**.

Collision Risk

The number of collisions was predicted to be 1.34collisions/annum, equivalent to one bird every 0.74 years for the V136 and 1.28 collisions/annum, equivalent to one bird every 0.78 years for the N133. It should be noted that collisions are more likely to occur to juvenile birds. This may result in less overall population effects on buzzard, due to the species' high fecundity for a raptor. Though collisions have been recorded at Irish wind farms (Fennelly, 2015)[113], overall, population effects of wind farms on buzzard are emerging as non-significant (Hötker *et al.*, 2006)[114].

In terms of the operational Owenreagh I and II Wind Farms, a buzzard corpse was also recovered near the hardstand of the existing T14 on 12 July 2020 during the bat carcass searches carried out (see Chapter 10 of the ES). Due to the decomposition, it was not determined whether this was an adult or juvenile bird. Despite this, buzzard activity was still high within the OSA, with a minimum of one pair successfully breeding within the 2 km Study Area in summer 2021. In comparing the baseline collision risk for buzzard, the estimated collision risk for the operational wind farm is 0.96-1.13 collisions/annum, which amounts to one bird every 0.87-0.88 years. The Development therefore results in a slightly higher collision risk for buzzard, likely due to a larger rotor swept area resulting in more buzzards entering the CRZ.

At the national (UK) level, based on 61,500–85,000 pairs cited in Woodward *et al.* (2020)[115], the magnitude of effect of 1.34 collisions/annum (worst-case scenario – V136) would be <u>negligible</u> (<<1% increase in background mortality as per Percival (2003)[116]). This would result in a **very low significance** of effect.

At the regional (NI) level, based on an annual adult survival rate of 0.9 (BTO BirdFacts)[117], it is estimated that the number of collisions/annum required to produce a 1% increase over baseline mortality would be 3-5 collisions per annum, based on an approximate regional population of 1,500-2,500 pairs (Woodward *et al.*, 2020). Therefore, the magnitude of effect at the regional level would be considered <u>negligible</u>, resulting in a **very low significance** of effect.

11.5.3.7.3 Final Decommissioning Phase

As assessed in Section 11.5.3.7.1, final decommissioning works have the potential to result in indirect disturbance to breeding and foraging buzzard, in the absence of mitigation, classed as **very low significance**.

Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. *British Birds*, 114, 723-747; Gilbert, G., Stanbury, A., & Lewis, L. (2021). Birds of Conservation Concern in Ireland 2020 – 2026. *Irish Birds*, 43, 1–22.

[113] Fennelly, R. F. (2015). *A Review of Bird Strike Mortality at Irish Onshore Windfarms*. CIEEM in-practice Issue 88 June 2015

[114] Hötker, H., Thomsen, K. M. & Jeromin, H. (2006). *Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats - facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation*. Michael-Otto-Institut im NABU, Bergenhusen.

[115] Woodward, I., Aebischer, N., Burnell, D., Eaton, M., Frost, T., Hall, C., Stroud, D. A. & Noble, D. (2020). Population estimates of birds in Great Britain and the United Kingdom. *British Birds*, 113, 69–104.

[116] Percival, S. M. (2003). *Birds and wind farms in Ireland: A review of potential issues and impact assessment*. Ecology Consulting, Coxhoe, Durham.

[117] Available at: https://app.bto.org/birdfacts/results/bob2870.htm (Accessed January 2023)

11.5.3.8 Riverine Species

11.5.3.8.1 Decommissioning/Construction Phase

Due to a red-listed and NI Priority List status, grey wagtails are assigned a medium sensitivity and dipper (amber-listed) are assigned a low sensitivity, as per Percival (2003)[118].

The works corridor between T8 and T9 crosses the Legnahone Burn utilised by grey wagtail. Though no nest sites were identified during the survey period, there is very limited potential for direct disturbance to a grey wagtail nest in the event of inappropriately timed construction works. Based on 9,550 (7,570–11,850) individuals in Northern Ireland (Crowe *et al.*, 2014)[119], the magnitude of effect of disturbance to one pair is assessed as negligible, resulting in a **very low significance** of effect at the regional (NI) level. No nest sites were identified for dipper within the OSA, and there is limited potential for direct disturbance to a nest site for this species during the decommissioning and construction phase.

Foraging grey wagtail and dipper could be displaced due to construction activities, in particular along the stretch of wind farm track which follows the Legnahone Burn for some distance. A pollution event or prolonged sedimentation affecting the aquatic invertebrate populations in the Legnahone Burn could also result in negative effects on riverine bird species (Sorace *et al.*, 2002)[120].

Although red listed, grey wagtails are relatively widespread and common on waterways and other waterbodies across Ireland. Severe winters during the last Bird Atlas (Balmer *et al.*, 2013)[121] were thought to contribute to the observed population decline in this species, which although still registering declines appears to be stabilising (Crowe *et al.*, 2014)[122]. At the regional level, isolated/localised effects on a small number of birds (likely 1 pair within the OSA) would be considered as negligible, resulting in a **very low significance** of effect. In addition, strict water quality measures will be in place, meaning that even at the local level, no significant effects are expected.

For dipper, disturbance/displacement effects on 1 pair would be negligible at the regional (NI) level (based on 550-1500 pairs in Woodward *et al.* (2020)[123]), resulting in a **very low significance** of effect. As with grey wagtail, with strict water quality measures in place, effects are also considered to be negligible at the local level.

11.5.3.8.2 Operational Phase

For grey wagtail and dipper, no impacts are anticipated in terms of operational disturbance or due to collision risk. Operational phase effects are therefore considered to be limited to deterioration in water quality.

In relation to development projects, grey wagtail and dipper regularly utilise man-made nest sites, including bridges and rock armouring around culverts. Any of the more

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[118] Percival, S. M. (2003). *Birds and wind farms in Ireland: A review of potential issues and impact assessment*. Ecology Consulting, Coxhoe, Durham.
[119] Crowe, O., Musgrove, A. J. & O'Halloran, J. (2014). Generating population estimates for common and widespread breeding birds in Ireland. *Bird Study*, 61(1), 82-92.
[120] Sorace, A., Formichetti, P., Boano, A., Andreani, P., Gramegna, C., Mancini, L. (2002). The presence of a river bird, the dipper, in relation to water quality and biotic indices in central Italy. *Environmental Pollution*, 118(1), 89-96.
[121] Balmer, D. E., Gillings, S., Caffrey, B. J., Swann, R. L., Downie, I. S. & Fuller, R. J. (2013). *Bird Atlas 2007-11: The breeding and wintering birds of Britain and Ireland*. BTO Books, Thetford.
[122] Crowe, O., Musgrove, A. J. & O'Halloran, J. (2014). Generating population estimates for common and widespread breeding birds in Ireland. *Bird Study,* 61(1), 82-92.
[123] Woodward, I., Aebischer, N., Burnell, D., Eaton, M., Frost, T., Hall, C., Stroud, D. A. & Noble, D. (2020). Population estimates of birds in Great Britain and the United Kingdom. *British Birds*, 113, 69–104.

substantial drain crossings could also create additional nesting cover for grey wagtail *e.g.* in the rock armouring associated with culverts.

As in the decommissioning and construction phase, should water quality measures be in place, the significance of effect on riverine species during the operational phase is assessed as **very low significance**.

11.5.3.8.3 Final Decommissioning Phase

As in Section 11.5.3.8.1, decommissioning works have the potential to result in some temporary, short-term disturbance and water quality impacts to foraging birds along the Legnahone Burn, which is classed as having a **very low significance** of effect.

11.5.3.9 Red-listed passerine species

11.5.3.9.1 Ground-nesting species

Decommissioning and Construction phase

Meadow pipit, skylark and cuckoo are ground nesting species with the potential to nest within the works corridor. Therefore, in the absence of mitigation, there is the potential for direct effects on nesting meadow pipit, skylark and cuckoo. At the regional (NI) level, population effects on meadow pipit (255,930 (196,470–318,760) birds), skylark (42,070 (30,270–55,380) birds) and cuckoo (1,190 (960–1,440) birds) (Crowe *et al.*, 2014)[124] would be assessed as having a negligible magnitude of effect, resulting in a **very low significance** of effect. At the local level, based on several pairs potentially breeding within the footprint of the works the magnitude of effect of direct impacts to nesting birds is assessed as low, resulting in a **low significance** of effect.

Poorly timed construction works, and the alteration of foraging habitat, have the potential to result in indirect impacts, causing the abandonment of breeding sites and displacement of foraging birds, again of **very low significance** of effect at the regional level and **low significance** at the local levelMeadow pipits and skylark are also common prey item for many species including merlin, which nest in the area and significant displacement of these species could potentially affect productivity within higher trophic levels.

Operational Phase

Pearce-Higgins *et al.* (2012) suggests potential positive impacts of wind farm construction on open habitat species such as meadow pipit and skylark. This, however, is based on vegetation removal during construction, resulting in the creation of more openness in the sward structure and increased nesting opportunities. In terms of displacement during the operational phase, impacts within 100 m of turbines have been observed for meadow pipit and skylark (Pearce-Higgins *et al.*, 2009). Hötker *et al.* (2006)[125] found mixed results on the habituation of skylark and meadow pipit to operational wind farms, with 3 studies indicating habituation and 3 studies indicating no habituation. Based on the potential displacement of several meadow pipit/skylark territories, as well as their importance as prey species, the magnitude of effect is assessed as negligible at the regional population level, resulting in a **very low significance** of effect and low at the local level, resulting in a **low significance** of effect at the local level,.

Collision Risk

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[124] Crowe, O., Musgrove, A. J. & O'Halloran, J. (2014). Generating population estimates for common and widespread breeding birds in Ireland. *Bird Study*, 61(1), 82-92.

[125] Hötker, H., Thomsen, K. M. & Jeromin, H. (2006). *Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats - facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation*. Michael-Otto-Institut im NABU, Bergenhusen

Though passerines are considered to be at low risk from collisions with turbines, and less sensitive to wind farm impacts overall, research on Portuguese wind farms found that breeding skylarks were the species with the highest overall mortality in heathland habitats; and suggested this was related to the display flights undertaken by male skylarks, which increases susceptibility to collision risk (Morinha *et al.*, 2014)[126]. This finding was based on spring turbine searches conducted at 9 wind farms (82 turbines), with *c.* 100 search visits (*c.* 900 turbine searches) generating 22 skylark carcasses. The authors used factors to correct for searcher efficiency and carcass removal rates by scavengers to provide a figure for 'real mortality'. This was found to be of a higher order of magnitude (225 collisions) and was considered capable of having long-term impacts on demographics (*c.* 90% of birds killed were male) and abundance.

Utilising this data set, Bastos *et al.* (2016)[127] ran population models for northern Portugal, which showed that the average local impact for collision on breeding skylark would increase over time, *i.e.* as the local population declines due to effects driven by a range of environmental factors (such as climate change) the magnitude of effect on the local breeding pairs increases due to turbine mediated mortality. The model predicted that direct impacts from operational wind farms on the local breeding populations would increase from 1.3%/km^2 in 2006 to 4%/km^2 in 2026. Accounting for all the wind farms in the region, the model also generated predicted regional cumulative impacts which increased from 1.2% to 3.7% of the total estimated breeding individuals. Based on Percival (2003)[128] this magnitude of effect on either the local or the regional population would be classed as <u>low</u> (1-5% of population affected). This would result in a **low significance** of effect.

Final Decommissioning Phase

As for the initial decommissioning phase, the displacement of/disturbance to, red-listed ground nesting species is considered to be of <u>negligible</u> magnitude of effect at the regional level and <u>low</u> magnitude of effect at the local level, resulting in a **very low significance** and **low significance** of effect, respectively

11.5.3.9.2 Other Red-listed Breeding Passerines

Decommissioning and Construction phase

Other NI priority species breeding within the OSA include lesser redpoll, house sparrow, mistle thrush, linnet and starling. The Development will not result in the loss of any breeding habitat for lesser redpoll (forestry plantation), and therefore there is not considered to be the potential for any direct impacts to this species. House sparrow was recorded breeding at a farm building off the Glenmornan Road, which will not be affected by the Development, and therefore there is not considered to be the potential for any direct impacts to this species. Starlings were recorded nesting within the existing substation, which is proposed to be demolished. This will result in the loss of used nesting habitat for this species.

Inappropriately timed vegetation removal has the potential to result in direct impacts to breeding mistle thrush (45,330 (39,090–51,950) birds in NI), song thrush (82,300 (72,830–92,800) birds in NI) and linnet (104,890 (82,280–131,460) birds in NI) (Crowe

[126] Morinha, F., Travassos, P., Seixas, F., Martins, A., Bastos, R., Carvalho, D., Magalhães, P., Santos, M., Bastos, E. & Cabral, J. A. (2014). Differential mortality of birds killed at wind farms in Northern Portugal. *Bird Study*, 61, 255-259.

[127] Bastos, R., Pinhanços, A., Santos, M., Fernandes, R.F., Vicente, J. R., Morinha, F., Honrado, J. P., Travassos, P., Barros, P. & Cabral, J. A. (2016). Evaluating the regional cumulative impact of wind farms on birds: how can spatially explicit dynamic modelling improve impact assessments and monitoring? *Journal of Applied Ecology*, 53, 1330-1340.

[128] Percival, S. M. (2003). *Birds and wind farms in Ireland: A review of potential issues and impact assessment*. Ecology Consulting, Coxhoe, Durham.

et al., 2014)[129]. Habitat loss associated with the Development (see **Technical Appendix 10.1: Ecological Impact Assessment**) largely includes loss of acid and improved grassland, degraded peatland and *c.* 100 m of hedgerow. Overall, the removal of suitable nesting habitat associated with these species is highly limited, with areas of forestry plantation and mature trees suitable for mistle thrush and song thrush being retained, and limited potential for direct habitat loss to linnet, which prefer to nest in dense hedgerows, scrub and gorse. It should also be noted that these species are relatively abundant and widespread (Crowe *et al.*, 2014)[130], with high fecundity and populations that are unlikely to be affected by the scale of the works. In the absence of mitigation, population effects on nesting birds are considered to be of negligible magnitude of effect, resulting in a **very low significance** of effect at the regional and local levels.

Disturbance to foraging birds during this phase is likely to have a localised effect, potentially leading to some temporary displacement of more sensitive species. In the absence of mitigation, these effects could be more acute in the breeding season. However, given the spatially and temporally constrained nature of the works, and the wide availability of alternative foraging habitats adjacent to the works corridor, the magnitude of any effect is assessed as negligible. Therefore, the significance effect is **very low significance** at the regional and local levels.

Operational Phase

Information on the effects of operational wind farms on small passerine birds is limited compared to studies on larger collision risk species, such as eagles and hen harriers. Some studies find limited effects of active turbines on passerine assemblages (Devereux *et al.*, 2008)[131], with others reporting mild to moderate displacement effects (Pearce-Higgins *et al.*, 2012)[132]. A study by Gómez-Catasús *et al.* (2018)[133] investigating the effects of wind farms on a threatened passerine (Dupont's lark) suggests that wind farms can have a significant and deleterious impact, with a magnitude of annual decline four times higher than for similar populations occurring in control areas without wind turbines.

Though red-listed, these species are still considered common and widespread and are not considered to be rarer or threatened in the NI or UK context. As such, the magnitude of effect is assessed as negligible, resulting in a **very low significance** of effect.

Final Decommissioning Phase

As for the initial decommissioning phase, the displacement of/disturbance to, red-listed passerine species is considered to be of negligible magnitude of effect, resulting in a **very low significance** of effect.

[129] Crowe, O., Musgrove, A. J. & O'Halloran, J. (2014). Generating population estimates for common and widespread breeding birds in Ireland. *Bird Study*, 61(1), 82-92.
[130] Crowe, O., Musgrove, A. J. & O'Halloran, J. (2014). Generating population estimates for common and widespread breeding birds in Ireland. *Bird Study*, 61(1), 82-92.
[131] Devereux, C. L., Den`ny, M. J. H. & Whittingham, M. J. (2008). Minimal effects of wind turbines on the distribution of wintering farmland birds. *Journal of Applied Ecology* ,45, 1689-1694.
[132] Wilson, M, Fernández-Bellon, D., Irwin, S. & O'Halloran, J. (2015). *The interactions between Hen Harriers and wind turbines*. Final project report, prepared by School of Biological, Earth & Environmental Sciences, University College Cork, Ireland; Pearce-Higgins, J. W., Stephen, L., Douse, A. & Langston, R. H. W. (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, 386–394.
[133] Gómez-Catasús, J., Garza, V. & Traba, J. (2018). Wind farms affect the occurrence, abundance and population trends of small passerine birds: The case of the Dupont's lark. *Journal of Applied Ecology*, 55(40), 2033-2042.

11.6 MITIGATION AND RESIDUAL EFFECTS

Potential effects on bird populations of low and very low significance have been identified relating to the decommissioning and construction, operational and final decommissioning stages of the Development. This section details the mitigation required to offset these effects. Mitigation approaches include mitigation by avoidance and mitigation by reduction and offsetting.

11.6.1 Decommissioning and Construction Phase Mitigation

Through project design (embedded mitigation) areas of heath and bog have been avoided and will be retained. These areas were identified as important for upland bird communities, especially breeding red grouse, merlin, snipe, meadow pipit and skylark. To avoid widespread disturbance to birds, access within the construction site will be restricted to the footprint of the proposed Development. The Development, including areas identified for certain activities, such as peat storage, and micrositing allowances, have been defined within Chapter 3: Development Description. Likewise, access routes will be agreed on site and no access between different parts of the infrastructure will be permitted, except insofar as micrositing is allowed.

To avoid direct and indirect disturbance to breeding birds, wherever feasible, the following restrictions on timings of construction works will be applied:

- Construction will be timed to commence outside the bird breeding season (April to August inclusive). This does not preclude construction continuing during the breeding season but would allow sensitive bird species to choose nesting sites away from sources of potential disturbance.
- Where removal of suitable nesting habitat is required to facilitate the works, including the infrastructural footprint, excavation of the grid connection route and temporary storage areas, wherever feasible, the preparatory clearance works will be undertaken prior to the 1st March in the construction year.
- Vegetation removal required for creation of bat feature buffers around turbines will be undertaken outside the bird breeding season (March to August inclusive).
- Once vegetation has been removed within the works corridor these areas will be retained in a condition that limits suitability for nesting birds for the remainder of the construction phase of the proposed development. Any areas of potential cover, particularly cover for ground nesting species, will be rendered unsuitable by cutting vegetation or tracking over with an excavator.
- There will be no clearance of vegetation suitable for nesting birds within the bird nesting season (March to August inclusive), unless checked for nesting birds by a suitably qualified ornithologist (performing the role of Ecological Clerk of Works - ECoW) and cleared by them for removal, taking account of both potential for direct nest destruction and disturbance to nesting birds in adjacent areas.
- Any construction works proposed during the nesting bird season (March to August inclusive) will be preceded by a nesting bird survey and associated reporting. The report will detail nesting or prospecting birds in the area and will detail buffer zones and measures required in order to avoid potential disturbance or impact, and will form part of any regular and final ECoW reporting as required for planning compliance. Particular attention will be given to sensitive bird species (including breeding raptors and waders).

- If works are scheduled to commence in February, a pre-construction visit will be required to monitor potential red grouse breeding habitat, as this species establishes breeding territories over the winter.

To avoid disturbance to breeding birds any site works occurring during the bird breeding season will require ongoing surveying, including:

- From the 1st March, weekly nesting bird surveys covering the upcoming works phase will be conducted.
- Surveys will be undertaken by an appropriately experienced ornithologists in order to ascertain constraints on the consented programme of works.
- Any breeding activity will be recorded and potential for active nests determined.
- Where an active nest is located or suspected for widespread species (including meadow pipit and skylark), an appropriate buffer zone will be applied, within which there will be no access or works permitted.
- Where an active nest is located for sensitive species that may be impacted by the works (for example breeding red grouse or snipe within or adjacent the works corridor), then works in that area will be delayed until after the bird nesting season, or NIEA-NED will be consulted on the application of an appropriate buffer distance.
- The ornithologist appointed to the project will determine survey effort, taking an evidenced based approach. The survey schedule adopted must be fully documented and justified. Likewise, all actions must be fully documented and provided as any part of post-construction compliance monitoring requirements in the end of season report.

The ornithologist's role, in conjunction with the ECoW will include:

- Providing advice to ensure legal compliance with respect to nesting birds;
- The application of appropriate buffers to ensure the protection of nesting birds from disturbance that are in line with current scientific understanding, *e.g*. as reviewed/published in Hötker *et al*. (2006)[134], Ruddock & Whittfield (2007)[135] as updated by Goodship & Furness (2020)[136], Pearce-Higgins *et al*. (2009)[137] and Tosh *et al*. (2014)[138].
- Ensuring that all required exclusion zones for nesting birds are adequately set out, protected and signed-off, and that all contractors working on the site abide by them;
- Liaison with contractors and construction staff working on site as required, through the provision of Toolbox talks.

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[134] Hötker, H., Thomsen, K.M. & Jeromin, H. (2006). Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats - facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation. Michael-Otto-Institut im NABU, Bergenhusen.
[135] Ruddock, M. & Whitfield, D. (2007). *A review of disturbance distances in selected bird species*. A report from Natural Research (Projects) Ltd to Scottish Natural Heritage.
[136] Goodship, N. M. and Furness, R. W. (2022). *Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species*. NatureScot Research Report 1283.
[137] Pearce-Higgins, J.W., Stephen, L., Langston, R.W., Bainbridge, I.P. & Bullman, R. (2009). The distribution of breeding birds around upland wind farms. *Journal of Applied ecology*, 46: 1323-1331.
[138] Tosh, D.G., Montgomery, W.I. & Reid, N. (2014). A review of the impacts of wind energy developments on biodiversity. Report prepared by the Natural Heritage Research Partnership (NHRP) between Quercus, Queen's University Belfast and the Northern Ireland Environment Agency (NIEA) for the Research and Development Series No. 14/02

11.6.2 Operational Phase Mitigation

- An ornithological Post Construction Monitoring Plan (PCMP) will be produced which will include methodical searches at turbine locations using standard best practice guidelines (in prep NatureScot) to look for bird casualties of collisions. Further details are outlined in Section 11.6.3, Monitoring.
- Fencing is to be limited, where possible, throughout the site to reduce collisions for red grouse and the possibility of low-flying merlin getting caught when in pursuit of prey. In the case where fencing is required, wildlife friendly fencing will be used. (This is outlined within the HMEP - **Technical Appendix 3.2.**).
- Measures specifically designed to ensure threats to water quality are in built within the design and will ensure any downstream avian receptors are protected from any pollution or sedimentation effects as a result of construction of the wind farm (see **Technical Appendix 3.1: Decommissioning and Construction Environmental Management Plan** (DCEMP)).

11.6.3 Operational Phase Enhancement Measures

Several enhancement measures are proposed, and these should be implemented/agreed with detailed plans provided prior to the commencement of constructions works, including:

- The inclusion of red grouse, snipe, golden plover, merlin, curlew (due to their historic breeding status within the OSA), and ground-nesting passerines such as meadow pipit and skylark in the **Technical Appendix 3.2: Draft HMEP**, which will create/enhance areas for these species, both within the OSA and wider area. Consideration has also been given within the HMEP towards species' (such as snipe and curlew) observed avoidance of turbines, and areas assigned to be managed for snipe and other sensitive species are located away from wind farm infrastructure. This will also be of benefit to kestrel foraging in the wider area.
- Where stream crossings are proposed these should be designed to include nesting crevices for grey wagtail.
- The potential for erecting nest boxes for dipper along the Legnahone Burn, in particular at the road bridge along the Napple Road should be investigated with the council. Foraging dipper were recorded along this stretch of the stream.

11.6.4 Decommissioning Phase Mitigation

Decommissioning phase effects are likely to be broadly similar to the decommissioning and construction phase effects, in terms of disturbance through increased noise levels, ground clearance works, and potential reinstatement. The implementation of all mitigation measures detailed in the decommissioning and construction phase will help ensure that all such impacts are avoided.

Therefore, it is proposed that a Decommissioning Plan be drafted prior to removal of the Development infrastructure. This will be put into place containing specific actions aimed at protecting important species, including all the mitigation measures specified for the decommissioning and construction phase. These include limitations on the working corridor, minimised impact on vegetation, and protection of nesting birds. A pre-decommissioning bird survey should be undertaken with the specific objective of identifying any species of nature conservation importance that may be affected by the decommissioning phase and works timed accordingly to avoid sensitive periods.

11.6.5 Ornithological Monitoring

As detailed in Section 11.6.1, construction works during the bird breeding season (March to August inclusive) will require ongoing nesting bird surveys to avoid disturbance to breeding birds.

NatureScot (formally SNH, 2017) guidelines recommend ongoing monitoring is important to assess any changes in bird activity on wind farm sites. New guidance is due to be issued specifically in relation to repowering sites. Examples of changes in bird activity include instances such as golden eagle, curlew or breeding hen harrier moving into the area, or potential golden plover displacement. Post-construction ornithological monitoring has also become increasingly important to assessing the cumulative effects of wind farms, as the number sites across the country increases annually.

As detailed in **Technical Appendix 3.2: Draft HMEP** there are habitat enhancement measures proposed, with some of the habitat management areas targeting habitat creation/enhancement for red grouse and breeding snipe, as well as other upland ground nesting species such as meadow pipit and skylark. Ornithological monitoring is required to determine the efficacy of the measures within the habitat management areas.

Ornithological monitoring surveys will commence in the construction year and in post-construction years 1, 2, 3, 5, 10, 15 and 20. A results report providing a full audit of the survey effort and detailing the main findings will be delivered within six months of completing a monitoring year. Reporting for Year 3 and Year 5 will assess the efficacy of the ornithological monitoring programme and modification can be implemented in agreement with NIEA. Note, start dates for post-construction monitoring years should be in line with either the start of the breeding season or non-breeding season; and it is acceptable for Year 1 post-construction monitoring to commence prior to the final close-out of construction, as long as the schedule is for turbines to be erected and turning for at least three months of the season, i.e. posing a collision risk for more than half of the season. As outlined in Section 11.6.4, pre-decommissioning ornithological surveys will also be required.

Surveys will be conducted by a suitably experienced ornithologist and may include the following elements to be agreed in consultation with NIEA-NED in the form an ornithological PCMP that will be produced prior to the commencement of works.

Standard post-construction monitoring required to monitor changes in site usage and turbine mediated mortality, incorporating:

- ***Vantage point surveys*** to SNH (2017) guidelines[139]
  - The proposed wind farm site can be covered from three of the vantage points used pre-construction (VP1, VP2, VP3), as the dimensions of the final site layout have been reduced. A fourth VP covering the southern slopes (VP4) could be retained as a control to monitor flight activity in the undeveloped lands adjacent to the proposed wind farm.
  - Post-construction surveying should be undertaken in years 1, 2, 3, 5, 10, 15 & 20.
  - For each VP 36 hours of watches should be conducted in each season, i.e. a total of 72 hours per VP for each monitoring year.
- ***Collision monitoring and associated surveys***
  - Turbine searches implemented to monitor fatalities (and possibly injured animals) due to collisions with turbines in post-construction in years 1, 2, 3, 5, 10, 15 & 20, incorporating methodology to monitor scavenger removal rates and searcher efficiency, which will allow for indicative estimates of 'real' fatality rates to be generated.
- Turbines requiring monitoring and survey schedule should be determined by the baseline study, which identified species at risk due to turbine mediate mortality and seasonal levels/locations of activity for these species. The survey protocols, such as

[139] Scottish Natural Heritage (2017). Recommended bird survey methods to inform impact assessment of onshore wind farms.

the dimensions of search areas, search intervals and search type (dog vs human) should follow the latest guidance, as and when published, and in the interim the approach should be fully justified based on a review of relevant publications and studies. Requirements to monitoring any turbines for potential bat fatalities should be incorporated, to create a consolidated monitoring protocol.

Monitoring required to monitor the effectiveness of habitat management areas is required for snipe, red grouse and other upland breeding birds and should include the following surveys:

- ***Breeding season snipe surveys*** –
  - Map suitable breeding snipe habitat within 500 m turbine buffer and habitat management areas.
  - All areas of suitable/historical snipe breeding habitat should be visited at least twice during the breeding season.
  - To optimise detection of displaying snipe (drumming/chipping birds) surveys should be limited to periods 3 hours after first light (dawn) and 3 hours before last light (dusk), as per O'Brien & Smith (1992)[140]. In addition, surveyors should aim to stay in areas of suitable habitat for as long as possible, with a minimum of 20 minutes suggested.
  - Pre-construction surveys required and in post-construction years 1, 2, 3, 5, 10, 15 & 20. The first survey window is mid-April to mid-May and the second visits should be conducted between mid-May to mid-June, with a minimum of two weeks between visits.
  - Days with light wind conditions (< 19 km/hr, 5.5 m/s, Force 3) should be selected for surveying and drizzle or light rain are acceptable during surveys, as these can result in increased display activity.
- ***Upland breeding bird surveys***
  - Pre-construction surveys required and in post-construction years 1, 2, 3, 5, 10, 15 & 20 – to monitoring changes in the abundance and distribution of breeding upland birds across the site.
  - A fixed transect route, repeating selected sections of the pre-planning transectsshould be set-up to sample parts of the 500m turbine buffer and habitat management areas. As a control (sampling an undeveloped area) this could include incorporating a transect route traversing the slopes to south of the wind farm. As a minimum, the completion of the transect route selected should be achievable by two surveyors in one day (two consecutive days if undertaken by one surveyor).
  - It is recommended that as a minimum two visits over the breeding season should be undertaken at least 14 days apart; incorporating an early season visit in May targeting the peak display period for most species and a later season visit in June surveying for fledging success and second/third breeding attempts.
  - All bird species present, numbers and behaviour should l be recorded to allow for an estimation in the numbers of breeding territories, as per common bird census (CBS) methodology described in Gilbert *et al*. (1998)[141], summarising Marchant (1983)[142] and Marchant *et al*. (1990)[143], all be it informed by significantly fewer visits than required for CBS.

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[140] O'Brien, M. & Smith, K.W. (1992) Changes in the status of waders breeding on wet lowland grassland in England and Wales between 1982 and 1989. *Bird Study* 39: 165-176.

[141] Gilbert, G., Gibbons, D.W. & Evans, J. (1998). *Bird Monitoring Methods*. RSPB, Sandy.

[142] Marchant, J.H. 1983. *Common Birds Census instructions*. BTO, Tring.

[143] Marchant, J.H., Hudson, R., Carter, S.P. & Whittington, P. 1990. *Population Trends in British Breeding Birds*. BTO, Tring.

- Surveys should be conducted between 08:30 and 18:00 in wind conditions not exceeding a Force 4 (> 28 km/hr, 7.9 m/s) and days with predominately dry weather should be targeted.

- ***Red grouse surveys areas***–
  - Estimate number and distribution of red grouse territories employing a combination of dawn surveys and tape-lure methodology
  - Pre-construction baseline required, surveying post-construction should be undertaken in years 1, 2, 3, 5, 10, 15 & 20.
  - Dawn surveys (30 mins before first light to 1 hour after dawn)can be undertaken in February/March targeting dry, still mornings (< 11 km/hr, 3.1 m/s, Force 2) using listening points, distributed at c. 500m intervals, and preferably covered on the same morning (i.e. using a minimum of two surveyor), which are set up to cover all suitable grouse habitat within 500 m turbine buffer and habitat management areas.
  - Tape-lure methods should follow those detailed in Cummins *et al*. (2010). All the 1-km squares (as per Irish grid) intersecting with the 500 m turbine buffer and habitat management areas supporting suitable red grouse habitatshould be identified. A minimum of three 1 km squares should be selected for tape-lure surveys in late February/early March targeting predominately dry days with light winds not exceeding Force 4 on the Beaufort scale. It is acceptable to re-align the 1 km^2 squares to maximise coverage of grouse habitats. As per Cummins *et al*. (2010)[144], transects lines should be set up at interval of 250 m within the 1 km^2 squares and fixed points for playing the tape-lure. To provide comparable data the transect routes and fixed tape-lure play points must remain consistent in each monitoring year.
- ***Reporting*** – A report detailing compliance with, and findings of, monitoring will be submitted to the Planning Authority within six months of the annual survey cycle ending.
- ***Review of monitoring programme*** – Reporting for Year 3 and Year 5 will assess the efficacy of the ornithological monitoring programme and modification can be implemented in agreement with NIEA. Based on the results of baseline ornithological surveys and the mitigation/enhancement proposed it is not anticipated that there will be a need for any contingency measures.

11.6.6 Residual Effects

The results of the impact assessment, in the absence of mitigation, indicate that bird activity is not likely to be significantly affected by the proposed Development. With the full implementation of the prescribed mitigation measures throughout the construction phase, operational phase, and decommissioning phase of the project, significant residual effects on KORs are not expected as a result of the Development. The specific residual effects on different species and species groups, following the application of mitigation relevant to them, is detailed in Table 11.9.

With the full implementation of the CEMP and draft HMEP measures as intrinsic parts of the design of this wind farm, it is anticipated that positive results can be achieved for the benefit of the avian population utilising this site. This will be monitored on an ongoing basis as part of these recommendations and in line with best practice guidelines.

[144] Cummins, S., Bleasdale, A., Douglas, C., Newton, S., O'Halloran, J. & Wilson, H.J. (2010) The status of Red Grouse in Ireland and the effects of land use, habitat and habitat quality on their distribution. Results of the National Red Grouse Survey 2006-2008. *Irish Wildlife Manuals*, No. 50. NPWS, DoEHLG, Dublin, Ireland.

11.7 CUMULATIVE EFFECT ASSESSMENT

Cumulative impacts on bird species are as a result of the influence of other wind farms, together with the Development, on displacement, collision or barrier impacts on birds. Table 11.8 lists the existing or consented wind farms located within 15 km of the Development.

Table 11.8: Wind farms located within 15 km of the Development

Wind Farm name	Number of turbines	Approx. distance to the Development
Curlyhill Road	1	6.5 km west
Stone Road	1	8.5 km south-west
Eglish	6	9.3 km north-east
Lislafferty Road	1	10 km south
Diamond Field	1	10 km south
Carrickatane	9	10 km north
Slieve Kirk	12	10.5 km north
Curryfree	6	11.5 km north
Bessy Bell	16	15 km south

The closest operational wind farm is 6.5 km away, which consists of one turbine. 44% of the wind farms in the wider area consist of just a single turbine. Inclusive of wind farms currently under construction, it is estimated that there are or will be in the region of 53 turbines within 15 km of the Development. The majority of these are more than 10 km away. Some of these wind farms are reaching the end of their operational life (*e.g.* Bessy Bell) and repowering has been considered. Typically, repowering projects replace the existing turbines with a smaller number of larger turbines.

The proposed Dalradian Gold Mine grid connection application (planning ref. LA11/2019/1000/F) lies within the hydrological catchment of the Development. The proposed grid connection application supports the Curraghinalt mine application (LA10/2017/1249/F) which lies outside the hydrological catchment of the Development. Both applications are subject to public inquiry by the Planning Appeals Commission (PAC), and at the time of writing, the date for the public inquiry hearings have not been scheduled. Significant direct impacts from the Development (on its own) on bird species as a result of killing or injuring through e.g., collision with overground infrastructure, or, direct habitat loss due to the Development footprint, can be ruled out. As such, there is no potential for impacts arising from the Dalradian Gold Mine grid connection application in-combination with the Development.

The baseline surveys revealed no regular commuting or passage migration routes through the wind turbine envelope (*e.g.* for goose or swan species). The Development was therefore not found to be on a significant migration route or regularly utilised flight line between roost/breeding sites and foraging areas. Species occurring within the OSA, such as buzzard, kestrel and sparrowhawk, are also not considered to be at risk of barrier effects from wind farms (Hötker *et al.*, 2006)[145]. Therefore, the Development is not expected to act in combination with other wind farms to form a barrier to bird movement. Additionally, the CRM revealed a low significance of effect to both national and regional populations.

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[145] Hötker, H., Thomsen, K. M. & Jeromin, H. (2006). *Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats - facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation*. Michael-Otto-Institut im NABU, Bergenhusen

Given the current low density of operational and consented wind farms within 15 km of the Development, there is not considered to be a risk of significant cumulative effects.

It is possible that the potential for cumulative effects may change over time, notably with respect to species with large foraging ranges, *e.g.* golden eagles, which are expanding their range and at some stage during the operational life of the Development may occupy territories that encompasses the Development. In addition, further monitoring of wind farm sites, particularly newer specifications, on the Island of Ireland will support future measures for bird conservation. This highlights the importance of an appropriate monitoring programme and associated potential mitigation.

11.8 SUMMARY OF EFFECTS

Table 11.9 provides a summary of the effects detailed within this chapter.

Table 11.9: Summary of Effects

Receptor	Potential Effect	Significance of Effect Percival (2003)	Measures Proposed	Residual Effect (Note – under Percival (2003) 'Very low' is the lowest level of potential impact)
Decommissioning/Construction Phase				
Red grouse	• Direct/indirect disturbance to nesting birds. • Loss of nesting and foraging habitat. • Temporary disturbance to/displacement of foraging birds.	• Low • Low-Very low • Low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: • Timing of site preparation works to occur outside of the breeding bird season. • The HMEP includes a specific Red Grouse Habitat Management Plan (RGHMP), notably including heather management of currently 'rank' habitat to promote the optimal condition of heather habitat sutable for foraging and breeding red grouse.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. The implementation of the RGHMP will reverse any potential loss of nesting and foraging habitat. These measures will result in residual impacts likely to be reduced to 'Very low', with likely positive impacts on the red grouse population in the longer term.
Golden plover	• Temporary disturbance to/displacement of foraging wintering birds.	• Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). No mitigation measures are proposed for potential temporary disturbance of foraging wintering birds.	The residual impact will remain at 'Very low'.

Receptor	Potential Effect	Significance of Effect Percival (2003)	Measures Proposed	Residual Effect (Note – under Percival (2003) 'Very low' is the lowest level of potential impact)
Snipe	• Direct/indirect disturbance to nesting birds. • Nesting and foraging habitat loss. • Temporary disturbance to/displacement of foraging birds. • Deterioration in habitat suitability due to changes in hydrological conditions.	• Very low • Very low • Very low • Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: • Timing of site preparation works to occur outside of the breeding bird season. • The HMEP includes a specific Snipe Habitat Management Plan (SHMP), notably including grazing management and creation of positive features and conditions (eg wader scrapes and water tables) to promote optimal conditions for foraging and breeding snipe. • Water quality mitigation measures.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. The implementation of the SHMP will reverse any potential loss of nesting and foraging habitat. These measures will result in residual impacts likely to be reduced further within the 'Very low' significance category, with likely positive impacts on the snipe population in the longer term.
Merlin	• Indirect disturbance to nesting birds. • Temporary disturbance to/displacement of foraging birds. • Temporary disturbance to/displacement of main prey species.	• Low-Very low • Very low • Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: • Timing of site preparation works outside of the breeding bird season.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. These measures will result in residual impacts likely to be reduced to 'Very low'.
Kestrel	• Indirect disturbance to nesting birds.	• Very low	Significance level below 'Medium' does not automatically trigger	The timing of site preparation works outside bird breeding season will avoid any direct

Receptor	Potential Effect	Significance of Effect Percival (2003)	Measures Proposed	Residual Effect (Note – under Percival (2003) 'Very low' is the lowest level of potential impact)
	• Temporary disturbance to/displacement of foraging birds.	• Very low	requirement for mitigation under Percival (2003). Measures to reduce impact are: • Timing of site preparation works outside of the breeding bird season.	impact on nesting birds and will reduce potential indirect impact though disturbance. These measures will result in residual impacts likely to be reduced further within the 'Very low' significance category.
Sparrowhawk	• Indirect disturbance to nesting birds.	• Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: • Timing of site preparation works outside of the breeding bird season.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. These measures will result in residual impacts likely to be reduced further within the 'Very low' significance category.
	• Temporary disturbance to/displacement of foraging birds.	• Very low		
Buzzard	• Indirect disturbance to nesting birds.	• Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: • Timing of site preparation works outside of the breeding bird season.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. These measures will result in residual impacts likely to be reduced further within the 'Very low' significance category.
	• Temporary disturbance to/displacement of foraging birds.	• Very low		
Riverine species	• Direct/indirect disturbance to nesting birds.	• Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: • Timing of site preparation works outside of the breeding bird season. • Water quality mitigation measures.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. Mitigation measures to avoid any deterioration in water quality on watercourses will avoid any potential indirect impact on species relying on aquatic habitats and associated species. These measures will result in residual impacts likely to be reduced further within the 'Very low' significance category.
	• Temporary disturbance to/displacement of foraging birds.	• Very low		
	• Water quality impacts to prey species of foraging birds	• Very low		

Receptor	Potential Effect	Significance of Effect Percival (2003)	Measures Proposed	Residual Effect (Note – under Percival (2003) 'Very low' is the lowest level of potential impact)
Red-listed ground-nesting passerines	• Direct/indirect disturbance to nesting birds.	• Low-Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: • Timing of site preparation works outside of the breeding bird season. • Appropriate buffer zones will be set up around ground nesting species during works to avoid disturbance. • The HMEP states that skylark and meadow pipit will benefit from the red grouse management measures.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. Targeted surveys and buffer zones to nest sites will avoid disturbance on individual pairs during construction. The implementation of the SHMP will reverse any potential loss of nesting and foraging habitat. These measures will result in residual impacts likely to be reduced to within the 'Very low' significance category, with likely positive impacts on the ground nesting passerine populations in the longer term.
	• Nesting and foraging habitat loss.	• Low-Very low		
	• Temporary disturbance to/displacement of foraging birds.	• Low-Very low		
Other red-listed passerines	• Direct/indirect disturbance to nesting birds.	• Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: • Timing of site preparation works outside of the breeding bird season.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. These measures will result in residual impacts likely to be reduced to within the 'Very low' significance category.
	• Nesting and foraging habitat loss.	• Very low		
	• Temporary disturbance to/displacement of foraging birds.	• Very low		
Operational Phase				
Red grouse	• Direct mortality due to collision with wind farm infrastructure	• Low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are:	The implementation of the RGHMP is likely to result in positive impacts on the red grouse population. Management within areas distinct from infrastructure will reduce potential for collisions, further reduced by avoidance / marking of fencing where feasible.

Receptor	**Potential Effect**	**Significance of Effect Percival (2003)**	**Measures Proposed**	**Residual Effect (Note – under Percival (2003) 'Very low' is the lowest level of potential impact)**
			• Fencing not permitted within key red grouse management areas under the HMEP. • The HMEP includes a specific Red Grouse Habitat Management Plan (RGHMP), notably including heather management of currently 'rank' habitat to promote the optimal condition of heather habitat sutable for foraging and breeding red grouse. • RGHMP includes significant area remote from proposed wind farm infrastructure.	These measures will reduce impacts while resulting in likely population increases, with residual impacts on the population likely to be reduced to within the 'Very low' significance category.
Golden plover	• Direct mortality due to collision with wind farm infrastructure.	• Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: • Specific management measures within the HMEP for red grouse will also create suitable conditions for golden plover.	These measures will enhance the suitability of the area for wintering golden plover. Residual impacts associated with direct mortality will remain within the 'Very low' significance category.
	• Displacement from turbine infrastructure (up to 850 m).	• Very low		
Snipe	• Direct mortality due to collision with wind farm infrastructure	• Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: • The HMEP includes a specific Snipe Habitat Management Plan (SHMP), notably including grazing	These measures will reduce impacts while resulting in likely population increases, with residual impacts on the population likely to be reduced to within the 'Very low' significance category.
	• Displacement from turbines (up to 400 m)	• Very low		
	• Deterioration in habitat suitability due to	• Very low		

Receptor	Potential Effect	Significance of Effect Percival (2003)	Measures Proposed	Residual Effect (Note – under Percival (2003) 'Very low' is the lowest level of potential impact)
	changes in hydrological conditions.		management and creation of positive features and conditions (eg wader scrapes and raising water tables) to promote optimal conditions for foraging and breeding snipe. • Water quality mitigation measures.	
Merlin	• Direct mortality due to collision with wind farm infrastructure	• Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). No operational phase mitigation is proposed for merlin.	Residual Impact will remain within the 'Very low' significance category.
	• Displacement from turbines	• Very low		
Kestrel	• Direct mortality due to collision with wind farm infrastructure	• Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). No operational phase mitigation is proposed for kestrel.	Residual Impact will remain within the 'Very low' significance category.
	• Displacement from turbines	• Very low		
Sparrowhawk	• Direct mortality due to collision with wind farm infrastructure	• Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). No operational phase mitigation is proposed for sparrowhawk.	Residual Impact will remain within the 'Very low' significance category.
	• Displacement from turbines	• Very low		
Buzzard	• Direct mortality due to collision with wind farm infrastructure	• Very low	Significance level below 'Medium' does not automatically trigger	Residual Impact will remain within the 'Very low' significance category.

Receptor	Potential Effect	Significance of Effect Percival (2003)	Measures Proposed	Residual Effect (Note – under Percival (2003) 'Very low' is the lowest level of potential impact)
	• Displacement from turbines	• Very low	requirement for mitigation under Percival (2003). No operational phase mitigation is proposed for buzzard.	
Riverine species	• Displacement due to deterioration in local water quality.	• Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: • Water quality mitigation measures. • Provision of nest boxes for dipper and grey wagtail along the Legnahone Burn will be investigated.	These measures will reduce impacts while resulting in possible population increases through the provision of nest boxes, with residual impacts on the population likely to be reduced to within the 'Very low' significance category.
Red-listed ground-nesting passerines	• Direct mortality due to collision with wind farm infrastructure (in particular, for skylark)	• Low-Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: • Habitat enhancement measures for snipe and red grouse as detailed within the HMEP will ensure more suitable habitat and nesting opportunities for ground nesting species.	These measures will result in possible population increases through the provision of improved habitat suitability, with residual impacts on the population likely to be reduced to within the 'Very low' significance category.
	• Displacement from turbines (up to 100 m)	• Low-Very Low		
Other red-listed passerines	• Displacement from turbines	• Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are:	Residual Impact will remain within the 'Very low' significance category.

Receptor	Potential Effect	Significance of Effect Percival (2003)	Measures Proposed	Residual Effect (Note – under Percival (2003) 'Very low' is the lowest level of potential impact)
			No operational phase mitigation is proposed for other red-listed passerines.	
Final Decommissioning Phase				
Red grouse	• Direct/indirect disturbance to nesting birds. • Temporary disturbance to/displacement of foraging birds.	• Low • Low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: • Timing of site preparation works outside of the breeding bird season. • Machinery to only use existing tracks and hardstands.	The timing of site preparation works outside bird breeding season and the use of existing tracks will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. These measures will result in residual impacts likely to be reduced to 'Very low'.
Golden plover	• Temporary disturbance to/displacement of foraging birds.	• Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). No mitigation measures are proposed for potential temporary disturbance of foraging wintering birds.	The residual impact will remain at 'Very low'.
Snipe	• Direct/indirect disturbance to nesting birds. • Temporary disturbance to/displacement of foraging birds. • Deterioration in habitat suitability due to	• Very low • Very low • Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: • Timing of site preparation works outside of the breeding bird season. • Machinery to only use existing tracks and hardstands.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. Water quality mitigation measures during decommissioning will avoid any potential deterioration in habitat suitability through pollution. These measures will result in residual impacts likely to be reduced further within the 'Very low' significance category.

Receptor	Potential Effect	Significance of Effect Percival (2003)	Measures Proposed	Residual Effect (Note – under Percival (2003) 'Very low' is the lowest level of potential impact)
	changes in hydrological conditions.		• Creation of post-decommissioning HMEP. • Water quality mitigation measures.	
Merlin	• Indirect disturbance to nesting birds.	• Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: • Timing of site preparation works outside of the breeding bird season.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. These measures will result in residual impacts likely to be reduced further within the 'Very low' significance category.
	• Temporary disturbance to/displacement of foraging birds.	• Very low		
	• Temporary disturbance to/displacement of main prey species.	• Very low		
Kestrel	• Indirect disturbance to nesting birds.	• Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: • Timing of site preparation works outside of the breeding bird season.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. These measures will result in residual impacts likely to be reduced further within the 'Very low' significance category.
	• Temporary disturbance to/displacement of foraging birds.	• Very low		
Sparrowhawk	• Indirect disturbance to nesting birds.	• Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: • Timing of site preparation works outside of the breeding bird season.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. These measures will result in residual impacts likely to be reduced further within the 'Very low' significance category.
	• Temporary disturbance to/displacement of foraging birds.	• Very low		
Buzzard	• Indirect disturbance to nesting birds.	• Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under	The timing of site preparation works outside bird breeding season will avoid any direct

Receptor	**Potential Effect**	**Significance of Effect Percival (2003)**	**Measures Proposed**	**Residual Effect (Note – under Percival (2003) 'Very low' is the lowest level of potential impact)**
	• Temporary disturbance to/displacement of foraging birds.	• Very low	Percival (2003). Measures to reduce impact are: • Timing of site preparation works outside of the breeding bird season.	impact on nesting birds and will reduce potential indirect impact though disturbance. These measures will result in residual impacts likely to be reduced further within the 'Very low' significance category.
Riverine species	• Direct/indirect disturbance to nesting birds.	• Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: • Timing of site preparation works outside of the breeding bird season. • Water quality mitigation measures.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. Mitigation measures to avoid any deterioration in water quality on watercourses will avoid any potential indirect impact on species relying on aquatic habitats and associated species. These measures will result in residual impacts likely to be reduced further within the 'Very low' significance category.
	• Temporary disturbance to/displacement of foraging birds.	• Very low		
	• Water quality impacts to prey species of foraging birds	• Very low		
Red-listed ground-nesting passerines	• Direct/indirect disturbance to nesting birds.	• Low-Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: • Timing of site preparation works outside of the breeding bird season. • Machinery to only use existing tracks and hardstands.	The timing of site preparation works outside bird breeding season and the use of existing tracks will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. These measures will result in residual impacts likely to be reduced to within the 'Very low' significance category.
	• Nesting and foraging habitat loss.	• Low-Very low		
	• Temporary disturbance to/displacement of foraging birds.	• Low-Very low		
Other red-listed passerines	• Indirect disturbance to nesting birds.	• Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance.
	• Nesting and foraging habitat loss.	• Very low		

Receptor	Potential Effect	Significance of Effect Percival (2003)	Measures Proposed	Residual Effect (Note – under Percival (2003) 'Very low' is the lowest level of potential impact)
	• Temporary disturbance to/displacement of foraging birds.	• Very low	Percival (2003). Measures to reduce impact are: • Timing of site preparation works outside of the breeding bird season.	These measures will result in residual impacts likely to be reduced further within the 'Very low' significance category.

11.9 STATEMENT OF SIGNIFICANCE

The OSA holds a bird assemblage in keeping with what would be expected in the context of an upland site in Northern Ireland, encompassing a mosaic of semi-improved agricultural grassland, unimproved acid grassland, bog, heath and conifer plantation. Some 81 bird species were recorded within the OSA and wider area during the field surveys, many of which are reliant on the upland (peat derived) habitats within the site, with the introduction of commercial forestry plantations facilitating the occurrence of more woodland/scrub species.

Notable species include:

- A maximum of 3-4 red grouse territories, which are red-listed and an NI Priority Species;
- Up to 3-4 breeding snipe territories within the OSA (varying year to year), which are red-listed and an NI Priority Species;
- Small flocks of wintering and passage golden plover, an Annex I and NI Priority Species, utilising the OSA for roosting and foraging; and
- Breeding merlin, which is an Annex I and NI Priority Species, adjacent to the OSA.

Analysis of the potential effects of collision risk and disturbance/displacement, with consideration given to proposed mitigation measures resulted in residual impacts that are considered of **low to very low significance**.

11.10 GLOSSARY

CEDaR	Centre for Environmental Data and Recording
CRM	Collision Risk Modelling
ECoW	Ecological Clerk of Works
ES	Environmental Statement
HMEP	Habitat Management and Enhancement Plan
KOR	Key Ornithological Receptor
NI	Northern Ireland
oDCEMP Plan	outline Decommissioning and Construction Environmental Management
OSA	Ornithological Study Area
PCMP	Post Construction Monitoring Plan
RoI	Republic of Ireland
SCI	Special Conservation Interest
SNH	Scottish Natural Heritage
SPA	Special Protection Area
WeBS	Wetland Bird Survey
ZoI	Zone of Influence

11.11 NTS TEXT

An assessment of the effects on ornithological receptors was carried out on existing available data, literature and field surveys undertaken within the ornithological Study Area (OSA) between 2018 and 2022. Consultations were also undertaken with NIEA and RSPB.

The Development does not occur within close proximity to any Special Protection Areas (SPAs) or Ramsar sites. There is, however, a downstream hydrological connection (40 km via watercourse) to the River Foyle SPA and Ramsar site via the Glenmornan River and Owenreagh Burn. Connectivity to Designated Sites is addressed within the shadow Habitats Regulations Assessment (sHRA).

Seven bird species were identified as 'Key Ornithological Receptors' (KORs) and were subject to a detailed assessment of potential effects, namely red grouse, golden plover, snipe, merlin, kestrel, sparrowhawk and buzzard. Additionally, significant effects were considered in the case of riverine species, ground-nesting passerines and other breeding red-listed passerines.

In the absence of mitigation, the Development has the potential to result in direct impacts such as nest destruction/chick mortality and mortality due to collision with turbines and turbine infrastructure, and indirect effects such as habitat loss, water quality impacts on riverine species and displacement of birds. Habitat loss within the development area largely includes degraded peatland, improved and acid grassland and some small areas of hedgerow and scrub. This has the potential to reduce foraging opportunities for birds, and nesting opportunities, in particular for ground-nesting species such as red grouse, snipe, meadow pipit and skylark.

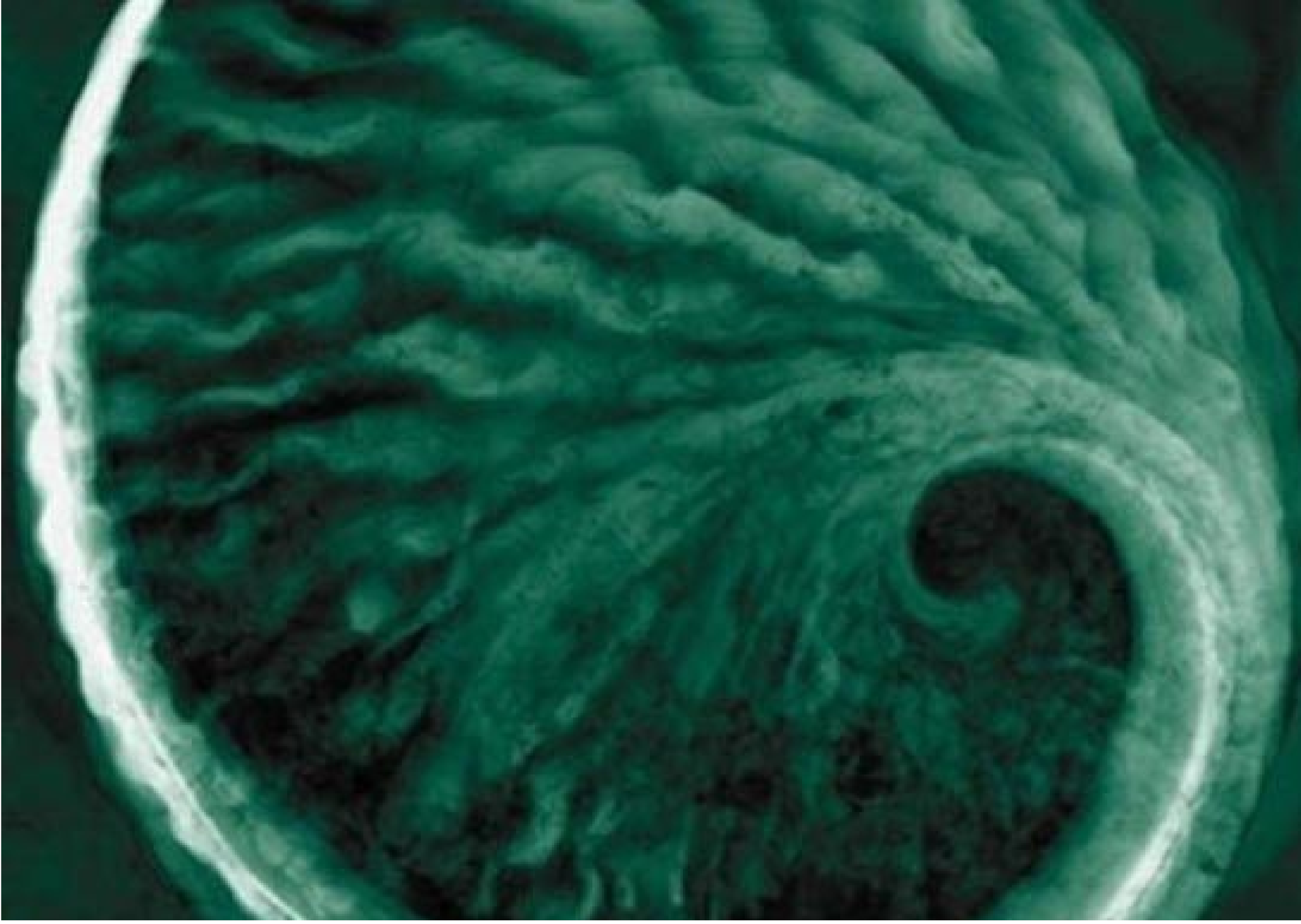
The Development was assessed alone and cumulatively with other wind farms in the area. No potentially significant habitat loss, disturbance, displacement or barrier effects on any of the KORs were identified with regards to the Development.

Mitigation measures have been proposed within the ES in order to reduce/alleviate the effects on the KORS. Measures which will be implemented include a draft Habitat Management and Enhancement Plan (HMEP), which will provide species-specific enhancement for red grouse and snipe and has the potential to have a positive effect on other bird species utilising the area. Mitigation measures proposed for the construction phase include pre-planned site preparation such as the removal of vegetation outside of the bird breeding season prior to carrying out construction activities on the site in addition to the implementation of the Construction Environmental Management Plan (CEMP) and the appointment of an Ecological Clerk of Works (ECoW). Specific measures for the protection of birds will be outlined in the CEMP. Where feasible, operations which have the potential to disturb birds will be timed accordingly to minimise any potential for impacts. This will be carried out in accordance with the advice of the Appointed ECoW and based on monitoring during construction at the site.

During the operational phase, post-construction monitoring will be carried out, and bird surveys will continue at the locations used pre-construction. The monitoring plan will be based on the results of post-construction monitoring surveys and carried out in line with best practice guidelines.

Analysis of the potential effects of collision risk and disturbance/displacement, with consideration given to proposed mitigation measures resulted in residual impacts that are considered of **low** to **very low significance** on the ornithological features of this site.

Considering the successful implementation of the HMEP and full implementation of the prescribed mitigation measures throughout the construction phase, operational phase, and decommissioning phase of the project, significant residual effects on Key Ornithological Receptors (KORs) are not expected as a result of the Development.



Owenreagh/Craignagapple Wind Farm

Ørsted Onshore Ireland Midco Limited

Environmental Statement – Chapter 12
Noise

06 September 2023

Project No.: 0696177

The business of sustainability

ERM

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Environmental Statement – Chapter 12 Noise

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Acronyms and Abbreviations

Name	Description
AGL	Above Ground Level
AM	Amplitude Modulation
BEIS	Business, Energy & Industrial Strategy
BERR	Business, Enterprise and Regulatory Reform
BPG	Best Practice Guidance
BS	British Standard
CRTN	Calculation of Road Traffic Noise
CoPA	Control of Pollution Act
dB	Decibel
dbA	Environmental Noise Level
DCSDC	Derry City & Strabane District Council Local
DfI	Department of Infrastructure
DTI	Department of Trade and Industry
FEI	Further Environmental Information
FI	Financial Involvement
GPG	Good Practice Guide
HGV	Heavy Good Vehicles
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IOA	Institute of Acoustics
ISO	International Organization for Standardization
EIA	Environmental Impact Assessment
EHO	Environmental Health Officer
ES	Environmental Statement
EPA	Environmental Protection Act
ETSU	Energy Technology Support Unit
LDP	Local Development Plan
NAL	Noise Assessment Limits
NE	Natural Environment
NI	Northern Ireland
OdCEMP	Outline Decommissioning and Construction Environmental Plan
ONR	Operational Noise Receptors

PfG	Programme for Government
PPS	Policy Plan Strategy
RDS	Regional Development Strategy
RE	Renewable Energy
SGNs	Supplementary Guidance Notes
SPPS	Strategic Policy Planning Statement

12. NOISE

12.1 Introduction

This Chapter of the Environmental Statement (ES) evaluates the likely significant effects of the proposed Owenreagh / Craignagapple Wind Farm ('the Development') on the acoustic environment of the area around the Development. This assessment was undertaken by Arcus Consultancy Services Limited (Arcus).

This Chapter of the ES is supported by the following Technical Appendix documents provided in **Volume 4**: ES Technical Appendices:

- **Technical Appendix A12.1: Baseline Data Analysis**;
- **Technical Appendix A12.2: Details of Construction Plant**; and,
- **Technical Appendix A12.3: Metrological and Acoustic Raw Data.**

This Chapter of the ES is supported by the following Figures provided in **Volume 3a**:

- **Figure 12.1: Construction Noise Assessment**; and,
- **Figure 12.2: Operational Noise Assessment.**

This Chapter includes the following elements:

- Guidance, Legislation and Information;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects;
- Statement of Significance; and,
- Glossary.

12.2 Guidance, Legislation and Information

The following guidance, legislation and information sources have been considered in carrying out this assessment:

- The Environmental Noise (Amendment) Regulations (Northern Ireland) 2018;[1]
- Clean Neighbourhoods and Environment Act (Northern Ireland) 2011;[2]
- BS 5228:2009+A1:2014 (BS 5228)[3];
- Calculation of Road Traffic Noise (1988)[4]
- Noise Policy Statement for Northern Ireland (2014)[5]
- Design Manual for Roads and Bridges (2011)[6]
- The Strategic Planning Policy Statement (SPPS) Northern Ireland
- Planning Policy Statement (PPS) 18: Renewable Energy[7];

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[1] Department of Agriculture, Environment and Rural Affairs (2018). The Environmental Noise (Amendment) Regulations (Northern Ireland) 2018.

[2] UK Government (2011). Clean Neighbourhoods and Environment Act (Northern Ireland) 2011.

[3] BS 5228:2009+A1:2014 Code of Practice for noise and vibration control on construction and open sites – Part 1: Noise and Part 2: Vibration.

[4] Department of Transport (1988). Calculation of Road Traffic Noise

[5] Department of Environment (2014).

[6] National Road Authority (2011). Design Manual for Roads and Bridges.

[7] Department of the Environment, Planning and Environmental Policy Group (2009). Planning Policy Statement 18, 'Renewable Energy'.

- Best Practice Guidance to PPS 18[8]
- ETSU-R-97: The Assessment and Rating of Noise from Wind Farms[9]; and,
- A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise[10].

12.2.1 The Environmental Protection Act (EPA) 1990

The EPA 1990 specifies mandatory powers available to Local Authorities in respect of any noise that either constitutes or is likely to cause a statutory nuisance, which is also defined in the Control of Pollution Act (CoPA) 1974. A duty is imposed on Local Authorities to carry out inspections to identify statutory nuisances, and to serve abatement notices against these. Procedures are also specified with regards to complaints from persons affected by a statutory nuisance.

12.2.2 Planning Policy Statement (PPS) 18: Renewable Energy

PPS 18 sets out the Department of the Environment's planning policy for development that generates energy from renewable resources that requires submission of a planning application and is therefore relevant to the Development.

The aim of PPS 18 is to facilitate the siting of renewable energy-generating facilities in appropriate locations within the built and natural environment. Its objectives include ensuring that the environmental and amenity impacts of renewable energy developments are adequately addressed.

Policy RE 1 states that renewable energy developments will be permitted provided that they do not result in an unacceptable adverse impact on human health or residential amenity. Specifically in relation to wind energy development the policy states that it will not "cause significant harm to the safety or amenity of any sensitive receptors arising from noise". Such potential impacts are relevant in the context of a noise assessment. It goes on to state that the Best Practice Guidance to PPS 18 will be taken into consideration in assessing proposals. It also states that "*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.*"

Furthermore, applications for wind energy development will be required to demonstrate that the development has taken into consideration the cumulative impact of existing wind turbines, those which have permissions and are currently the subject of valid but undetermined applications, and that the development will not cause significant harm to the safety or amenity of any sensitive receptors arising from noise. Sensitive receptors include habitable (though not necessarily occupied) residential accommodation, future occupants of committed developments, hospitals, schools and churches.

12.2.3 Best Practice Guidance to PPS 18

The Best Practice Guidance (BPG) provides background information on the various renewable energy technologies that may come forward in Northern Ireland. Section 1 relates to applications for onshore wind energy and includes a discussion of various planning issues, including noise.

It states that well designed wind farms should be located so that increases in ambient noise levels are kept to acceptable levels with relation to background noise, normally achieved through good turbine design and ensuring adequate separation between turbines and noise-sensitive receptors. The characteristics of wind turbine noise are discussed, and it is stated that ETSU-R-97 makes a series of recommendations that can be regarded as relevant guidance on good practice and that it should be used in the assessment and rating of noise from wind energy developments. A summary of the recommendations of ETSU-R-97 is provided below.

[8] Department of the Environment, Planning and Environmental Policy Group (2009). Best Practice Guidance to Planning Policy Statement 18, 'Renewable Energy'.

[9] ETSU 1996, ETSU-R-97 The Assessment and Rating of Noise from Wind Turbines, ETSU for the DTI, 1996.

[10] A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise, IOA, 2013.

12.2.4 BS 5228:2009+A1:2014

BS 5228:2009+A1:2014 (BS 5228) provides guidance relevant to the effects of noise and vibration during construction and decommissioning. This standard:

- Is published in two parts: Part 1 – Noise; and Part 2 - Vibration;
- Refers to the need for the protection against noise and vibration of persons living and working in the vicinity of, and those working on construction and open sites;
- Recommends procedures for noise and vibration control in respect of construction operations;
- Stresses the importance of community relations, and states that early establishment and maintenance of these relations throughout site operations will go some way towards allaying people's concerns;
- Provides recommendations regarding the supervision, planning, preparation and execution of works, emphasising the need to consider noise at every stage of the operation;
- Describes methods of controlling noise at source and its spread; and,
- Includes a discussion of noise control targets, and example criteria for the assessment of the significance of noise effects.

12.2.5 ETSU-R-97: The Assessment and Rating of Noise from Wind Farms

ETSU-R-97 provides a framework for the assessment and rating of noise from wind turbine installations. It is the standard for wind farm developments in the UK, and the methodology has therefore been adopted for the present assessment. The guidance is currently under review; however, ETSU-R-97 still remains valid and recognised as the most comprehensive guidance on wind development noise assessments, it is therefore adopted in this assessment.

Both background noise and noise from wind turbines typically vary with wind speed. According to ETSU-R-97, wind farm noise assessments should therefore consider the site-specific relationship between wind speed and background noise, along with the particular noise emission characteristics of the proposed wind turbines.

ETSU-R-97 specifies the use of the $L_{A90,10min}$ descriptor for both background and wind turbine noise (i.e., A-weighted sound pressure level exceeded 90% of the time in a 10-minute measurement interval, see 12.12.9 Glossary for definitions). Therefore, unless otherwise specified, all references to noise levels within this Chapter relate to this descriptor. Similarly, all wind speeds referred to relate to a height of 10 metres (m) Above Ground Level (AGL) at the location of the Development, standardised in accordance with current good practice guidance[11].

The document recommends the application of external noise limits at the nearest noise sensitive properties, to protect outside amenity and prevent sleep disturbance inside dwellings. These limits take the form of a 5 dB margin above the prevailing background noise level, except where background noise levels are lower than certain thresholds, where fixed lower limits apply. ETSU-R-97 notes that noise from existing wind turbines should not form part of the background noise level from which noise limits for new wind energy developments are derived. Separate limits apply for daytime and night-time periods, as outlined below. The limits apply to the cumulative effects of all wind turbines that affect a particular location.

A 'simplified criterion' is also described which may be applicable where there are large separation distances between the proposed turbines and nearest noise-sensitive receptors. In such cases, a fixed limit of 35 dB, $L_{A90,10min}$ applies, without reference to background noise levels.

During daytime, the guidance specifies limits designed to protect the amenity of residents whilst within the external amenity areas of their properties. The limits are based on the prevailing background noise level for 'lower daytime' periods, defined in ESTU-R-97 as:

- 18:00 – 23:00 every day; plus
- 13:00 – 18:00 on Saturday; and,
- 07:00 – 18:00 on Sundays.

[11] Institute of Acoustics – Good Practise Guide (GPG): 2013

ETSU-R-97 recommends that the fixed lower noise limit for daytime should be set within the range 35 to 40 dB, $L_{A90,10min}$, with choice of value dependent on the following factors:

- The number of dwellings in the neighbourhood of the Development;
- The effect of the noise limits on the number of kilo Watt hours (kWh) generated; and,
- The duration and level of exposure.

Different standards apply at night, where potential sleep disturbance is the primary concern rather than the requirement to protect outdoor amenity. Night-time is considered to be all periods between 23:00 and 07:00. A limit of 43 dB(A) is recommended at night at wind speeds or locations where the prevailing wind speed related night-time background noise level is lower than 38 dB(A). At other times, the limit of 5 dB above the prevailing wind speed-related background noise level applies. The value of night-time fixed lower limit was selected in order to ensure that internal noise levels remained below those considered to have the potential to cause sleep disturbance, taking account of the attenuation of noise when passing from outdoors to indoors, and making allowance for the presence of open windows.

Where the occupier of the property has a financial interest in the development (otherwise known as being a Financially Involved property), ETSU-R-97 states that the fixed lower noise limit for both daytime and night-time can be increased to 45 dB(A) and that *"…consideration should be given to increasing the permissible margin above background".*

12.2.6 The IOA Good Practice Guide (GPG)

The GPG was published by the Institute of Acoustics (IOA) in May 2013 and has been endorsed by the Northern Ireland Executive as current industry good practice. The GPG is supported by a suite of six Supplementary Guidance Notes (SGNs), published in 2014. The guide presents good practice in the application of the ETSU-R-97 assessment methodology at various stages of the assessment process. The recommendations provided in the GPG have been followed throughout this assessment.

The GPG provides advice on the assessment of cumulative noise impact, detailing a number of possible cumulative scenarios and recommended approaches. Advice is also provided with regard to the geographical scope of a cumulative noise assessment, to determine the area within which a cumulative noise assessment is necessary.

Where a new noise source is introduced to a given scenario with a noise level which is predicted to be 10 dB or more below the existing level, the increase in the total noise level is negligible. On this basis, the necessary extents of a cumulative noise assessment can be determined. Paragraph 5.1.4 of the GPG states:

> *"If the proposed wind farm produces noise levels within 10 dB of any existing wind farm(s) at the same receptor location, then a cumulative noise impact assessment is necessary".*

As noted in ETSU-R-97, the GPG states that noise from existing wind turbines should not form part of the background noise level from which noise limits for new wind energy developments are derived.

12.2.7 Low-Frequency Noise, Infrasound, Amplitude Modulation and Vibration

12.2.7.1 Low Frequency Noise and Infrasound

A study[12], published in 2006 by acoustic consultants Hayes McKenzie on the behalf of the Department of Trade and Industry (DTI), investigated low frequency noise from wind farms. This study concluded that there is no evidence of health effects arising from either infrasound or low frequency noise generated by wind turbines, but that complaints attributed to low frequency noise were in fact, possibly due to a phenomenon known as Amplitude Modulation (AM).

In February 2013, the Environmental Protection Authority of South Australia published the results of a study into infrasound levels near wind farms[13]. This study measured infrasound levels at urban

[12] The measurement of low frequency noise at three UK wind farms, Hayes Mckenzie, The Department for Trade and Industry, URN 06/1412, 2006.

[13] Environment Protection authority (2013) Infrasound levels near wind farms and in other environments [online] Available at: http://www.epa.sa.gov.au/xstd_files/Noise/Report/infrasound.pdf (accessed 16/11/2022).

locations, rural locations with wind turbines close by, and rural locations with no wind turbines in the vicinity. It found that infrasound levels near wind farms are comparable to levels away from wind farms in both urban and rural locations. Infrasound levels were also measured during organised shut downs of the wind farms; the results showed that there was no noticeable difference in infrasound levels whether the turbines were active or inactive.

Bowdler et al. (2009)[14] concludes that:

"...there is no robust evidence that low frequency noise (including 'infrasound') or ground-borne vibration from wind farms generally has adverse effects on wind farm neighbours".

In 2018 the World Health Organization (WHO) Regional Office for Europe published "*Environmental Noise Guidelines for European Region*", which found that the current evidence available in relation to the health effects of noise from wind turbines, other than annoyance, is either absent or of poor quality. In regards to infrasound, it states:

> *"…Wind turbines can generate infrasound or lower frequencies of sound than traffic sources. However, few studies relating exposure to such noise from wind turbines to health effects are available. It is also unknown whether lower frequencies of sound generated outdoors are audible indoors, particularly when windows are closed".*

There is currently no scientific consensus that infrasound from wind turbines cause adverse health effects, and any current research in this field is still disputed or under review. As guidelines or policy is currently unavailable, in accordance with standard industry practice, an assessment of infrasound cannot be undertaken for this application.

12.2.7.2 Amplitude Modulation

A study[15] was carried out on behalf of the Department for Business, Enterprise and Regulatory Reform (BERR) by the University of Salford, which investigated the incidence of noise complaints associated with wind farms and whether these were associated with AM. This report defined AM as aerodynamic noise from wind turbines with a greater degree of fluctuation than normal at blade passing frequency. Its aims were to ascertain the prevalence of AM on UK wind farm sites, to try to gain a better understanding of the likely causes, and to establish whether further research into AM is required.

The study concluded that AM has occurred at only a small number of wind farms in the UK (4 of 133), and only for between 7% and 15% of the time. It also stated that the causes of AM are not well understood and that prediction of the effect is not currently possible.

This research was updated in 2013 by an in-depth study undertaken by Renewable UK[16], which identified that many of the previously suggested causes of AM have little or no association to the occurrence of AM in practice. The generation of AM is based upon the interaction of a number of factors, the combination and contributions of which are unique to each site. With the current knowledge, it is not possible to predict whether any particular site is more or less likely to give rise to AM, and the incidence of AM occurring at any particular site remains low, as identified in the University of Salford study.

In 2016, the IOA proposed a measurement technique[17] to quantify the level of AM present in any particular sample of wind farm noise. This technique is supported by a review commissioned by the Department of Business, Energy & Industrial Strategy (BEIS, formerly The Department of Energy & Climate Change)[18], which follows on from the conclusions of the IOA study in order to define an appropriate assessment method for AM, including a penalty scheme and an outline planning condition. Notwithstanding this, the suggested outline planning condition is not as yet validated or

[14] Bowdler et al. (2009). Prediction and Assessment of Wind Turbine Noise: Agreement about relevant factors for noise assessment from wind energy projects. Acoustic Bulletin, Vol 34 No2 March/April 2009, Institute of Acoustics.

[15] Research into aerodynamic modulation of wind turbine noise'. Report by University of Salford, The Department for Business, Enterprise and Regulatory Reform, URN 07/1235, July 2007.

[16] Renewable UK, 2013: Wind Turbine Amplitude Modulation: Research to Improve Understanding as to its Cause and Effects.

[17] Institute of Acoustics, (2016) A Method for Rating Amplitude Modulation in Wind Turbine Noise.

[18] BEIS, (2016), Review of the evidence on the response to amplitude modulation from wind turbines.

endorsed by the UK government, the study remains in a draft form and therefore at this stage its appropriateness to developments remain under review.

Section 7.2.1 of the GPG therefore remains current, stating:

> *"The evidence in relation to 'Excess' or 'Other' Amplitude Modulation (AM) is still developing. At the time of writing, current practice is not to assign a planning condition to deal with AM".*

Without an adopted yardstick or criteria for incidence of AM there is no persuasive evidence of likelihood to harm to residential amenity, or evidential basis for the necessity of attaching an associated condition on any forthcoming planning permission. To require, by planning condition, that the proposed development comply with some future standards would be unreasonable, and as such, at this time in accordance with standard industry practice, AM is not assessed.

12.2.7.3 Vibration

Research undertaken by Snow[19] found that levels of ground-borne vibration 100 m from the nearest wind turbine were significantly below criteria for 'critical working areas' given by British Standard BS 6472:1992 "Evaluation of human exposure to vibration in buildings (1 Hz to 80 Hz)" and were lower than limits specified for residential premises by an even greater margin.

Ground-borne vibration from wind turbines can be detected using sophisticated instruments several kilometres from the wind farm site as reported by Keele University[20]. This report clearly shows that, although detectable using highly sensitive instruments, the magnitude of the vibration is orders of magnitude below the human level of perception and does not pose any risk to human health.

12.2.7.4 Conclusion

No specific assessments of low frequency noise, infrasound, AM, or vibration from the operation of the turbines are considered necessary and are therefore not considered further, as agreed with consultees through the scoping process (see section 12.3.1 and 12.3.2, below).

12.3 Assessment Methodology and Significance Criteria

12.3.1 Scoping Responses and Consultations

Consultation for this ES topic was undertaken with the organisations shown in Table 12.1.

Table 12.1. Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Derry City and Strabane District Council (DCSDC) Environmental Health Service	Scoping Response 26/08/2019	The methodology proposed in the Scoping Request was generally accepted, though it was noted that any increase of the daytime fixed lower limit over 35 dB should be justified.	This assessment has been based on a daytime fixed lower of 35 dB for the development and 37.5 dB cumulative limits based on past approved limits of Craignagapple wind farm, justification provided (see Section 12.3.2.2).
		All raw data (meteorological and acoustic) used to derive background noise levels shall be provided.	The data used to derive background noise levels is presented in Section 12.4.3.2. Metrological and acoustic data is presented in

[19] ETSU (1997), Low Frequency Noise and Vibrations Measurement at a Modern Wind Farm, prepared by D J Snow.

[20] Microseismic and infrasound monitoring of low frequency noise and vibrations from wind farms: recommendations on the siting of wind farms in the vicinity of Eskdalemuir, Scotland". Keele University, 2005.

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
			Technical Appendix A12.3: Metrological and Acoustic Raw Data.
		Wind turbine manufacturer's sound power level data (including uncertainty applied) shall be provided.	Sound Power Level data (including the uncertainty vales applies) are presented in Section 12.3.4 and 12.517.30041.0.
		The calculation spreadsheets used to predict/determine receptor noise levels shall be provided.	Calculations of operational turbine noise were undertaken using industry standard modelling software SoundPlan 8.2. Model input parameters are presented in Section 12.3.2.2. Given the complexity of the modelling process, it is neither possible nor practicable to provide calculation spreadsheets.
		Where appropriate, 'valley corrections' shall be applied to predicted noise levels.	Valley corrections (and barrier corrections), in line with the GPG, are included within the calculations undertaken by the modelling software, which takes account of the local terrain. The predicted levels presented in this Chapter therefore include any / all valley corrections, where appropriate (see Section 12.3.2.2).
		The use of existing background noise and wind speed measurement data necessitates that the data is re-analysed for use with a new turbine hub height.	The existing background noise and wind speed measurement data has been re-analysed for use with a 90 m hub height, considered worst-case for this assessment (see Section 12.4.3.1).
		A review of the potential implications of future forestry works upon background noise levels should be undertaken.	The potential implications of the impact of forestry works on background noise levels is discussed in Section 12.4.3.1.
		All relevant cumulative wind energy developments should be included within the noise impact assessment.	All relevant cumulative wind energy developments have been included within the operational noise assessment (see Section 12.3.2.3).
		The assessment should include all new approved,	The assessment considers all potentially noise-sensitive

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
		committed or existing residential developments. All representative monitoring locations agreed with EHO.	receptors within the Study Area (defined in Section 12.3.3.2). Monitoring locations adopted from past ES in the area were agreed with EHO
		An assessment of construction and decommissioning noise, and noise from the substation, should be included within the assessment.	Noted. See Sections 12.3.2.1, 12.3.2.7 and 12.5.1 for further information.
		The DCSDC confirm that Low Frequency Noise, Infrasound, Amplitude Modulation and ground borne vibration is to be scoped out of the assessment	These items have been scoped out of the assessment (see Section 12.3.2.6).
	Email Response to Baseline Data Analysis Summary 10/06/2022	The Environmental Health Officer (EHO) acknowledged that the approach of using filtered background noise data is in accordance with ETSU-R-97 and the GPG, however requested that 'verification' measurements were undertaken to demonstrate whether the existing data is representative of contemporary background noise levels.	Addressed in Section 12.4.3.1.
		The EHO noted the need for clarity in the choice of daytime fixed lower limit.	This assessment has been based on a daytime fixed lower limit of 35 dB,$L_{A90,10min}$ (see Section 12.3.2.2). This is the most stringent fixed lower limit available under ETSU-R-97 methodology.
		The EHO noted the need for 'proxy' measurements for the purpose of demonstrating compliance with the noise limits at a later date.	The use of proxy or intermediate measurement locations for post-consent compliance measurements is in line with the GPG and is accepted. The exact measurement location(s) should be determined at the time of the compliance monitoring, taking account of local conditions.

12.3.2 Scope of Assessment

12.3.2.1 Decommissioning and Construction Noise Assessment Methodology

The assessment of noise from the initial decommissioning and construction phase has been limited to noise-sensitive receptors within 1,000 m of the decommissioning and construction works, as beyond this distance there is no reasonable prospect of a significant effect. Infrastructure elements within 1,000 m of noise-sensitive receptors include access tracks, hardstanding (e.g., turbine laydown areas), wind turbine foundations and the wind turbines. The construction noise assessment therefore considers noise generated by these elements, in addition to noise from on-Site haulage.

Haulage traffic movements are based on worst-case figures from Table 13.11 of **Chapter 13: Traffic and Transport**, which provides peak traffic movement figures during the delivery of aggregates used in the construction of the access tracks and hardstanding, which is a worst-case scenario. At other times noise from haulage is expected to be substantially lower.

Construction Traffic Noise on Public Roads

Noise from construction traffic on public roads has been assessed on the basis of the change in traffic noise levels due to the addition of traffic associated with construction of the Development. Projected baseline traffic flows for each location at the predicted time of initial decommissioning and construction (i.e., 2025) have been sourced from Table 13.7 in **Chapter 13: Traffic and Transport**. The percentage increases in traffic have then been used together with the number of vehicles, proportion of HGVs and likely speed (based on the type of road) to calculate the likely change in traffic noise level due to construction traffic for each month of the construction programme, using the method described in Calculation of Road Traffic Noise (CRTN)[21].

Throughout the construction phase of the Development, deliveries of concrete will occur periodically, increasing vehicle flows above that during the peak month when no deliveries take place. As such, assessment of the peak month daily construction traffic including concrete delivery has also been included. As outlined in Section 13.6.1 of **Chapter 13: Traffic and Transport**, deliveries of concrete are anticipated to occur on a maximum of 14 non-consecutive days.

In the event that on-site concrete batching is employed, the increases in traffic assessed for concrete delivery days would not occur.

Construction Noise Significance Criteria

BS 5228 provides several example criteria for the assessment of the significance of noise effects from construction activities. Of those available, 'Example Method 2 – 5 dB(A) Change' has been selected for the current assessment as it is more appropriate for rural areas where the acoustic environment can be low and is more in keeping with conventional EIA methodologies for noise than alternative methods which relate to eligibility for noise insulation. Using this method, noise levels generated by construction activities are deemed to be significant if:

- The L_{Aeq} level of construction noise exceeds lower threshold values of 65 dB(A) during daytime (includes 0700 to 1300 Saturday)[22], 55 dB(A) during evenings and weekends[23] or 45 dB(A) at night[24]; and,
- The total noise level (pre-construction ambient noise plus construction noise) exceeds the pre-construction ambient noise level by 5 dB(A) or more for a period of one month or more.

Construction noise levels in excess of the threshold values that would occur for a period of one month or more are regarded as significant in terms of the EIA Regulations.

Construction Traffic Noise Significance Criteria

The magnitude of effects, in terms of the predicted change in traffic noise levels on public roads, expressed as $L_{A10,18hour}$ in accordance with CRTN, and based on criteria defined in DMRB[25] are defined as follows:

- Negligible: change of less than 1 dB;
- Minor: change of 1 to 3 dB;

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[21] Calculation of Road Traffic Noise, Department of the Environment, 1988

[22] 0700-1900 weekdays, 0700-1300 Saturdays

[23] 1900-2300 weekdays, 1300-2300 Saturdays and 0700-2300 Sundays

[24] 2300-0700 every day

[25] Design Manual for Roads and Bridges, Highways Agency / Transport Scotland, Volume II Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 7 HD 213/11, Noise and Vibration – Revision 1, November 2011, Table 3.1 – Classification of Magnitude of Noise Impacts in the Short Term

- Moderate: change of 3 to 5 dB; and,
- Major: change of 5 dB or more.

Effects of Moderate or Major magnitude are considered significant in terms of the EIA Regulations[26]. Effects of Negligible or Minor magnitude are considered not significant in terms of the EIA Regulations.

12.3.2.2 Operational Noise Assessment Methodology

The operational noise assessment process comprises the following steps:

i) Identification of potential receptors (typically residential dwellings);

ii) Determining the prevailing, wind speed-dependent background noise levels at nearby receptors;

iii) Establishment of limits for acceptable levels of wind turbine noise, based on the background noise levels and appropriate fixed lower limits;

iv) Prediction of the likely levels of wind turbine noise received at each receptor; and,

v) Comparison of the predicted levels with the noise limits.

The method of measuring background noise is described in ETSU-R-97, and supported by the GPG. In brief, it involves continuous measurement of both background noise levels at a representative number of receptors and wind speeds on the development site for a period of at least one week. The resulting data is then sorted into quiet daytime and night-time periods and the relationship between wind speed and background noise established for each location. For the purpose of this assessment, background noise levels have been derived from existing survey data, as described in Section 12.3.5.

Selection of Wind Turbine Fixed Lower Noise Limits

As discussed at Section 12.2.5, the noise limits described in ETSU-R-97 are a combination of a 5 dB margin above the prevailing wind speed-dependent background noise level and fixed lower limits, applicable where background noise levels are low. These limits apply to the Development in isolation and cumulative effects. The daytime fixed lower noise limit is defined as a value within the range 35 to 40 dB(A). A daytime fixed lower noise limit of 35 dB(A) for the Development in isolation has been adopted in this assessment.

The daytime cumulative and therefore, the apportioned noise limits for the Development are based on a fixed lower limit of 37.5 dB $L_{A90,10min}$, or 5 dB above background (the most stringent under ETSU-R-97 methodology). The night-time cumulative and apportioned noise limits are based on a fixed limit of 43 dB $L_{A90,10min}$, or 5 dB above background, as per ETSU-R-97 requirements. Further detail is provided in Section 12.4.3.3.

These limits have been based on the approved Craignagapple wind farm environmental statement and decision notice from the planning service of Northern Ireland, and similar decision notices for other wind turbine applications in the area, one example (Ref: J/2010/0481/F), states as following:

'At all houses not financially associated with the development in the vicinity of the proposed development, existing or approved at the date of this planning permission, the noise level as a result of these turbines shall not exceed:

(a) During the night-time hours (23.00-0700hrs) the greater of the night hours LA90, 10min background noise level plus 5 dB(A) or 43 dB(A) at wind speeds not exceeding 12 metres per second; and

(b) At all other times the greater of the quiet waking hours LA90, 10min background noise level plus 5dB(A) or 37.5 dB(A) at wind speeds not exceeding 12 metres per second.'

A provision is included within ETSU-R-97 for higher fixed lower limit of 45 dB for daytime and night-time periods where a receptor has financial involvement with a development. Some receptors, such as 43 Koram Road and receptors surrounding it, have financial involvement (FI) in the Development,

[26] The Department for Infrastructure (2017) The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017. Available at: https://www.legislation.gov.uk/nisr/2017/83/made (Accessed 23/06/2023)

[26] Substation noise predictions based on a sound power level of 94 dB(A) using a generic frequency profile for a

however, as a conservative approach these have been assessed to the standard lower limit, therefore the 45 dB fixed lower limit has not been applied.

Noise Predictions

Noise predictions have been made using industry standard 3D noise modelling software SoundPLAN (v8.2), which implements the ISO 9613-2[27] methodology and takes account of the specific data and parameters recommended in the GPG, as summarised below:

- The turbine sound power levels should be stated and these should include an appropriate allowance for measurement uncertainty. If the data provided contains no allowance for measurement uncertainty, or uncertainties are not stated, an additional 2 dB should be included;
- Atmospheric absorption should be calculated based on conditions of 10°C and 70% relative humidity;
- The ground factor assumed should be G=0.5 (mixed ground) except in urban areas or where noise propagates across large bodies of water, where G=0 (hard ground) should be assumed;
- A receiver height of 4.0 m should be assumed;
- Barrier attenuation should be limited to 2 dB, when there is no line of sight from the receptor to the turbine;
- An additional 3 dB should be added to noise immission levels at properties located across a valley or with heavily concave ground between the receptor location and the wind turbine(s)[28]; and,
- The predicted noise levels ($L_{Aeq,t}$) should be converted to the required $L_{A90,10min}$ by subtracting 2 dB.

ISO 9613-2 provides a prediction of noise levels likely to occur under worst case conditions; those favourable to the propagation of sound, i.e., down-wind or under a moderate, ground-based temperature inversion as often occurs at night (often referred to as stable atmospheric conditions). The specific measures recommended in the GPG have been shown to provide good correlation with levels of wind turbine noise measured at operational wind farms[29,30].

12.3.2.3 Cumulative Noise Assessment

ETSU-R-97 states that the assessment should take account of the effect of noise from all wind turbines that may affect a particular receptor. A screening exercise was conducted to identify any wind turbines either operational, consented, or proposed (i.e., the subject of a current planning application), considered to have the potential to result in cumulative noise impacts when assessed in conjunction with the Development. For the purposes of the noise assessment, a search area of 5 km from the Development has been used to identify cumulative wind farm developments, and a search area of 2.5 km from the Development has been used to identify single wind turbine cumulative developments. At greater distances, these respective cumulative development types are not considered to have the potential to result in cumulative noise impacts.

One cumulative development has been identified, as detailed in Table 12.2 and shown in Figure 12.2.

Table 12.2. Cumulative Developments

Development	Planning Reference	Status	No. of Turbines
Ballykeery Road Turbine	J/2010/0410/F	Planning	1

[27] ISO 9613-2:1996 Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation.
[28] Equation to determine concave ground as presented in Section 4.3.9 of the GPG.
[29] Bullmore et al. (2009). Wind Farm Noise Predictions and Comparison with Measurements, Third International Meeting on Wind Turbine Noise, Aalborg, Denmark 17 – 19 June 2009.
[30] Cooper & Evans (2013). Effects of different meteorological conditions on wind turbine noise.

It should be noted that there is a Ballykeery wind turbine in operation and the application above has been submitted for a larger turbine specification in replacement of the operating turbine. As such, the cumulative assessment in this chapter assess the larger and louder wind turbine specification and therefore presents the worst-case cumulative scenario.

In the event the Development is consented, the operational Owenreagh I and II wind farms will be decommissioned prior to the construction of the Development, and the Craignagapple Wind Farm application has lapsed in planning permission and will not be constructed. As such, the Owenreagh and Craignagapple turbines will not form part of the cumulative scenario and have not been considered further in the cumulative assessment. The relevant data applied in this assessment for the cumulative wind farms is detailed in Section 12.5.2.

Cumulative noise effects have been addressed through the derivation of apportioned noise limits (see Section 12.517.46071.0), which define the noise 'budget' available to the Development. As the only cumulative development is in planning and not yet constructed, a separate assessment of the Development only has been undertaken as well (section 12.5.2.2).

The method of predicting wind farm noise levels is described in the GPG as discussed in Section 12.3.2.2. This method has been applied to all operational noise predictions within this Chapter of the ES.

12.3.2.4 Wind Turbine Noise Significance Criteria

The acceptable limits for wind turbine operational noise are clearly defined in ETSU-R-97. Therefore, this assessment determines whether the calculated immission levels at nearby noise sensitive properties lie below the noise limits derived in accordance with ETSU-R-97. Where the noise immission levels at noise-sensitive receptors are shown to be below derived noise limits, the effect is considered to be not significant in terms of The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017[31] (as amended).

As such, the approach to assessment followed in other technical chapters within this ES is not applicable to the effects of wind turbine noise, and effects are not considered in terms of their magnitude and the sensitivity of receptors as these factors are implicit in the limits defined by ETSU-R-97.

12.3.2.5 Final Decommissioning Noise

Noise produced during final decommissioning of the Development is likely to be of a similar nature to that during construction, although the duration of decommissioning will be shorter than that of construction. The conclusions of the construction noise assessment would also be relevant to decommissioning noise, and that a separate assessment is unnecessary. Any legislation, guidance or good practice relevant at the time of decommissioning would be complied with.

12.3.2.6 Elements Scoped Out of Assessment

The following elements have been scoped out of the assessment for reasons described in previous sections of this Chapter:

- Decommissioning and construction noise where noise generating activities are greater than 1,000 m from receptors;
- Final decommissioning noise (because the assessment is the same as for decommissioning and construction noise);
- Low frequency noise;
- Infrasound;
- Amplitude Modulation; and,
- Vibration.

[31] The Department for Infrastructure (2017) The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017. Available at: https://www.legislation.gov.uk/nisr/2017/83/made (Accessed 23/06/2023)

12.3.2.7 Substation Noise

In addition to the above, the DCSDC's Scoping Response requested consideration of substation noise, as noted in Section 12.3.1.

Operational substation noise is produced primarily by electrical equipment such as transformers located on site. Noise levels from these sources are generally low.

The nearest noise-sensitive receptor is located approximately 1,300 m from the proposed substation. In order to determine the potential for a significant effect, a simple calculation has been undertaken in line with ISO 9613 (see Section 12.3.2.2), which shows that typical noise levels from an average sized wind farm substation[32] at a distance of 1,300 m would be approximately 8 dB, substantially below the measured background noise levels at any wind speed (see Section 12.4.3.2). It can therefore be determined that due to the large distances between the substation and the nearest noise-sensitive receptors, there is no reasonable prospect of noise from the operational substation resulting in adverse effects and as such it has been scoped out from further consideration.

12.3.3 Study Area

12.3.3.1 Decommissioning and Construction Noise

The Study Area for the decommissioning and construction noise assessment is 1,000 m from any development infrastructure, as shown in Figure 12.1.

12.3.3.2 Operational Noise and Cumulative Operational Noise

The GPG states that a cumulative assessment is required in areas where the difference in predicted noise levels between the Development and other wind energy developments is less than 10 dB (i.e., the Study Area). The Study Area for the operational noise assessment, defined in accordance with the GPG, is shown in Figure 12.2. It comprises the area where cumulative wind turbine noise levels are greater than 35 dB, $L_{A90,10min}$, and where noise levels from the Development are 10 dB greater than, or within 10 dB of, noise levels from cumulative developments. This shown on Figure 12.2 as the un-shaded and orange shaded areas within the 35 dB, $L_{A90,10min}$ contour.

A number of assessment locations have been identified within the Study Area; these are detailed in Table 12.10

12.3.4 Design Parameters

The GPG notes that most sites at planning stage will not have selected a preferred turbine, therefore a candidate turbine representative of a range of turbines should be selected to provide appropriate source noise levels. Once noise levels have been predicted at the potentially affected properties, compliance with noise limits can be assessed and design advice provided if compliance with the limits is considered unlikely.

The two candidate turbines being considered for the Development are the Nordex N133 4.8 MW and the Vestas V136 4.2 MW. In order to take a worse-case approach to the assessment, noise predictions have been based upon the highest sound power level data of the two candidate turbines at each wind speed, as detailed in Table 12.3; the V136 is greater at 4 ms^{-1}, and the N133 is greater from 5 ms^{-1} to 12 ms^{-1}. The candidate turbine dimensions have been based on the N133, with a maximum tip height of 156.5 m and a hub height of 90 m; sound power level data has been standardised from hub height to 10 m height. The sound power level data includes a margin for uncertainty; in line with the GPG, a +2 dB correction for uncertainty has therefore been included in the sound power levels detailed in Table 12.3

32 Substation noise predictions based on a sound power level of 94 dB(A) using a generic frequency profile for a primary substation transformer.

Table 12.3. Noise Emission Data – Sound Power Level, dB, LWA

	Standardised 10 m Wind Speed, ms-1								
	4	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	Sound Power Level, dB(A)								
Nordex N133 4.8 MW, 90 m hub[33]	96.3	102.0	106.2	106.5	106.5	106.5	106.5	106.5	106.5
Vestas V136, 4.2 MW, 88.5 m hub[34]	96.8	101.7	105.3	105.9	105.9	105.9	105.9	105.9	105.9
Worst-case combined data, 90 m hub	**96.8**	**102.0**	**106.2**	**106.5**	**106.5**	**106.5**	**106.5**	**106.5**	**106.5**

The octave-band frequency spectrum at the wind speed for which the maximum sound power level is achieved (7 ms^{-1}) is detailed in Table 12.4. Octave-band data from the N133 has been used, as the candidate turbine with the highest maximum sound power level.

Table 12.4. Octave-band Spectra – Nordex N133 4.8 MW

	Octave Band Centre Frequency (Hz)							
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
	Sound Power Level, dB(A), at standardised 10m windspeed of 7 ms-1							
Sound Power Level, dB, LWA, Scaled to 106.5 dB(A)[35]	88.4	94.1	98.7	100.5	99.4	99.5	97.2	86.6

12.3.5 Baseline Survey Methodology

The area of the Development has an extensive planning history, with Environmental Impact Assessments carried out for the operational Owenreagh I Wind Farm, operational Owenreagh II Wind Farm, and the consented Craignagapple Wind Farm (not constructed). A baseline noise survey was undertaken in 2014 at a number of receptors surrounding the Development, as part of the consented Craignagapple Wind Farm Noise Assessment[36]. Additional baseline measurements were carried out at a further two locations in 2015 as part of the subsequent Further Environmental Information (FEI) Report[37]. Inspection of both reports indicates that the measurements were carried out by a suitably qualified person, were agreed with Council Environmental Health Department, and conform to the requirements of ETSU-R-97 and the GPG.

The 2015 baseline survey was undertaken at two locations to the south of the 2014 measurement locations MPZB and MPZD. The 2015 data was discussed during consultation with the DCSDC, however as the design of the Development has progressed, the locations at which the 2015

[33] Nordex N133/4.8 Noise level, Power curves, Thrust curves F008_272_A13_EN Revision 02, 2020-01-31

[34] Nordex N133/4.8 Octave sound power levels F008_272_A19_IN Revision 01, 2018-07-24

[35] Performance Specification V136-4.0/4.2 MW 50/60 Hz (Low HH) Document no.: 0067-7066 V02 2017-11-18

[36] Noise Assessment Report (2014), Brookfield Renewable Energy Group.

[37] Craignagapple Wind Farm Further Environmental Information Planning Ref: J/2010/0481/F (2016), Brookfield Renewable.

measurements were undertaken (as well as the nearest noise-sensitive receptors to the consented Craignagapple Wind Farm) are now outwith the operational noise Study Area. As such, the 2015 baseline survey data has not been considered further in this assessment.

In order to undertake background noise measurements unaffected by existing wind turbine noise (in line with ETSU-R-97 and the GPG), it would be necessary to shut down the operational Owenreagh I and Owenreagh II wind turbines for the duration of the survey period. As typical background noise surveys occur for between two to six weeks, the loss of generation over this period prevents this approach from being economically viable. However, Section 5.2 of the GPG suggests a number of alternative approaches, including the use of directional filtering to identify and remove the influence of operational turbine noise from the measured background noise levels.

The 2014 baseline survey data was measured in the presence of the operational Owenreagh I and Owenreagh II wind turbines, and the influence of the operational turbines was removed through the use of directional filtering. This approach was accepted by the DCSDC for the 2016 Craignagapple FEI Report. As there has been no substantial changes to the background noise environment surrounding the Development (as discussed in Section 12.4.3.1), including the presence of the operational wind turbines and additional residential units, the 2014 baseline survey data is considered appropriate for use in this assessment.

As agreed with the EHO during consultation (see Table 12.1), the existing data from previous baseline surveys undertaken in 2014 have been re-analysed for use in this assessment, based on a hub height of 90 m (compared to the 67 m hub height used for the Craignagapple noise assessment), as detailed in Section 12.4.3.1.

Noise-sensitive receptors have been identified as residential dwellings, schools, places of worship or medical care facilities located within the Study Area.

Where a number of receptors are located in close proximity, a Noise Assessment Location (NAL) has been selected to represent all nearby receptors; NALs are chosen as those likely to experience the highest levels of wind turbine noise, as a worst case.

12.3.6 Assessment Limitations

Baseline noise surveys were undertaken in 2014 at a number of locations which are representative of the closest noise-sensitive receptors to the proposed Development. The baseline data was previously accepted by the DCSDC as part of the consented Craignagapple Wind Farm noise impact assessment, including the use of directional filtering to remove the influence of operational wind turbine noise from the measured data.

As discussed in Section 12.4.3.1, as part of the process of re-analysing the baseline data, a number of worst-case assumptions have been made to ensure that the noise limits derived from this data follow a conservative approach.

Baseline noise levels have been set across a wind speed range of 1 ms^{-1} to 12 ms^{-1}; where insufficient valid data[38] was available at the upper or lower ends of this range, the background noise levels for the missing wind speeds have been set as equal to the nearest wind speed where valid data is available, or ‘flat-lined’ (see Section 12.4.3.2). For higher wind speeds, this results in lower background noise levels, and for lower wind speeds, this results in higher background noise levels, which is a conservative approach.

With regards to the required wind speed range for valid data, it should be noted that the candidate wind turbine reaches its maximum sound power level at 7 m/s (see Table 12.3), and that valid data is available up to a minimum of 9 m/s at all monitoring locations for both daytime and night-time periods (see Table 12.8 and Table 12.9). This is in line with Section 2.9.2 of the GPG, which states:

“With increasing hub heights a modern pitch-regulated turbine may achieve its maximum sound power level at a standardised wind speed of 7-8 m/s. In such cases acquisition of background noise data at wind speeds up to 12 m/s is not considered necessary.”

[38] Valid data defined as a minimum of 5 data points per 1 m/s wind speed bin (unfiltered data), or 3 data points per 1 m/s wind speed bin (filtered data), in line with Section 2.9.5 of the GPG.

The baseline data was analysed based on a worst-case hub height of 90 m, and standardised to a height of 10 m in accordance with the GPG.

It is therefore concluded that no significant assessment limitations exist.

12.3.7 Embedded Mitigation

Operational noise was a key factor in the design of the turbine layout. Each layout iteration was modelled to determine its noise impact, and amended as required to ensure that the Development could operate in accordance with ETSU-R-97.

12.3.8 Implications of Climate Change

The consequences of the projected climate change scenario, as outlined in Chapter 15 of this ES, are unlikely to substantially affect baseline noise conditions of this assessment as periods of rainfall are excluded and the variation with wind speed was taken into account, in line with requirements of ETSU-R-97 and current good practice.

12.3.9 Future Baseline in Absence of the Proposed Development

In the case of the absence of the proposed Development, Owenreagh I and II will not be decommissioned. Provided no other significant development would be in operation, the environmental noise levels in the absence of the proposed Development are likely to remain largely similar to those currently experienced.

12.3.10 Micro-siting

The locations of the turbines and other infrastructure would be subject to ‘micro-siting’. This process allows for minor changes in turbine or infrastructure locations to respond to possible variations in ground conditions across the Site, which would only be confirmed following detailed Site investigation work carried out immediately prior to construction. It is anticipated that the agreed 'tolerance' micro-siting distance of 50 m would form a condition accompanying any consent. A change of 50 m in turbine position will have negligible effects (<0.5 dB) on the turbine noise levels and as such the results of this assessment remain valid and accounts for the micro-siting tolerance of 50 m.

12.4 Baseline Conditions

12.4.1 Receptor Identification

Potential operational noise-sensitive receptors have been identified using Ordnance Survey Northern Ireland (OSNI) data, along with aerial photography and observations made during site visits. Of the identified receptors located within the study area, a representative selection has been assessed based on proximity and similarity of residential environment context. Providing the assessed receptors are shown to be compliant with the requirements of ETSU-R-97, receptors located further from the Development would also comply.

12.4.2 Construction Noise

Figure 12.1 shows the location of potentially noise-sensitive properties located within 1 km of any Development infrastructure. These receptors are specific to construction noise only and are presented in Table 12.5, along with the relevant Irish National Grid (ING) coordinates.

Table 12.5. Construction Noise Receptors (CNRs)

Property ID	Address	X Coordinate (ING)	Y Coordinate (ING)
CNR 1	101 Hollyhill Road	242635	398227
CNR 2	51 Napple Road	245122	396215

Property ID	Address	X Coordinate (ING)	Y Coordinate (ING)
CNR 3[39]	43 Koram Road	240895	397441
CNR 4[40]	Unlisted with access driveway adjacent to 7-13 Ballykeery Road	242766	394636

12.4.3 Operational Noise

12.4.3.1 Baseline Noise Data

Overview

The 2014 data was originally analysed based on a 67 m hub height, as part of the Craignagapple Wind Farm noise impact assessment, and as such it would be inappropriate to re-use the same derived background noise levels and noise limits for the Development (for which a hub height of 90 m is proposed). Wind speed measurements were undertaken at several heights up to a maximum of 70 m; in line with the GPG, this data can therefore be re-analysed to derive 10 m standardised wind speeds for hub heights of up to a maximum of 116 m.

During consultation, the EHO proposed that short-term 'verification' measurements were undertaken at the measurement locations used for the 2014 baseline survey, in order to demonstrate that contemporary background noise levels are comparable with the existing data. The 2014 data was captured over a period of several weeks, therefore in order to make a meaningful comparison with the existing baseline data, any further measurements would need to be undertaken in a like-for-like manner, at the same measurement locations over an equivalent period of time. As such, there is no reasonable way to 'validate' the existing data in this manner and it is not necessary to do so based on the fact that the methodology has been validated numerous times in its application for wind farms throughout the UK.

Changes in background noise levels are most likely to occur as the result of major developments (e.g., roads or large industrial developments) in or near to the measurement locations; no developments of this nature (being either constructed or decommissioned) have been identified in proximity to any of the measurement locations. Noise level changes may also occur as a result of changes in road traffic levels, however (as noted in Section 12.5.1.2), traffic levels generally increase over time leading to higher traffic noise levels, meaning the use of the 2014 data now would be a conservative approach.

The EHO, during consultation, requested that a review of the potential impacts of future forestry works on nearby receptors be considered, in particular the effect on background noise of the presence/absence of areas of woodland. Where noise measurements for the existing datasets were undertaken in proximity to forested areas, directional filtering was used to split the background noise data into 'upwind' and 'downwind' for comparison; no clear influence from the presence of wooded areas (e.g., wind induced noise) could be identified during analysis. These measurement locations were also located adjacent to roads, which would typically result in raised background noise levels that would likely provide masking of other noise sources. The presence of forestry and potential future forestry works are therefore not considered to have a strong influence on baseline noise levels.

The existing datasets were measured in the presence of operational wind turbine noise from Owenreagh I and II developments, and as part of the 2014 baseline analysis directional filtering was employed in order to exclude measured data during periods where the measurement location was downwind of operational turbines. As part of the consultation process for the Development, a technical report was issued to the DCSDC outlining a number of potential filtering approaches for each measurement location, and in each instance the approach which resulted in the most conservative background noise levels was chosen in order to ensure a conservative approach is

[39] Considered representative of the nearby receptors located within the Study Area, adjacent to CNR 3 but at greater distances from the Development (as shown on Figure 12.1).

[40] Considered representative of the nearby receptors located within the Study Area, adjacent to CNR 4 but at greater distances from the Development (as shown on Figure 12.1).

taken to the operational noise assessment. Further detail on the datasets and filtering approaches is included in sections below.

Datasets

A total of five datasets were collected in 2014 at the locations detailed in Table 12.6. Of these five measurement locations, only three are representative of receptors located within the operational noise Study Area; the remaining two datasets (identified in Table 12.6 as MPZB and MPZD) have therefore not been considered further in this assessment.

Table 12.6. Noise Measurement Locations

Measurement Location Name	Address	X Coordinate (ING)	Y Coordinate (ING)	Representative of Receptors within Study Area
MPZA	44 Crockan Road	242683	398318	Yes
MPZB	21 Ballykeery Road	244998	395690	No
MPZC	12 Ballykeery Road	242730	394594	Yes
MPZD	17 Koram Road	241171	395182	No
MPZE	43 Koram Road	240881	397473	Yes

Analysis and Filtering

Directional filtering was applied to the data for the 2014 assessment, in order to exclude the impact of the operational Owenreagh I and II wind turbines on the measured background noise levels, as recommended in the GPG.

In order to ensure a conservative approach, a number of filtering options have been considered for each dataset; the approach which results in the lowest background noise levels (overall or at key wind speeds) has been chosen in each instance. The approaches are as follows:

- **Original Analysis:** Directional filtering formed part of the data analysis undertaken for the Craignagapple Wind Farm noise impact assessment. This approach to filtering has been previously accepted by the DCSDC, and therefore has been considered as part of this assessment. For the 2014 data, a record of each filtered 10-minute measurement has been preserved, allowing the data to be filtered in an identical manner to the original assessment;
- **Downwind filtering:** A directional filter focused on the centre of the operational turbines (covering a 180° sector) was applied, which excluded all data when the measurement locations were downwind of the turbines. This approach has been applied consistently across the six datasets, allowing comparison with and validation of the original analysis; and,
- **No directional filtering:** The directional filtering to exclude the influence of the operational turbines assumes that noise levels will be higher during downwind conditions, as would typically be expected. However, at some measurement locations (particularly those positioned at greater distances from the operational turbines), this may not necessarily be the case; a scenario considering no directional filtering was therefore also considered, in order to ensure the worst case (i.e., lowest) background levels were identified.

Technical Appendix 12.1: Baseline Data Analysis presents graphs for each Noise Measurement Location, showing trendlines based on the three filtering approaches outlined above. Table 12.7, below, summarises the worst-case approach taken for each dataset. In each instance, the same approach has been applied to both daytime and night-time periods.

Table 12.7. Approach to Filtering

Monitoring Location	Filtering Approach Used	Rationale
MPZA	180° Downwind Filter (Day) No Directional Filtering (Night)	During the day, the 180° downwind filter results in the lowest background noise levels between 6 – 9 m/s, levels at higher wind speeds were consistent across all wind directions and so were not excluded (filtered datasets illustrated as “Additional Exclusions” in Chart 12.1). During the night, the lowest background noise levels were found without filtering the data, at all but one wind speed (10 m/s).
MPZC	No Directional Filtering (Day and Night)	During the day, the removal of all directional filtering results in the lowest daytime background noise levels above 5 m/s, therefore this approach is considered the most conservative. During the night, the lowest background noise levels were found without filtering the data.
MPZE	No Directional Filtering (Day and Night)	During the day, the lowest background noise levels were found without filtering the data, at all but one wind speed (9 m/s). During the night, the lowest background noise levels were found without filtering the data, at all but one wind speed (10 m/s).

12.4.3.2 Background Noise Levels

Figure 12.1 to Figure 12.6 detail the results of the background noise data analysis for each location, for quiet daytime and night periods, as defined in ETSU-R-97.

At high wind speeds, where insufficient data (see Section 12.3.6) was available in a wind speed ‘bin’[41], the background noise level is set equal to the last value where sufficient valid data was available. At low wind speeds where the trendline values are greater than those at higher wind speeds, the background noise level is set equal to the lowest value on the trendline. In each of these scenarios, the background noise level is ‘flat-lined’ in order to ensure a conservative approach. The ‘flat-lined’ values are referred to on the following charts as ‘Assumed Prevailing Background Noise’.

[41] Each 1 m/s wind speed bin is equal to the integer value +/- 0.5 dB. For example, the 6 m/s wind speed bin covers the range of 5.50 m/s to 6.49 m/s.

Chart 12.1. Quiet Daytime MPZA

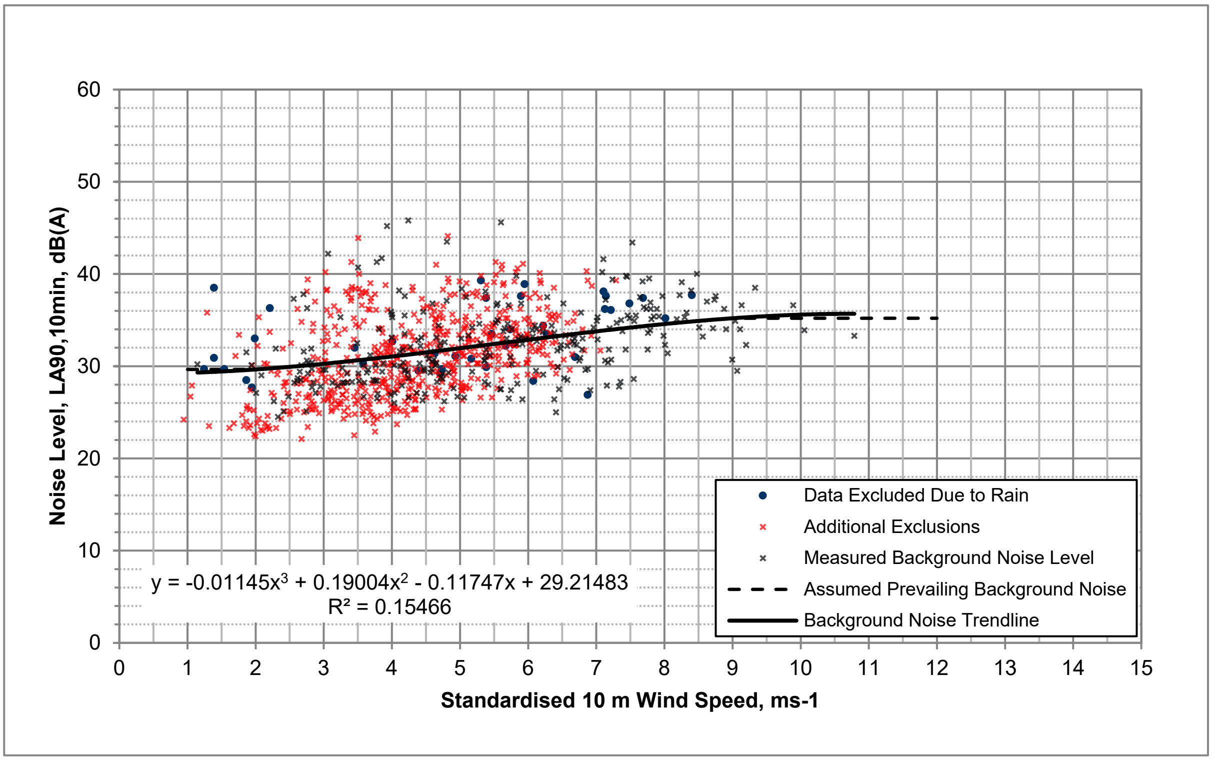

Chart 12.2.Night-time – MPZA

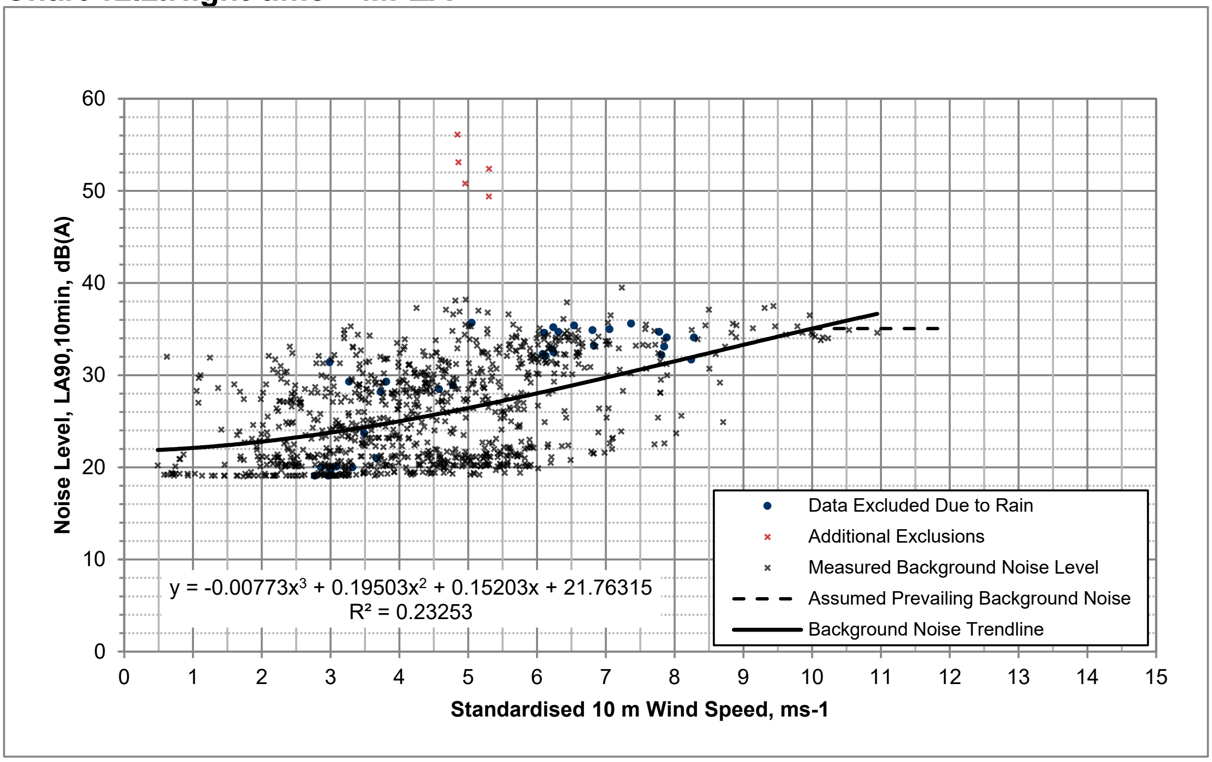

Chart 12.3. Quiet Daytime - MPZC

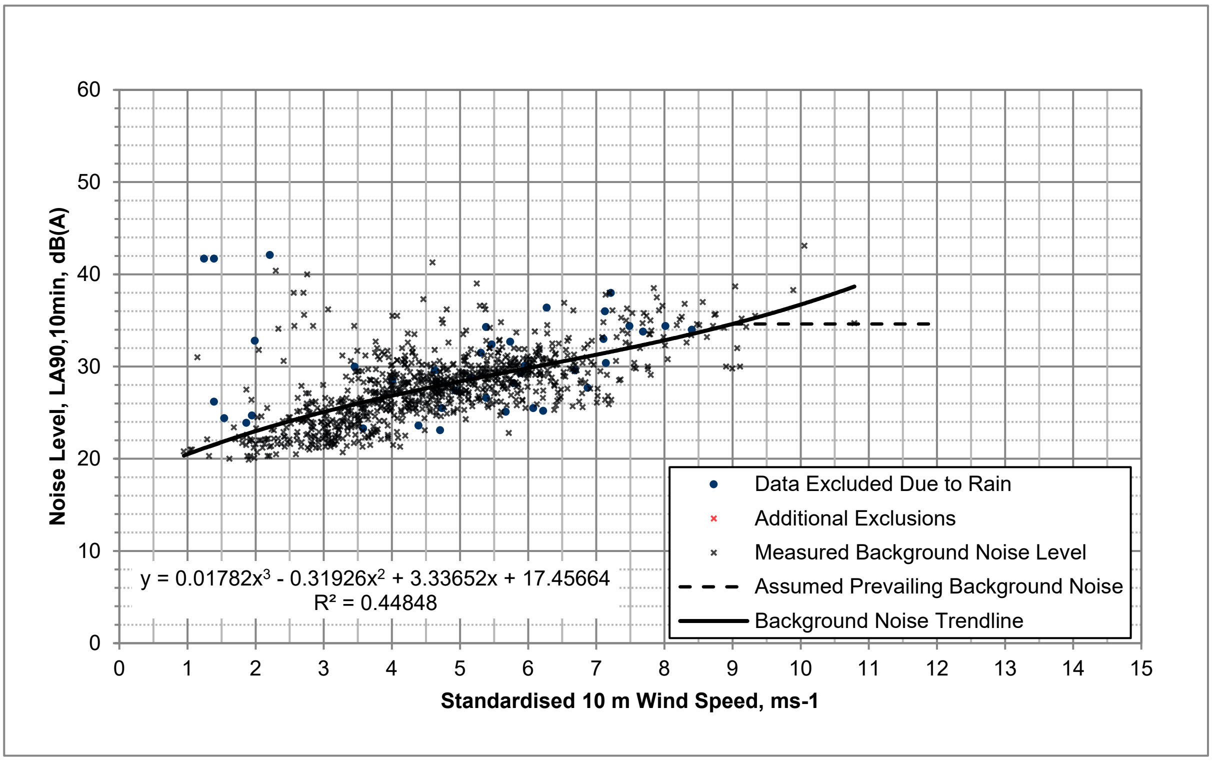

Chart 12.4. Nighttime - MPZC

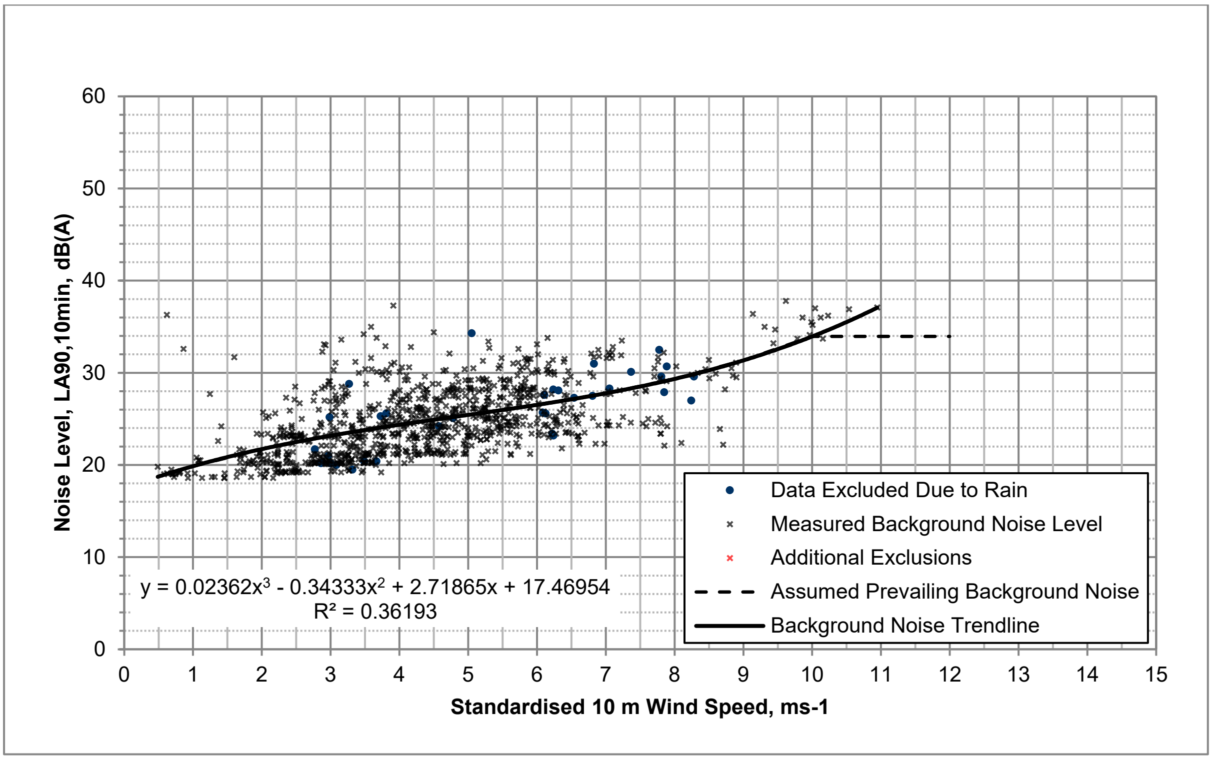

Chart 12.5. Quiet Daytime - MPZE

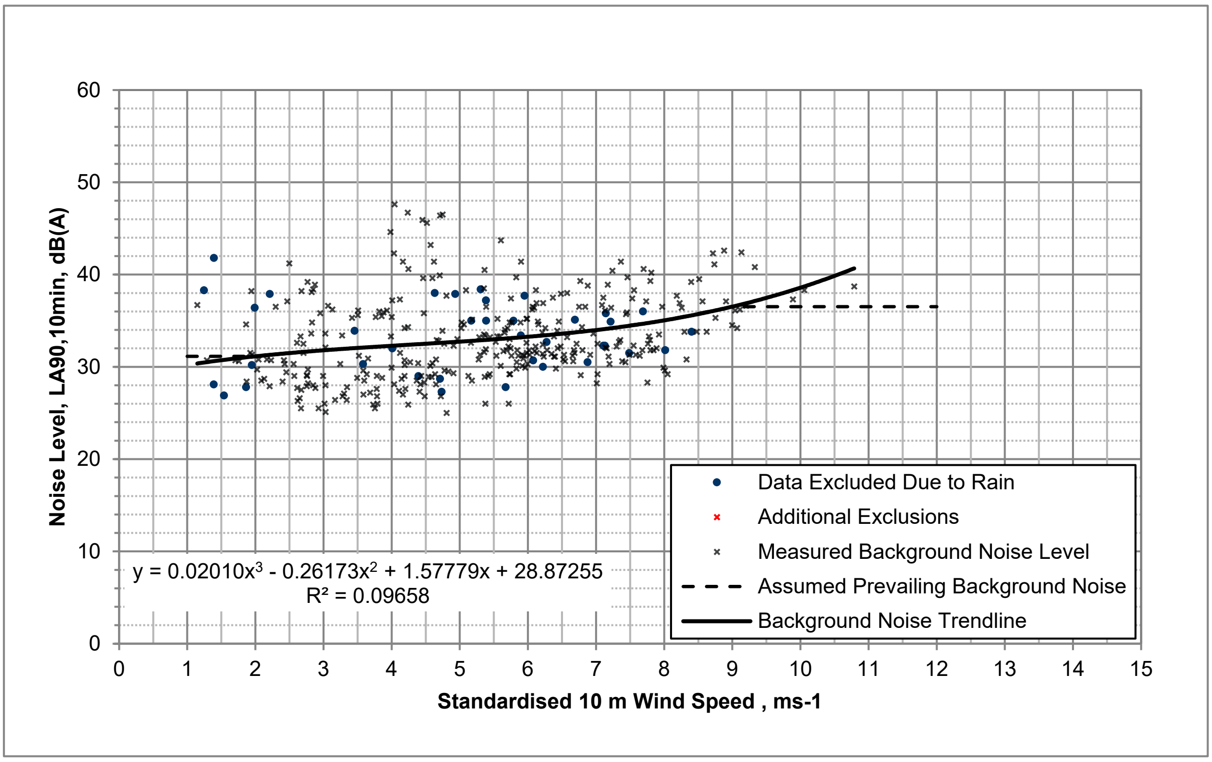

Chart 12.6. Night-time MPZE

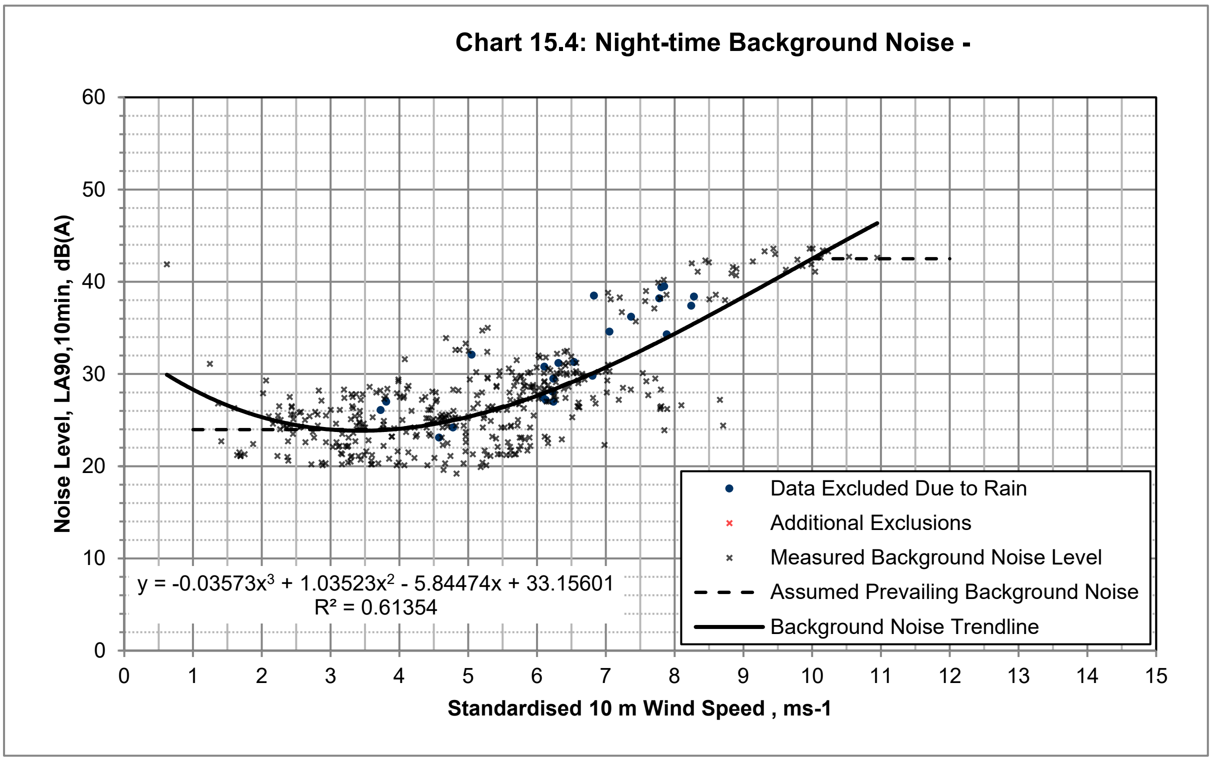

Table 12.8 and Table 12.9 present the derived background noise levels for daytime and night-time periods based on the filtering approaches identified above, for a hub height of 90 m.

Values in *italics* indicate that the data has been 'flat-lined'. This has been done where insufficient data was available at higher wind speeds due to filtering, or where the line of best fit resulted in a value that was lower than the previous wind speed.

Table 12.8. Derived Background Noise Levels - Daytime

Monitoring Location	Wind Speed Standardised to a height of 10 m / Background Noise Level dB(A)											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
MPZA	*29.6*	29.6	30.3	31.1	31.9	32.9	33.8	34.6	35.2	*35.2*	*35.2*	*35.2*
MPZC	20.5	23.0	25.1	26.8	28.4	29.8	31.3	32.8	34.6	*34.6*	*34.6*	*34.6*
MPZE	*31.1*	31.1	31.8	32.3	32.7	33.3	34.0	35.0	36.5	*36.5*	*36.5*	*36.5*

Table 12.9. Derived Background Noise Levels – Night-time

Monitoring Location	Wind Speed Standardised to a height of 10 m / Background Noise Level dB(A)											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
MPZA	22.1	22.8	23.8	25.0	26.4	28.0	29.7	31.5	33.3	35.1	*35.1*	*35.1*
MPZC	19.9	21.7	23.2	24.4	25.4	26.5	27.8	29.3	31.3	33.9	*33.9*	*33.9*
MPZE	*24.0*	*24.0*	24.0	24.1	25.3	27.6	30.7	34.4	38.4	42.5	*42.5*	*42.5*

12.1.1.1 Assessed Receptors

The assessed receptors are a representative selection of those located within the Study Area identified in Figure 12.2. For each of these receptors, Table 12.10 details the source of the respective background noise levels, from which the cumulative noise limits are derived. These receptors have been chosen based on their close distance, direction, and context, which make these representatives of all other receptors in the area.

Table 12.10. Operational Noise Receptors (ONRs)

Receptor ID	Address	X Coordinate (ING)	Y Coordinate (ING)	Source of Background Noise Data
ONR 1	101 Hollyhill Road	242635	398227	MPZA
ONR 2	97 Hollyhill Road	242776	398246	
ONR 3	12 Ballykeery Road	242766	394636	MPZC
ONR 4	43 Koram Road	240895	397441	MPZE

12.4.3.3 Cumulative Noise Limits

Table 12.11 details the ETSU-R-97 cumulative noise limits for each assessed receptor. It is from these limits that apportioned noise limits applicable to the Development are derived.

Table 12.11. Cumulative Noise Limits

Receptor Name	Standardised 10 m Wind Speed, ms^{-1}								
	4	5	6	7	8	9	10	11	12
	Cumulative Noise Limit, dB, $L_{A90,10min}$								
Daytime									
ONR 1	36.1	36.9	37.9	38.8	39.6	40.2	40.2	40.2	40.2
ONR 2	36.1	36.9	37.9	38.8	39.6	40.2	40.2	40.2	40.2
ONR 3	35.0	35.0	35.0	36.3	37.8	39.6	39.6	39.6	39.6
ONR 4	37.3	37.7	38.3	39.0	40.0	41.5	41.5	41.5	41.5
Night-time									
ONR 1	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
ONR 2	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
ONR 3	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
ONR 4	43.0	43.0	43.0	43.0	43.0	43.4	47.5	47.5	47.5

12.5 Assessment of Potential Effects

12.5.1 Construction Noise

12.5.1.1 Construction of Site Infrastructure

Table 12.12 details the distances between the closest noise-sensitive receptors and each construction activity. Values in *italics* indicate that the receptor is located more than 1,000 m from a specific construction activity, and as such no assessment of that activity is required.

Table 12.12. Distance to Decommissioning and Construction Activities

Receptor Name	Construction Activity		
	Decommissioning / Construction of Tracks and/or Hardstanding	Construction of Turbine Foundations	Decommissioning / Construction of Turbines
	Distance to Receptor[42], m		
CNR 1	993	*1,241*	*1,241*
CNR 2	983	*1,053*	*1,053*
CNR 3	809	918	918
CNR 4	940	*1,410*	940

[42] The distances presented in this Table are specifically from the nearest anticipated noise emitting plant to the receptor and may differ from distances presented elsewhere in this EIA Report.

Details of the numbers and types of plant and their noise emission levels assumed for each phase of construction based upon experience of similar developments are provided in **Technical Appendix A12.2: Details of Construction Plant** of this ES together with details of the calculations carried out to predict construction noise levels.

It should be noted that the predicted noise levels are based on worst-case assumptions, including:

- Modelling assumes all plant is located at the closest point to the receptor for each activity;
- Noise due to HGV traffic on haulage routes is included and assumes worst case traffic movements occurring during concrete pouring (Table 13.3, **Chapter 13: Traffic and Transport**); and,
- No reduction from noise as a result of topographical screening.

The results of these calculations are shown in Table 12.13 As noted in Section 12.3.2.1, construction noise from activities located greater than 1,000 m from receptors has been screened out on the basis of there being no reasonable prospect of a significant; this is represented by a dashed line below.

Table 12.13. Predicted Construction Noise Levels

Receptor Name	Construction Activity		
	Decommissioning / Construction of Tracks and/or Hardstanding	**Construction of Turbine Foundations**	**Decommissioning / Construction of Turbines**
	Predicted Noise Level, dB, $L_{Aeq,12hr}$ (day)		
CNR 1	40.9	-	-
CNR 2	41.0	-	-
CNR 3	42.4	46.9	47.4
CNR 4	41.3	-	47.4

As can be seen from Table 12.14 the predicted levels of construction noise are below the daytime lower threshold of 65 dB(A) at all receptors. Night-time construction works are not intended, where night-time works may be necessary, it will be short in duration and an advance notice to the nearby residence will be issued of the planned work, therefore night-time noise impact is not assessed. As such, construction noise effects are considered to be **not significant** in terms of the EIA Regulations.

12.5.1.2 Construction Traffic Noise

Details of the calculation of the change in road traffic noise levels are contained in **Technical Appendix A12.2: Details of Construction Plant**

Table 12.14 and Table 12.15 provide a summary of the results for the estimated worst-case increase in traffic flows for each location along the planned route for both days where there are no concrete deliveries, and where concrete deliveries will take place. The resulting magnitude of effect as described in Section 12.3.2.1 is also included.

Table 12.14. Predicted Construction Traffic Noise Effects – Non-concrete Day

Location	Change in Traffic Noise Level, dB	Magnitude of Effect
Napple Road - T13 Site Entrance	Baseline flows <1000, see below	

Napple Road - T14 Site Entrance	Baseline flows <1000, see below	
Glenmornan Road - T8-T12 Site Entrance	Baseline flows <1000, see below	
Glenmornan Road - West of T1-T2 Site Entrance	Baseline flows <1000, see below	
Moorlough Road - Between Chestnut Road and Sentry Road	Baseline flows <1000, see below	
Art Road - Between Sentry Road and Berryhill Road	Baseline flows <1000, see below	
Berryhill Road - Between Pine Road and Woodend Road	0.8	Negligible
Woodend Road - South of Ballymagorry	Baseline flows <1000, see below	
A5 - Victoria Road - North of Ballymagorry	0.3	Negligible

It can be seen from Table 12.15 that the predicted change in the level of road traffic noise during construction of the Development is less than 3 dB in all cases with effects of negligible or minor significance. As such, construction traffic noise effects are **not significant** in terms of the EIA Regulations.

Table 12.15. Predicted Construction Traffic Noise Effects – Concrete Day

Location	Change in Traffic Noise Level, dB	Magnitude of Effect
Napple Road - T13 Site Entrance	Baseline flows <1000, see below	
Napple Road - T14 Site Entrance	Baseline flows <1000, see below	
Glenmornan Road - T8-T12 Site Entrance	Baseline flows <1000, see below	
Glenmornan Road - West of T1-T2 Site Entrance	Baseline flows <1000, see below	
Moorlough Road - Between Chestnut Road and Sentry Road	Baseline flows <1000, see below	
Art Road - Between Sentry Road and Berryhill Road	Baseline flows <1000, see below	
Berryhill Road - Between Pine Road and Woodend Road	1.7	Minor
Woodend Road - South of Ballymagorry	Baseline flows <1000, see below	
A5 - Victoria Road - North of Ballymagorry	0.7	Negligible

As detailed in **Chapter 13: Access, Transport and Traffic**, the traffic flows during non-concrete and concrete days at all Locations with exception of the junctions at Berryhill Road and Victoria Road are predicted to be of fewer than 1000 vehicles/day. The CRTN calculation method therefore cannot be used at these locations and it is therefore not appropriate to assess effects in terms of the change in traffic noise level. Noise levels due to traffic at these locations has therefore been calculated at 10 m from the road using the BS 5228 methodology and assessed using criteria described in BS 5228.

Table 12.16 and Table 12.17 detail the results of this process for peak month periods with and without concrete deliveries.

Table 12.16. Predicted Construction Traffic Noise Effects – Non-concrete Day

Location	Predicted Noise Level, dB, L_{Aeq}
Napple Road - T13 Site Entrance	55.0
Napple Road - T14 Site Entrance	54.7
Glenmornan Road - T8-T12 Site Entrance	54.6
Glenmornan Road - West of T1-T2 Site Entrance	54.9
Moorlough Road - Between Chestnut Road and Sentry Road	56.7
Art Road - Between Sentry Road and Berryhill Road	58.0
Woodend Road - South of Ballymagorry	56.6

Table 12.17. Predicted Construction Traffic Noise Effects – Non-concrete Day

Location	Predicted Noise Level, dB, L_{Aeq}
Napple Road - T13 Site Entrance	58.6
Napple Road - T14 Site Entrance	58.5
Glenmornan Road - T8-T12 Site Entrance	58.5
Glenmornan Road - West of T1-T2 Site Entrance	58.6
Moorlough Road - Between Chestnut Road and Sentry Road	59.4
Art Road - Between Sentry Road and Berryhill Road	60.2
Woodend Road - South of Ballymagorry	59.4

It can be seen from tables above that on non-concrete days:

- The predicted change in noise levels at Berryhill Road, and Victoria Road is negligible; and,
- The predicted noise level at all other locations is below 65 dB(A).

On Days where there would be deliveries of concrete:

- The predicted change in noise levels at Berryhill Road, and Victoria Road is minor and negligible respectively; and,
- The predicted noise level at all other locations is below 65 dB(A).

Effects on days without concrete deliveries, and days with concrete deliveries would therefore be **not significant** in terms of the EIA Regulations**.**

12.5.2 Operational Wind Turbine Noise

12.5.2.1 Predicted Noise Levels due to the Development

Table 12.18 details the predicted noise immission levels due to the operation of the Development, following the methodology described in Section 12.3.2.2, and using the noise emission data presented in Table 12.19 and Table 12.20. As previously noted, predicted noise levels are worst-case, based upon the assumption that each receptor is directly downwind of all Development turbines simultaneously, which cannot occur in practice.

Table 12.18. Predicted Operational Noise Levels due to the Development

Receptor	Standardised Wind Speed at 10 m AGL, ms^{-1}								
	4	5	6	7	8	9	10	11	12
	Predicted Noise Level, dB, $L_{A90,10min}$								
ONR 1	26.5	31.7	35.8	36.2	36.2	36.2	36.2	36.2	36.2
ONR 2	26.5	31.7	35.8	36.2	36.2	36.2	36.2	36.2	36.2
ONR 3	23.9	29.1	33.2	33.6	33.6	33.6	33.6	33.6	33.6
ONR 4	26.3	31.5	35.6	36.0	36.0	36.0	36.0	36.0	36.0

12.5.2.2 Assessment of Development Noise

The assessment of Development noise (in absence of cumulative developments) is a simplified assessment of the proposed turbine noise against noise limits as described in Section 12.2.5, in accordance with ETSU-R-97. Table 12.19 and Table 12.20 present the respective background levels used to derive the appropriate noise limits (i.e., 5 dB above background or a 35 dB(A) lower limit for daytime and 43 dB(A) for night). Noise limits for the Development are presented in Table 12.19 below.

Table 12.19. Noise Limits for the Development

Receptor	Standardised Wind Speed at 10 m AGL, ms^{-1}								
	4	5	6	7	8	9	10	11	12
	Noise Limit, dB, $L_{A90,10min}$								
Daytime									
ONR 1	36.1	36.9	37.9	38.8	39.6	40.2	40.2	40.2	40.2
ONR 2	36.1	36.9	37.9	38.8	39.6	40.2	40.2	40.2	40.2
ONR 3	35.0	35.0	35.0	36.3	37.8	39.6	39.6	39.6	39.6
ONR 4	37.3	37.7	38.3	39.0	40.0	41.5	41.5	41.5	41.5
Night-time									
ONR 1	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
ONR 2	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0

Receptor	Standardised Wind Speed at 10 m AGL, ms^{-1}								
	4	5	6	7	8	9	10	11	12
	Noise Limit, dB, $L_{A90,10min}$								
ONR 3	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
ONR 4	43.0	43.0	43.0	43.0	43.0	43.4	47.5	47.5	47.5

Table 12.20 details the difference (margin) between predicted noise immission and the Development noise limits for the assessed receptors. A negative margin indicates that the predicted noise level is below the derived noise limit.

Table 12.20. Margin between Predicted Development Noise and Limits

Receptor	Standardised 10 m Wind Speed, $ms\text{-}^{1}$								
	4	5	6	7	8	9	10	11	12
	Margin, dB								
Daytime									
ONR 1	-9.6	-5.2	-2.1	-2.6	-3.4	-4.0	-4.0	-4.0	-4.0
ONR 2	-9.6	-5.2	-2.1	-2.6	-3.4	-4.0	-4.0	-4.0	-4.0
ONR 3	-11.1	-5.9	-1.8	-2.7	-4.2	-6.0	-6.0	-6.0	-6.0
ONR 4	-11.0	-6.2	-2.7	-3.0	-4.0	-5.5	-5.5	-5.5	-5.5
Night-time									
ONR 1	-16.5	-11.3	-7.2	-6.8	-6.8	-6.8	-6.8	-6.8	-6.8
ONR 2	-16.5	-11.3	-7.2	-6.8	-6.8	-6.8	-6.8	-6.8	-6.8
ONR 3	-19.1	-13.9	-9.8	-9.4	-9.4	-9.4	-9.4	-9.4	-9.4
ONR 4	-16.7	-11.5	-7.4	-7	-7	-7.4	-11.5	-11.5	-11.5

As Table 12.20 shows, worst-case noise levels due to the Development are below the noise limits at all assessed receptors, and as such are **not significant** in terms of the EIA Regulations.

12.5.2.3 Cumulative Assessment

Calculation of Apportioned Noise Limits

The only cumulative development pertinent to this assessment is the Ballykeery Wind Turbine as detailed in Table 12.23. When assessing cumulative noise levels, consideration should be given to any noise limits or other noise-related planning conditions applicable to each development. Where there is no reasonable prospect of a cumulative development producing noise levels up to its consented (or proposed) limits, the GPG recommends that predicted noise levels should be used along with an additional safety margin. This approach prevents the sterilisation of an area in which existing wind turbine noise levels are substantially lower than the ETSU-R-97 limits, enabling further appropriate development to be considered.

Details of the noise emission data for the cumulative development are presented in Table 12.21 and Table 12.22[43].

Table 12.21. Noise Emission Data – Vestas V52 - 59 m Hub Height

	Standardised 10 m Wind Speed, ms-^{1}								
	4	5	6	7	8	9	10	11	12
	Sound Power Level, dB(A)								
Sound Power Level, dB, LWA, inc. allowance for uncertainty	93.7	98.5	100.5	101.2	102.1	102.8	103.3	103.5	103.5

The octave-band frequency spectrum at the wind speed 8 ms^{-1} is detailed in Table 12.22.

Table 12.22. Octave-band Spectra – Vestas V52 - 59 m Hub Height

	Standardised 10 m Wind Speed, ms^{-1}							
	63	125	250	500	1000	2000	4000	8000
	Sound Power Level, dB(A)							
Sound Power Level, dB, LWA (scaled to 103.5 dB)	82.5	89.6	96.1	99.3	97.3	94.2	88.3	79.2

Table 12.23 details the predicted 'adjusted' noise levels for the Ballykeery Road Turbine (excluding noise due to the Development) for each of the assessed receptors identified in Table 12.10. It should be borne in mind that as the noise assessment follows GPG advice with regard to cumulative noise effects, the noise levels presented in Table 12.11 are a theoretical worst case; a number of conservative assumptions have been made as detailed in the previous sections of this Chapter, such as the assumption that each receptor is directly downwind of all turbines simultaneously, which cannot occur in practice.

Table 12.23. Predicted Noise Levels – Ballykeery Road Turbine

Receptor	Standardised Wind Speed at 10 m AGL, ms^{-1}								
	4	5	6	7	8	9	10	11	12[44]
	Predicted Noise Level, dB, $L_{A90,10min}$								
ONR 1	7.4	9.1	9.5	9.5	9.5	9.5	9.5	9.5	*9.5*
ONR 2	7.3	9.0	9.4	9.4	9.4	9.4	9.4	9.4	*9.4*
ONR 3	31.1	32.8	33.2	33.2	33.2	33.2	33.2	33.2	*33.2*

[43] Data source Craignagapple Wind Farm Further Environmental Information Report (2016). Sound power level data provided inclusive of uncertainty (amount not specified).
[44] Levels at 12m/s wind speed were set the same as 11mm/s predicted levels.

Receptor	Standardised Wind Speed at 10 m AGL, ms^{-1}								
	4	5	6	7	8	9	10	11	12[44]
	Predicted Noise Level, dB, $L_{A90,10min}$								
ONR 4	10.5	12.2	12.6	12.6	12.6	12.6	12.6	12.6	*12.6*

Apportioned Noise Limits

Cumulative noise limits based on the fixed lower limits as presented in Section12.3.2.2 are presented in Table 12.24 below.

Table 12.24. Noise Limits for the Cumulative Assessment

Receptor	Standardised Wind Speed at 10 m AGL, ms^{-1}								
	4	5	6	7	8	9	10	11	12
	Noise Limit, dB, $L_{A90,10min}$								
Daytime									
ONR 1	37.5	37.5	37.9	38.8	39.6	40.2	40.2	40.2	40.2
ONR 2	37.5	37.5	37.9	38.8	39.6	40.2	40.2	40.2	40.2
ONR 3	37.5	37.5	37.5	37.5	37.8	39.6	39.6	39.6	39.6
ONR 4	37.5	37.7	38.3	39.0	40.0	41.5	41.5	41.5	41.5
Night-time									
ONR 1	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
ONR 2	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
ONR 3	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
ONR 4	43.0	43.0	43.0	43.0	43.0	43.4	47.5	47.5	47.5

Cumulative noise effects have been addressed through the derivation of apportioned noise limits. Apportioned noise limits are created by logarithmically subtracting the cumulative noise (i.e., the Ballykeery wind turbine), from the cumulative noise limits. The result is the remaining noise budget available to the Development.

The resulting apportioned limits applicable to the Development in isolation are presented in Table 12.25. These limits may be presented in the planning conditions of any consent for the Development and will ensure the Development's compliance with ETSU-R-97 when considered both individually and cumulatively.

Table 12.25. Noise Limits Apportioned to the Development

Receptor	Standardised Wind Speed at 10 m AGL, ms^{-1}								
	4	5	6	7	8	9	10	11	12

	Noise Limit, dB, $L_{A90,10min}$								
Daytime									
ONR 1	37.5	37.5	37.9	38.8	39.6	40.2	40.2	40.2	40.2
ONR 2	37.5	37.5	37.9	38.8	39.6	40.2	40.2	40.2	40.2
ONR 3	36.4	35.7	35.5	35.5	36.0	38.5	38.5	38.5	38.5
ONR 4	37.5	37.7	38.3	39.0	40.0	41.5	41.5	41.5	41.5
Night-time									
ONR 1	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
ONR 2	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
ONR 3	42.7	42.6	42.5	42.5	42.5	42.5	42.5	42.5	42.5
ONR 4	43.0	43.0	43.0	43.0	43.0	43.4	47.5	47.5	47.5

Margin between Predicted Development Noise and Apportioned Noise Limits

Table 12.26 details the difference (margin) between predicted noise immission levels and the apportioned noise limits) for the assessed receptors. A negative margin indicates that the predicted noise level is below the derived noise limit.

Table 12.26. Margin between Predicted Development Turbine Noise and Apportioned Noise Limits

Receptor	Standardised 10 m Wind Speed, ms-1								
	4	5	6	7	8	9	10	11	12
	Margin, dB								
Daytime									
ONR 1	-11.0	-5.8	-2.1	-2.6	-3.4	-4.0	-4.0	-4.0	-4.0
ONR 2	-11.0	-5.8	-2.1	-2.6	-3.4	-4.0	-4.0	-4.0	-4.0
ONR 3	-12.5	-6.6	-2.3	-1.9	-2.4	-4.9	-4.9	-4.9	-4.9
ONR 4	-11.2	-6.2	-2.7	-3.0	-4.0	-5.5	-5.5	-5.5	-5.5
Night-time									
ONR 1	-16.5	-11.3	-7.2	-6.8	-6.8	-6.8	-6.8	-6.8	-6.8
ONR 2	-16.5	-11.3	-7.2	-6.8	-6.8	-6.8	-6.8	-6.8	-6.8

Receptor			Standardised 10 m Wind Speed, ms-1								
			4	5	6	7	8	9	10	11	12
			Margin, dB								
ONR 3	-19.1	-13.9	-9.8	-9.4	-9.4	-9.4	-9.4	-9.4	-9.4		
ONR 4	-16.7	-11.5	-7.4	-7.0	-7.0	-7.4	-11.5	-11.5	-11.5		

Worst-case noise levels due to the Development meet the apportioned noise limits at all assessed receptors, and as such are **not significant** in terms of the EIA Regulations.

12.6 Mitigation and Residual Effects

12.6.1 Decommissioning and Construction Noise

The good practice measures detailed below will be implemented to manage the effects of noise and vibration during construction operations, and will be required of all contractors:

- Construction operations shall be limited to times agreed with DfI Planning);
- Deliveries of turbine components, plant and materials by HGV to Site shall only take place within times agreed with DfI Planning;
- The site contractors shall be required to employ the best practicable means of reducing noise emissions from plant, machinery, and construction activities, as advocated in BS 5228-1:2009;
- Where practicable, the work programme will be phased, which would help to reduce the combined effects arising from several noise emitting operations;
- Where necessary and practicable, noise from fixed plant and equipment will be contained within suitable acoustic enclosures or behind acoustic screens;
- All sub-contractors appointed by the main contractor will be formally and legally obliged, and required through contract, to comply with all environmental noise conditions;
- Where practicable, night-time working will not be carried out. Local residents shall be notified in advance of any night-time construction activities likely to generate significant noise levels, e.g. abnormal load movement; and,
- Any plant and equipment normally required for operation at night (23:00 - 07:00), e.g. generators or dewatering pumps, shall be silenced or suitably shielded to ensure that the night-time lower threshold of 45 dB, $L_{Aeq,night}$ shall not be exceeded at the nearest noise-sensitive receptors.

Application of the above measures to manage construction noise will ensure that effects are minimised as far as is reasonably practicable and that the construction process is operated in compliance with the relevant British Standard BS5228.

12.6.2 Operational Noise

As demonstrated in Table 12.23, operational wind turbine noise due to the Development is compliant with the noise limits derived in line with the requirements of ETSU-R-97 and the GPG, therefore no mitigation is required for operational noise.

12.6.3 Residual Effects

Application of the above measures to manage construction noise will ensure that effects are minimised as far as is reasonably practicable and that the construction process is operated in compliance with the relevant legislation[45].

[45] BS5228-1 & 2

Residual effects with appropriate mitigation applied would be not significant as per the EIA Regulations.

12.7 Summary of Effects

provides a summary of the effects detailed within this chapter.

Table 12.27. Summary of Effects

Receptor	Potential Effect	Significance of Effect	Mitigation Proposed	Residual Effect
Decommissioning/ Construction Phase				
All Receptors	N/A (see Section 12.3.2.1)	Not Significant	Good practice measures specified in Section 12.6.1.	**Not Significant**
Operational Phase				
All Receptors	N/A (see Section 12.3.2.4)	Not Significant	None	**Not Significant**
Final Decommissioning Phase				
All Receptors	N/A (see Section 12.3.2.1)	Not Significant	Good practice measures specified in Section 12.6.1.	**Not Significant**

12.8 Statement of Significance

An assessment of potential noise effects associated with the Development has been carried out.

Predicted levels of construction noise are below the daytime lower threshold of 65 dB(A) at all receptors. As such, construction noise effects are considered to be **not significant** in terms of the EIA Regulations.

Predicted noise levels due to increased traffic movements on public roads as a result of the Development have been assessed. The increase in road traffic noise due to the construction of the Development has been found to be **not significant** in terms of the EIA Regulations.

The effect of operational noise has been assessed in accordance with ETSU-R-97 and in line with current best practice (i.e., the GPG). It has been shown that, with the mitigation scheme outlined in Section 12.6.2, the Development would comply with the requirements of ETSU-R-97 at all receptor locations. The effect of operational noise is therefore **not significant** in terms of the EIA Regulations.

The cumulative effects of the Development in conjunction with nearby wind energy developments either operational, consented or the subject of a current planning application were taken into consideration in the above assessment, in accordance with ETSU-R-97 and the GPG. The effect of cumulative operational noise is therefore **not significant** in terms of the EIA Regulations.

Noise during decommissioning will be of a similar nature to that of construction and will be managed to ensure compliance with best practice, legislation, and guidelines current at the time in order to ensure that effects are **not significant** in terms of the EIA Regulations.

12.9 Glossary

AGL: Above Ground Level

Background Noise: The background noise level is the underlying level of noise present at a particular location for the majority (usually 90%) of a period of time. As such it excludes any short-duration noises, such as individual passing cars (but not continuous traffic), dogs barking or passers-by. Sources of background noise typically include such things as wind noise, traffic and continuously operating machinery (e.g., air conditioning or generators).

Decibel (dB): The decibel is the basic unit of noise measurement. It relates to the cyclical changes in air pressure created by the sound (Sound Pressure Level) and operates on a logarithmic scale, ranging upwards from 0 dB. 0 dB is equivalent to the normal threshold of human hearing at a frequency of 1000 Hz. Each increase of 3 dB on the scale represents a doubling in the Sound Pressure Level, and is typically the minimum noticeable change in sound level under normal listening conditions. For example, while an increase in noise level from 32 dB to 35 dB represents a doubling in sound pressure level, this change would only just be noticeable to the majority of listeners.

dB(A): Environmental noise levels are usually discussed in terms of dB(A). This is known as the A-weighted sound pressure level, and indicates that a correction factor has been applied, which corresponds to the human ear's response to sound across the range of audible frequencies. The ear is most sensitive in the middle range of frequencies (around 1000-3000 Hertz (Hz)), and less sensitive at lower and higher frequencies. The A-weighted noise level is derived by analysing the level of a sound at a range of frequencies and applying a specific correction factor for each frequency before calculating the overall level. In practice this is carried out automatically within noise measuring equipment by the use of electronic filters, which adjust the frequency response of the instrument to mimic that of the ear.

Frequency: The frequency of a sound is equivalent to its pitch in musical terms. The units of frequency are Hertz (Hz), which represents the number of cycles (vibrations) per second.

Noise Emission: The sound power level emitted from a given source.

Noise Immission: The sound pressure level detected at a given location (e.g. nearest dwelling).

$L_{A90,t}$: This term is used to represent the A-weighted sound pressure level that is exceeded for 90% of a period of time, t. This is used as a measure of the background noise level.

$L_{Aeq,t}$: This term is known as the A-weighted equivalent continuous sound pressure level for a period of time, t. It is similar to an average, and represents the sound pressure level of a steady, continuous noise which has the same energy as the actual measured noise.

Low-frequency noise: Noise at the lower end of the range of audible frequencies (20 Hz – 20 kHz). Usually refers to noise below 250 Hz. Should not be confused with infrasound, which is sound below the lowest normally audible frequency, 20 Hz.

Noise: Unwanted sound. May refer to both natural (e.g. wind, birdsong etc.) and artificial sounds (e.g. traffic, noise from wind turbines, etc.).

Noise-sensitive receptors: Locations that may potentially be adversely affected by the addition of a new source of noise (typically residential dwellings).

Sound power (W): The sound energy radiated per unit time by a sound source, measured in watts (W).

Sound power level (Lw): Sound power measured on the decibel scale, relative to a reference value (Wo) of 10-12 W.

Sound pressure (P): The fluctuations in atmospheric pressure relative to atmospheric pressure, measured in Pascals (Pa).

Sound pressure level (Lp): Sound pressure measured on the decibel scale, relative to a sound pressure of 2 x 10-5 Pa.

Vibration: In this context, refers to vibration carried in structures such as the ground or buildings, rather than airborne noise.

The Netherlands
New Zealand
Norway
Panama
Peru
Poland
Portugal
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Romania
Singapore
South Africa
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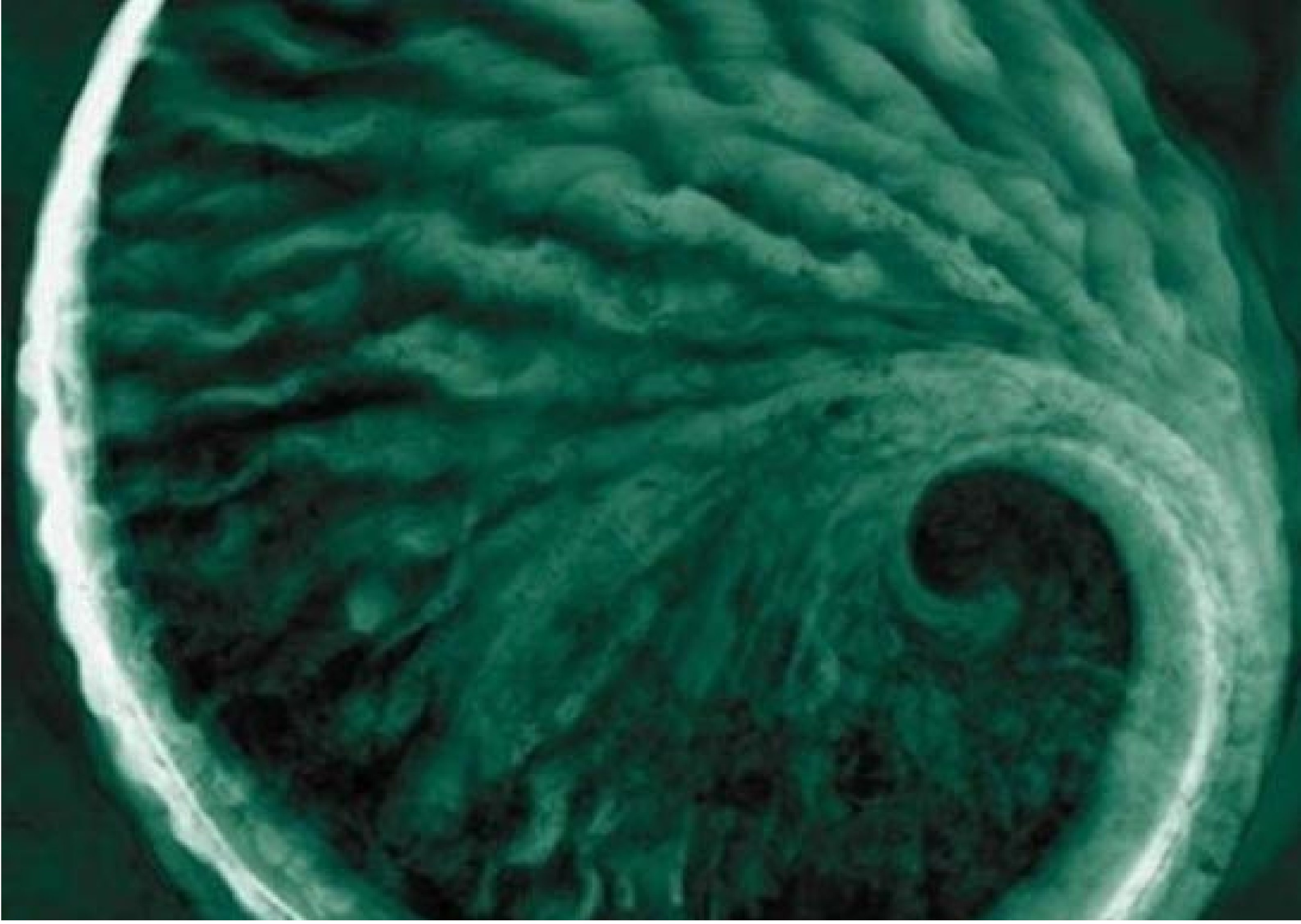

Ørsted Onshore Ireland Midco Limited

Owenreagh/Craignagapple Wind Farm

Environmental Statement – Chapter 13 Traffic and Transport

06 September 2023

Project No.: 0696177

The business of sustainability

ERM

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06 September 2023

Owenreagh/Craignagapple Wind Farm

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CONTENTS

List of Tables

Acronyms and Abbreviations

Name	Description
ALRA	Abnormal Load Route Assessment
ALV	Abnormal Load Vehicles
CSA	Core Study Area
CO_2	Carbon Dioxide
DfI	Department for Infrastructure
DMRB	Design Manual for Roads and Bridges
EIA	Environmental Impact Assessment
EcIA	Ecological Impact Assessment
ES	Environmental Statement
HGV	Heavy Goods Vehicles
kph	Kilometers per hour
LPP	Local Policy Plan
NRTF	National Road Traffic Forecasts
NI	Northern Ireland
NO_2	Nitrogen Dioxide
PM_{10}	Particulate Matter
PPS	Policy Planning Statement
RTC	Road Traffic Collisions
SPPS	Strategic Planning Policy Statement
TTRO	Temporary Traffic Regulation Order

13 TRAFFIC AND TRANSPORT

13.1 Introduction

This Chapter of the Environmental Statement (ES) evaluates the effects of the proposed Owenreagh / Craignagapple Wind Farm ('the Development') on the Traffic & Transport resource. This assessment was undertaken by Environmental Resources Management Inc. (ERM).

This Chapter of the ES is supported by the following Technical Appendix documents provided in **Volume 4** ES Technical Appendices:

- **Technical Appendix A13.1: Abnormal Load Route Assessment (ALRA)**;
- **Technical Appendix A13.2: Traffic Count Data**;
- **Technical Appendix A13.3: Construction Development Programme**;
- **Technical Appendix A13.4: Access Junction Design and Visibility Splay Assessment**; and,
- **Technical Appendix A13.5: Passing Bay Design**.

This chapter of the ES is also supported by the following Figures provided in **Volume 3a**:

- **Figure 13.1: Haul Route**;
- **Figure 13.2: Road Traffic Collision Assessment**; and,
- **Figure 13.3: Traffic Count Locations**

This Chapter includes the following elements:

- Guidance, Legislation and Information;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Decommissioning and Construction Phase Traffic Assessment;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects;
- Statement of Significance; and,
- Glossary.

13.2 Guidance, Legislation and Information

The following guidance, legislation and information sources have been considered in carrying out this assessment:

- Strategic Planning Policy Statement for Northern Ireland (SPPS) 2015;[1]
- Planning Policy Statement 3 (PPS 3), Access Movement and Parking[2]

[1] Department for Infrastructure (2015). Strategic Planning Policy Statement for Northern Ireland [Online] Available at: https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/SPPS.pdf (Accessed 06/04/23)

[2] Department For Infrastructure (2005) Planning Policy Statement 3 (PPS 3) - Access Movement and Parking [Online] Available at: https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/PPS03%20Access%20Movement%20and%20Parking.pdf (Accessed 06/04/2023)

- Planning Policy Statement 13 (PPS 13), Transportation and Land Use;[3]
- Development Control Advice Note 15[4];
- Transport Assessment – Guidelines for Development Proposals in Northern Ireland;[5]
- National Road Traffic Forecasts (1997)[6];
- Guidelines for Traffic Impact Assessment (the IEMA Guidelines)[7];
- Design Manual for Roads and Bridges (DMRB) – Volume 15[8]; and,
- Design Manual for Roads and Bridges (DMRB) – LA111 Noise and Vibration[9].

13.3 Assessment Methodology and Significance Criteria

13.3.1 Scoping Response and Consultation

Consultation for this ES topic was undertaken with the organisation shown in Table 13.1.

Table 13.1. Consultation Response

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Department for Infrastructure (DfI) Roads	Consultation Response 03/10/21	▪ All modes of travel which access the development are to be assessed for the peak period of construction, operation or decommissioning; ▪ A screening exercise can be undertaken in accordance with the IEMA Guidelines; ▪ Pre-Covid traffic surveys should be undertaken and NRTF growth factors applied; ▪ The Applicant is to review the route geometry and propose any works required; and,	▪ This is the methodology used in this chapter of the ES (see section 13.3); ▪ A screening exercise as described in the IEMA Guidelines has been undertaken (see section 13.3.7); ▪ Surveys were undertaken in November 2022 which is post Covid (see section 13.3.6). NRTF factors have been applied; ▪ A passing bay design has been undertaken and is submitted with the application; and,

[3] Department for Regional Development (2005). Planning Policy Statement 13 (PPS 13) Transportation and Land Use [Online] Available at: https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/PPS13%20Transportation%20and%20Land%20Use.pdf (Accessed 06/04/23)

[4] NI Planning and Roads Service (1999) Development Control Advice Note 15 (DCAN 15) 2nd Edition [Online] Available at: https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/DCAN%2015%20-%20Vehicular%20Access%20Standards_0.pdf (Accessed 06/04/23)

[5] Department for Regional Development (2006). Transport Assessment – Guidelines for Development Proposals in Northern Ireland [Online] Available at: https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/Transport%20Assessment_1.pdf (Accessed 06/04/23)

[6] Department for Environment, Transport and the Regions (1997). National Road Traffic Forecasts.

[7] Institute of Environmental Management and Assessment (IEMA, 1993). Guidelines for Traffic Impact Assessment.

[8] Department for Transport (2013) Standards for Highways Volume 15.

[9] Design Manual for Roads and Bridges (2020) LA111 Noise and Vibration [Online] Available at: LA 111 revision 2 Noise and vibration-web.pdf

		▪ Access design should be undertaken to DCAN 15.	▪ All access junctions have been assessed/designed to DCAN 15. These are shown in **Technical Appendix A13.4: Access Junction Design and Visibility Splay Assessment**.
DfI Roads	Consultation Meeting 11/11/21	▪ Traffic counts are not being accepted during the pandemic period; ▪ Therefore, all links apart from the A5 it should be assumed that the 10% threshold of significance will be exceeded; and, ▪ With respect to the A5 a 30% threshold can be applied except at its junction with the B49.	▪ Traffic counts have been undertaken post the pandemic period; ▪ The 10% threshold has been exceeded on all links except the A5; and, ▪ A 30% threshold has been applied to the A5 and a 10% threshold to the A5/B49 junction at Ballymagorry.
DfI Roads	Consultation Meeting 13/01/23	▪ Details of the number of vehicles/trips and the size/type of vehicles coming to site, both during the construction and operational phases of the development. This will need to be broken down per access; ▪ Visibility Splays of junction designs should be based on the 85th percentile speeds in conjunction with DCAN 15; and, ▪ Drawings detailing the visibility splays and haulage traffic movements at the Glenmornan Road/Gorticrum Road and Glenmornan Road/Hollyhill Road junctions are required.	▪ Details in Section 13.5 and 13.6.1 of this EIA Chapter. ▪ All visibility splays have been assessed based on 85th percentile speeds and DCAN 15. These are shown in **Technical Appendix A13.4: Access Junction Design and Visibility Splay Assessment**; and, ▪ Further information is provided in Section 13.3.10

13.3.2 Scope of Assessment

The key temporary effects which may occur during the decommissioning and construction phase in relation to traffic and transportation are as follows:

- Accidents and Safety;
- Driver Delay;
- Pedestrian Amenity and Delay;
- Severance;
- Noise and Vibration;
- Hazardous Loads;
- Visual Effects; and,

- Air Quality.

In addition to the above temporary effects the following permanent effect could occur and has therefore been considered in this assessment:

- Road safety at the proposed site entrance junctions.

13.3.3 Elements Scoped Out of Assessment

Operational traffic to the Development is expected to be minimal and has therefore been scoped out of the assessment, although as noted above road safety at the site entrance junctions has been considered as these will also be used during operation. Any likely significant effects on Ecological receptors within the vicinity of the haul routes are considered within **Chapter 10: Ecology** and **Technical Appendix A13.1: Ecological Impact Assessment (EcIA)**. Potential effects to ecological receptors were determined to be **not significant** in terms of the EIA Regulations.

Final decommissioning will occur after the operational phase of the Development and will result in less traffic than during the Development's initial decommissioning/construction phase as all below ground infrastructure will be left in-situ, therefore an assessment of decommissioning traffic has been scoped out of this ES.

13.3.4 Study Area / Survey Area

The study area extends to the haul routes between the site and the Port of Delivery (Foyle Port) or the nearest major trunk road (the A5). The Port of Delivery will be used for delivering wind turbine components; however, most vehicle trips are not associated with turbine components and the origin of other construction materials is not currently known. Therefore, two routes warrant consideration, the Abnormal Load Route which will be used for wind turbine components and the General Construction Traffic Route which will be used for other materials.

These two routes are listed below. Detailed numerical assessment will only be provided for the General Construction Traffic Route, this is because the impact of Abnormal Loads is primarily associated with the required road improvement works. Road improvement works are identified in **Technical Appendix A13.1: ALRA**.

13.3.4.1 Abnormal Load Route

Wind turbine components will be delivered to Foyle Port, Derry/Londonderry (the Port of Delivery) and transported overland to the Site. The haul route used for the delivery of wind turbine components (the Abnormal Load Route) has been assessed for geometry in **Technical Appendix A13.1: ALRA**.

A new off-road track will be constructed between the B49 Berryhill Road and Sentry Road south-east of Ballymagorry. This track will be for use by Abnormal Load Vehicles (ALVs) only and does not form part of the General Construction Traffic Route. This track has been designed to accommodate ALVs for turbine delivery and will have a loose bound surface. As the track will only be used by ALVs it will only be accessed under escort and therefore its junctions have not been assessed for visibility. The track will be gated, and these gates will be closed at all times except during delivery.

The Abnormal Load Route is shown in Figure 13.1 and is defined as follows:

- Vehicle to leave Foyle Port onto Port Road;
- Turn right onto Maydown Road;
- Turn right at Maydown Roundabout onto A2 Clooney Road westbound;
- Continue through Gransha Roundabout on A2 Clooney Road;
- Turn left onto Caw Roundabout onto A514 southbound;
- Continue through Crescent Link Roundabout onto A514 southbound;
- Continue through Kilfennan Link Roundabout onto A514 southbound;

- Turn right at Altnagelvin Roundabout onto A6 Dungiven Road which becomes Glendermott Road which becomes King Street northbound;
- Turn left at Waterside Roundabout onto A2 southbound;
- Continue through Duke Street Roundabout onto A2 Duke Street southbound;
- Continue through signalised junction onto A5 Victoria Road southbound;
- At Ballymagorry turn left onto Woodend Road;
- Turn left onto B49 Berryhill Road eastbound;
- Turn right onto new off-road ALV track;
- Continue straight onto Sentry Road;
- Continue through junction with Art Road to continue on Sentry Road;
- Continue past junction onto Moorlough Road;
- Turn right onto Glenmornan Road
- Continue through crossroad with Hollyhill Road onto Glenmornan Road;
- Pass Site Entrances 1 to 5;
- Turn left or right onto Napple Road; and,
- Enter Site Entrance 6 or Site Entrance 7 (as shown on Figure 3.1).

13.3.4.2 General Construction Traffic Route

The precise origin of general construction traffic is not known and will come from a variety of locations depending on the appointed suppliers of construction materials. For the purposes of this assessment, and in line with policy context outlined in Section 13.2, the route from the nearest major trunk road and the Site will be considered. Therefore, the route considered for general construction traffic is as follows:

- Leave A5 at Ballymagorry turning left onto Woodend Road;
- Turn left onto B49 Berryhill Road Eastbound;
- Turn right onto Pine Road;
- Turn left onto Sentry Road;
- Continue through junction with Art Road to continue on Sentry Road;
- Continue past junction onto Moorlough Road;
- Turn right onto Glenmornan Road
- Continue through crossroad with Hollyhill Road onto Glenmornan Road;
- Pass Site Entrances 1 to 5;
- Turn left or right onto Napple Road; and,
- Enter Site Entrance 6 or Site Entrance 7.

Delivery of aggregates for the formation of tracks and hardstandings may result in vehicles originating from locations closer to the site. A review of potential quarry locations indicates that there are several quarries in the vicinity of Artigarvan. In any case, aggregate deliveries will be directed to use the above route to access the site even if required to join it part way through.

As described in 13.3.4.1 general construction traffic will not be permitted to use the off-road track to the south-east of Ballymagorry. This track is for the exclusive use of ALVs under escort as the junctions have not been designed for visibility and the track will be surfaced only with aggregate.

Each of the above routes are shown in Figure 13.1.

13.3.5 Design Parameters

Due to the environmental constraints at the Development such as active peat, six new site entrance junctions are to be constructed as part of the initial decommissioning and construction phase, and one existing junction is to be improved. Each of the seven junctions has been designed with a permanent footprint to accommodate the largest general construction vehicle anticipated, which is a 16.5 metre (m) heavy goods vehicle (HGV). At most of these junctions, an additional temporary widening area will be required to accommodate ALV delivery during the decommissioning and construction phase.

Detailed drawings of the proposed new and improved site entrances are provided in **Technical Appendix A13.4: Access Junction Design and Visibility Splay Assessment** with accompanying visibility splay assessments.

The visibility splay assessments were undertaken to DCAN 15 and were informed by speed survey data collected as part of the baseline traffic data, which is presented in **Technical Appendix A13.2: Traffic Count Data**. In summary, all the proposed new and improved site entrance junctions comply with the DCAN 15 standard for visibility and can therefore operate safely for their intended function.

13.3.6 Baseline Survey Methodology

Baseline traffic flow information was collected at nine locations on the General Construction Traffic Route using Automatic Traffic Counts (ATCs) as shown in Figure 13.3. These ATCs were undertaken over a 14 day period from 20/10/2022 to 02/11/2022, these dates are considered ‘neutral’ from a traffic perspective i.e. not occurring during school or other holidays, and outside the period deemed to be potentially affected by COVID19. Traffic surveys were undertaken by a third-party sub-contractor Streetwise Services Ltd (Streetwise).

Traffic growth factors were applied to the measured baseline traffic flow to give the estimated traffic flow during the year of construction which is assessed for 2025. These factors were calculated from the National Road Traffic Forecasts (NRTF) (referenced in Section 13.2). Separate traffic growth factors were calculated for HGVs and total traffic, in line with the information presented in Table 2 of the NRTF. The ‘central’ forecast scenario (the most likely scenario) was used. The factors applied were 1.0275 and 1.0497 to total traffic and HGV traffic respectively.

13.3.7 Methodology for the Assessment of Effects

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.

An initial screening exercise was undertaken to identify routes where likely significant effects could potentially occur. The Institute of Environmental Management and Assessment (IEMA 1993) Guidelines suggest two broad principles:

- Rule 1 – include road links where traffic flows are predicted to increase by more than 30% (or where the number of heavy goods vehicles is predicted to increase by more than 30%); and,
- Rule 2 – include any other specifically sensitive areas where traffic flows are predicted to increase by 10% or more.

Where the predicted increase in traffic flow is lower than these thresholds, the significance of the effects is low or not significant with no further detailed assessments warranted. Consequently, where the predicted increase in traffic flow is greater than these thresholds, the potential effects may be significant and are assessed in greater detail.

The IEMA (1993) guidelines are intended for the assessment of environmental effects of road traffic associated with major new developments giving rise to traffic generation, as opposed to short-term construction. In the absence of alternative guidance and as the traffic generation during the operational phase is very low, these guidelines have been applied to assess the short-term decommissioning and construction phase of the Development.

Where existing traffic levels are generally low (e.g., rural roads and some unclassified roads), any increase in traffic flow may result in a predicted increase that would be higher than the IEMA (1993) guideline thresholds. In these situations, it is important to consider any increase in terms of overall traffic flow in relation to the capacity of the road, before making a conclusion on whether the effect is significant as defined under the EIA Regulations.

Any change in traffic flow which is greater than the thresholds set out in the IEMA (1993) guidelines has been subject to further analysis. The magnitude of potential effects has been identified through consideration of receptor sensitivity against the degree of predicted change to baseline conditions, the duration and reversibility of this change and professional judgement.

13.3.8 Sensitivity of Receptors

The sensitivity of the baseline conditions, including the importance of environmental features on or near to the site or the sensitivity of potentially affected receptors, will be assessed in line with best practice guidance, legislation, statutory designations and / or professional judgement.

Table 13.2 details the framework for determining the sensitivity of receptors.

Table 13.2. Framework for Determining Sensitivity of Receptors

Sensitivity of Receptor	Definition
Very High	The receptor has no ability to absorb change without profoundly altering its present character, is of high strategic value, or of national importance. For example: ▪ Routes with existing high traffic levels which are at or very close to exceeding capacity; ▪ Receptors such as populated urban areas where existing traffic levels are high and there is no capacity to absorb additional traffic flow on adjacent routes; ▪ Strategic nationally important routes with no capacity to absorb additional traffic flow; ▪ At severe/fatal accident hotspots where an increase in traffic flow is likely to increase the likelihood or severity of accidents; ▪ A route with very poor pedestrian facilities and a high traffic flow level where an increase in traffic is likely to decrease pedestrian amenity severely; ▪ At a settlement which is bisected by a major route where a significant change in traffic flow or composition is likely to severely increase severance; ▪ A receptor where due to the presence of noise and vibration inducing road surfaces (e.g. cattle grids or cobbles) close to a residential property or similarly sensitive receptor, a change in traffic flow or traffic composition is likely to severely affect the perception of noise and vibration due to traffic; and, ▪ At a location where pedestrian crossing facilities are informal and where a significant change in traffic flow level might induce severe pedestrian crossing delay also where children/elderly people might frequently cross an informal crossing.

High	The receptor has little ability to absorb change without fundamentally altering its present character, is of high strategic value, or of national importance. For example: ▪ Routes with existing high traffic levels which have little additional traffic flow capacity; ▪ Receptors such as populated urban areas where existing traffic levels are high and there is little capacity to absorb additional traffic flow on adjacent routes; ▪ Strategic nationally important routes with little capacity to absorb additional traffic flow; ▪ At severe accident hotspots where an increase in traffic flow may increase the likelihood or severity of accidents; ▪ A route with poor pedestrian facilities and a high traffic flow level where an increase in traffic is likely to decrease pedestrian amenity significantly; ▪ At a settlement which is bisected by a major route where a significant change in traffic flow or composition is likely to significantly increase severance; ▪ A receptor where due to the presence of noise and vibration inducing road surfaces (e.g. cattle grids or cobbles) close to a residential property or similarly sensitive receptor, a change in traffic flow or traffic composition may significantly affect the perception of noise and vibration due to traffic; and, ▪ At a location where pedestrian crossing facilities are informal and where a significant change in traffic flow level might induce significant pedestrian crossing delay also where children/elderly people might regularly cross an informal or priority crossing.
Medium	Areas where the transport network has moderate capacity to change, without significantly altering its state. For example: ▪ Routes with existing moderate traffic levels which have some additional traffic flow capacity; ▪ Receptors such as populated urban areas where existing traffic levels are moderate and there is some capacity to absorb additional traffic flow on adjacent routes; ▪ Receptors such as rural roads where existing traffic levels are moderate and there is some capacity to absorb additional traffic flow on adjacent routes; ▪ Strategic nationally important routes with some capacity to absorb additional traffic flow ▪ At slight accident hotspots where an increase in traffic flow may increase the likelihood or severity of accidents; ▪ A route with moderate pedestrian facilities where an increase in traffic is may decrease pedestrian amenity; ▪ At a settlement which is bisected by a major route where a significant change in traffic flow or composition is likely to moderately increase severance;

	■ A receptor where due to the presence a road close to a residential property or similarly sensitive receptor, a change in traffic flow or traffic composition may moderately affect the perception of noise and vibration due to traffic; and, ■ At a location where pedestrian crossing facilities are informal or substandard and where a significant change in traffic flow level might induce a moderate pedestrian crossing delay.
Low	Areas where the transport network is tolerant to change without detriment to its state. For example: ■ Routes with existing low traffic levels which have additional traffic flow capacity; ■ Receptors such as populated urban areas where existing traffic levels are low and there is capacity to absorb additional traffic flow on adjacent routes; ■ Receptors such as rural roads where existing traffic levels are low and there is capacity to absorb additional traffic flow on adjacent routes; ■ Strategic nationally important routes with capacity to absorb additional traffic flow; ■ On routes with a low level of historical accident data where a change in traffic flow or composition would have a low effect on the likelihood or severity of accidents; ■ A route with formal pedestrian facilities where an increase in traffic would have a low effect on pedestrian amenity; ■ A settlement which is bisected by a road, but where the effect of increased traffic or change in composition would have a low effect on severance; ■ A receptor which is not highly sensitive to changes in noise level (e.g. a school) or where receptors are set back from the road and therefore their sensitivity to changes in noise as a result of changes in traffic flow or composition are low; and, ■ A location where pedestrian crossing facilities are formal but priority, or pedestrian flows are sufficiently low that changes to traffic flow or composition are unlikely to cause a significant pedestrian delay.
Negligible	Areas where the transport network is highly tolerant to change without detriment to its state. For example: ■ Routes with existing very low traffic levels which have a lot additional traffic flow capacity; ■ Receptors such as populated urban areas where existing traffic levels are very low and there is a lot of capacity to absorb additional traffic flow on adjacent routes; ■ Receptors such as rural roads where existing traffic levels are very low and there is a lot of capacity to absorb additional traffic flow on adjacent routes; ■ Strategic nationally important routes with a lot of capacity to absorb additional traffic flow; ■ On routes with a very low level of historical accident data where a change in traffic flow or composition would have a negligible effect on the likelihood or severity of accidents; ■ A route with formal pedestrian facilities where an increase in traffic would have a negligible effect on pedestrian amenity;

	■ A settlement which is not bisected by a road or where the effect of increased traffic or change in composition would have a negligible effect on severance; ■ A receptor which is negligibly sensitive to changes in noise level (e.g., a sports stadium) or where receptors are set very far back from the road and therefore their sensitivity to changes in noise as a result of changes in traffic flow or composition are negligible; and, ■ A location where pedestrian crossing facilities are formal and controlled, or pedestrian flows are negligible (i.e., where there are no footways) such that changes to traffic flow would not result in a change to pedestrian delay.

13.3.8.1 Magnitude of Effect

The magnitude of potential effects will be identified through consideration of the Development, the degree of change to baseline conditions predicted as a result of the Development, the duration and reversibility of an effect and professional judgement, best practice guidance and legislation.

The criteria for assessing the magnitude of an effect are presented in Table 13.3.

Table 13.3. Framework for Determining Magnitude of Effects

Magnitude of Effects	Definition
High	The proposals could result in: ■ An appreciable change in terms of length and/or duration to the present traffic routes or schedules or activities, which may result in hardship; ■ A high likelihood of increased accidents or a large increase in the severity of possible accidents; ■ A substantial loss of pedestrian amenity; ■ A substantial increase in severance; ■ A substantial increase in traffic caused noise or vibration; or, ■ A substantial increase in pedestrian delay.
Medium	The proposals could result in: ■ Changes to the existing traffic routes or activities such that some delays or rescheduling could be required, which cause inconvenience; ■ A medium likelihood of increased accidents or a moderate increase in the severity of possible accidents; ■ A moderate loss of pedestrian amenity; ■ A moderate increase in severance; ■ A moderate increase in traffic caused noise or vibration; or, ■ A moderate increase in pedestrian delay.
Low	The proposals could result in: ■ Occasional cause of a minor modification to routes, or a very slight delay in present schedules, or on activities in the short-term; ■ A low likelihood of increased accidents or a low increase in the severity of possible accidents;

	■ A low loss of pedestrian amenity; ■ A low increase in severance; ■ A low increase in traffic caused noise or vibration; or, ■ A low increase in pedestrian delay.
Negligible	The proposals could result in a barely perceptible effect on: ■ Movement of road traffic above normal level; ■ Likelihood or severity of accidents; ■ Pedestrian amenity ■ Severance; ■ Traffic caused noise and vibration at receptors; or, ■ Pedestrian delay Where there is no effect, this is stated.

13.3.8.2 Significance of Effect

The sensitivity of the asset and the magnitude of the predicted effects will be used as a guide, in addition to professional judgement, to predict the significance of the likely effects. Table 13.4 summarises guideline criteria for assessing the significance of effects.

Table 13.4. Framework for Assessment of the Significance of Effects

Magnitude of Effect	Sensitivity of Resource or Receptor				
	Very High	**High**	**Medium**	**Low**	**Negligible**
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

Effects predicted to be of major or moderate significance are ‘significant’ in the context of the EIA Regulations and are shaded in light grey in the above table.

13.3.9 Assessment Limitations

No limitations in the assessment were identified. Up to date traffic count information was collected as part of the assessment.

13.3.10 Embedded Mitigation

Temporary improvement works on minor roads approaching the site are proposed to mitigate the effect of increased traffic. These improvements are in the form of a comprehensive series of passing bays which have been designed to accommodate the largest size of general construction traffic vehicle which will access the site a 16.5 m articulated HGV. The minimum standard of bays which will be provided are intervisible bays on the General Construction Traffic Route between the B49 Berryhill Road and the Site Entrance junction.

The above mitigation will greatly improve the situation for all vehicles travelling on the General Construction Traffic Route and will prevent the possibility of road blockage due to HGVs meeting on narrow single-track roads.

In addition to the above, the following traffic management measures is proposed to address the concerns raised by DfI with regards the potential restriction to the visibility splays at the existing Hollyhill Road / Glenmornan Road junction and Gorticrum Road / Glenmornan Road junction. It should be noted that currently, signage advising vehicles on Glenmornan Road to stop on approach is present at these junctions.

- Enhanced signage in the form of temporary warning signage should be installed on Glenmornan Road on approach with Hollyhill Road / Glenmornan Road junction and Gorticrum Road / Glenmornan Road junction respectively to further caution drivers on the need to slow down on approach. Advisory signage such as ‘Heavy Plant Crossing’ and ‘Construction Site Traffic’ signs on approach to Glenmornan Road, from both the north and south should be installed on Hollyhill Road and Gorticrum Road respectively to alert drivers about the increased HGV traffic on Glenmornan Road;
- Consider a temporary change in the priority rules at the Hollyhill Road / Glenmornan Road and Gorticrum Road / Glenmornan Road crossroad junctions respectively whereby traffic on Hollyhill Road and Gorticrum Road would give way to traffic on Glenmornan Road. A Temporary Traffic Regulation Order (TTRO) may be required to implement this change and will be subject to a separate application to DfI roads and their consenting process, prior to the start of construction;
- Employ the services of traffic marshals/Banksmen to co-ordinate movements at both junctions; and,
- Consider the use of temporary traffic signals and the temporary reduction in the speed limit at both junctions.

It is considered that implementation of the above measures would enhance safety at these junctions, and this demonstrates that the perceived risk can be mitigated.

13.4 Baseline Conditions

13.4.1 Theoretical Road Capacity

Typical capacity values for a variety of road types are provided within the Design Manual for Roads and Bridges (DMRB) – Volume 15[10]. It is acknowledged that this document has been withdrawn as part of the ongoing reformatting of the DMRB however the quoted traffic flow capacities still remains valid for use in this assessment.

Capacity is defined as the maximum sustainable flow of traffic passing in one hour under favourable road and traffic conditions and depends on the road type, speed limit and width. Defining the capacity of single-track roads is complex and is dependent on the size and intervisibility (this term is defined in section 13.11 of this chapter) of the passing bays, a professional best estimate is provided below based on the proposed temporary improvement works having been undertaken.

Table 13.5 gives the estimated capacity of each of the roads within the Study Area noting that, within DMRB Volume 15, design speeds are defined in kilometres per hour (kph).

It should be noted that where a given road has multiple sections with differing characteristics within the study area, the section with the lowest capacity has been used in this assessment and is indicated in below.

[10] Department for Transport (2013) Standards for Highways Volume 15.

Table 13.5. Theoretical Road Capacities

Road	Type, Condition, Width	Design Speed (kph)	Capacity (veh/hour/direction)	Two-Way Hourly Flow	Two-Way Daily Flow
Napple Road	Rural – Poor Single 4.0 m	96	140	280	6,720
Glenmornan Road	Rural – Poor Single 4.0 m	96	140	280	6,720
Moorlough Road	Rural – Poor Single 4.0 m	96	140	280	6,720
Art Road	Rural – Poor Single 4.0 m	96	140	280	6,720
Berryhill Road	Rural – Typical Single 6.0 m	96	900	1,800	43,200
Woodend Road	Urban – Single 6.0 m	48	800	1,600	38,400
A5	Rural – Typical Single 6.0 m	96	900	1,800	43,200

13.4.2 Baseline Traffic Flow

The ATCs collected 'classified' traffic data, i.e., data which identifies vehicle classification or vehicle type as it passes the counter. A full copy of the data, as provided by Streetwise is presented in **Technical Appendix A13.2: Traffic Count Data**. A summary of results which have been used in this assessment are presented in Table 13.6 below. The below data presents the Average Daily Traffic (ADF) at each count location for total traffic and HGV traffic.

Table 13.6. Baseline Traffic Flow

Ref.	Road	Location	ADF	HGV ADF	%HGV
1	Napple Road	T13 Site Entrance	54	20	37.3
2	Napple Road	T14 Site Entrance	76	9	11.8
3	Glenmornan Road	T8-T12 Site Entrance	26	8	31.4
4	Glenmornan Road	West of T1-T2 Site Entrance	48	18	37.5
5	Moorlough Road	Between Chestnut Road and Sentry Road	981	102	10.4
6	Art Road	Between Sentry Road and Berryhill Road	977	195	20.0
7	Berryhill Road	Between Pine Road and Woodend Road	4,739	674	14.2
8	Woodend Road	South of Ballymagorry	813	98	12.1
9	A5 - Victoria Road	North of Ballymagorry	12,441	1,365	11.0

13.4.3 Future Baseline Scenarios

As detailed in Section 13.3.6, traffic growth factors were applied to the measured baseline traffic flows to predict what baseline flows will occur in the year of construction which is assessed as being 2025.

Table 13.7 shows the predicted 2025 baseline traffic flow at each location within the Study Area.

Table 13.7 Predicted Baseline Traffic Flow 2025

Ref.	Road	Location	ADF*	HGV ADF*	%HGV
1	Napple Road	T13 Site Entrance	55	21	38.2
2	Napple Road	T14 Site Entrance	77	10	13.0
3	Glenmornan Road	T8-T12 Site Entrance	26	9	34.6
4	Glenmornan Road	West of T1-T2 Site Entrance	49	19	38.8
5	Moorlough Road	Between Chestnut Road and Sentry Road	990	104	10.5
6	Art Road	Between Sentry Road and Berryhill Road	986	199	20.2
7	Berryhill Road	Between Pine Road and Woodend Road	4,783	685	14.3
8	Woodend Road	South of Ballymagorry	821	100	12.2
9	A5 - Victoria Road	North of Ballymagorry	12,555	1,388	11.1

NOTE - TOTALS MAY NOT ADD UP DUE TO ROUNDING

13.4.4 Sensitive Receptors

For the assessment of effects of traffic generation on road safety and driver delay, the receptor is the road users. The sensitivity of road users in terms of each of these types of effect is determined with reference to Table 13.2 and is set out in each assessment section.

For other types of effects of traffic generation, as per (IEMA 1993) Guidelines, particular groups of locations which may be sensitive to changes in traffic conditions should be identified. The Guidelines suggest, for example, that people, home, schools and the elderly may be sensitive to changes in traffic conditions. A desktop search was undertaken for the route to site within the Study Area.

Several receptors of medium or high sensitivity to changes in traffic have been identified within the Study Area and are detailed in Table 13.8. These receptors are either located on proposed delivery routes or located within close proximity and require access through the proposed delivery routes.

Table 13.8. Sensitive Receptors

Receptor	Route	Relevant Traffic Count Location	Sensitivity	Justification
Fox Lodge Cricket Club, Ballymagorry	A5	9	Low	Located on the General Construction Traffic Route and access is solely taken from this route. However, the route is a trunk road with a high baseline traffic flow level, therefore low sensitivity to change.
The Hills Church and Leckpatrick Parish Church, Ballymagorry	A5	9	Low	Located on the General Construction Traffic Route and access is solely taken from this route. However, as above, the route is a trunk road with a high baseline traffic flow level, therefore low sensitivity to change.
Residential and Commercial Properties in Ballymagorry	A5	9	Low	Several properties front directly onto this route. However, as above, the route is a trunk road with a high baseline traffic flow level, therefore low sensitivity to change.
Artigarvan Primary School	B49 Berryhill Road	7	Low	The school is not located directly on the route. As there is no primary school in Ballymagorry pupils are likely to travel to this school from the town using the B49 Berryhill Road. However this route has no pedestrian facilities of any kind between the two towns, therefore pupils are likely to be bussed or driven in private cars and thus have a low sensitivity to changes in traffic flow on this route.
Minor Single-Track Roads on the Route to Site	Moorlough Road, Glenmornan Road and Napple Road	1-6	Low – with embedded mitigation	Once the embedded mitigation has been implemented these routes have the capacity to absorb additional traffic flow as baseline traffic flow levels on these routes are very low.

13.4.5 Road Traffic Collision Data

Analysis was carried out of all ‘slight’, ‘serious’ and ‘fatal’ Road Traffic Collisions (RTCs) on the General Construction Traffic Route between the A5 north of Ballymagorry and the Site Entrance. Data was collected from the Police Service of Northern Ireland (PSNI) published via Open Data NI[11] for the last 5 years (2017 - 2021).

Figure 13.2 shows all of the recorded RTCs within the study area which amounts to two ‘slight’ classification RTCs located within Ballymagorry. ‘Slight’ classification means that the RTC was reported to the PSNI but that no party required medical treatment as a result of the RTC.

[11] OpenData NI – Police Recorded Injury Road Traffic Collision Statistics Northern Ireland [Online]. Available: https://www.opendatani.gov.uk/search-global?q=road+traffic+collision [Accessed 15/12/22]

13.5 Decommissioning and Construction Phase Traffic Generation

13.5.1 Site Establishment

HGV and other vehicle movements will be required during site establishment. This will comprise the erection of welfare facilities, delivery of construction site vehicles and import of plant and equipment. Most of these movements will be as HGVs and low loaders which will deliver and then depart the site empty.

Table 13.9 details the anticipated vehicle movements for site establishment. Details of site demobilisation are provided in Section 13.5.9.

Table 13.9. Vehicle Movements - Site Establishment

Operation	Vehicle Type	Construction Month	Total Movements	Max Movements/Month
On-site vehicles	Car/LGV	1	10	10
Construction Compounds	HGV Low Loader	1	40	40
Overall			**50**	**50**

13.5.2 Decommissioning Existing Turbines

All 15 of the existing wind turbines are to be decommissioned as part of the construction/decommissioning phase of the Development. The existing 15 turbines will be decommissioned over a three-month period between months two and four. All components from the existing turbines will be removed from the site by HGV. Turbine blades and towers will be broken up on-site such that they can be removed by HGV.

It is anticipated that five HGVs will be required per turbine, resulting in a total of 75 HGV loads being required which is equal to 150 HGV movements. A further two HGV loads per turbine will be required for the removal of ancillary equipment, resulting in four HGV movements per turbine. Therefore, in total 105 HGV loads will be required for decommissioning which will result in a total of 210 HGV movements.

Table 13.10 details the anticipated vehicle movements for turbine decommissioning.

Table 13.10. Vehicle Movements - Decommissioning Existing Turbines

Operation	Vehicle Type	Construction Month	Total Movements	Max Movements/Month
Removal of Turbines	HGV	2-4	210	70
Overall			**210**	**70**

13.5.3 Access Tracks and Hardstandings

All stone required for formation of on-site access tracks, crane pads and hardstandings is assumed to be imported to site. Commercial agreements on the source of this aggregate have not been reached at the time of writing this ES, so several potential options have been considered. Several existing quarries have been identified north-west of the site which are accessed from Moorlough Road, the route to site for vehicles originating from these quarries would therefore be the same as for general construction traffic joining directly onto Moorlough Road.

As far as reasonably possible the existing site access tracks will be re-used for the Development. However, for the purposes of this assessment, it has been assumed that all tracks will be constructed as new tracks. This approach represents a worst-case scenario in terms of material import requirements as the bearing capacity of existing tracks is unknown and may not be suitable for the transport of wind turbine components, furthermore due to the larger size of turbines proposed more stringent requirements in terms of maximum track gradients and corner radii are required.

Therefore, the total length of access tracks required for the Development is estimated at 5,881 m. Tracks will be of an average width of 6 m, therefore the total surface area of tracks is approximately 35,286 m^2.

Tracks will be constructed to an average depth of 0.45 m. Taking the total surface area of 35,286 m^2 and applying a 0.45 m depth results in a total volume of material of 15,879 m^3 being required.

Additionally, five turning heads will be constructed which each have a surface area of 970 m^2. These will be constructed to a depth of 0.45 m resulting in a total volume of aggregate of 2,183 m^3 being required for turning heads.

Fourteen crane pads will require to be constructed, each has a surface area of 5,952 m^2 excluding the track area, resulting a total surface area of 83,328 m^2. Crane pads will be constructed to a depth of 0.45 m, therefore the volume of stone required is approximately 37,498 m^3.

Three compounds will be constructed, one of which is to house the substation. This will result in a total area of hardstanding which is approximately 27,004 m^2 to a depth of 0.45 m, resulting in a volume of 12,152 m^3 of aggregate being required.

Summing the above elements, a total of 67,712 m^3 of aggregate is estimated to be required for the Development, as a worst case. Aggregate will be transported by HGV dumpers which have a capacity of 9 m^3, therefore 7,523 vehicle loads will be required which will result in 15,046 vehicle movements.

In addition to the aggregate itself, an excavator and roller will be required on-site to process the aggregate and construct the tracks and hardstandings. Both the excavator and roller will be transported to site via HGV low-loader which will result in an additional two deliveries, or four HGV movements, at the commencement of this phase of works and a further two deliveries, or four HGV movements, at the end of this phase.

Other miscellaneous deliveries will be required throughout this phase for drainage materials, and geotextiles for example. This is estimated to result in an additional two deliveries per month, or eight deliveries in total or 16 HGV vehicle movements over the 4-month period for this element of works.

Table 13.11 below shows the number of vehicle movements anticipated from the above elements.

Table 13.11. Vehicle Movements - Access Tracks and Hardstandings

Operation	Vehicle Type	Construction Month	Total Movements	Max Movements/Month
On-site vehicles	HGV Low Loader	2, 5	8	4
Aggregate	HGV Dumper	2-5	15,046	3,762
Miscellaneous	HGV	2-5	16	4
Overall			**15,070**	**3,770**

13.5.4 Substation Construction

Stone for construction of the hardstanding on which the control building and substation will site has been accounted for in the above section which is summarised in Table 13.11. This will be delivered throughout the period of aggregate delivery as detailed above.

Concrete will be required for the control building, this is assumed to require ten HGV concrete wagon loads, resulting in 20 movements. It is assumed that concrete will be delivered over a concentrated period during month 6.

An additional ten HGV loads have been assumed for the delivery of the control building electrical components and switchgear, resulting in 20 vehicle movements. It is assumed that this will take place during months 7 and 8 following completion of construction of the control building.

One transformer will require to be delivered by ALV due to its weight. This will result in two ALV movements. Two escort vehicles are assumed to accompany the ALV resulting in four vehicle movements. It is assumed that the transformer will be delivered during month 8.

Table 13.12 indicates the number of vehicles associated with substation construction.

Table 13.12. Vehicle Movements - Substation Construction

Operation	Vehicle Type	Construction Month	Total Movements	Max Movements/Month
Concrete	HGV Concrete Wagon	6	20	20
Electrical Equipment	HGV	7-8	20	10
Transformer	ALV	8	2	2
ALV Escort	Car/Van	8	4	4
Overall			**46**	**20**

13.5.5 Turbine Foundations

The concrete for each turbine foundation will be formed from imported ready-mix concrete. Each foundation will require up to 500 m^3 of concrete, this is based upon a worst-case scenario and is dependent on ground conditions. Therefore, for the 14 foundations which are required a total of 7,000 m^3 of concrete will be required.

Assuming a volumetric capacity of 8 m^3 per concrete wagon, approximately 63 ready-mix HGV loads would be required to supply the required concrete for each foundation, resulting in 882 concrete loads in total, or 1,764 vehicle movements, for foundation pouring.

Concrete delivery will occur over a 3-month period, however, each foundation is required to be poured over a continuous (approximately) 10-hour period. Foundations would be poured on non-consecutive days during this period of works with 14 days of foundation pouring required to deliver concrete for the 14 turbines. Therefore, on concrete pouring days, 126 HGV vehicle movements will be experienced in addition to the deliveries experienced for other concurrent elements of work.

In addition to concrete, steel rebar will require to be imported. It is assumed that up to five HGV loads per turbine will be required, therefore 70 loads will be required for the 14 turbines resulting in 140 vehicle movements. Rebar will be delivered throughout the concrete delivery period.

Additional miscellaneous items will be required to be delivered to support the foundation construction phase. These include shuttering, geotextiles and equipment. It is assumed that most of these deliveries would occur in month four, and the further deliveries that are required during the pouring phase would be timed to avoid pouring days to lower the peak traffic flow. An allowance for 12 miscellaneous deliveries during this phase of works has been made, this would result in up to 24 two-way HGV movements.

Table 13.13 indicates the anticipated number of two-way vehicles required for turbine foundation construction.

Table 13.13. Vehicle Movements - Turbine Foundations

Operation	Vehicle Type	Construction Month	Total Movements	Max Movements/Month
Concrete	HGV Concrete Wagon	4-6	1,764	630
Rebar	HGV Low Loader	4-6	140	47
Miscellaneous	HGV	4	24	24
Overall			**1,928**	**701**

13.5.6 Cable Installation and Electrical Works

Electrical cabling for wind farm power distribution will require to be delivered and will constitute 50 HGV movements over the period of delivery. Table 13.14 indicates the number of vehicle movements associated with electrical cabling delivery.

Table 13.14. Vehicle Movements - Cabling

Operation	Vehicle Type	Construction Month	Total Movements	Max Movements/Month
Electrical Cabling	HGV Low Loader	6-7	50	25

13.5.7 Crane Delivery

Two cranes will be required to erect and decommission the turbines during the Development's initial decommissioning/construction phase. The main crane is likely to be a mobile lattice boom crane. The main crane will be transported to site in several loads which will include three ALVs and a further five HGVs which will depart site and return prior to the crane being removed, resulting in a total of 20 HGV movements.

The ALVs will require a further two escort vehicles to accompany them on their journey to and from the Site, it has been assumed that the escort vehicles will depart the Site and return prior to the crane departing, therefore the number of escort vehicle movements is eight.

In addition to the main crane, a smaller pilot crane will be required. This will be a mobile crane which will be self-propelled to site and would constitute an ALV due to its weight. An additional HGV delivery will be required for the pilot crane to transport the counterweights, it has been assumed that this HGV will depart Site and then return prior to the crane departing therefore this will result in four HGV movements for delivery and removal of the counterweights. The ALV will require two escort vehicles, resulting an in additional eight car/van movements.

Table 13.15 indicates the number of vehicle movements associated with crane delivery.

Table 13.15. Vehicle Movements - Crane

Operation	Vehicle Type	Construction Month	Total Movements	Max Movements/Month
Main Crane	ALV	7, 10	6	3
	HGV	7, 10	20	10

	Escort Car/Van	7, 10	8	4
Pilot Crane	ALV	7, 10	2	1
	HGV	7, 10	4	2
	Escort Car/Van	7, 10	8	4
Overall			**48**	**24**

13.5.8 Turbine Delivery

Turbines will be delivered as separate components, the majority of which will require transportation via ALV. The towers will be transported in three separate sections and each blade will be transported individually. Five further abnormal load vehicles will be required to transport the nacelle and hub. Each turbine will therefore require 11 ALV movements, each ALV will be accompanied by two escort vehicles.

Therefore, for all 14 turbines 154 ALV movements will be required, with an additional 154 HGV movements occurring due to the retracted ALV departing the site. 308 additional car or van movements will be required for the escort vehicles.

In addition to the above 144 HGV vehicle movements will be required for the delivery of turbine accessories and ancillary equipment. indicates the number of vehicle movements that are expected for turbine delivery.

Table 13.16 indicates the number of vehicles associated with delivery of the turbines.

Table 13.16. Vehicle Movements - Turbines

Operation	Vehicle Type	Construction Month	Total Movements	Max Movements/Month
Turbines	ALV	8-11	154	40
	Escort Car/Van	8-11	308	80
	HGV	8-11	154	40
Ancillary Equipment	HGV	8-11	144	36
Overall			**760**	**196**

13.5.9 Site Demobilisation

The principal vehicle movements associated with the site restoration phase will be associated with dismantling of the temporary construction compound and removal of construction phase plant and equipment from the site. It has been assumed that the number of movements during this phase will be the same as during the site establishment phase which was 50 HGV movements.

Table 13.17 summarises the number of vehicle movement associated with Site demobilisation.

Table 13.17. Vehicle Movements - Site Demobilisation

Operation	Vehicle Type	Construction Month	Total Movements	Max Movements/Month
On-site vehicles	Car/LGV	11-12	10	10
Construction Compounds	HGV Low Loader	11-12	40	40
Overall			**50**	**25**

13.5.10 Fuel

Fuel will require regular delivery to the site throughout the construction period for plant and equipment and is expected to total one HGV fuel tanker delivery per week, resulting in two vehicle movements per week or eight vehicle movements per month from site mobilisation; totalling 96 vehicle movements over the duration of construction.

Table 13.18 indicates the number of vehicle movements associated with fuel delivery.

Table 13.18. Vehicle Movements - Fuel

Operation	Vehicle Type	Construction Month	Total Movements	Max Movements/Month
Fuel	HGV Fuel Tanker	1-12	96	8

13.5.11 Staff

It is assumed that 50 staff will be required on site per day, and to provide a worst-case scenario assessment this staffing level is assumed to be consistent throughout the decommissioning and construction phase. Therefore, up to 100 car/van movements per day are expected from staff. Some level of car sharing is likely to reduce the traffic numbers below what is estimated here.

Assuming a 26 day working month, the total number of staff movements per month is expected to be 2,600. This will result in a total of 31,200 vehicle movements associated with staff.

Table 13.19 below summarises the number of vehicle movements for staff.

Table 13.19. Vehicle Movements - Staff

Operation	Vehicle Type	Construction Month	Total Movements	Max Movements/Month
Staff	Car/Van	1-12	31,200	2,600

13.5.12 Summary

Table 13.20 provides a summary of all deliveries expected throughout duration of construction. The values calculated in this section may differ from those generated in **Technical Appendix A13.3: Construction Development Programme** due to both rounding and assuming the worst-case scenario, which has led to an artificial inflation of the values in the Construction Development Programme.

Table 13.20. Anticipated Vehicle Movements – Summary

Operation	Vehicle Type	Construction Months	Total	Max Monthly
Site Establishment				
Site Establishment	Car or Minibus	1	10	10
Site Establishment	HGV	1	40	40
Subtotal			**50**	**50**
Decommissioning Existing Turbines				
Removal of Turbines	HGV Low-Loader	2-4	70	210
Subtotal			**92**	**210**
Access Track and Hardstanding Construction				
On-Site Vehicles	HGV Low-Loader	2-5	8	4
Aggregate	HGV Dumper	2-5	15,046	3,762
Miscellaneous	HGV	2-5	16	4
Subtotal			**15,070**	**3,770**
Substation Construction				
Concrete	HGV Concrete Wagon	6	20	20
Electrical Equipment	HGV	7-8	20	10
Transformer	ALV	8	2	2
ALV Escort	Car/Van	8	4	4
Subtotal			**46**	**20**
Turbine Foundations				
Concrete	HGV Concrete Wagon	4-6	1,764	630
Rebar	HGV Low Loader	4-6	140	47
Miscellaneous	HGV	4-6	24	24
Subtotal			**1,928**	**701**

Electrical Cabling				
Electrical Cabling	HGV	6-7	50	26
Subtotal			**50**	**26**
Crane Delivery				
Main Crane	ALV	7, 10	6	3
	HGV	7, 10	20	10
	Escort Car/ Van	7, 10	8	4
Pilot Crane	ALV	7, 10	2	1
	HGV	7, 10	4	2
	Escort Car/ Van	7, 10	8	4
Subtotal			**48**	**24**
Turbines				
Turbine Components	ALV	7-10	154	40
	Escort Car or Van	7-10	308	80
	HGV	7-10	154	40
Ancillary Equipment	HGV	7-10	144	36
Subtotal			**760**	**196**
Site Demobilisation				
Site Demobilisation	Car or Minibus	11-12	10	10
Site Demobilisation	HGV	11-12	40	40
Subtotal			**50**	**50**
Fuel				
Fuel Delivery	HGV Fuel Tanker	1–12	96	8
Subtotal			**96**	**8**
Staff				
Staff	31,200	1-12	31,200	2,600

Subtotal	**31,200**	**2,600**
Totals	**Total**	**Max Monthly***
Total HGV and Abnormal Load Movements	17,970	4,275
Total Car and Van Movements	31,548	2,688
Overall Total	**49,508**	**N/A****

*Max monthly for peak month of each vehicle type.

Peaks for each element do not necessarily coincide. Refer to programme in **Technical Appendix A13.3: Construction Development Programme.

13.6 Assessment of Potential effects

13.6.1 Traffic Generation

A detailed breakdown of the distribution of vehicle movements in each month of the decommissioning and construction phase of the Development is provided in **Technical Appendix A13.3: Construction Development Programme**. The peak month for deliveries, Month 4, was identified and used to predict traffic increase on routes within the Study Area.

A worst-case scenario was assumed in which all traffic passes each traffic count location within this study. Whilst this assumption will be the case for all HGVs, as all HGV traffic will be directed to use the improved haul route, this may not be the case for all car traffic. Staff and construction personnel, depending on their point of origin, may approach via a different route.

When pouring turbine foundations all concrete for one foundation will be delivered within a single day, it is therefore not appropriate to distribute this traffic across the month. Instead, a calculation of the traffic flow increases on the 14 non-consecutive days of concrete pouring, and separately on days during the peak month with no concrete pouring, has been made.

From inspection of the construction program presented in **Technical Appendix A13.3: Construction Development Programme** during the peak month (month 4) 6,515 vehicle movements (excluding concrete delivery) are predicted. Assuming a 26-day working month, 251 movements per day made up of 100 car/van movements and 151 HGV movements are predicted on non-concrete pouring days. On an estimated maximum of five days during Month 4 an additional 126 HGV movements are anticipated taking the daily total vehicles on those days up to 377 made up of 100 car/van movements and 277 HGV movements.

Table 13.21 details the estimated number of vehicle movements per access junction.

Table 13.21 Estimated HGV Movements per Access Junction

Junction	Turbine Location	HGV Movements
1	T1 & T2	3,003
2	T3, T4 & T5	3,939
3	T6	3,134
4	T7	1,153
5	T8, T9, T10, T11, T12	6,206

6	T13	1,183
7	T14	1,153

Table 13.22 details the anticipated vehicle flow during the peak month on days with no concrete pouring, and the percentage increase in traffic above baseline predicted at each location within the Study Area.

Table 13.22. Predicted Peak Month Average Daily Traffic - Non-Concrete Day

Traffic Count Location	Total Vehicle Movements			HGV Movements		
	2025 Baseline	Baseline + Development	Increase (%)	2025 Baseline	Baseline + Development	Increase (%)
1: Napple Road	54	305	459.8	20	171	740.8
2: Napple Road	77	327	326.7	9	160	1646.2
3: Glenmornan Road	26	276	973.8	8	159	1852.0
4: Glenmornan Road	48	299	517.3	18	169	823.1
5: Moorlough Road	990	1,241	25.3	104	254	145.3
6: Art Road	986	1,236	25.4	198	349	76.0
7: Berryhill Road	4,782	5,033	5.2	685	836	22.0
8: Woodend Road	820	1,071	30.5	100	250	151.2
9: A5 Victoria Road	12,554	12,805	2.0	1387	1538	10.9

Table 13.23 details the anticipated vehicle flow in the peak month on days where concrete deliveries will take place; this will occur on a maximum of 14 non-consecutive days over the three-month period of this phase of works. Therefore, there is anticipated to be five concrete pouring days in months 4 and 5 and six concrete pouring days in month 6.

Table 13.23. Predicted Peak Month Average Daily Traffic - Concrete Delivery Day

Traffic Count Location	Total Vehicle Movements			HGV Movements		
	2025 Baseline	Baseline + Development	Increase (%)	2025 Baseline	Baseline + Development	Increase (%)
1: Napple Road	54	431	691.1	20	397	1852.7
2: Napple Road	77	453	491.0	9	386	4117.1
3: Glenmornan Road	26	402	1463.5	8	385	4631.7
4: Glenmornan Road	48	425	777.5	18	395	2058.5
5: Moorlough Road	990	1,367	38.0	104	480	363.3
6: Art Road	986	1,362	38.2	198	575	190.0
7: Berryhill Road	4,782	5,159	7.9	685	1062	55.0
8: Woodend Road	820	1,197	45.9	100	476	378.1
9: A5 Victoria Road	12,554	12,931	3.0	1387	1764	27.1

As detailed in Section 13.3.7, a screening exercise was undertaken to determine which routes are predicted to exceed the threshold of significance. As agreed in consultation with DfI Roads the lower 10% threshold of significance would apply to all routes except for the A5.

Therefore, the following sub-sections of this assessment will consider all routes except the A5.

In terms of traffic generation although the percentage increase in traffic predicted during the decommissioning and construction phase is high, this is coming from a low baseline traffic flow. It is important to consider the absolute hourly traffic flow which, assuming an 8-hour working day will be 19 additional HGV movements per hour during the peak month on non-concrete pouring days. On concrete pouring days this will be 35 additional HGV movements per hour on average. The above increase in traffic is temporary during the decommissioning and construction phase.

13.6.2 Accidents and Safety

Substantial embedded mitigation has been proposed, as described in Section 13.3.10. This mitigation will significantly reduce accidents and safety effects on the single-track roads on the Route to Site. The RTC data (Section 13.4.5) identified only two ‘slight’ RTCs on the Route to Site, therefore the sensitivity of the route to accidents and safety is considered low.

In the absence of identifiable trends in RTCs or known accident hotspots, an increase in overall traffic flow or HGV composition is not sufficient to affect the safe operation of the road network. Due to the proposed passing places, the Development may have a temporary beneficial effect on the single-track road sections.

The effect on accidents and safety is therefore at worst negligible and is acting on a receptor of low sensitivity, therefore the significance of the effect is negligible and **not significant** in terms of the EIA Regulations.

13.6.3 Driver Delay

All roads within the Study Area are operating significantly below capacity and are predicted to continue to do so even during the decommissioning and construction phase of the Development, particularly when considering the proposed embedded mitigation (section 13.3.10). The effect of general increase in traffic on driver delay is therefore considered to be negligible and **not significant** in terms of the EIA Regulations.

Some driver delay can be expected to occur on routes due to the slow movement of ALVs between the port of delivery and the Site. Where safe to do so, ALVs will occasionally stop to allow traffic to pass if necessary. ALV movements will be scheduled overnight as far as reasonably possible, to minimise disruption and residents located on the Abnormal Load Route will be informed of the timing and duration of any disruption.

Due to the overall limited number of loads across the construction programme and the short-term nature of this phase of works, the anticipated magnitude of change in driver delay is low acting on a receptor of low sensitivity. The significance of this effect is therefore negligible and **not significant** in terms of the EIA Regulations.

13.6.4 Pedestrian Amenity and Delay

The only location on the General Construction Traffic Route which is expected to have any existing pedestrian flows is within the town of Ballymagorry on the A5. The predicted increase in traffic here is below the threshold of significance. The A5 is a major trunk road with a high baseline traffic flow and the main pedestrian crossing facility within Ballymagorry is a signalised pedestrian crossing.

Therefore, the change in pedestrian amenity here is negligible acting on a receptor of low sensitivity. The significance of effect is therefore negligible and **not significant** in terms of the EIA Regulations.

13.6.5 Severance

Severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery. The only community located on the General Construction Traffic Route which has the potential to experience severance is Ballymagorry which is located on the A5. The predicted increase in traffic here is below the threshold of significance.

Therefore, the effect of construction on severance is considered to result in a negligible magnitude of change on a receptor of low sensitivity. Thus, the effect of increased traffic on severance is considered negligible and **not significant** as per the EIA Regulations.

13.6.6 Noise and Vibration

Assessment of effects of Noise and Vibration as a result of off-site construction vehicle movements has been considered using the guidance contained in DMRB – LA 111[12].

In accordance with the guidance the following points have been noted when considering the need for a quantitative assessment of off-site construction traffic noise and vibration:

- The level of detail of a noise and vibration assessment shall be proportionate to the quality of data available and the risk of likely significant effects occurring; and
- Are there any noise sensitive receptors where there would be a reasonable stakeholder expectation that a construction noise/vibration assessment would be undertaken?

It should be noted that all on-site construction noise and vibration effects, and operational noise effects are considered in **Chapter 12: Noise** of this ES.

[12] Department for Transport (May 2020) – Design Manual for Roads and Bridges – LA 111 Noise and Vibration – Available at: https://www.standardsforhighways.co.uk/dmrb/search?q=noise&pageNumber=1 [Accessed 15/12/22]

Considering off-site transport related noise/vibration effects against the above bullet points, there are a number of sensitive receptors located close to the proposed general construction traffic route. However, this route is an established transport corridor, and there should be an expectation that it is used by HGV traffic. Therefore, there is no 'reasonable stakeholder expectation' that a quantitative noise/vibration assessment be undertaken for a temporary and fully reversible change in traffic flow as a result of the Development.

Furthermore ground-borne vibration resulting from HGV and ALV movements is generally only likely to be perceptible where vehicles traverse discontinuities, such as rough surfaces (including pot-holes) or speed-humps. Effects from the temporary increase in traffic are therefore only likely to be experienced at receptors located next to such road defects, in which case the maintaining authority (i.e., the local authority) would be responsible for enacting repairs.

Airborne vibrations resulting from low frequency sound emitted by vehicle engines and exhausts can result in detectable vibrations in building elements such as windows and doors and cause disturbance to local people. Due to the short-term and temporary nature of the increase in traffic movements, the effect of noise and vibration upon receptors along the route results in a negligible magnitude of change on a receptor of low sensitivity. Thus, the effect of increased in traffic movement on noise and vibration is negligible and **not significant** in terms of the EIA Regulations.

13.6.7 Hazardous Loads

Fuel will be regularly transported to the site over the duration of construction of the Development. All fuel will be transported by suitably qualified contractors, and all regulations for the transportation and storage of hazardous substances will be observed. No other hazardous substances are expected to be transported to Site. Therefore, the effect of the transportation of hazardous substances is considered to result in a negligible magnitude of change on a receptor of low sensitivity. Thus, the effect of hazardous load is considered negligible and **not significant** in terms of the EIA Regulations.

13.6.8 Visual Effects

The movements of ALVs could be considered visually intrusive. This effect would be short-term and would only occur during the movement of abnormal loads. Therefore, the visual effect upon receptors along the routes as a result of the ALVs is considered to result in a negligible magnitude of change on a receptor of low sensitivity. Thus, the effect of ALVs on severance is considered negligible and **not significant** in terms of the EIA Regulations.

13.6.9 Air Quality

Maintaining good local air quality is essential for the human health and overall quality of life for people living in the area. Road transport accounts for a significant proportion of emissions of a number of pollutants including carbon dioxide (CO_2), nitrogen dioxide (NO_2), and particulate matter (PM_{10}). Nitrogen oxide emissions are also of concern for nearby vegetation and ecosystems.

Current guidance[13] on matters relating to air quality advises that significant impacts to local air quality may be found in the following cases:

- Where the road alignment will change by 5 m or more; or
- Daily traffic flows will change by 1,000 AADT or more; or
- Heavy Duty Vehicle flows will increase by 200 AADT or more; or
- Daily average speed will change by 10 km/hr or more; or,
- Peak hour speed will change by 20 km/hr or more.

[13] Design Manual for Road and Bridges – LA 105 Air Quality [Online] Available at: https://www.standardsforhighways.co.uk/prod/attachments/10191621-07df-44a3-892e-c1d5c7a28d90?inline=true. (Accessed on 15/12/2022)

Given the predicted volume of construction traffic, none of the above criteria will be met or exceeded. In addition, due to the temporary nature of the increase in vehicles using the proposed access route, any effects on local air quality will be short term and reversible.

Therefore, the effect of the increase in traffic on local air quality results in a negligible magnitude of change on a receptor of low sensitivity. Thus, the effect of increased traffic on air quality is negligible and **not significant** in terms of the EIA Regulations.

13.7 Mitigation and Residual Effects

Substantial embedded mitigation is proposed (Section 13.3.10) in the form of temporary passing bays on the single-track sections of the Route to Site.

There are a number of traffic management measures that are proposed by the Applicant to help reduce the effects of the abnormal load convoys and construction traffic on the surrounding road network. These measures will be discussed and agreed with DfI prior to construction and full detailed measures shall be included within the Construction Traffic Management Plan (CTMP) for the Site which would be agreed in consultation with DfI and finalised post consent. The CTMP will be submitted for the approval by the relevant authorities prior to the commencement of construction of the Development to ensure that the proposed mitigation measures are implemented successfully. The measures would include:

- Advance warning signs shall be installed on the approaches to the affected road network. Temporary signage advising drivers that abnormal loads and construction traffic will be operating shall be erected on the local road sections of the route;
- An advance escort shall be required to warn oncoming vehicles ahead of the abnormal loads convoy, with one escort staying with the convoy at all times. The escorts and convoy will remain in radio contact at all times where possible;
- A police escort shall also be implemented, where necessary, to facilitate the delivery of the predicted loads; and,
- The times in which convoys travel shall be agreed with the police. Typical delivery times for similar projects has seen the early morning periods used in constrained sections, as traffic levels are generally lighter than those found in the afternoon.

These are referred to in the assessments in Section 13.6, and the residual effects are as assessed in that section.

13.8 Cumulative Effect Assessment

It has been identified that the proposed Altgolan Wind Farm development located on land north of No. 94 Scraghy Road Killen Co. Tyrone has the potential to result in cumulative traffic and transport effects on the A5.

This application is yet to be decided and the construction route and timescales is unknown. However, with the A5 being the major road route in that area, we assume that temporary increases in HGV traffic are not uncommon. Baseline flows in Table 13.6 suggest there is spare capacity on this route.

The Dalradian mine grid connection (Planning Ref: LA11/2019/1000/F) also has the potential to result in cumulative traffic and transport effects on Napple Road and Glenmornan Road. This application is yet to be decided and is unlikely to coincide with the decommissioning and construction phase of the Development.

On that basis and given that any developments would be subject to appropriate planning conditions, no significant cumulative traffic effects are identified. In the event that this development is scheduled to be constructed simultaneously, it is assumed that the respective CTMPs would be agreed in consultation to minimise disruption and maintain traffic effects at a less than significant level.

13.9 Summary of Effects

Table 13.24 provides a summary of the effects detailed within this chapter.

Table 13.24. Summary of Effects

Receptor	Potential Effect	Significance of Effect	Mitigation Proposed	Residual Effect
Decommissioning/ Construction Phase				
Road Users	Accidents and Safety	Negligible	The CTMP will include measures to enhance existing road safety conditions during the construction phase.	Not Significant
Non-motorised Users	Pedestrian Amenity and Delay	Negligible	CTMP will set out a phasing and timing strategy for construction traffic movements. Where necessary construction traffic movements will be reduced during periods of increased pedestrian activity	Not Significant
Road Users	Driver Delay	Negligible	CTMP will set out a phasing and timing strategy for construction traffic movements. Where necessary construction traffic movements will be reduced during periods of increased baseline traffic.	Not Significant
Settlements along route	Severance	Minor	The CTMP will set out a phasing, timing and routing strategy for construction traffic movements. Where necessary construction traffic movements will be reduced during periods of increased baseline traffic.	Minor, Not Significant
Road Users and Settlements along route	Noise and Vibration	Minor	N/A	Minor, Not Significant

Road users and local residents	Hazardous Loads	Negligible	N/A	Not Significant
Road users and local residents	Visual Effects	Negligible	N/A	Not Significant
Road Users and Settlements along route (Abnormal Load Movements)	Combined effect of the above	Minor	Advance warning signs will be posted prior to abnormal load movements. Abnormal load movements will be scheduled to avoid periods of increased baseline traffic as well as school opening and closing periods. All abnormal load movements will be fully escorted to warn on-coming vehicles and advise other road users.	Minor, Not Significant
Operational Phase				
No significant effects are anticipated due to traffic during operation				
Final Decommissioning Phase				
No significant effects are anticipated due to traffic during the final decommissioning				

13.10 Statement of Significance

Effects are considered to be significant for the purposes of the EIA Regulations where the effect is classified as being of 'major' or 'moderate' significance. The worst effect in relation to traffic and transportation identified is of ‘minor’ significance and therefore there are **no significant** effects in relation to traffic and transportation.

13.11 Glossary

ALV - Abnormal Load Vehicle.

NRTF - National Road Traffic Forecast is a document produced by the Department for Transport which details the predicted annual percentage increase in traffic which will occur throughout the UK.

Traffic Generation – A specific increase in vehicular trips which occurs because of a Development. This effect generally refers to permanent traffic increases caused by a new road, place of work, housing or leisure development etc.

Abnormal Load – A vehicle which exceeds the maximum vehicle characteristics for either size or weight. Such vehicles may only use public roads following an application to the relevant statutory bodies and with consideration for the suitability of the roads in question to carry such vehicles.

Visibility Splay – The area which can be seen along the major road from a point on the mouth of the junction of the minor road. Provision of adequate visibility at new junctions onto public roads is a requirement of the design guidance (DCAN 15)

Intervisibility – In this case refers to the ability for drivers to see from one passing bay to the next passing bay such that a decision can be made as to whether to proceed onto the next section of single-track road.

The Netherlands
New Zealand
Norway
Panama
Peru
Poland
Portugal
Puerto Rico
Romania
Singapore
South Africa
South Korea
Spain
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Switzerland
Taiwan
Tanzania
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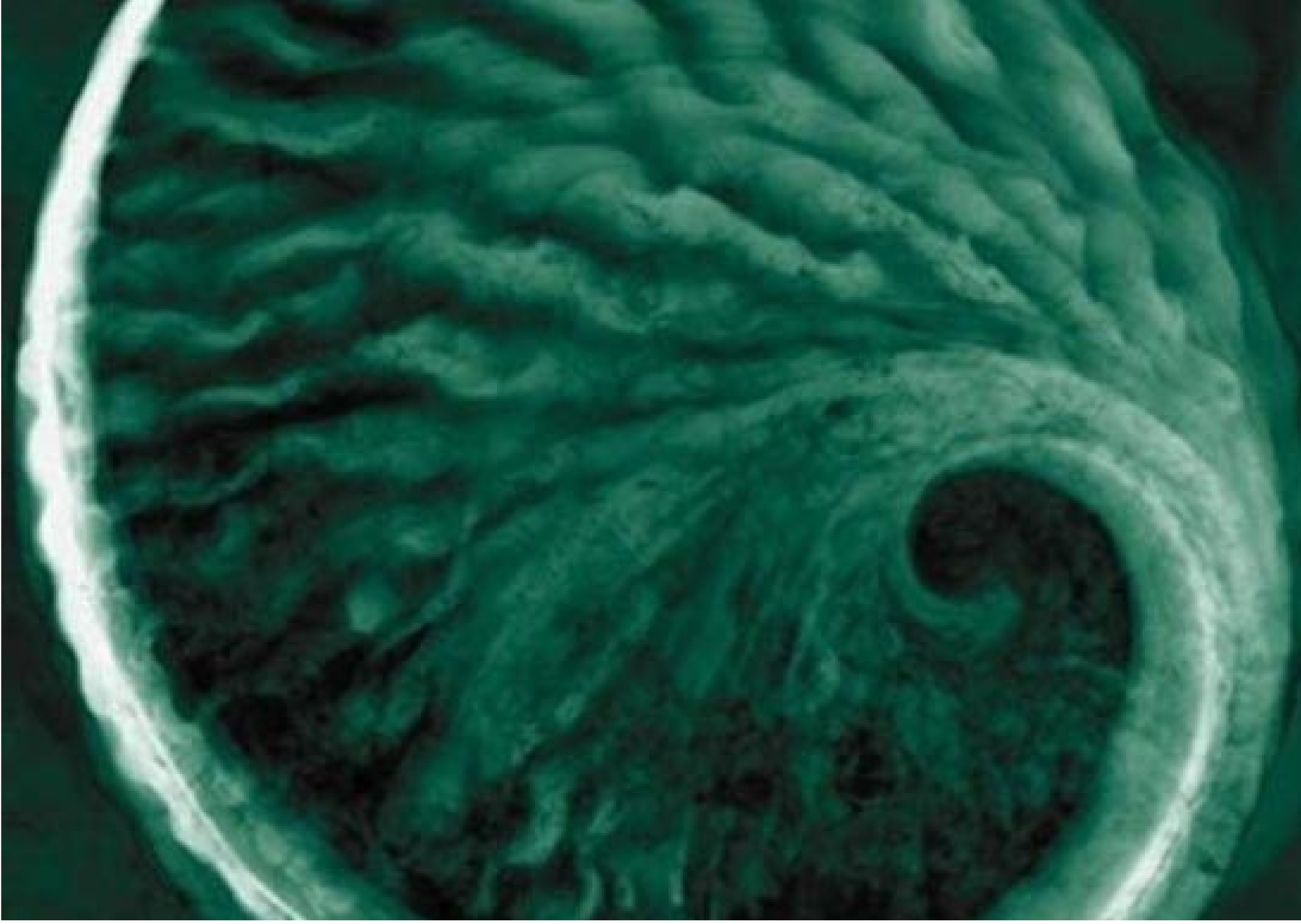

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Owenreagh/Craignagapple Wind Farm

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06 September 2023

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Acronyms and Abbreviations

Name	Description
AHLI	Area of High Landscape Importance
AONB	Area of Outstanding Natural Beauty
CSA	Core Study Area
DfC	Department for Communities
DfI	Department for Infrastructure
EIA	Environmental Impact Assessment
ES	Environmental Statement
GVA	Gross Value Added
IAT	International Appalachian Trail
LDP	Landscape Designation Plan

LPP	Local Policy Plan
NCR	National Cycle Route
NGR	National Grid Reference
NI	Northern Ireland
NITB	Northern Irish Tourism Board
PPS	Policy Planning Statement
RDS	Regional Development Strategy
RED	Renewable and Low Energy Development
SCA	Special Countryside Area
SPPS	Strategic Planning Policy Statement
WECA	Wind Energy Capacity Area

14. LAND-USE, SOCIO-ECONOMICS, TOURISM AND RECREATION

14.1 Introduction

This Chapter of the ES assesses the likely significant effects of the Development on the land-use, socio-economics, tourism and recreation resources, identifies whether there is any potential for significant effects to arise (both in isolation and in combination with other developments) and outlines any mitigation and enhancement measures. This assessment was undertaken by Environmental Resource Management Inc. (ERM) and BiGGAR Economics Ltd. The assessment considered the potential effects during the following phases of the Development:

- Decommissioning and Construction:
- Decommissioning of the Operational Owenreagh I and II Wind Farms;
- Construction of the Development;
- Operation of the Development; and,
- Final decommissioning of the Development.

The initial decommissioning phase of the Operational Owenreagh I and II Wind Farms, and the construction phase, are likely to occur partly in tandem and would have a greater effect than if the two processes were to arise at different times. This represents the worst-case assessment parameters, when compared with the final decommissioning of the proposed wind turbines and associated infrastructure alone. Therefore, effects during this final decommissioning phase are not discussed separately in this chapter.

This Chapter of the ES is supported by the following Figures provided in **Volume 3a** Figures:

- **Figure 14.1: Tourism and Recreation Study Areas.**

This Chapter of the ES is supported by the following Technical Appendix document produced by BiGGAR Economics Ltd provided in **Volume 4** Technical Appendices:

- **Technical Appendix A14.1: Economic Impact Assessment of Owenreagh and Craignagapple Wind Farm**.

This Chapter includes the following elements:

- Assessment Methodology;
- Baseline Survey Methodology;
- Baseline Description;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects; and,
- Statement of Significance.

14.1.1 Scoping and Consultation Responses

Responses to Scoping and consultation for this ES topic is summarised in Table 14.1.

Table 14.1. Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
DfI Economics	EIA Scoping, September 2021	▪ Why are the assessments based on [UK onshore wind energy sector] studies from 2012 and 2015, are there not updated studies that can be used?	The work towards the ES included a literature review, and **Technical Appendix A14.1: Economic Impact Assessment of Owenreagh and Craignagapple Wind Farm** includes relevant renewable energy sector literature from 2019.
		▪ Please provide the range of values regarding how much energy is produced from the site in terms of total installed capacity and capacity factor (load factor) to demonstrate how much energy is to be exported to the grid and how many homes will be supplied in real terms. Please include all calculations, sources, and assumptions for these figures. In previous economic statements the total capacity was given which was misleading in terms of how much energy was being supplied to homes once the wind farm was in operation.	The socio-economic assessment does not quote the number of homes equivalent that will be supplied. As set out in section 4.1 of **Technical Appendix A14.1: Economic Impact Assessment of Owenreagh and Craignagapple Wind Farm**, the maximum rated power generation capacity (in MegaWatts, MW) and the number of turbines is used to estimate the increase in economic activity resulting from the construction and operation of the Development. The capacity factor would not affect the calculations or conclusions of this report, but is estimated to be ~30% for the anticipated turbine type. Using the estimated capacity factor, total capacity, and the average annual household consumption rate of 3,200 kWh (as set out by the Utility Regulator), it was determined that the proposed Development would power between 65,000 and 78,000 homes.[1]
		▪ Please include Gross Value Added figures for direct and indirect employment including how many jobs and wages will be created in the construction phase and in the medium to long term once operational. Furthermore, how much of the total construction phase spending and jobs will be within NI or other regions.	This is set out in section 4 of **Technical Appendix A14.1: Economic Impact Assessment of Owenreagh and Craignagapple Wind Farm**.
		▪ Detail the Impact on tax revenues generated, any subsidies provided and potential impact on social security payments.	This is set out in section 5 of **Technical Appendix A14.1: Economic Impact Assessment of Owenreagh and Craignagapple Wind Farm**.

[1] Orsted, 2023, Available at: www.craignagapplewindfarm.com, [Accessed May 2023].

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
		▪ Please provide a breakdown of the Labour market conditions, the construction industries performance over recent years, employment rates in each sector (how each sector can benefit) and potential for Job displacement in the local area. Furthermore, some reference of the ability of the local workforce to avail of the opportunities provided by this project (skill levels in the region).	This is set out in sections 3 and 4 of **Technical Appendix A14.1: Economic Impact Assessment of Owenreagh and Craignagapple Wind Farm**.
		▪ Impact on consumers in terms of energy costs and the environmental impact in terms of reduced levels of CO_2; and, ▪ Impacts to homeowners within the area in terms of potential impact on house prices.	Potential impact on energy costs is discussed in section 5 of **Technical Appendix A14.1: Economic Impact Assessment of Owenreagh and Craignagapple Wind Farm**. The carbon balance/savings assessment is set out in **Chapter 15: Other Issues** of the ES. A discussion of the impact on baseline house prices is included in section 3 of **Technical Appendix A14.1: Economic Impact Assessment of Owenreagh and Craignagapple Wind Farm**.
		▪ Please include an assessment of the carbon footprint of the wind turbines regarding manufacturing, supply, installation, and decommissioning. Including figures on when we can expect the wind farm to become carbon neutral once it is in operation.	This is included in the 'carbon calculator' used to inform the climate change section of **Chapter 15: Other Issues**.
Tourism manager at DC&SDC	Check for recreation receptors within 5km, February 2023	▪ The following recreation receptors were identified by Arcus within 5 km of the project: – Balix Hill Walk; and, – National Cycle Route 92 No response was received with further receptors.	Potential impacts to these receptors area accessed in Section 14.5 of **Chapter 14: Socio-Economics, Tourism and Recreation**)
DC&SDC Access Officer	Check for recreation receptors within 5km,	No response was received	

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
	February 2023		
Tourism NI	Check for recreation receptors within 5km, February 2023	No Response was Received	
Sustrans	Check for recreation receptors within 5km, February 2023	▪ Sustrans identified two greenways (recreation receptors), referred to as Omagh to Gortin and Omagh to Strabane, that were being developed by the adjacent council. However, these receptors were located approximately 10 km away from the Development.	Assessment of these recreation receptors was scoped out as the nearest point of each receptor was located more than 5 km away from the Development.
Outdoor Recreation (NI)	Check for recreation receptors within 5km, February 2023	▪ Outdoor Recreation NI identified the following recreation receptors within a 5km radius of the Development: – Moor Lough; – The Burn Walk; and, – Knockavoe Hill.	

No other responses to the Scoping Request were made in respect of tourism, recreation, land use and socio-economics, so the proposed scope set out in the Scoping Request is adopted in this ES.

14.1.2 Study Areas

Study areas for this topic are as proposed in the Scoping Report (**Technical Appendix A2.1: Scoping Report**). No consultees have raised any issues. The Core Study Area (CSA) for the purpose of this chapter is based on the site area at the timing of EIA Scoping.

14.1.2.1 Tourism and Recreation Study Areas

Direct effects on recreation and tourism receptors could occur only within the CSA where direct physical changes could occur, however, there are no such receptors within the CSA so direct effects have not been considered any further. For indirect effects on tourism receptors (which include long-distance routes), the study area is defined as land within 10 kilometres (km) of the CSA (the 'Tourism Study Area'). For indirect effects on recreational receptors (local walking and cycling routes, angling lakes riding schools and sports facilities), the study area is defined as land within 5 km of the CSA (the 'Recreation Study Area').

Cumulative effects (that may arise as a result of adding the Development to a baseline that includes other, proposed developments that are yet to be constructed and those currently operational) are considered within the same area, noting that the proposed developments with the potential to contribute to such effects may be up to 20 km of the CSA at the time of Scoping.

These Study Areas are shown in Figure 14.1.

14.1.2.2 Land Use Study Area

The Land-Use Study Area is defined as the footprint of the Development as shown in Figure 3.1.

14.1.2.3 Socio-Economic Study Area

The socio-economic baseline, as outlined in **Technical Appendix A14.1: Economic Impact Assessment of Owenreagh and Craignagapple Wind Farm**, sets Owenreagh/Craignagapple Wind Farm within the context of the following study areas:

- Derry City & Strabane local government district;
- Northern Ireland; and,
- the UK.

14.1.3 Elements Assessed in Full

14.1.3.1 Tourism and Recreation Consideration

The key issues for the assessment of likely significant tourism and recreation effects relating to the Development are:

- Indirect effects, including reduction in amenity or intrusion, changes in the setting and context of the tourism or recreational resource; and
- The potential for cumulative effects of the same type as set out above in combination with other developments.

14.1.3.2 Land Use Considerations

The key issues for the assessment of likely significant land use effects relating to the Development are:

- Both short-term and long-term, yet reversible effects associated with the use of the land for Development infrastructure, which would be removed in the event that the infrastructure is decommissioned.

14.1.3.3 Socio-Economic Considerations

The key issues for the assessment of likely significant socio-economic effects relating to the Development are:

- Direct effects, both short- and long-term, arising from the employment opportunities generated during the initial development, decommissioning and construction and operational stages of the Development and the associated indirect economic effects (both short- and long-term) to the wider area such as the impact of employees spending their salaries in the local area; and,
- The potential for cumulative effects of the same type as set out above were also assessed.

14.1.4 Elements Scoped Out of Assessment

14.1.4.1 Tourism and Recreation Considerations

Where appropriate, other potential effects that could have an indirect effect on tourism, recreation receptors have been assessed in the following chapters:

- Potential landscape and visual effects have been considered in **Chapter 6: Landscape and Visual Impact Assessment**; and,
- Potential traffic effects have been assessed in **Chapter 13: Traffic and Transport.**

As detailed in the **Technical Appendix 2.1: Scoping Request**, there are no recognised footpaths identified within the Strabane Town & District Map or inhabited properties within the CSA. Direct recreational and tourism effects would be within the CSA, and as there are no specific recreational and tourism receptors within the CSA, direct recreational and tourism effects are scoped out of the assessment.

14.1.4.2 Land Use Considerations

Land use effects outside of the Land Use Study Area have been scoped out as only direct effects (i.e. physical changes) are defined for land use.

14.1.4.3 Socio-Economic Considerations

No aspect of the socio-economic assessment was scoped out.

14.2 Assessment Methodology

14.2.1 Legislation, Policy and Guidance

The following guidance, legislation and information sources have been considered in carrying out this assessment (refer to **Chapter 5: Policy and Legislative Context**)

- Building a Better Future, Regional Development Strategy for Northern Ireland 2035, Department for Regional Development[2];
- Everyone's Involved Sustainable Development Strategy (Northern Ireland Executive)[3];
- Sustainable Development Implementation Plan 2011 – 2014: Focus on the Future (Northern Ireland Executive)[4];

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[2] Department for Regional Development, 2010, Building a Better Future, Regional Development Strategy for Northern Ireland 2035, [Online] Available at Regional Development Strategy 2035 | Department for Infrastructure (infrastructure-ni.gov.uk) (Accessed 28/11/2022)

[3] Northern Ireland Executive, 27 May 2010, Everyone's Involved Sustainable Development Strategy [Online]. Available at NI Executive Sustainable Development Strategy - 'Everyone's Involved' | Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk) (Accessed 28/11/2022)

[4] Northern Ireland Executive, 2010, Sustainable Development Implementation Plan 2011 – 2014: Focus on the Future [Online]. Available at: sustainable_development_strategy_april2010.pdf (niassembly.gov.uk) (Accessed 28/11/2022)

- Strategic Planning Policy Statement for Northern Ireland (SPPS): Planning for Sustainable Development (DoE) [5];
- Planning Policy Statement (PPS) 16: Tourism (2013) (DoE)[6];
- PPS16: Tourism[7]
- PPS18: Renewable Energy (2009) (DoE)[8];
- PPS 21: Sustainable Development in the Countryside (2010)[9]; and,
- Emerging local development plan: Derry City & Strabane District Council Local Development Plan 2032[10].

These policies were used to help identify receptors of potential tourism and recreation effects. Further details on the relevant policy and guidance that apply to this chapter are provided in **Chapter 5: Policy and Legislative Context**.

14.2.1.1 Shaping our Future, Regional Development Strategy for Northern Ireland 2035

The Regional Development Strategy[2] (RDS) sets out the framework for spatial development of the Region (Northern Ireland) up to 2035. The strategy aims to take account of the economic ambitions and needs of the Region, and put in place spatial planning, transport and housing priorities that will support and enable the aspirations of the Region to be met. Key policies of relevance to this Development include:

- RG5: Deliver a Sustainable and Secure Energy Supply;
- RG9: Deliver our Carbon Footprint and Facilitate Mitigation and Adaptation to Climate Change Whilst Improving Air Quality; and,
- RG11: Conserve, Protect and, where possible, Enhance our Built Heritage and our Natural Environment.

14.2.1.2 Strategic Planning Policy Statement for Northern Ireland (SPPS)

The Strategic Planning Policy Statement[11] (SPPS) is the regional planning policy document for Northern Ireland. It contains a suite of planning policy and is a material planning consideration in the assessment of all planning applications in NI. Section 6.216 states that:

"Renewable energy technologies support the wider Northern Ireland economy and also offer new opportunities for additional investment and employment, as well as benefitting our health and well being, and our quality of life."

Sections 6.251 through 6.266 outline the planning systems role in the development of tourism. Section 6.254 states that:

"Sustainable tourism development is brought about by balancing the needs of tourists and the tourism industry with conserving the tourism asset. This requires management and the planning system has a key role in

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[5] The Department of the Environment, September 2015. Strategic Planning Policy Statement for Northern Ireland (SPPS) [Online]. Available at: The Strategic Planning Policy Statement | Department for Infrastructure (infrastructure-ni.gov.uk) (Accessed 28/11/2022)

[6] The Department for the Environment, June 2013, Planning Policy Statement 16: Tourism [Online]. Available at: 18 June 2013 (niassembly.gov.uk) (Accessed 28/11/2022)

[7] The Department for the Environment, June 2013, Planning Policy Statement 16: Tourism [Online]. Available at: https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/PPS16%20Tourism.pdf

[8] The Department for the Environment, August 2009, Planning Policy Statement 18: Renewable Energy [Online]. Available at: Best Practice Guidance to PPS 18 'Renewable Energy' | Department for Infrastructure (infrastructure-ni.gov.uk) (Accessed 28/11/2022)

[9] The Department for the Environment, 2010, Planning Policy Statement 21: Sustainable Development in the countryside [Online]. Available at: Planning Policy Statement 21 'Sustainable Development in the Coutryside' (eplani.org) (Accessed 28/11/2022)

[10] Derry City & Strabane District Council (2021), Local Development Plan (LDP) 2032. Available at: https://www.derrystrabane.com/Subsites/LDP/Local-Development-Plan [Accessed on 16/06/21]

[11] Department of the Environment (2015), The Strategic Planning Policy Statement (SPPS). Available at: https://www.infrastructure-ni.gov.uk/publications/strategic-planning-policy-statement

managing tourism related development through planning policies that provide a framework for identifying appropriate development opportunities and safeguarding tourism assets from harmful development."

14.2.1.3 Planning Policy Statement for Northern Ireland (PPS)

PPS16: Tourism This highlights the contribution tourism makes to the Northern Ireland economy in terms of revenues it generates, employment opportunities and the potential it creates for economic growth. Policy TSM 8 of PPS16 states 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 a negative impact on a tourism asset such as to significantly comprise its tourism value. The supporting text states that a tourism asset is defined as any feature associated with the built or natural environment which is of intrinsic interest to tourists.

PPS18 Renewable Energy: Acknowledges that wind farms are not inherently incompatible with tourism, but that tourism should be considered during the design process to prevent any unreasonable impacts from the Development. When considering potential effects to tourism during the design of the Development, the policy states '*the judgment of acceptability based on landscape protection should provide adequate protection for tourism interests.*'[12] As such, landscape and visual effects, and their relationship with tourism are considered in the sections below.

14.2.1.4 Emerging local development plan: Derry City & Strabane District Council Local Development Plan 2032

The Council are currently preparing their Local Development Plan 2032, which when adopted will replace all existing plans for the Council area, and all planning applications must have regard to. The Draft Plan Strategy was published in December 2019 and is of limited material weight in the current application determination until such time as the Plan Strategy is formally adopted. The following draft policies are of relevance;

- NE 5 Development within or affecting the setting of the Sperrin AONB – *"… All proposals must demonstrate how they have considered siting, massing, shape, design, finishes and landscaping in order to positively enhance our important AONB landscape.";*
- RED 1 Renewable and Low Carbon Energy Development – General Criteria – Sets out general criteria to meet for new wind energy development and repowering of existing development:
  - *"In the first instance, proposals for renewable energy must accord with the relevant LDP landscape designations (Refer also to Chapter 21 Natural Environment): - Wind Energy Capacity Area (WECA) - Special Countryside Area (SCA) - Area of High Landscape Importance (AHLI) - Area of Outstanding Natural Beauty (AONB)";* and
  - *"Within designated Wind Energy Capacity Areas (WECAs), any further wind energy development proposals, including re-powering, will need to be very carefully considered so that they do not unacceptably intensify existing adverse landscape impacts in these area"*
- Designation WECA 1 - Wind Energy Capacity Areas (WECAs) - localised areas of the District that have experienced significant pressure (existing operational and approved) from wind farms and single turbines so need careful consideration of any further such proposals, to prevent unacceptable further development. These designations are indicated for strategic purposes only and boundaries will be fully defined at the LDP Local Policies Plan (LPP) stage. It is anticipated that the Plan Strategy may be adopted in late 2023.

14.2.2 Methodology for the Assessment of Effects

The significance of the likely effects of the Development has been classified by professional consideration of the sensitivity of the receptor and the magnitude of the potential effect. The methodology for the assessment of effects for this Chapter follows that detailed in **Chapter 2: EIA Methodology** of this ES. The potential types of effects, sensitivity, magnitude and significance criteria for the assessment of land use, socio-economics, tourism and recreation are provided below.

[12] The Department for the Environment, August 2009, Planning Policy Statement 18: Renewable Energy [Online]. Available at: Best Practice Guidance to PPS 18 'Renewable Energy' | Department for Infrastructure (infrastructure-ni.gov.uk) (Accessed 28/11/2022)

Effects on the land use, socio-economics, tourism, and recreation resource can be described as direct, indirect or cumulative as outlined in Table 14.2. In addition, they are described as positive or negative.

Table 14.2. Type of Effect

Type of Effect	Description
Direct Effect	For example: Jobs created during the decommissioning and construction, and operational phases of the Development. Physical disturbance to the land-use resource within the initial decommissioning/ construction stages, such as the footprint of the Development or decommissioning and construction activities impacting on any rights of access.
Indirect Effect	For example: Jobs created by the additional expenditure of wages into the local and wider economy and the purchasing of basic materials, equipment and office or accommodation space for staff as a result of the Development. An effect on amenity of nearby tourism and recreational receptors resulting from changes in the visual environment caused by the Development.
Cumulative Effect	Cumulative effects are those where the combined effect of two or more developments (be they operational or proposed) are of greater significance than those of the Development itself.

14.2.2.1 Sensitivity of Receptors

The sensitivity of the baseline conditions, including the importance of potentially affected receptors, will be assessed in line with best practice guidance, legislation, statutory designations and / or professional judgement.

Table 14.3 details the framework for determining the sensitivity of receptors, as detailed in **Chapter 2: Methodology** of this ES.

Table 14.3. Framework for Determining Sensitivity of Receptors

Sensitivity of Receptor	Definition
Very High	Assets / receptors of international importance (e.g. European)
High	Assets / receptors of national importance (e.g. UK)
Medium	Assets / receptors of regional importance (e.g. Northern Ireland)
Low	Assets / receptors of local importance (e.g. Derry City and Strabane Council Area)
Negligible	Assets / receptors of negligible importance (e.g. a receptor that is not afforded protection under the Local Plan or other policy)

14.2.2.2 Magnitude of Effect

The magnitude of potential effects will be identified through consideration of the Development, the degree of change to baseline conditions predicted as a result of the Development, the duration and reversibility of an effect and professional judgement, best practice guidance and legislation.

The criteria for assessing the magnitude of an effect are presented in Table 14.4, as detailed in **Chapter 2: Methodology** of this ES.

Table 14.4. Framework for Determining Magnitude of Effects

Magnitude of Effects	Definition
High	Total loss or major alteration of the socio-economic, land use, tourism or recreational asset / receptor.
Medium	Loss of, or material alteration to, one or more key elements of the socio-economic, land use, tourism or recreational asset / receptor.
Low	Slight alteration of the socio-economic, land use, tourism or recreational asset / receptor.
Negligible	Barely, perceptible alteration of the socio-economic, land use, tourism or recreational asset / receptor.

Significance of Effect

The sensitivity of the asset and the magnitude of the predicted effects will be used as a guide, in addition to professional judgement, to predict the significance of the likely effects. Table 14.5 summarises guideline criteria for assessing the significance of effects, as detailed in **Chapter 2: Methodology** of this ES.

Table 14.5. Framework for Assessment of the Significance of Effects

Magnitude of Effect	Sensitivity of Receptor				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Major / Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

Effects assessed as being of major or moderate significance are ‘significant’ in the context of the EIA Regulations and are shaded in the above table.

14.2.2.3 Assessment Limitations

Whilst efforts have been made to ensure that the key tourism and recreation facilities in the area have been identified through a combination of desk studies, site visits and consultation with key stakeholders, it is possible that there are a number of small attractions that will not have been identified through the data collection process.

14.3 Baseline Survey Methodology

14.3.1 Tourism and Recreation Baseline Methodology

Tourism and recreation effects will be considered based on the guidance from Guidelines for Environmental Impact Assessment[13] and a Handbook for EIA[14] and consider:

- Tourism and recreation receptors; and,
- Public attitudes to wind farms.

The following sources of information have been used to inform the tourism and recreation baseline description set out in this Chapter:

- Derry City & Strabane District Council (Derry City & Strabane – Tourism (derrystrabane.com), and in particular:
  - The Strabane Map[15];
  - Tourism 2025[16];
  - Rural Tourism[17];
- Donegal Tourism CLG and Donegal County Council (https://www.govisitdonegal.com/);
- Tourism NI (www.tourismni.com);
- Walk NI (www.walkni.com); and,
- Sustrans (Northern Ireland) (www.sustrans.org.uk/northern-ireland).

Information concerning the public's perception of windfarms has been gathered from studies undertaken across the UK and the Republic of Ireland.

14.3.2 Land Use Baseline Methodology

Baseline conditions have been established through desktop studies, including mapping and aerial imagery, and various site visits undertaken for the landscape visual impact assessment (LVIA), archaeology and cultural heritage, hydrology and hydrogeology, geology and peat, ecology and ornithology, as part of the EIA, as well as for public consultation purposes.

14.3.3 Socio-Economic Baseline Methodology

Technical Appendix A14.1: Economic Impact Assessment of Owenreagh and Craignagapple Wind Farm, outlines the socio-economic baseline. Appendix 1 of the report provides a method statement, highlighting that the approach followed in estimating the economic impact is based on industry best-practice. It draws on evidence on the construction and operational costs associated with a range of onshore wind farm projects across the UK from a study conducted in 2015 by BiGGAR Economics on behalf of RenewableUK[18], and RenewableUK's most recent report[19] on wind farm repowering. The analysis also relies on evidence from more recent case studies of actual construction and operational costs in the sector, as well as publicly available government statistics.

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[13] Institute of Environmental Management and Assessment (IEMA) (2004) Guidelines for Environmental Impact Assessment.

[14] SNH (2003) A Handbook for Environmental Impact Assessment, Appendix 5: Guide to Outdoor Access Assessment.

[15] Strabane Visitor Information Centre (2023). Strabane Map. Available at: https://www.derrystrabane.com/getattachment/Services/Tourism/Strabane-Map/Strabane_District_WEB-(1).pdf [accessed on 13/02/2023].

[16] Derry City and Strabane District Council (2018). Tourism 2025: A New Level of Ambition. Available at: https://www.derrystrabane.com/getmedia/4d4c8908-02ca-4e43-a8a1-c679358f3356/DCSDC_Tourism_Strategy_2018_LowRes.pdf [accessed on 13/02/2023].

[17] Derry City and Strabane District Council (2023). Rural Tourism (web page): https://www.derrystrabane.com/Services/Tourism/Rural-Tourism [accessed on 13/02/2025].

[18] RenewableUK (2015), Onshore Wind: Economic Impacts in 2014. Available at: onshore_economic_benefits_re.pdf (ymaws.com)

[19] RenweableUK (2019), Onshore Wind: The UK's Next Generation. Available at: Onshore Wind: The UK's Next Generation - RenewableUK

14.4 Baseline Description

This section details information relating to tourism and recreation within the tourism and recreational study area, the current land use of the Site and the current socio-economic conditions within the socio-economic study areas.

14.4.1 Tourism and Recreation Baseline

Tourism contributes a significant amount to Derry City and Strabane District Council's economy every year. In 2018, there were an estimated 334,874 overnight trips spent in the area with an estimated total of 1,025,913 nights spent staying in the area. These trips are estimated to have brought £55,433,203 into the local economy. Of these visitors, it is estimated that 45% of these were visiting from elsewhere in Northern Ireland, with 28% visiting from Great Britain, and 7% visiting from the rest of Europe[20]. These visits and overnight stays support over 4,685 tourism jobs which make up 8.7% of the total jobs in Derry City and Strabane District Council[21].

Moving forward, Derry City and Strabane District Council have published 'Tourism 2025 – A New Level of Ambition'[22] which sets out priorities and activities to double visitor spend to £100 million and create an additional 1000 jobs in the sector by 2025.

The CSA is located within a relatively remote setting with recreation opportunity based around the natural environment such as hills, lakes, rivers and forests. Although the CSA is located within the Sperrins AONB, no recognised tourism or recreation resources are located within the CSA.

Under The Access to the Countryside (Northern Ireland) Order 1983[23], public access is restricted to:

- Areas of land which are in public ownership and to which the public are invited to use;
- Public rights of way; or
- Where the public have the landowner's permission to visit.

In addition, in some areas of Northern Ireland, there is *de facto* access to open land. This means that the landowners tolerate access but, irrespective of the historic use of the land, there is no legal basis to the situation[24].

Many walking routes are not formally designated public rights of way and access depends on the goodwill and tolerance of local landowners. There are no designated public rights of way or footpaths within 2 km of the CSA.

A desk study was conducted at scoping and identified receptors as shown in Table 14.6. Points of interest, such as sculptures, and community facilities, such as social farms, have not been included as tourism receptors, since people are not expected to travel appreciable distances for these features.

Table 14.6. Local Tourism Receptors within 10 km and Recreation Receptors

Tourism and Recreation Resource	Amenities	Location
Sperrins AONB	Walking, Horse Riding	The CSA is located entirely within the Sperrins AONB. Specific walking and horse-riding routes are included below.
The Burn Walk	Walking	4.7 km south west of the CSA

[20] NISRA (2018) Derry and Strabane, Tourism https://www.derrystrabane.com/getmedia/d43ad189-ea0c-4c56-9547-750a156e6c54/Tourism-250719.pdf (accessed 24/01/2023)
[21] Derry City and Strabane District Council (2021) Tourism Derry City & Strabane - Tourism (derrystrabane.com) (accessed 24/01/2023)
[22] Tourism 2025 – A New Level of Ambition. Available at DCSDC_Tourism_Strategy_2018_LowRes.pdf (derrystrabane.com) [Accessed 23/12/2022].
[23] The Access to the Countryside (Northern Ireland) Order 1983. Available online at: https://www.legislation.gov.uk/nisi/1983/1895 [Accessed on 04/01/2023]
[24] NIDirect (2021) Public rights of way and access to the countryside guide. Available online at A Guide to Public Rights of Way and Access to the Countryside (nidirect.gov.uk) [Accessed on 04/01/2023]

Tourism and Recreation Resource	Amenities	Location
Moor Lough	Angling	0.4 km north east of the CSA
Konckavoe Hill	Walking	3.3 km west of the CSA
Ballyskeagh Stables	Horse riding	3.1 km north-west of the CSA
Balix Hill Walk	Walking	2.7 km east of the CSA
Wilson Ancestral Home	Heritage site	3.6 km west of the CSA
Clogherny Wedge Tomb	Heritage site	4.3 km east of the CSA
Lough Ash	Angling	4.4 km north east of the CSA
Lough Ash Wedge Tomb	Heritage site	5 km north east of the CSA
National Cycle Network Route 92	Cycling Route	6.7 km west of the CSA
Barrontop Fun Farm	Childrens' farm attraction	2.3 km north of the CSA
Foyle Canoe Trail	Canoeing	6.6 km west of the CSA
Strabane Canal	Canal boating	6.7 km north west of the CSA
Bradkeel Forest	Walking	6.1 km east of the CSA
Ligfordrum Wood	Walking	Extends from Southern boundary of the CSA
Koram Wood	Walking	2.5km south of the CSA
Skinboy Wood	Walking	4.0km South of the CSA
International Appalachian Trail	Long distance walking route	9.3 km south east of the CSA
Ulster Way	Long distance walking route	c. 10 km south west of the CSA

The Burn Walk is 1 of 3 of the Woodland Trust's 'Woodlands on Your Doorstep' in Northern Ireland, located c. 4.7 km east of the CSA. The Burn Walk encompasses 1.25 ha. and is publicly accessible. It consists of paths that loop around the Cavanalee River and provide access to Pattens Glen.[25] For the purposes of this assessment the Burn Walk is assessed as being of medium sensitivity, in accordance with Table 14.3., due to it being 1 of only 3 Woodland Trust's 'Woodlands on Your Doorstep' in Northern Ireland.

Moor Lough, a 16.2 ha reservoir at the head of the River Bush, is a freshwater lake utilised by NI Water and is available for brown trout and rainbow trout fishing subject to DAERA licencing and permitting[26]. There is also a picnic area on its western shore, and is ringed by a footpath. Moor Lough is located 0.5 km northeast of the CSA. It is one of 10 locations identified by NI Direct[27] for angling in County Tyrone, and hence is considered important at the Derry City and Strabane District Council level, corresponding to a low sensitivity (Table 14.3).

Knockavoe Hill is named on the Strabane Map. Knockavoe Hill is 296 m above sea level, located c. 3.3 km east of the CSA. There is no public footpath shown on OS mapping, however an off-road trail is present on the western slopes of the hill. A 'trig pillar' is reportedly located at the top of the hill. For

[25] Woodland Trust (2018). The Burn Walk Management Plan 2018-2023. Available at: publicmanagementplan (woodlandtrust.org.uk). [accessed on 04/04/23].
[26] NIDirect.gov.uk (Undated). Angling at Moor Lough. Available at: Angling at Moor Lough | nidirect [accessed on 04/01/23].
[27] NIDirect.gov.uk (Undated). Fisheries in County Tyrone. Available at: Fisheries in County Tyrone | nidirect [accessed on 04/01/23].

the purposes of this assessment, it is assessed as being of negligible sensitivity, in accordance with Table 14.3.

Ballyskeagh Stables, a British Horse Society (BHS) approved riding school and livery centre is located 3.1 km north-west of the CSA. As a BHS approved amenity, it is considered important at the Derry City and Strabane District Council level, corresponding to a low sensitivity (Table 14.3).

Balix Hill Walk is named on the Strabane Map. Balix Hill is 403 m above sea level, located c. 2.7 km east of the CSA. However, there is no public footpath up to it shown on OS mapping and no further web-based information about a specific walk up Balix Hill has been identified. For the purposes of this assessment, it is assessed as being of negligible sensitivity, in accordance with Table 14.3.

Although **Chapter 7: Cultural Heritage** identifies numerous heritage assets within the 10 km Study Area, only the following three heritage sites were determined to have touristic value based on their depiction on the Strabane Town and District Council Tourism Map.[28] These include Wilson Ancestral Home, Lough Ash Wedge Tomb and Clogherny Wedge Tomb.

Wilson Ancestral Home is an early 19th century Category B+ Listed Building, it is only open to the public between 2pm and 5pm, Tuesdays to Sundays, in July and August. It is therefore considered to be of local importance at the Derry City and Strabane District Council level, corresponding to a low sensitivity (Table 14.3).

Clogherny Wedge Tomb is a relatively well preserved prehistoric Scheduled Monument (TYR 011:018) and is, therefore, of importance at a national level. However, the Scheduled Monument is difficult to access, with no clear path to the site; instead, a traverse across peat and long grass is necessary. Consequently, visitor numbers are likely very low, corresponding to a low sensitivity tourism amenity.

Lough Ash Wedge Tomb is a stone age historic feature to the north of Lough Ash. It is signposted from Loughash Road by a brown tourist signpost, and there is an information board next to the tomb. The only parking available is for 1-2 cars at the nearby road junction, and there are no public facilities. Visitor numbers are expected to be very low, corresponding to a low sensitivity tourism amenity.

Lough Ash is a 15 ha lake that is stocked with brown and rainbow trout, and is available from March to October for anglers[29], located 4.4 km north east of the CSA. It is promoted by the Loughs Agency in a guide for angling in the Foyle and Carlingford area, and hence it is considered important at the Derry City and Strabane District Council level, corresponding to a low sensitivity (Table 14.3).

There is one National Cycle Route (NCR) within the Tourism Study Area. National Cycle Route 92 passes broadly north to south and is made up of two sections of route. A small section passes along a traffic-free route along the Foyle through Derry, while the main section passes between Ballinamallard in the south, through Omagh, and finally to Lifford, beyond Strabane. To the south of the Site, it forms a circular route, which passes through Gortin, Plumbridge and Newtownstewart, passing within approximately 6.7 km of the CSA. As a long-distance route running in sections through Omagh, Strabane, Lifford and Derry/Londonderry, it is of regional importance (at the Northern Ireland level), and of medium sensitivity (Table 14.3).

Barrontop Fun Farm is a farm that is open to visitors with particular facilities for children[30]. As of February 2023, their web page (Facebook) said that the farm was permanently closed. As the farm is permanently closed it corresponds to a negligible sensitivity (Table 14.3).

Bradkeel Forest is a c. 140 ha, primarily coniferous public forest that is managed for commercial timber production and located 6.1 km east from the CSA[31]. There are no visitor facilities, including parking, to ensure access is maintained for forestry vehicles. The public are welcome to visit on foot. As a publicly owned forest that can be accessed on foot, it is considered locally important at the Derry City and Strabane District Council level, corresponding to a low sensitivity (Table 14.3).

[28] Derry City and Strabane District Council (2023). Strabane Town Map. Available at: Strabane_District_WEB-(1).pdf (derrystrabane.com) [Accessed May 2023].

[29] Loughs Agency (2019). Angling Guide: Game, Coarse and Sea, Foyle and Carlingford. Available at: https://www.loughs-agency.org/app/uploads/2019/06/250319-Final-68pg_A4_Book_compressed.pdf [accessed on 09/02/2023].

[30] Barrontop Farm (2021). Facebook page: https://www.facebook.com/people/Barrontop-Farm/100068199876649/ [accessed on 13/02/203].

[31] nidirect government services (2023). Bradkeel Forest. (Website). Available at: https://www.nidirect.gov.uk/articles/bradkeel-forest [accessed on 09/02/2023].

The Foyle Canoe Trail and Strabane Canal are located 6.6 and 6.7 km west and northwest of the CSA, respectively. Over 53 km from the start of the River Foyle to the Atlantic Ocean, the Foyle Canoe Trail meanders through both Northern Ireland and the Republic of Ireland[32]. The Foyle Canoe Trail is, therefore, of regional importance, corresponding to a medium sensitivity (Table 14.3). Strabane Canal flows into the River Foyle, and is considered important at the Derry City and Strabane District Council level, corresponding to a low sensitivity (Table 14.3).

Several areas of woodland located south of the CSA are classified together as Ligfordrum Forest[33], covering an areas of c. 620 ha. These are named as follows: Ligfordrum Wood, Koram Wood and Skinboy Wood. Each is detailed separately in Table 14.5 and below.

Ligfordrum Wood is a 397 ha woodland managed by Forest Service Northern Ireland for commercial coniferous production[34]. This woodland is composed of 5 spatially distinct areas of woodland, located at distances directly adjacent to the southern boundary of the CSA to approx. 3.7km south of the CSA. Three of these areas of woodland contain forestry track which are accessible to the public on foot. No facilities or parking are available at the site. As a publicly owned forest that can be accessed on foot, it is considered locally important at the Derry City and Strabane District Council level, corresponding to a low sensitivity (Table 14.3).

Koram Wood is located 2.5km south of the CSA and covers an area of approx. 45 ha. It has no facilities or parking available. The predominately coniferous woodland is managed by Forest Service Northern Ireland for commercial production. A small section of forestry track is present and available for use by the public on foot. As a publicly owned forest that can be accessed on foot, it is considered locally important at the Derry City and Strabane District Council level, corresponding to a low sensitivity (Table 14.3).

Skinboy Wood comprised an area of approx. 140 ha and is located 4 km south of the CSA. The predominately coniferous woodland is managed by Forest Service Northern Ireland for commercial production. No known forestry tracks are located in the bounds of the woodland, but it is listed as publicly accessible. However, no facilities or packing is located at the woodland. As a publicly owned forest that can be accessed on foot, it is considered locally important at the Derry City and Strabane District Council level, corresponding to a low sensitivity (Table 14.3).

The International Appalachian Trail (IAT) is a 279-mile-long distance walking trail, 9.3 km south-east of the CSA, starting in West Donegal in the Republic of Ireland which continues into Northern Ireland passing through the Sperrins Mountains, the Causeway Coast and Glens of Antrim before it finishes in Larne in County Antrim. As a long-distance footpath, it is of regional importance (at the Northern Ireland level), and of medium sensitivity (Table 14.3).

The longest distance walking route in the area is the Ulster Way[35]. The 636-mile circular route essentially encircles Northern Ireland, crossing briefly into the Republic of Ireland in several places. It passes to the east and south of the Sperrin Mountains, coming within approximately 10 km of the CSA, near Gortin. As a long-distance footpath, it is of national importance, and of high sensitivity (Table 14.3).

The Council's Local Development Plan (LDP) 2032, includes Evidence Base EVB 12: Open Space and Recreation[36] and focuses on current open space and recreation provision, as well as outdoor sport and children's play provision which would not be affected by the Development and do not have the potential to receive effects from the Development, and are not considered further in this chapter.

No other tourism and recreation receptors have been identified within the Study Areas.

Visitor accommodation in the locality around the CSA is primarily located within Strabane. Given the separation, visitors to these properties are highly unlikely to be substantially affected by a slight change in view, where such views are available, and effects on visitors at their accommodation would not be significant and are not considered further in this chapter.

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[32] CanoeNI (2023). Available at: Foyle Canoe Trail in Northern Ireland (canoeni.com) [accessed on 24/01/2023]

[33] Indirect government services (2023). Available at: Ligfordrum Forest | nidirect [accessed on 11/04/2023]

[34] Indirect government services (2023). Available at: Ligfordrum Forest | nidirect [accessed on 11/04/2023]

[35] WalkNI (2023). Ulster Way (website). Available at: https://walkni.com/ulster-way/ [accessed on 17/01/2023].

[36] Derry City and Strabane District Council (2017). Local Development Plan 2032: Open Space and Recreation. Available at: EVB-12-Open-Space,-Sport-and-Outdoor-Recreation.pdf (derrystrabane.com) [accessed on 04/01/2023].

14.4.1.1 Public Attitudes towards Wind Farm Development

Although data for Northern Ireland is limited, existing studies into the attitudes of visitors, tourists and tourism organisations towards wind farms in the UK suggests that renewable energy schemes have their own tourism pull. Independent UK studies have shown that the negative effects of wind farms on tourism are negligible, and there is a growing body of evidence to suggest that wind farms have the potential to develop into wider tourist attractions where greenways and walking trails are established around the wind farm for visitors to enjoy.

The most recent studies[37] regarding public attitudes to renewable energy has shown that support for renewable energy has remained high with 88% expressing support for the use of renewables. Opposition to renewables was very low at 2%. Moreover, 79% of respondents felt that renewable energy projects should provide direct benefits to the communities in which they are located, whilst 74% agreed that renewable industries and developments provide economic benefits to the UK.

Interactions conducted online research for The Irish Wind Energy Association[38] between November and December 2022 (published in 2022) to measure and track perception and attitudes around wind power amongst Irish adults. An online survey was conducted amongst a nationally representative sample of 1017 Irish adults, while a supplemental booster survey sampled 201 residents of rural areas. In the study period 85% of those surveyed in the 'Countryside/Village' sample set were in favour of the use of wind power, accompanied by 80% in favour within the 'Nationally Representative' sample. It was recorded that 10% of those polled neither favouring or oppose wind power, and only 2% strongly opposing the use of wind power. Within the 'Nationally Representative' sample approximately 1 in 5 respondents quoted 'reduces C02 emissions', and 'good for the environment' as being benefits of wind energy.

The potential for likely significant effects on tourism is closely linked to the perception of those visiting the area. A Northern Irish Tourism Board (NITB) survey undertaken in August 2011 concluded that tourists, on the whole, seem generally positive or neutral to the prospect of wind farm development and less than 5% of domestic (Northern Irish) tourists said they would be discouraged from returning to an area that had wind farms[39]. Research by VisitScotland in April 2012 observed that 80% of respondents said their decision on where to visit or stay in Scotland would not be affected by the presence of a wind farm[40]. In addition, 52% of all respondents disagreed that windfarms spoil the look of the UK/Scottish countryside, with a further 29% neither agreeing nor disagreeing.

This survey backs up a previous study commissioned by the Scottish Government in 2008 to investigate the economic impacts of wind farms on Scottish tourism[41]. This study found that three quarters of all respondents felt that wind farms had a positive or neutral impact on the landscape and that 68% of tourists reacted positively to the statement "*A well sited wind farm does not ruin landscape*". Furthermore, 93% of all visitors that had seen a wind farm during their visit to Scotland stated that this would not impact their intentions to return to Scotland for future holidays**Error! Bookmark not defined.**.

Likewise, research of visitor attitudes to wind farms in the Republic of Ireland observed that 47% of tourists consider that wind farms actually have a positive impact, and only 10% think they have very negative impacts[42].

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37 Department for Business, Energy and Industrial Strategy, December 2022, Energy and Climate Change Public Attitude Tracker [Online]. Available at: BEIS PAT Autumn 2022 Energy Sources and Energy Infrastructure (publishing.service.gov.uk) [accessed 05/01/2023].

38 Interactions, IWEA Public Attitude Monitor December 2022, Available Online at IWEA 2019 Public Attitudes Monitor (windenergyireland.com) [accessed 31/0/23]

39 NITB (2011). Windfarms, Available Online at WindFarm-VAS-(FINAL)-(2).pdf (failteireland.ie) [accessed 04/01/23]

40 VisitScotland (2012) Wind Farm Consumer Research. Available online at: Windfarm Consumer Research final docx (parliament.scot) [Accessed on 05/01/23]

41 Glasgow Caledonian University, Moffat Centre and CogentSi (2008). The Economic Impacts of Wind Farms on Scottish Tourism. Available online at: http://www.gov.scot/Resource/Doc/214910/0057316.pdf [Accessed on 05/01/2023]

42 Fáilte Ireland and Millward Brown Lansdowne (2012). Attitudes to Wind Farms in the Republic of Ireland Available online at: http://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/4_Visitor_Insights/WindFarm-VAS-(FINAL)-(2).pdf?ext=.pdf [Accessed on 05/01/2023]

A study by BiGGAR Economics[43] examined data to test if there was a correlation between the presence of wind farms in a particular area and tourism employment in that area. The report concluded, "*This research has analysed trends in tourism employment in the localities of 44 wind farms developed in recent years, providing a substantial evidence base. The study found no relationship between tourism employment and wind farm development, at the level of the Scottish economy, across local authority areas nor in the locality of wind farm sites*".

In a Public Local Inquiry for a Section 36 windfarm application at Harburnhead (reported in July 2014), West Lothian, in Scotland, the reporter concluded the following in relation to potential effects on tourism: *"If wind farms had a significant adverse impact on the number or experience of visitors, we would expect clear evidence of this by now."* [44]

Wind farms can be tourist attractions in themselves, providing additional interest in an area and a different experience that can complement other tourist experiences. The Best Practice Guidance to PPS18 acknowledges that wind energy developments can co-exist and potentially enhance tourism and leisure interests[8].

Rigged Hill Windfarm, located within the Causeway Coast and Glens Council area and operated by ScottishPower Renewables, has incorporated the Ulster Way walking route onto its access tracks. Educational visits have been actively encouraged and hosted at the Operational Corkey Windfarm over a number years[45]. RES has collated visitor numbers from these organised educational visits in relation to windfarm sites from 1995-2012 as part of the 2013 Meenamullen Wind farm ES[46]. During this period there were 924 visitors visiting the Operational Corkey Windfarm, compared with 7,388 visitors to Elliots Hill Windfarm and 597 to Gruig Windfarm. All visitors to the operational Corkey Windfarm were recorded from 1985 – 2007. No records have been kept since 2007.

It should also be noted that the Orsted holds public and educational events throughout the year at select wind farm sites. For example, an educational event on the importance of wind energy's role in the decarbonisation of the energy sector was held at Booltiagh Wind Farm in County Clare on June 15th, 2022. Primary school students were invited to celebrate Global Wind Day and to participate in an interactive workshop that highlighted the importance of wind energy in the global energy economy.[47]

Elsewhere in Scotland, Whitelee Windfarm (operated by ScottishPower Renewables) regularly attracts walkers, runners, cyclists and horse riders to use its 130 km of trails on a daily basis and has had over 735,000 visitors to its visitor centre since opening. In the Republic of Ireland, the largest onshore wind farm Galway Wind Park contains 48 km of recreational hiking trails that are open to visitors.[48]

The above evidence and studies highlight the varying opinions of visitors regarding wind energy development; however, they suggest that the majority of those surveyed do not have negative attitudes towards wind farms and that wind farm sites can be tourist destinations in their own right.

14.4.2 Land-Use Baseline

The CSA is located is located approximately 5 km east of Strabane and 6 km southeast of Antigarvan, in County Tyrone, located entirely within the Sperrin AONB. The topography of the CSA and its immediate vicinity comprises undulating upland. As outlined in **Chapter 1: Introduction**, the CSA is currently host to 15 turbines. The operational Owenreagh I Wind Farm (Planning Ref: J/93/0286) comprises nine turbines and the operational Owenreagh II Wind Farm (Planning Ref: J/2004/1015/F) comprises a further six turbines. The CSA also includes land which was subject to the planning permission (Planning Ref: Planning Ref: J/2010/0481/F) for Craignagapple Wind Farm, comprising six turbines. The CSA is characterised by undulating topography and moorland land cover, with upland

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43 BiGGAR Economics (2021). Wind Farms and Tourism Trends in Scotland: Evidence from 44 Wind Farms. Available at: Microsoft Word - BiGGAR Economics Wind Farms and Tourism 2021.docx [accessed on 05/01/2023].

44 The Scottish Government, (2014), Harburnhead Wind Farm Decision Notice. Available online at: http://www.dpea.scotland.gov.uk/Document.aspx?id=206011 [Accessed on 05/01/2023]

45 ScottishPower Renewables (2019). Corkey Windfarm Repowering Environmental Statement.

46 RES Group (2013). Chapter 19: Socio-Economic and Tourism Assessment.

47 Orsted (2022). School Children Celebrate Global Wind Day at Co Clare Wind Farm. Available at: School Children Celebrate Global Wind Day at Co Clare Wind Farm (orsted.ie) [Accessed July 2023].

48 SSE Renewables (2023). Galway Wind Park. Available at: Galway Wind Park | SSE Renewables [Accessed May 2023].

agriculture (moorland and sheep grazing) the primary land use practice at the locality, which is of relatively low economic value and is commonplace in Northern Ireland.

The CSA has economic value as an operational wind farm, and environmental value as part of the Sperrin AONB, as a carbon store (peat) and as part of a wider peatland area including active peat. However, the CSA is not unique in providing these environmental benefits, and hence land use at the CSA is assessed as being of importance at the Derry City and Strabane Council level, and hence of low sensitivity (see Table 14.3).

14.4.3 Local and Regional Socio-Economic Baseline

Between 2020 and 2043, the population of Derry City and Strabane is expected to fall, while the populations of both Northern Ireland and the UK are expected to rise. These trends are largely based on the area's limited attractiveness with regards to economic opportunities, as Derry City and Strabane experiences higher levels of deprivation compared to Northern Ireland as a whole. This is also reflected in relatively smaller shares of the population with degree level qualifications and lower levels of economic activity (see **Technical Appendix A14.1: Economic Impact Assessment of Owenreagh and Craignagapple Wind Farm**).

The Development and the growth generally of the onshore wind sector in Derry City and Strabane provides the area with an opportunity for economic growth. This will be important if demographic projections are to be reversed and a skilled workforce is to be attracted to the area, with the Development expected to support an estimated 90 jobs in Derry City and Strabane during the initial decommissioning and construction phase (see **Technical Appendix A14.1: Economic Impact Assessment of Owenreagh and Craignagapple Wind Farm**).

While employment in Derry City and Strabane is largely concentrated in public sector roles in public administration, education and health, the area has a relatively larger construction sector. This sector will play a role during the decommissioning and construction phase of the Development and could benefit from non-specialised construction activity as part of balance of plants works (see **Technical Appendix A14.1: Economic Impact Assessment of Owenreagh and Craignagapple Wind Farm**).

14.4.4 Embedded Mitigation

Embedded mitigation includes measures embodied in the design of the Development to eliminate or reduce negative effects that would otherwise occur. These are set out in **Chapter 4: Site Selection and Design**.

14.4.4.1 Tourism and Recreation Mitigation

As there are no tourism resources identified within the CSA, any likely significant effects on tourism and recreation arising from the Development are solely indirect, as a result of changes to the visual environment. A coherent design has sought to minimise such effects, as set out in **Chapter 4: Site Selection and Design** and **Chapter 6: Landscape and Visual Impact Assessment**.

14.4.4.2 Land Use Mitigation

Effects on land use arise as a result of the footprint of the Development. As set out in **Chapter 4: Site Selection and Design**, as much infrastructure of the Operational Owenreagh I and II Wind Farms has been proposed to be re-used as possible, to minimise additional land-take from the Development. In addition, **Technical Appendix A3.2: Draft Habitat Management Enhancement Plan (DHMEP)** sets out how the improvement of habitats will be carried out.

14.4.4.3 Socio-economic Mitigation

Likely significant economic effects of the Development are positive and arise as a result of the initial decommissioning and construction and operational phase employment, direct contributions to the local economy in the form of for example business rates and land lease payments, alongside contributing towards lowering the levelised cost of electricity to the consumer and contributing to low carbon economy policy goals. Embedded mitigation (enhancement) of these effects arises as a direct result of the Development itself increasing the output of the site from 9.6 MW to potentially 67.2 MW, through maximising the Site's generation capacity, when compared to the Operational Owenreagh I and II Wind Farms. The design process outlined in **Chapter 4: Site Selection and Design** sought to balance environmental effects and generation capacity, to maximise generation capacity and associated economic benefits, where this would not lead to unacceptable negative environmental effects.

14.5 Assessment of Likely Significant Effects

The effects arising from the Development have been considered during its decommissioning and construction and operational phases. Effects occurring during the decommissioning and construction phases would be short term effects, and those occurring as a result of the operational phase of the Development would be long-term effects that would be reversible should the Development be decommissioned.

14.5.1 Potential Decommissioning and Construction Effects

14.5.1.1 Tourism and Recreation Effects

This assessment investigates potential decommissioning and construction effects of the Development on the tourism and recreational receptors. Recreational amenity encompasses a range of experiential factors, including visual pleasure, a sense of space, exercise, fresh air, light, company or solitude, tranquillity, appreciating wildlife or other surroundings and other factors, which may include subjective factors. It is not necessarily the case that a significant visual effect (or other type of effect) leads to a significant recreational amenity effect, although it may, and this is considered in the assessments.

The Burn Walk is a recreational resource that is primarily used as a hiking/walking trail. It consists of paths that loop around the Cavanalee River and provide access to Pattens Glen, with a publicly accessible parking area located off Fountain Street.[49] The walking trail is surrounded by mature trees and views to east towards the Development are limited to glimpsed views. Overall, recreational amenity effects during the decommissioning and construction phase of the Development would be negligible, and **not significant** (in accordance with Table 14.5).

Moor Lough as a recreational resource is principally used for angling, and it has a picnic area along its western shore. Visual effects of the Development at this location are assessed in **Chapter 6: Landscape and Visual Impact Assessment**, section 6.9.4, viewpoint 4. At a distance of 1.5 km, the magnitude of change on the views of recreational visitors would be high during the decommissioning and construction phase. The ground level construction works would be mostly screened by the intervening landform. The higher-level construction works, involving the use of tall cranes and the emergence of the turbines, would form a more readily visible feature that would be experienced by recreational visitors over a potentially longer duration. While operational wind turbines are already visible along this ridgeline, the emergence of closer range and larger turbines would from a defining feature. Visitors to the Lough will be generally focused on the Lough and views across the Lough, such that views of the under-construction turbines would be visible obliquely, or across the Lough from its north shore. When considering that visual amenity forms only one part of the recreational amenity and that other aspects will remain unchanged, recreational effects on visitors to Moor Lough will be medium (see Table 14.4). As a receptor with low sensitivity (see section 14.4.1), this results in an effect that is minor and **not significant** (in accordance with Table 14.5).

Knockavoe Hill is named on the Strabane Map; however, there is no public footpath up it shown on OS mapping and it assumed that visitors can access the top of the hill from Evish Road. Views of the Development infrastructure are likely to be available from the north, east and south sides of Knockavoe Hill, so views for walkers would be available from the top, and from the path up if the path is on the north, east or south sides of the hill. Visual effects at this distance are likely to be significant, in accordance with **Chapter 6: Landscape and Visual Impact Assessment**. Visual amenity forms only one part of the recreational amenity, although for hill walkers it may be an important factor. As a result, effects on recreational amenity on Knockavoe Hill Walk are assessed as being of low to medium magnitude, in accordance with Table 14.4. As a receptor with negligible sensitivity, this results in an effect that is negligible, and **not significant** (in accordance with Table 14.5).

Ballyskeagh Stables contains and is largely surrounded by mature trees, and views south-east towards the Development are generally limited to glimpsed views. Overall, recreational amenity

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49 Woodland Trust (2018). The Burn Walk Management Plan 2018-2023. Available at: publicmanagementplan (woodlandtrust.org.uk). [accessed on 04/04/23].

effects during the decommissioning and construction phase of the Development would be negligible, and **not significant** (in accordance with Table 14.5).

Balix Hill walk, although not identified specifically on maps, is assumed to lead from a public road to the top of Balix Hill. Views of the Development infrastructure are likely to be available from the south, west and north sides of Balix Hill, so views for walkers would be available from the top, and from the path up if the path is on the south, west or north sides of the hill. Visual effects at this distance are likely to be significant, in accordance with **Chapter 6: Landscape and Visual Impact Assessment**. Visual amenity forms only one part of the recreational amenity, although for hill walkers it may be an important factor. As a result, effects on recreational amenity on Balix Hill Walk are assessed as being of low to medium magnitude, in accordance with Table 14.4. As a receptor with negligible sensitivity, this results in an effect that is negligible, and **not significant** (in accordance with Table 14.5).

Residents and visitors to Wilson's Ancestral Home would experience a medium-low magnitude of visual effect from locations along the access track, but views of the Development from the property would be screened by vegetation, as assessed in **Chapter 6: Landscape and Visual Impact Assessment** (section 6.9.6, viewpoint 6). When considering that visual amenity forms only one part of the recreational amenity and that visitors will be focused on the historical nature and occupation of the property rather than views from the access track, effects on recreational amenity at Wilson's Ancestral Home are assessed as being of negligible magnitude. As a receptor with low sensitivity (see section 14.4.1), this results in an effect that is negligible and **not significant** (in accordance with Table 14.5).

The Development is unlikely to be visible from Clogherny Wedge Tomb, any glimpse visibility would be limited to 1-4 blade tips. As the receptor is over 4 km from the Development and visual amenity forms only one part of the recreational amenity and that visitors will be focused on the historical nature of the Scheduled Monument rather than views from the monument itself, effects on recreational amenity at Clogherny Wedge Tomb are assessed as being of negligible magnitude. As a receptor with low sensitivity (see section 14.4.1), this results in an effect that is negligible and **not significant** (in accordance with Table 14.5).

Anglers at Lough Ash would be predominantly focused on their sport. Figure 6.9 suggests that views of the Development turbines may be visible, and at 4.4 km from the CSA, it is possible that visual effects would be assessed as significant (in accordance with general findings in **Chapter 6: Landscape and Visual Impact Assessment**). However, given that the visual environment is not the principal component of recreational amenity at Lough Ash, the magnitude of effect on recreational amenity at Lough Ash is assessed as low. As a receptor with low sensitivity (see section 14.4.1), this results in an effect that is negligible and **not significant** (in accordance with Table 14.5).

Visitors to Lough Ash Wedge Tomb would be predominantly focused on the feature itself, and the information board. The walk from the public road is c. 30 m in length, in a north-south direction, while the Development is to the southwest. Figure 6.9 suggests that views of the Development turbines may be visible, and at 5 km from the CSA, it is possible that visual effects would be assessed as significant (in accordance with general findings in **Chapter 6: Landscape and Visual Impact Assessment**). However, given that the visual environment is not the principal component of recreational amenity at Lough Ash Wedge Tomb, the magnitude of effect on recreational amenity at Lough Ash Wedge Tomb is assessed as negligible. As a receptor with low sensitivity (see section 14.4.1), this results in an effect that is negligible and **not significant** (in accordance with Table 14.5).

National Cycle Route 92 passes within approximately 4 km to the south of the CSA, to the north of Newtownstewart and west of Plumbridge. There is potential of indirect effects; theoretical visibility along the route would be intermittent. Where this occurs, which is limited to 1-2 km of the route, views would be oblique and unlikely to include all turbines within the Development, due to screening by the ridgeline of Owenreagh Hill, as shown on Figure 6.10, as shown on the ZTV on Figure 6.10 and discussed further in **Chapter 6: Landscape and Visual Impact Assessment**. Cyclists generally look forwards, while cycling, and hence are less likely to be aware of, or focused on, the visual effects that would be oblique to the road. When considering that visual amenity forms only one part of the recreational amenity and that other aspects will remain unchanged, recreational effects on this section of National Cycle Route 92 are assessed as being of low magnitude. As a receptor with medium sensitivity (see section 14.4.1), this results in an effect that is minor and **not significant** (in accordance with Table 14.5).

Visitors to Barrontop Fun Farm would be predominantly focused on the farm and the animals. Figure 6.9 suggests that views of the Development turbines may be visible, and at 5 km from the CSA, it is possible that visual effects would be assessed as significant (in accordance with general findings in **Chapter 6: Landscape and Visual Impact Assessment**). However, given that the Barrontop Fun Farm is permanently closed the potential effect of the Development on the receptor is assessed as negligible. As a receptor with negligible sensitivity (see section 14.4.1), this results in an effect that is negligible and **not significant** (in accordance with Table 14.5).

Bradkeel Forest is a small, publicly-owned forest that is open to walkers, but without facilities. As a forest, any views would be only available from the edge of the forest, or from areas that have recently been clear-felled. At 6.7 km from the CSA, visual effects would be not significant, and overall effects on recreational amenity would be less than this. Potential effects are assessed as being of low magnitude. As a receptor with low sensitivity, this results in a negligible effect that is **not significant** (in accordance with Table 14.5).

The Foyle Canoe Trail begins in Lifford, Ireland, approximately 7.2 km west of the CSA, linked to Strabane, Northern Ireland, by the Lifford Bridge which crosses the River Foyle. The Development would not be visible from the start point, however, areas of the Foyle Canoe Trail to the north of Lifford and Strabane could experience some visibility of the site. Any visibility would be limited, owing to the distance of between 7.2 and 6.4 km from the receptor to the Development. As a receptor with medium sensitivity (see section 14.4.1), this results in an effect that is negligible and **not significant** (in accordance with Table 14.5).

Ligfordrum Wood is a 397 ha woodland managed by Forest Service Northern Ireland for commercial coniferous production open to walkers but without facilities[50]. As a forest, any views would be only available from the edge of the forest, or from areas that have recently been clear-felled. Visual effects would be not significant, and overall effects on recreational amenity would be less than this. Potential effects are assessed as being of low magnitude. As a receptor with low sensitivity, this results in a negligible effect that is **not significant** (in accordance with Table 14.5).

Koram Wood is located 2.5km south of the CSA and covers an area of approx. 45 ha. It has no facilities or parking available. The predominately coniferous woodland is managed by Forest Service Northern Ireland for commercial production. As a forest, any views would be only available from the edge of the forest, or from areas that have recently been clear-felled. Visual effects would be not significant, and overall effects on recreational amenity would be less than this. Potential effects are assessed as being of low magnitude. As a receptor with low sensitivity, this results in a negligible effect that is **not significant** (in accordance with Table 14.5).

Skinboy Wood comprises an area of approx. 140 ha and is located 4 km south of the CSA. The predominately coniferous woodland is managed by Forest Service Northern Ireland for commercial production. No known forestry tracks are located in the bounds of the woodland, but it is listed as publicly accessible. However, no facilities or packing is located at the woodland. As a forest, any views would be only available from the edge of the forest, or from areas that have recently been clear-felled. At 4 km from the CSA, visual effects would be not significant, and overall effects on recreational amenity would be less than this. Potential effects are assessed as being of low magnitude. As a receptor with low sensitivity, this results in a negligible effect that is **not significant** (in accordance with Table 14.5).

Strabane Canal is in proximity to the Foyle Canal Trail, located 6.7 km northwest of the CSA. There is a 3 km Towpath walk from which the Strabane Canal can be viewed. Although the Development may be visible in long distance views from the Towpath, the main focus of the walk is the Strabane Canal itself, with informative signage along the way as part of the Strabane Canal Restoration Project. As a receptor with medium sensitivity (see section 14.4.1), this results in an effect that is negligible and **not significant** (in accordance with Table 14.5).

The International Appalachian Trail (IAT) is a 279-mile-long distance walking trail, 9.3 km south-east of the CSA, starting in West Donegal in the Republic of Ireland which continues into Northern Ireland passing through the Sperrins Mountains, the Causeway Coast and Glens of Antrim before it finishes

[50] Indirect government services (2023). Available at: Ligfordrum Forest | nidirect [accessed on 11/04/2023]

in Larne in County Antrim. An approximate 1.6 km section of the long-distance footpath would have theoretical visibility of the Development, however, as the receptor is over 9 km from the Development, effects on recreational amenity are assessed as being of negligible magnitude. As a receptor with medium sensitivity (see section 14.4.1), this results in an effect that is negligible and **not significant** (in accordance with Table 14.5).

The Ulster Way is the most important walking route in the area, to the east and south of Gortin; to the south of Newtownstewart; and to the north-west of Drumquin. As outlined in Section 6.4.5.4 of **Chapter 6: Landscape and Visual Impact Assessment**, at a minimum of approximately 10 km, and with limited theoretical visibility occurring across short discrete sections of the route, the Ulster Way is not considered to be of relevance to the landscape and visual assessment, especially as some sections of the route which would experience theoretical visibility have existing visibility of operational wind farms in closer proximity than the Development. However, viewpoint 14 (described in section 6.9.14) is representative of the views of walkers on the Ulster Way at its closest point to the Development. The route as a whole is not included in the detailed assessment of principal visual receptors, as only short sections would be affected, which already experience views of existing wind farms. Temporary and short-term visual effects at this viewpoint are assessed as being of “low” magnitude during the decommissioning and construction phase. When considering that visual amenity forms only one part of the recreational amenity, recreational effects are assessed as being of negligible magnitude. As a receptor with high sensitivity (see section 14.4.1), this results in an effect that is minor and **not significant** (in accordance with Table 14.5).

14.5.1.2 Land-Use Effects

During the decommissioning and construction phase, the current land use as moorland with wind farm would change to be a construction site. Actual decommissioning and construction work would be localised to the existing and proposed infrastructure, with the majority of the Land-Use Study Area remaining as upland agriculture (moorland). It is expected that sheep would cease to be grazed within the more immediate surrounds of the Land-Use Study Area, for health and safety reasons. The operational Owenreagh I and II Wind Farms would be removed and replaced with the new Development infrastructure and turbines. The footprint of the infrastructure would increase temporarily, before the habitat management provisions outlined in **Technical Appendix A3.2: DHMEP** were implemented and became effective in restoring to vegetated habitat those aspects of former infrastructure not required for the Development and its future operation and maintenance.

Changes to land use during the decommissioning and construction phase would be of medium magnitude (see Table 14.4), albeit temporary. Combined with a low sensitivity receptor, the land use effects would be minor (see Table 14.5) and **not significant** in terms of the EIA Regulations.

14.5.1.3 Economic Benefits

Direct Benefits

Employment opportunities that may be available for local contractors include:

- Development and planning;
- Balance of plant;
- Turbines; and,
- Grid connection.

The economic impact of the decommissioning and construction phase was estimated for the socio-economic study areas. In order to do this, it was necessary to estimate the proportion of each type of contract that might be secured in each of these three Study Areas (Derry City and Strabane District Council, Northern Ireland, and the UK). **Technical Appendix A14.1: Economic Impact Assessment of Owenreagh and Craignagapple Wind Farm** shows that the largest proportion of capital expenditure will be on turbine related contracts (57%), followed by balance of plant (19%), grid connection (15%) and development and planning (9%). To estimate the ability of businesses across Derry City and Strabane, Northern Ireland, and the UK to carry out the contracts required to develop and build Owenreagh/Craignagapple Wind Farm, an analysis of industries within each of the study areas and the availability of required contractors was undertaken. The assessment drew on evidence from other studies carried out by BiGGAR Economics across the Derry City and Strabane, Northern

Ireland and the UK, and on a report on the economic impact of onshore wind in Northern Ireland commissioned by the Northern Ireland Renewables Industry Group (NIRIG).

On this basis, it was assumed that during the construction period Derry City and Strabane could benefit from total spending of £12.4 million or 13% of capital expenditure. Balance of plant contracts (£4.7 million) will be associated with the greatest level of local benefits, primarily linked with construction and civil engineering activities. Similarly, balance of plant contracts will constitute the largest opportunity for businesses across Northern Ireland and the UK, with Northern Irish contractors expected to receive up to £12.0 million and UK businesses £18.6 million. There will also be opportunities for businesses in Northern Ireland and the UK to carry out most of the grid connection works and development contracts. As turbines will be manufactured outside the UK, local, regional, and national spending on this contract category will be more limited. These expenditures could generate £6.0 million direct GVA in Derry City and Strabane, £15.1 million direct GVA in Northern Ireland and £22.6 million direct GVA across the UK. It is considered that this represents a temporary, positive effect of medium magnitude to the Derry City and Strabane area, low magnitude at the Northern Ireland scale and negligible magnitude at the UK Study scale. This results in an effect on the economy that is of minor significance for each of the Derry City and Strabane area (low sensitivity), Northern Ireland scale (medium sensitivity), and in the UK (high sensitivity) and **not significant**.

Employment during the decommissioning and construction phase are reported in ‘job years’ rather than Full-time Equivalents (FTEs) because the contracts would be short term. It is anticipated that the initial development and decommissioning construction phases would support 90 job years in Derry City and Strabane, 260 job years in Northern Ireland and 390 in the UK. This represents a temporary, positive, low magnitude direct effect in Derry City and Strabane and Northern Ireland, and negligible in the UK. This results in an effect on the economy that is minor in Derry City and Strabane (low sensitivity), Northern Ireland (medium sensitivity), and in the UK (high sensitivity), and **not significant**.

Indirect and Induced Benefits

To estimate indirect impacts, Northern Irish Type 1 GVA and employment multipliers[51] were applied to GVA and employment supported by the decommissioning and construction phase of the Development. It is anticipated that the decommissioning and construction phase would indirectly support 20 job years in Derry City and Strabane, 160 in Northern Ireland and 430 in the UK. Furthermore, Northern Ireland and the UK can expect to receive £7.7 million and £22.8 million, respectively, from indirect impacts, while Derry City and Strabane can expect to receive £1.1 million. In a similar way, those working on the decommissioning and construction of the Development will have an impact on economic activity by spending their salaries and wages (induced economic impact). To estimate this impact, Type 2 Northern Irish GVA and employment multipliers were estimated and applied to the direct GVA, and employment associated with the decommissioning and construction phase. It was estimated that indirect employees would generate 20 job years in Derry City and Strabane, 70 job years in Northern Ireland, and 330 in the UK. This would add £1.3 million GVA in Derry City and Strabane, £4.7 million in Northern Ireland, and £18.7 million in the UK. It is considered that this represents a temporary, positive effect of minor significance to the Derry City and Strabane, Northern Ireland, and UK Study Areas. This results in an effect on the economy that is minor in Derry City and Strabane (low sensitivity), Northern Ireland (medium sensitivity) and in the UK (high sensitivity) and **not significant**.

The total impact during the decommissioning and construction phase is the sum of direct, indirect, and induced impacts from expenditure of direct employees. The total combined impact is estimated to be up to £8.3 million GVA and support 130 years of employment in Derry City and Strabane, £27.4 million GVA and support 500 years of employment in Northern Ireland, £64.1 million GVA and 1,140 years of employment across the UK. It is considered that this represents a temporary effect of minor positive significance to the Derry City and Strabane, Northern Ireland and UK Study Areas. This results in an effect on the economy that is minor in Derry City and Strabane (low sensitivity), Northern Ireland (medium sensitivity), and in the UK (high sensitivity) and **not significant**.

[51] Northern Ireland Statistics and Research Agency (NISRA) (2022), NI Economic Accounts Project - 2017 and 2018 Experimental Results.

14.5.2 Likely Significant Operational Phase Effects

14.5.2.1 Tourism and Recreation Effects

All likely significant effects on tourism and recreation receptors during the operational phase would be indirect, via changes to the visual environment caused by the removal of the Owenreagh I and II Wind Farms, and construction of the 14 proposed new turbines. These effects would be the same as for the decommissioning and construction phase assessed in Section 14.5.1.1, above, because the principal effect during that phase was the visibility of the new turbines. All operational effects on tourism and recreation would be the same as assessed in Section 14.5.1.1, therefore, **no significant effects** on tourism and recreation receptors are likely to occur during the operational phase.

14.5.2.2 Land-Use Effects

During the operational phase, the land use in the study area would change, relative to the baseline, which currently contains the Operational Owenreagh I and II Wind Farms and moorland. This will involve a change from 15 smaller turbines and associated infrastructure and moorland to 14 larger turbines and associated infrastructure and less moorland. The uses of the Site apart from renewables, for active peat and upland agriculture, will continue essentially as per the baseline scenario, although areas will be enhanced for wildlife and carbon storage through measures set out in **Technical Appendix A3.2: DHMEP**. This would be a physical land use change of medium magnitude (see Table 14.4). The value of the land would increase relative to the baseline, as a result of the increased capacity of the repowered windfarm adding to the diversification, low carbon, and sustainable future of the Site. This would lead to a long-term, reversible, positive change of medium magnitude (see Table 14.4). Combined with a low sensitivity, the positive land use effects would be minor (see Table 14.5) and **not significant**.

14.5.2.3 Economic Benefits

Direct Benefits

During the operational phase, the Development will generate economic benefits. It was estimated that each year of operations will result in spending of around £2.0 million. Based on the ability of Northern Irish and UK contractors to deliver the required contracts, it was estimated that £0.5 million would be spent on operations and maintenance contracts in Derry City and Strabane, £1.5 million in Northern Ireland, and £1.8 million across the UK. This represents a long-term, reversible, low magnitude direct positive effect in Derry City and Strabane (low sensitivity), Northern Ireland (medium sensitivity) and the UK (high sensitivity), which is of minor significance in the Study Areas and **not significant** in terms of the EIA Regulations.

Indirect and Induced Benefits

Those directly employed by the Development during the operational phase will have a wider benefit on the economy by spending their salary.

Spending was split across the different contracts performed during operations and maintenance. Sectoral spending was then divided by the relevant turnover per GVA and turnover per job ratios to estimate the direct GVA and employment associated Development. In this way, it was estimated that the Development could support £0.2 million direct GVA and less than 10 direct jobs in Derry City and Strabane, £0.7 million and 10 direct jobs in Northern Ireland, and £0.9 million direct GVA and 10 direct jobs across the UK.

The direct GVA and employment supported by operational spending were then multiplied by the relevant Type 1 and Type 2 GVA and employment multipliers to estimate indirect and induced impacts. Adding together direct, indirect and induced impacts, it was estimated that the operations and maintenance of the Development could each year generate, £0.3 million GVA and support less than 10 jobs in Derry City and Strabane, £1.4 million GVA and support 20 jobs across Northern Ireland, and £2.7 million GVA and 40 jobs across the UK.

This represents a long-term, reversible, low magnitude indirect, positive effect in Derry City and Strabane (low sensitivity), Northern Ireland (medium sensitivity), and the UK (high sensitivity), which is of minor significance in the Study Areas and **not significant** in terms of the EIA Regulations.

14.5.3 Mitigation and Residual Effects

Ørsted may hold a series of meet-the-buyer events, allowing local contractors to learn about opportunities to bid for contracts, and time to upskill prior to any tender process. Ørsted has significant experience in organising these types of events and has a good understanding of the local area's capacity given that it currently operates Owenreagh I and II Wind Farms.

Where possible, training and support for local businesses can be organised to increase their capacity to bid. Ørsted can work to encourage the main infrastructure contractor to work with local contractors partners such as the Department for Energy and the Northern Regional College, which has branches in Ballymoney, Coleraine and Ballymena.

As described in **Technical Appendix A14.1: Economic Impact Assessment of Owenreagh and Craignagapple Wind Farm**, throughout the operation of Owenreagh/Craignagapple Wind Farm, Ørsted has committed to providing community benefits worth £5,000 per MW of installed capacity. Based on a maximum generating capacity of 67.2MW, up to £340,000 would be available each year to those communities living in proximity of the wind farm. This would be used to enhance local communities and contribute to increased local economic activity.

The existing wind farm has already supported a series of projects across the community, including the installation of a defibrillator at Tristan Road, Evish and funding to Owen Roes' GAA Club, Clann na nGael GAA Club, Artigarvan Hall, and the Drummond Centre. The Clann na nGael GAA Club was able to use funding provided by the Owenreagh I and II Community Benefit Fund to complete repairs that allowed the sport club to reopen in 2022 after being closed for the last 2 years.[52] Similarly, funds from the proposed wind farm development will be managed by an independent organisation and allocated to activities supporting local aspirations.

These mitigation measures add confidence in the delivery of the benefits set out and assessed in Sections 14.5.1.3 and 14.5.2.3 for the decommissioning and construction, and operational, phases, respectively. Residual effects remain assessed as minor, at the District Council, Northern Ireland and UK levels, however.

No direct effects are predicted upon any features of tourism or recreational value during the initial decommissioning and construction or operational phases of the Development. No mitigation for the negligible, indirect effects on tourism and recreational receptors is necessary or proposed.

Mitigation (including for ecological net gain) for land use effects has been embedded into the scheme, including the habitat management provisions outlined within **Technical Appendix A3.2: DHMEP**, as set out in Section 14.5, and no further mitigation is proposed.

Given that no mitigation for tourism, recreation and land use effects is proposed beyond that embedded into the Development design, as set out in **Chapter 3: Development Description, Chapter 4: Site Selection and Design,** and Section 14.5 of this chapter, the residual effects are the same as described above.

14.5.4 Cumulative Effect Assessment

This assessment considers the potential for significant effects to occur on relevant receptors when considering adding the Development to a cumulative baseline comprising the current baseline, plus other consented, but not built, windfarm developments and windfarm developments for which a valid planning application has been submitted (Refer to **Technical Appendix 2.4: Cumulative Developments**.

The Development is assessed as having the potential to lead to non-negligible cumulative effects when the effect from the Development alone (see section 14.5) is assessed as being of low, or greater, magnitude.

All other potential cumulative effects were assessed as negligible because the magnitude of change of the Development alone was assessed as being negligible.

[52] Orsted (2022). Local club reopens sports hall after much needed refurbishment. Available at: [Local club reopens sports hall after much needed refurbishment (orsted.ie)] [Accessed July 2023].

14.5.4.1 Tourism and Recreation Cumulative Effect

As tourism and recreation effects are solely indirect, through changes to the visual environment caused by the Development, there is potential for significant tourism and recreation cumulative effects only when there are significant visual cumulative effects. **Chapter 6: Landscape and Visual Impact Assessment**, section 6.11.6, Table 6.8, concluded that no visual receptors or viewpoints would have significant cumulative effects, and therefore there can be no significant cumulative tourism and recreation effects.

14.5.4.2 Land Use Cumulative Effect

Land use effects are direct and apply to the land that is directly affected only. There is no potential for cumulative effects from other wind farm developments at the Development footprint; however, there is potential for minor land use cumulative effects from the proposed overhead power line that will form part of the grid connection for the Dalradian mine and will be located within 29 m of turbine T13 at its closest point to the Development. These cumulative effects to land-use are not significant in terms of the EIA Regulations.

14.5.4.3 Socio-Economic Cumulative Effect

This section considers the cumulative effects on direct employment opportunities and economic benefits, which would arise from the initial decommissioning and construction and operation phases of the Development in conjunction with other wind farms. Wind farms that are operational are considered as part of the baseline. If under-construction, consented and application stage windfarms are constructed and operated there would be economic benefits arising from these schemes that are yet to be realised. There is not a particular geographic scale threshold for considering cumulative wind farm developments, because the positive effects of the Development were assessed as non-negligible at local, regional and national scales (see section 14.5.1.3) and hence wind farm development across these scales will contribute to cumulative effects from the Development at each of these scales.

Direct Employment Opportunities

The more other wind farms are constructed and operated locally, regionally and nationally, the greater the benefits to the economy at those scales. Should all of the schemes identified in **Technical Appendix A2.4: Cumulative Developments** be constructed and operated, the cumulative effect on direct employment will be positive for the Northern Ireland and UK Study Areas. The contribution of the Development to this positive effect is assessed as being of positive effect, with minor magnitude.

Indirect Economic Benefits

As for direct employment opportunities, should all of the schemes identified in **Technical Appendix A2.4: Cumulative Developments** be constructed and operated, the cumulative indirect effect on the economy will be positive for the Study Areas. The contribution of the Development to this positive effect is assessed as being of positive, with minor magnitude.

14.6 Summary of Effects

Table 14.7 summarises the effects assessed in this chapter.

Table 14.7. Summary of Effects. All effects are negative, unless otherwise stated.

Receptor	Potential Effect	Significance of Effect	Mitigation/ Enhancement Proposed	Residual Effect	Cumulative Effect
Decommissioning / Construction Phase					
Tourism and Recreation					

Receptor	Potential Effect	Significance of Effect	Mitigation/ Enhancement Proposed	Residual Effect	Cumulative Effect
Burn Walk	Recreational amenity	Negligible	None	Negligible	Negligible
Moor Lough	Recreational amenity	Minor	None	Minor	Negligible
Knockavoe Hill	Recreational amenity	Minor	None	Negligible	Negligible
Ballyskeagh Stables	Recreational amenity	Negligible	None	Negligible	Negligible
Balix Hill Walk	Recreational amenity	Negligible	None	Negligible	Negligible
Wilson Ancestral Home	Recreational amenity	Negligible	None	Negligible	Negligible
Clogherny Wedge Tomb	Recreational amenity	Negligible	None	Negligible	Negligible
Lough Ash	Recreational amenity	Minor	None	Minor	Negligible
Lough Ash Wedge Tomb	Recreational amenity	Minor	None	Minor	Negligible
National Cycle Network Route 92	Recreational amenity	Minor	None	Minor	Negligible
Barrontop Fun Farm	Recreational amenity	Minor	None	Minor	Negligible
Bradkeel Forest	Recreational amenity	Negligible	None	Negligible	Negligible
Foyle Canoe Trail	Recreational amenity	Negligible	None	Negligible	Negligible
Ligfordum Wood	Recreational amenity	Negligible	None	Negligible	Negligible
Koram Wood	Recreational amenity	Negligible	None	Negligible	Negligible
Skinboy Wood	Recreational amenity	Negligible	None	Negligible	Negligible
Strabane Canal	Recreational amenity	Negligible	None	Negligible	Negligible
International Appalachian Trail	Recreational amenity	Negligible	None	Negligible	Negligible
Ulster Way	Recreational amenity	Minor	None	Minor	Negligible

Receptor	Potential Effect	Significance of Effect	Mitigation/ Enhancement Proposed	Residual Effect	Cumulative Effect
Land Use					
The land use within the Development footprint	Change from moorland to construction site	Minor	None	Minor	None
Socio-Economic					
Derry City and Strabane District Council	Direct employment opportunities and increased economic activity	Minor, positive	Meet the buyer events. Training and support for local businesses. Preferential weighting for local employment in tenders.	Minor, positive	Minor, positive
Northern Ireland		Minor, positive		Minor, positive	Minor, positive
United Kingdom		Minor, positive		Minor, positive	Minor, positive
Operational Phase					
Tourism and Recreation					
All receptors	Same as for the decommissioning / construction phase, above				
Land Use					
The land use within the Development footprint	Change from small wind farm and moorland to moorland and large wind farm	Minor, positive	None	Minor, positive	None
Socio-Economic					
Derry City and Strabane District Council	Direct employment opportunities and increased economic activity	Minor, positive	Community benefit fund of £5,000 per MW installed capacity per year.	Minor, positive	Minor, positive
Northern Ireland		Minor, positive		Minor, positive	Minor, positive
United Kingdom		Minor, positive		Minor, positive	Minor, positive

14.7 Statement of Significance

No significant residual effects are likely on tourism and recreation as a result of the initial decommissioning and construction phase or operational phase of the Development. No significant cumulative effects are likely on tourism and recreational receptors.

No significant residual effects are likely on land use as a result of initial decommissioning and construction phase or operational phase of the Development. No significant cumulative effects are predicted on the land use.

Positive effects on local employment and the District Council, Northern Ireland and UK economies are likely during the decommissioning and construction phase and operational phase of the Development. These effects will not be significant in terms of the EIA Regulations. When added to a baseline including other proposed wind farm developments at the local, Northern Ireland and UK scales, minor, positive cumulative effects from the Development are predicted on local employment and the District Council, Northern Ireland and UK economies, which also would not be significant.

The Netherlands
New Zealand
Norway
Panama
Peru
Poland
Portugal
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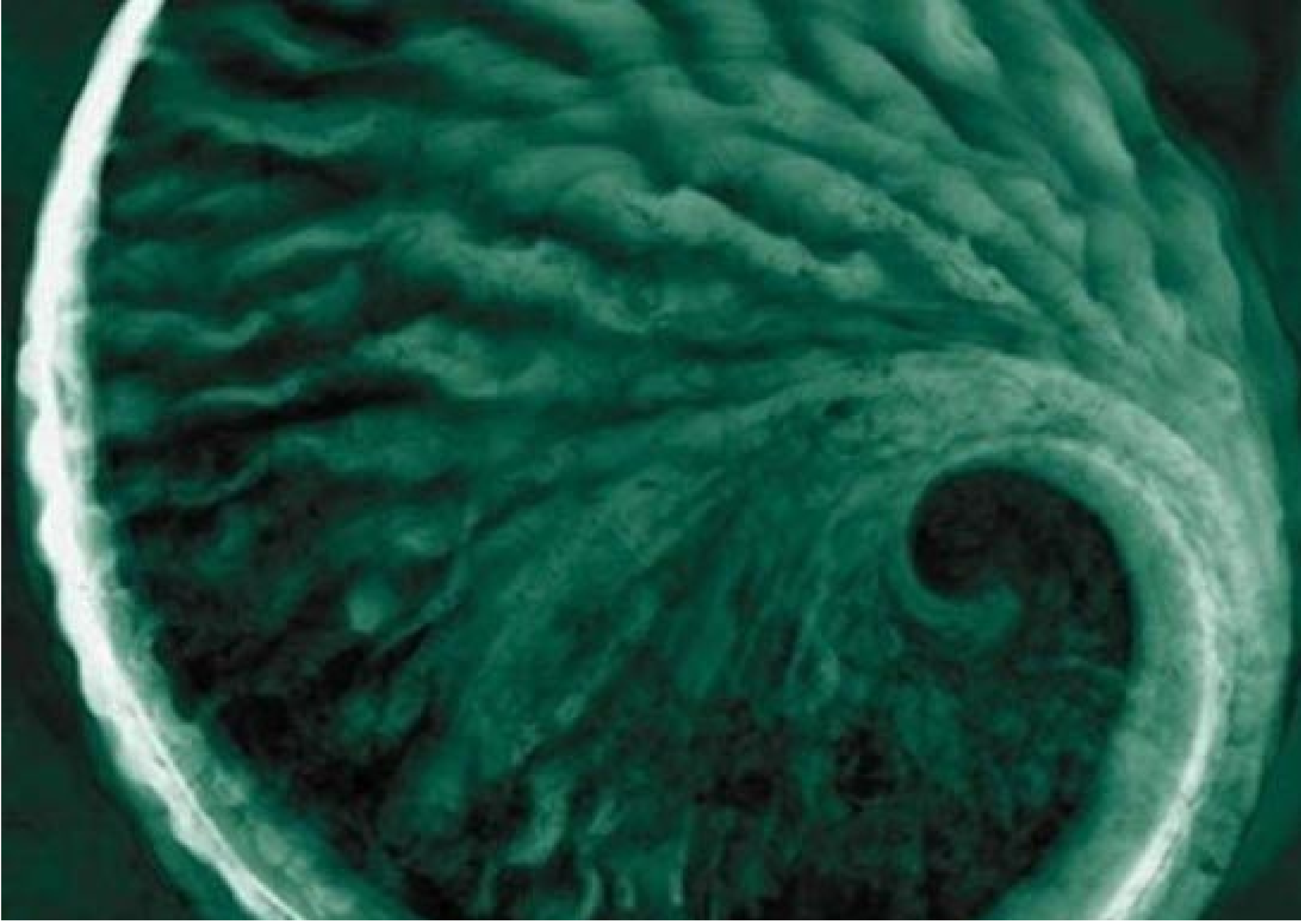

Ørsted Onshore Ireland Midco Limited

Owenreagh/Craignagapple Wind Farm

Environmental Statement- Chapter 15 Other Issues

06 September 2023

Project No.: 0696177

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The business of sustainability

Signature Page

06 September 2023

Owenreagh/Craignagapple Wind Farm

Environmental Statement- Chapter 15 Other Issues

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CONTENTS

List of Tables

Acronyms and Abbreviations

Name	Description
ALV	Abnormal Load Vehicles
BFS	Belfast International Airport
CAA	Civil Aviation Authority
CCIA	Climate Change Impact Assessment
CDM	Construction, Design and Management
CSN	Communication, Navigation and Surveillance
DAERA	Department of Agriculture, Environment and Rural Affairs
DECC	Department of Energy and Climate Change
EC	European Commission
GIS	Geographical Information Systems
HGV	Heavy Goods Vehicle
HHIA	Human Health Impact Assessment
IEMA	The Institute of Environmental Management and Assessment
NATS	National Air Traffic Services
NIEA	Northern Ireland Environmental Agency
oDCEMP	Outline Decommissioning Environmental Management Plan
PAC	Planning Appeals Commission
PSR	Primary Surveillance Radar
RAF	Royal Air Force
RVAA	Residential Visual Amenity Assessment

15 OTHER ISSUES

15.1 Introduction

This chapter of the Environmental Statement (ES) evaluates the effects of the Development on issues not covered elsewhere in the ES, which include:

- Telecommunications and Utilities;
- Shadow Flicker;
- Aviation and Radar;
- Human Health (including major accidents and disasters);
- Climate Change (including a carbon balance assessment); and,
- In-combination effects associated with the interrelationships between ES chapters.

This assessment was undertaken by Environmental Resources Management (ERM) Limited . The assessment considers the potential significant effects of the Development during the following phases of the Development:

- Decommissioning of the operational Owenreagh I and II Wind Farms (initial phase of the Development);
- Construction of the Development (likely to occur partly in tandem with the above phase);
- Operation of the Development; and,
- Decommissioning of the Development (final phase).

The decommissioning of the operational Owenreagh I and II Wind Farms and the construction of the Development is likely to occur partly in tandem and would have a greater effect than if the two processes were to arise at different times. This represents a worst-case scenario for assessment purposes. Any effects arising as a result of the future decommissioning of the Development are considered to be no greater than the effects arising when these first two phases are combined. As a result, the final decommissioning phase has not been considered further in this assessment.

This chapter of the ES is supported by the following Figures provided in **Volume 3a**:

- **Figure 15.1 – Telecoms Links and Proposed NIE Overhead Power Line.**
- This Chapter of the ES is supported by the following Technical Appendix documents provided in **Volume 4** ES Technical Appendices:
- **Technical Appendix A15.1: Shadow Flicker Assessment; and,**
- **Technical Appendix A15.2: Carbon Balance Assessment.**

This Chapter includes the following elements:

- Introduction;
- Individual assessments of each the topics listed above (including methodology, baseline, and summary of potential effects and appropriate mitigation); and,
- Statement of Significance.

15.2 Telecommunications and Utilities

15.2.1 Scope

Due to the size and nature of wind turbines, they have the potential to interfere with electromagnetic signals passing above ground during operation, or existing infrastructure buried below ground during any decommissioning and construction activity. Infrastructure affected can include telecommunication links, microwave links, television reception and overhead and underground utility cables.

Microwave links can be affected by reflection, diffraction, blocking and radio frequency interference caused by wind turbines in their line of sight or in proximity to the paths of the links. In general, the directional nature of telecommunications and microwave links means that interference can be avoided by defining clearance zones beyond which any degradation of the links will be insignificant.

15.2.2 Assessment Methodology

The potential effects assessed in this chapter have been identified through consultation and desk based technical assessments. Effects during the decommissioning and construction phase are classed as temporary, short-term effects. Potential effects which are associated with the operational phase of the Development are classified as long-term, but reversible should the Development be decommissioned.

It is industry practice not to assess the effects on telecommunications and utilities links from wind farms during the construction and decommissioning phases because effects are similar, but less than those encountered during the operational phase which is significantly longer in duration. Consequently, this assessment does not further consider effects associated with decommissioning and construction activities on these receptors and will focus on the operational effects to form a robust worst-case assessment.

Effects on these receptors are of a technical nature and where unacceptable effects are predicted to occur, a technical solution may be sought with the owner/operator of the infrastructure to ensure the continued acceptable technical operation of the infrastructure. Following this approach, it is inappropriate to assess the significance of these effects in relation to the Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 in the same way as for other receptors presented in this ES.

15.2.3 Guidance

There are a number of documents which provide guidance on telecommunications and utilities considerations for wind energy developments. The guidance documents considered in this assessment are:

- Department for the Environment (2009), Planning Policy Statement 18: Renewable Energy[1];
- Ofcom (2003) Guidelines for Improving Digital Television and Radio Reception[2]; and,
- Ofcom (2009) Tall Structures and Their Impact on Broadcast and Other Wireless Services[3].

The potential effects as a result of the Development have been assessed with reference to the above documents.

Best Practice Guidance to Planning Policy Statement 18: Renewable Energy[2] makes reference to the potential of wind turbines to affect electromagnetic signals. Paragraph 1.3.59 states that "*provided careful attention is paid to siting, wind turbines should not cause any significant adverse effects on communication systems which use electromagnetic waves as the transmission medium*".

This document also provides guidance on how turbine siting can mitigate potential impacts. Paragraph 1.3.61 states that "*specialist organisations for the operation of the electromagnetic links typically require a 100 m clearance either side of a link of sight link from the swept area of turbine blades, although some operators are willing to accept Fresnel zones of avoidance".* Fresnel zones surround telecommunication links, which, if impinged upon, can degrade the quality of the telecommunication link; the size of the Fresnel zone is dependent on the frequency and length of the link.

[1] Department of the Environment (2009). Planning Policy Statement 18: Renewable Energy. Available online at: Planning Policy Statement 18 'Renewable Energy' Best Practice Guidance (infrastructure-ni.gov.uk) [Accessed on 06/12/2022].

[2] OFCOM (2003). Guidelines for Improving Digital Television and Radio Reception, OFCOM, United Kingdom. Available online at: http://ofcom.org.uk/static/archive/ra/publication/ra_info/ra415/ra415.htm [Accessed 08/12/2022].

[3] OFCOM (2009). Tall Structures and Their Impact on Broadcast and Other Wireless Services, OFCOM, United Kingdom. Available online at: Microsoft Word - Guidance_FINAL_V3.doc (ofcom.org.uk) [Accessed 08/12/2022].

15.2.4 Consultation

Consultation with the relevant organisations was initiated during the initial stages of the EIA to identify any potential microwave or telecommunication links that could be affected by the Development. An area of search was specified as a 2 km radius of the approximate centre point of the turbine envelope. Ofcom monitors the fixed microwave links throughout the UK, whereas JRC manages the radio spectrum used by the UK Fuel and Power Industry. Atkins undertakes a similar role for the water industry (although does not manage links operated by NI Water). The findings are summarised in Table 15.1.

Table 15.1. Summary of Consultation Responses on Telecoms

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Adelphi Net1 ltd	Email 08/09/2021	No objections to the Development.	
NI Water	Email 30/11/2021	No objections to the Development.	
Arqiva	Letter/Email 06/12/2021	Further information on turbine specifications requested on 05/11/2021 due to the presence of a transmit link and two (2) receiving links in the area surrounding the development that could be impacted. Turbine T9 identified as key risk. Additional correspondence confirmed that the current Development design is not likely to impact Arqiva's nearby infrastructure but technical assessment will be required if the Development design changes.	Turbine specifications provided for T2, T6, T7, and T9 following Arqiva's initial response. Further consultation conducted to discuss potential mitigation measures and modelling completed to more accurately define the buffer zones after Development design changes. The nearest turbine blade tip (T2) to the links is 117.9m away, which is outside the 100m buffer zone. Further details assessing the potential effects of the Development on Arqiva telecoms infrastructure is provided in Section 15.2.5.1.
BT Radio Network Connection	Email 15/08/2021	No impacts to BT's planned or existing radio links anticipated.	
PSNI Information and Communication Services	Email 04/11/2021	No impacts to PSNI telecoms infrastructure anticipated but technical assessment will be required if current Development design changes.	
UK Crown Bodies-D.I.O LMS	Email 11/08/2021	No objections to the Development.	

Vodafone (on behalf of Northern Ireland Electric (NIE) and System Operator Northern Ireland (SONI))	Email 13/10/2021	No objections to the Development.*	

* Refer to Section 15.2.5.2 for further details regarding NIE's response.

15.2.5 Assessment of Effects

15.2.5.1 Telecommunications and Television Reception

Details of the Development have been shared with the known link operators, in the first instance this consisted of a request to Ofcom to provide a list of known telecommunication links within 2 km of the centre of the Site. Ofcom identified several telecommunication link operators with links in the area, as identified in Table 15.1.

NI Water Ltd, Vodafone, SONI, NIE, PSNI, Adelphi Net1 Ltd., Defence Infrastructure Organisation (DIO), and BT do not object to the Development.

Arqiva operates microwave links between Strabane Mast and two masts (Claudy and Muldonagh) to the north. The links pass between turbines 3 and 4, but higher than the turbines, and not reaching within 100 m of any turbine blade tips. Arqiva advised that there is a risk of reflections and other interference from the nearest turbines on these two links, which could reduce the quality of the link communication below accepted standards. These are represented on Figure 15.1.

Further consultation was undertaken with Arqiva regarding potential impacts to the Claudy and Muldonagh links from the Development. A 3-D model was created for each of the turbines to further evaluate potential effects to the aforementioned Arqiva assets. The model accounted for the hub height and turbine blade length, measuring the distance from the blade tip to Arqiva's assets in the area. Turbine T2 was closest to the Claudy mast's Fresnel zone and was located approximately 118 m away, whilst turbine T3 was located the nearest to the Muldonagh mast's Fresnel zone at approximately 132 m. A summary of the model results is represented in Table 15.2 below.

Table 15.2. Summary of Turbine Blade Tip Distances from Arqiva Assets

Turbine No.	Potentially Impacts Arqiva Asset	Distance (m)
T1	Muldonagh	426.0
T2	Claudy	117.9
T3	Muldonagh	132.2
T4	Claudy	186.2
T5	Claudy	334.5
T6	Claudy	506.5
T7	Claudy	322.8
T8	Claudy	820.3
T9	Claudy	1223.6
T10	Claudy	1338.5
T11	Claudy	1011.3
T12	Claudy	710.8
T13	Claudy	707.0

Turbine No.	Potentially Impacts Arqiva Asset	Distance (m)
T14	Claudy	1176.7

As shown on Table 15.2 above, none of the Development's turbines will interfere with the 100 m buffer zone defined by Arqiva; therefore, no potential significant effects are anticipated. If micrositing of the turbines results in the turbine blade tips for T2 and/or T3 encroaching upon 100 m buffer zone, mitigation measures are available and will be developed with Arqiva following consultation. Following consent for the Development, if required, an agreement with Arqiva will be put in place to implement the mitigation prior to the decommissioning and construction phase of the Development, to ensure that communication between the masts continues to be effective during all phases of the Development.

Based on the information received during consultation, the remote nature of the Development from properties, and the results from 3-D modelling, **no significant** effects per the EIA Regulations are predicted on telecommunications or radio reception as a result of the Development.

15.2.5.2 Utilities

Development traffic will use public roads for site access and a combination of new and existing site tracks for accessing the area in which the operational Owenreagh I and II Wind Farm turbines are sited, and in which the proposed new turbines would be sited. Beyond the operational Owenreagh I and II Wind Farms there are no known existing utilities on the Site. An overhead power line was located close to the site entrance; however, this has recently been decommissioned.

During initial consultation NIE indicated that they had no existing utilities on the Site and no objections to the Development. Further consultation subsequently identified that NIE have applied for a 33kV wooden-pole overhead power line (Planning Application Reference LA11/2019/1000/F), which would be located within 29 m and 50 m of turbines T13 and T14, respectively.

The 33 kV power line involving both construction of above ground 33 kV overhead line supported by wooden poles and underground 33kV cable laid below ground level in ducts, to serve Curraghinalt mine (referred to as Dalaradian mine throughout this report). The 33 kV power line in proximity to T13 and T14 is an overhead line supported by wooden poles. This 33 kV is currently under consideration (Planning Ref: LA10/2017/1249/F).

The grid connection application (LA11/2019/1000/F) and the Dalradian mine application are set to be subject to public inquiry by the Planning Appeals Commission. At the time of writing this ES, the date for the public inquiry hearings have not been scheduled by the PAC, however the PAC commissioner has been appointed.

The earthworks for the decommissioning and construction phase activity are proposed on the site of the operational Owenreagh I and II Wind Farms, and there are no buried utilities other than the operational Owenreagh I and II Wind Farm infrastructure.

As a result, the potential for damage to any utilities infrastructure during the decommissioning and construction phase is low, and services checks will be carried out pre-construction to minimise potential effects and ensure relevant health and safety legislation is complied with. If the aforementioned 33 kV overhead powerline is consented, mitigation measures will be decided in consultation with NIE.

During operation, no disturbance to existing utilities is anticipated.

15.2.5.3 Cumulative Effects

Planned and operational wind turbines within 30 kilometres of the Development were identified and agreed with DfI Planning, as detailed in **Technical Appendix A2.4: Cumulative Developments**. Potential cumulative effects to telecommunications and utilities are unlikely as the Development. Given the pre-consent status of the proposed 33 kV overhead powerline associated with the Dalradian mine, it is unlikely that this will result in potential significant cumulative effects. If consented, mitigation measures to reduce any potential cumulative effects associated with the Development and the overhead powerline will be decided in consultation with NIE. As such, potential cumulative effects to telecommunications and utilities from the Development are **not significant** per the EIA Regulations.

15.2.6 Summary of Effects

Telecommunication and television/radio providers were contacted during scoping to identify potential effects to any known assets within a 2 km radius of the Development. Arqiva advised that there is a risk of reflections and other interference from the nearest turbines on the Claudy and Muldonagh links, which could reduce the quality of the link communication below accepted standards if the links' Fresnel zones pass within less than 100 m of the turbines. A 3D model was created to investigate potential effects to these links and it was determined that none of the Development turbines encroach upon the 100 m buffer zone defined by Arqiva (refer to Table 15.2). Therefore, it was determined that any potential effects would be negligible, long term in duration, and reversible.

Any effects arising from alterations to the existing utility infrastructure will be short-term and temporary. These effects would only occur for a short duration during the decommissioning and construction phase whilst the necessary works are carried out and will be accounted for in pre-construction utility checks. No potential effects to existing utilities are anticipated during operation of the Development.

There are **no significant effects** predicted on telecommunications, television/radio reception or utilities as a result of the Development.

15.3 Shadow Flicker

15.3.1 Scope

Shadow flicker is an effect that can occur when the sun moves behind a wind turbine rotor and the shadows of moving wind turbine blades passing over a small opening (window) within a property, briefly reducing the intensity of light within the room and causing a flickering to be perceived. The likelihood and duration of shadow flicker depends upon the positioning of the sun, turbine and window locations, turbine orientation, time of day, time of the year and weather conditions.

Flickering light can have the potential to cause disturbance and annoyance to residents if it affects occupied rooms of a house. Individuals with photosensitive epilepsy can be sensitive to flickering light that is usually in the range of 3-50 Hertz (Hz). The frequencies of flicker caused by modern turbines (less than 1 Hz) are below the frequencies known to trigger effects in these individuals[4] and therefore shadow flicker from turbines is not predicted to affect any individuals with photosensitive epilepsy. These effects are therefore scoped out and not considered further in this assessment. Potential effects are considered in the context of nuisance.

15.3.2 Assessment Methodology

The potential effects assessed in this Chapter have been identified through desk-based technical assessments in line with the Best Practice Guidance detailed in Section 15.3.2.1 and **Technical Appendix A15.1: Shadow Flicker Assessment**.

15.3.2.1 Guidance

Guidance presented within the Best Practice Guidance to PPS18: Renewable Energy describes shadow flicker as an effect that: "*Under certain combinations of geographical position and time of day, the sun may pass behind the rotors of a wind turbine and cast a shadow over neighbouring properties. When the blades rotate, the shadow flicks on and off; the effect is known as 'shadow flicker'. It only occurs inside buildings where the flicker appears through a narrow window opening. A single window in a single building is likely to be affected for a few minutes at certain times of the day during short periods of the year. The likelihood of this occurring and the duration of such an effect depends upon:*

- *the direction of the residence relative to the turbine(s);*

[4] Epilepsy Action, (2007), Photosensitive Epilepsy. Available online at: http://www.epilepsy.org.uk/info/photosensitive-epilepsy [Accessed 08/12/2022].

- *the distance from the turbine(s);*
- *the turbine hub-height and rotor diameter;*
- *the time of year;*
- *the proportion of day-light hours in which the turbines operate;*
- *the frequency of bright sunshine and cloudless skies (particularly at low elevations above the horizon); and,*
- *the prevailing wind direction*."

Problems caused by shadow flicker are rare. At distances greater than ten rotor diameters from a turbine, the potential for shadow flicker is very low. The seasonal duration of this effect can be calculated from the geometry of the machine and the latitude of the site. Where shadow flicker could be a problem, developers should provide calculations to quantify the effect and where appropriate take measures to prevent or ameliorate the potential effect, such as by turning off a particular turbine at certain times.

Careful site selection, design and planning, and good use of relevant software, can help avoid the possibility of shadow flicker in the first instance. It is recommended that shadow flicker at neighbouring offices and dwellings "within 500 m should not exceed 30 hours per year or 30 minutes per day".

Planning Practice Guidance for Renewable and Low Carbon Energy[5] was published by the UK Government Department for Communities and Local Government in 2013. Although this guidance only applies in England, it provides additional technical information on onshore wind power which is still applicable. The Planning Practice Guidance describes the conditions in the UK under which flicker might occur and states that "*only properties within 130 degrees either side of north, relative to the turbines can be affected at these latitudes in the UK – turbines do not cast long shadows on their southern side*".

A detailed study was undertaken by Parsons Brinckerhoff Consultants on behalf of the Department of Energy and Climate Change (DECC) in 2011 to update the government's evidence of shadow flicker[6]. This research drew the following conclusions:

- "*The study area of 130 degrees north detailed in the current government guidance was considered appropriate;*
- *It confirmed that there is unlikely to be a significant effect at distances greater than 10 rotor diameters; and*
- *The frequency of flicker from modern wind turbines is unlikely to cause any health effects and nuisance and is not considered as a significant risk*."

15.3.2.2 Study Area

In line with the PPS18 on onshore wind, a 'Study Area' of ten rotor diameter distance (1,360 m) and 130 degrees either side of north around each proposed turbine location was mapped using a Geographical Information System (GIS).

[5] Department for Communities and Local Government, (2013), Planning Practice Guidance for Renewable and Low Carbon Energy. Available online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/225689/Planning_Practice_Guidance_for_Renewable_and_Low_Carbon_Energy.pdf. [Accessed 08/12/2022].

[6] Department of Energy and Climate Change (DECC), (undated), Update of UK Shadow Flicker Evidence Base. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48052/1416-update-uk-shadow-flicker-evidence-base.pdf [Accessed 08/12/2022].

15.3.3 Consultation

Consultation with the relevant organisations was initiated during the initial stage of the EIA to identify potential shadow flicker effects that could be linked to the Development. A summary of the findings is detailed in Table 15.3.

Table 15.3. Summary of Consultation Responses on Shadow Flicker

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Department for Infrastructure	Letter 13/10/2022	Shadow flicker assessment is required if any residential properties fall within ten times the rotor diameter distance of the turbines and within 130 degrees either side of north.	20 receptors, 17 of which are habitable, were identified within a ten rotor diameter distance of the turbines. As such a shadow flicker assessment was conducted and potentially significant effects were identified for several receptors. Mitigation measures have been proposed and will render potential effects **not significant** in terms of the EIA regulations. Refer to **Technical Appendix A15.1: Shadow Flicker Assessment** for further details.

15.3.4 Assessment of Effects

There are 20 dwellings, 17 of which are habitable, within a ten rotor diameter distance of the turbines. Potential shadow flicker effects were assessed based on the recommended threshold of 0.5 hours per day and/or 30 hours per year. It was determined that six of the receptors, three of which have a financial interest in the Development, were calculated as theoretically having potential to experience periods shadow flicker exceeding the threshold. Mitigation may be required if shadow flicker is annoying to residents of these properties. Potential mitigation measures could include the following:

- Control at Property: the provision of blinds, shutters, or curtains to affected properties;
- Control on Pathway: for example, screening via planting close to an affected property; and,
- Control at Source: for example, a shutdown of turbines at times when effects occur.

Implementation of appropriate mitigation (preferable control at the source), if required, will ensure that shadow flicker levels remain below the recommended threshold at all neighbouring properties, such that shadow flicker effects due to the operation of the Development are **not significant** as per the EIA Regulations.

15.3.4.1 Cumulative Effects

Screening was conducted to identify any other developments within a ten rotor diameter distance of the Development that could potentially contribute to cumulative shadow flicker effects. No other developments were within the specified buffer zone where cumulative shadow flicker effects could occur; therefore, a detailed cumulative assessment of shadow flicker is not required and no cumulative shadow flicker effects are likely.

15.3.5 Summary of Effects

Potential significant shadow flicker effects were identified for six receptors within the Study Area. Implementation of appropriate mitigation, as outlined in Section 15.3.4 above, will ensure that shadow flicker levels remain below the recommended threshold at all neighbouring properties, such that shadow flicker effects due to the operation of the Development are negligible and **not significant** as per the EIA Regulations.

15.4 Aviation and Radar

15.4.1 Scope

The operation of wind turbines has the potential to cause a variety of adverse effects on aviation during turbine operation. These include but are not limited to:

- Physical obstructions;
- Generation of unwanted returns on Primary Surveillance Radar (PSR); and,
- Adverse effects on overall performance of Communications, Navigation and Surveillance (CNS) equipment.

The Site is 72 km west of Belfast International Airport (BFS), 95 km west of George Best Belfast City Airport, 26 km west of City of Derry Airport, and 68 km east of Donegal Airport. The turbines of the operational Owenreagh I and II Wind Farms are not within the safeguard area of BFS's primary surveillance radar, and have been accommodated to date by both the airport and NATS (En Route) Plc (NATS), which also uses the BFS radar. The operational Owenreagh I and II Wind Farms are not in radar line of sight of Belfast City Airport's radar and the City of Derry Airport does not currently have radar facilities. The Development is also beyond Derry Airport's obstacle limitation surfaces.

There are no active Royal Air Force (RAF) bases within 50 km of the Site; however, several private airfields were identified to the west and north of the Development, with the closest private airfield being the Dunnamanagh Airstrip to the north. The proposed turbines are 156.5 m in height and could potentially impact the operations of these nearby private airfields. In accordance with the CAA Policy Statement *'Lighting of Onshore Wind Turbine Generators in the UK with a maximum blade tip height at or in excess of 150m Above Ground Level'*[7] aviation lighting is required to mitigate these potential impacts to aircraft travelling above the Development.

It is proposed to install lighting at the turbines located on the periphery of the wind farm (T1, T2, T7, T10, T12, T13, and T14). The lighting proposed is steady and red, with a medium intensity of 2000 candela (cd). In conditions where visibility extends beyond 5 km the intensity of the lighting will be dimmed to 10% of its full intensity, which is 200cd. In conditions where visibility does not extend beyond 5 km the full intensity at 2,000 cd will be dimmed naturally by the poor visibility. These lights will be fixed on the hubs of the turbines. Three low intensity lights (32 cd) would also be fitted at an intermediate height on all the turbines. No lighting will be switched on until 'Night' has been reached, as measured at 50 cd/m^2 or darker, which means there will be no effect during the hours of twilight.

15.4.2 Consultation

Consultation with the relevant aviation organisations was initiated during the Scoping process, to identify any potential aviation issues that could be affected by the Development. The findings are summarised in Table 15.4.

[7] https://publicapps.caa.co.uk/docs/33/DAP01062017_LightingWindTurbinesOnshoreAbove150mAGL.pdf

Table 15.4.Summary of Consultation Responses on Aviation

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Belfast International Airport	Email 06/09/2021	Development at the time of consultation was outside the safeguarding area. No objections with the caveat that this decision could change if the size of the safeguarded area changes.	
City of Derry Airport	Email 24/11/2021	No objections to the Development.	
Department for Infrastructure	Letter 13/10/2022	Development should consult Belfast International Airport and City of Derry Airport, whilst also accounting for any private airfields in the vicinity.	Refer to response to CAA below.
NATS	Letter 19/08/2021	Development determined to meet current safeguarding criteria. No objections.	
CAA	Email 03/08/2021	No response, does not engage with Applicants pre-submission.	Due to the proposed turbine height exceeding 150m, it was proposed that aviation lighting is installed on the peripheral turbines of the Development in accordance with the relevant CAA guidance. Taking into consideration the proposed embedded mitigation measures outlined in Section 15.4.1, potential effects to aviation and radar are **not significant** in terms of the EIA Regulations.

15.4.2.1 Cumulative Effects

For potential cumulative aviation and radar effects, only planned and operational wind turbines within 30 kilometres of the Development were considered. This list of developments were agreed with DfI Planning, as detailed in **Technical Appendix A2.4: Cumulative Developments**. Potential cumulative effects to aviation are unlikely as the Development and the planned and operational wind farms in the surrounding area have or will have aviation lighting. Considering that the Development lies outside the relevant radar safeguarded areas, it will not contribute to potential cumulative radar effects. As such, potential cumulative effects to aviation and radar from the Development are **not significant** per the EIA Regulations.

15.4.3 Summary of Effects

With the implementation of the aviation lighting measures outlined above, **no significant** effects to aviation and radar are predicted from the Development per the EIA Regulations.

15.5 Human Health

15.5.1 Scope

As per the EIA Regulations and as agreed at Scoping, a Human Health Impact Assessment (HHIA) has been included as part of the overall EIA process. With respect to the Development, this section would simply draw together the findings of other assessments undertaken as part of the EIA process.

Limited Interactions with humans are possible, and consideration has been given to the findings of the following assessments:

- Traffic and Transportation (**Chapter 13: Traffic and Transport**);
- Noise (**Chapter 12: Noise**);
- Residential Amenity (**Technical Appendix A6.2: Residential Visual Amenity Assessment (RVAA)**);
- Shadow Flicker (**Technical Appendix A15.1: Shadow Flicker Assessment**);
- Health and Safety at Work including best practices (**Chapter 15: Other Issues** and **Technical Appendix A3.1: oDCEMP**); and
- Major accidents and disasters (**Chapter 15: Other Issues** and **Technical Appendix A3.1: oDCEMP**).

The scope of the EIA in respect of Human Health was set out in the Scoping Report (**Technical Appendix A2.1: Scoping Request**) and this was agreed by the Council, with conditions, in its Scoping response, as noted in Table 15.5**.**

Properly designed and maintained wind turbines are a safe technology. Site design and inbuilt buffers from sensitive receptors will minimise the risk to humans from the operation of the turbines. Risks associated with ice build-up, lightning strike and structural failure are removed or reduced through inbuilt turbine mechanisms in modern machines and have been scoped out of the assessment. Potential health impacts are therefore related primarily to decommissioning and construction related impacts, and operational impacts on residential amenity.

15.5.2 Assessment Methodology

The potential effects in this chapter have been identified through technical assessments in line with best practice guidance detailed in Section 15.5.3**.**

The nature and magnitude of the potential effect will determine the people/population affected.

Significance is assessed as per the assessments identified in Section 15.5.1 above.

Cumulative effects are considered in the assessments drawn from **Chapter 12: Noise** and **Chapter 13: Traffic and Transport**, and where relevant these are included in this section.

15.5.3 Guidance

Guidance presented within the Best Practice Guidance PPS18: Renewable Energy states that:

"Development that generates energy from renewable resources will be permitted provided that the proposal, and any associated building and infrastructure, will not result in an unacceptable adverse impact on:

- Public safety, human health, or recreational amenity"

Further guidance has been taken from the Institute of Environmental Management Association (IEMA) (2017) Health in Environmental Impact Assessment. A Primer for a Proportionate Approach[8] and Health and Safety Executives Report entitled The Study and Development of a Methodology of the Estimation of the Risk and Harm to Persons from Wind Turbines[9]. This report concludes that the risk of fatality from wind turbines (at two hub heights or greater from the turbine) is low in comparison to other societal risks. It is roughly equivalent to the risk of fatality from taking two aircraft flights per annum.

15.5.4 Consultation

Table 15.5. Summary of Consultation Responses on Human Health

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Derry City & Strabane Environmental Health Department	Letter 26/08/2021	Approved of methodology and scope outlined in the scoping report. Recommended that background noise data from 2010 be reassessed in the context of the proposed Development. A planning condition to address potential amplitude modulation will be added on the if the Development receives approval. EH would like an assessment to be made of noise from Construction and Decommissioning noise and noise from the substation.	Potential human health effects (including from noise) during the decommissioning and construction phases, the operational phase, and the final decommissioning are summarised in Sections 15.5.7-15.5.12 below. Further information on these potential effects can be found in the Chapters and Technical Appendices of this ES that are identified in Section 15.5.1 above.

15.5.5 Assessment of Effects

The sections below summarise the human health effects on potential receptors identified in the relevant technical assessments referenced within Section 15.5.1 of this Chapter.

15.5.6 Traffic and Transport

The potential effect that traffic and transportation associated with the Development has been considered in **Chapter 13: Traffic and Transport**.

8 IEMA (2017) Health in Environmental Impact Assessment. A Primer for a Proportionate Approach. [Online] Available at https://www.iema.net/assets/newbuild/documents/IEMA%20Primer%20on%20Health%20in%20UK%20EIA%20Doc%20V11.pdf [Accessed 08/12/2022]

9 Health and Safety Executive, 2013, RR968, Study and development of a methodology for the estimation of the risk and harm to persons from wind turbines, Available Online at http://www.hse.gov.uk/research/rrpdf/rr968.pdf [Accessed 08/12/22]

15.5.6.1 Decommissioning and Construction Phase

The temporary increases in traffic levels resulting from construction/decommissioning activities was considered in **Chapter 13: Traffic and Transport,** Section 13.5 where it is noted that although the potential percent increase in traffic generation will be high during the construction and decommissioning phases, this increase must be considered in the context of a low baseline traffic flow.

Potential traffic effects from this increase in traffic generation are assessed in **Chapter 13: Traffic and Transport,** Section 13.6.1. Mitigation measures are both embedded in the design of the Development as discussed in **Chapter 4: Site Selection and Design** and set out in **Chapter 13: Traffic and Transport,** Section 13.7.

The following are the key potential effects associated with access and traffic:

- Accidents and Safety;
- Driver, pedestrian and cyclist delay and amenity;
- Severance;
- Noise and Vibration;
- Hazardous Loads;
- Visual Effects; and,
- Air Quality.

Increased traffic and access associated with decommissioning and construction of the Development could potentially impact road safety in the surrounding area. This is considered in **Chapter 13: Traffic and Transport,** Section 13.6.2**.** Substantial embedded mitigation has been proposed in the form of passing bays, as described in **Chapter 13: Traffic and Transport,** Section 13.3.10. This mitigation will significantly reduce the potential for accidents and safety effects on the single-track roads on the route to Development. It was concluded that the impacts on road safety during the decommissioning and construction phase is negligible and acting on a receptor of low sensitivity; therefore, the potential effects are **not significant** in terms of the EIA Regulations.

Potential driver delays from the Development are considered in **Chapter 13: Traffic and Transport,** Section 13.6.3. Driver delays usually occur at junctions that are operating close to or at capacity. Considering that the roads within the Study Area are operating significantly below capacity any increases in traffic are anticipated to have a low magnitude of change in driver delay on a receptor of low sensitivity. Although some driver delay can be expected to occur on routes due to the slow movement of Abnormal Load Vehicles (ALVs), ALV movements will be scheduled overnight as far as reasonably possible to minimise disruption and residents located on the Abnormal Load Route will be informed of any disruption. Embedded mitigation measures along the route to the Development in the form of passing bays will further reduce any potential driver delays that could result from the Development's decommissioning and construction phase. Any delays will be infrequent and of short duration, hence the potential effects are **not significant** in terms of the EIA Regulations.

Potential effects to pedestrian crossings and amenities are considered **Chapter 13: Traffic and Transport,** Section 13.6.4. The only location on the General Construction Traffic Route which is expected to have any existing pedestrian flows is within the town of Ballymagorry on the A5. The predicted increase in traffic here is below the threshold of significance and the main pedestrian crossing facility within Ballymagorry is a signalised pedestrian crossing. Therefore, the change in pedestrian amenity here is negligible acting on a receptor of low sensitivity. The significance of effect is therefore negligible and **not significant** in terms of the EIA Regulations.

Severance is the effect of splitting communities that exist on both sides of an access route, caused by increases in traffic levels. Severance was considered in **Chapter 13: Traffic and Transport,** Section 13.6.5, where it is noted that the proposed transport route passes through nearby Ballymagorry. Ballymagorry is likely already experiencing severance effects due to its division by the A5, which is a major trunk road with high baseline traffic flows. This indicates that Ballymagorry is a receptor of high sensitivity to potential severance effects, but any potential effects from the Development on severance are likely to be minor due to the receptor already being divided by the A5. It was concluded that the effect of severance during the decommissioning and construction phase is minor and **not significant** in terms of the EIA Regulations.

With regards to noise, vehicles associated with decommissioning and construction phase have the potential to generate noise levels that could impact nearby sensitive receptors (i.e. residential properties). Ground and airborne vibrations were scoped out of this assessment. These potential noise effects are assessed in **Chapter 12: Noise,** Section 12.5.1.2 and **Chapter 13: Traffic and Transport,** Section 13.6.6. However, the Construction Traffic route is an established transport corridor and there should be an expectation that it is used by heavy goods vehicle (HGV) traffic. Combined with the short term and temporary nature of the increase in traffic movements, it is considered that the effect of noise upon receptors along the route would range from minor to negligible, and **not significant** in terms of the EIA Regulations.

Fuel will be regularly transported to the site over the duration of construction of the Development and all regulations for the transportation and storage of hazardous substances will be observed. Fuel safety and storage procedures are further detailed in the **Technical Appendix A3.1: Outline Decommissioning and Construction Environmental Management Plan (oDCEMP)**. No other hazardous substances are expected to be transported to Site. As such, the effect of the transportation of hazardous substances is negligible and **not significant** in terms of the EIA Regulations.

Based on the volume of construction traffic and the short term, temporary nature of the construction/decommissioning phases of the Development, potential impacts to visual effects and air quality are **not significant** in terms of the EIA Regulations.

15.5.6.2 Operational Phase

Potential effects to traffic during the Development's operational phase is considered in **Chapter 13: Traffic and Transport.** Traffic during the operational phase will consist of movement by staff that will supervise the operation of the Development and visit the Development to conduct routine maintenance. This is unlikely to involve HGVs and would be of negligible magnitude, and hence any related effects are **not significant** in terms of the EIA Regulations.

15.5.7 Noise

Potential noise-sensitive receptors were identified in the vicinity of the Development. The potential for significant noise effects is limited to residential amenity in the local area caused by the decommissioning and construction activities and operation of the proposed wind turbines. These effects reduce as the distance from the Development increases.

15.5.7.1 Decommissioning and Construction Phase

Construction noise was assessed for construction activities (including increased traffic) during the initial decommissioning and construction phase. Noise effects for noise-sensitive structures more than 1,000 m away from Development infrastructure (i.e., access tracks, turbines, etc.) and vibration were scoped out of the EIA, as agreed by the Council. A set of best practice measures to minimise effects is presented in **Chapter 12: Noise**.

The predicted levels of construction noise are below the daytime lower threshold of 65 dB(A) at all receptors. As such, construction noise effects are considered to be **not significant** in terms of the EIA Regulations.

The predicted levels of noise from construction traffic are also assessed in **Chapter 12: Noise** and the predicted change in the level of road traffic noise during construction of the Development is less than 3 dB in all cases with effects of negligible or minor significance. As such, construction traffic noise effects are **not significant** in terms of the EIA Regulations.

15.5.7.2 Operational Phase

The effects of noise from the operation of the Development have been assessed using the methodology for assessing wind turbine noise recommended by The Northern Ireland Executive[10]. The existing levels of background noise were measured at a selection of representative properties

[10] ETSU-R-97, The Assessment and Rating of Noise from Windfarms, ETSU for the DTI, 1996

situated in the vicinity of the Development, and their relationship to windspeed established, following a methodology agreed with the Council. The noise modelling accounted for 'valley corrections' and incorporated potential noise impacts from the construction, operation, and decommissioning of the Development's substation.

Appropriate noise limits for the Development were set at the most stringent daytime noise lower limit of 35 dB, LA90 or 5dB above background noise levels, taking into account the cumulative effects of other wind energy development in the locality, either in planning, consented, or operational[11]. Noise levels due to the operation of the Development were predicted using a recognised calculation technique and modelling software, compared to the noise limits, and found to be acceptable.

As a result, all noise effects likely to arise from the operation of the Development were assessed as **not significant**.

15.5.8 Residential Visual Amenity

An assessment of residential visual amenity has been undertaken in **Chapter 6: Landscape and Visual**, and further in the **Technical Appendix A6.2: RVAA** which is submitted in support of the planning application, as a standalone document, but does not form part of the ES.

Residents are considered to be of high sensitivity to the Development as they are static 'receptors' whose enjoyment of the property is likely to be affected by the quality of visual amenity experienced there. The purpose of the RVAA is to inform the planning process. It is in this context that the Technical Guidance[12] makes the following statement: 'It is not uncommon for significant adverse effects on views and visual amenity to be experienced by people at their place of residence as a result of introducing a new development into the landscape. In itself this does not necessarily cause particular planning concern. However, there are situations where the effect on the outlook / visual amenity of a residential property is so great that it is not generally considered to be in the public interest to permit such conditions to occur where they did not exist before.'

The Development will decommission and replace the wind turbines of the operational Owenreagh I and II Wind Farms with larger turbines. A number of properties will experience a change in their view, and in certain scenarios would experience a significant visual change when compared to the current baseline.

A significant visual change or effect does not equate to a significant effect on amenity under the EIA Regulations. Application of the standard residential amenity test, of whether the visual change would be such to render a property an unattractive place to live, found that no neighbouring residential property assessed would fall into this category, during any phase of the Development. Under the EIA Regulations, any residential amenity effects are considered as negligible, consisting predominantly of views which already contain views of wind turbine development, and **not significant**.

15.5.9 Shadow Flicker

An assessment of the potential effects of shadow flicker is provided in Section 15.3 of this chapter. The potential for significant shadow flicker effects was identified at 6 receptors, but with the implementation of the proposed mitigation measures there are **no significant effects** anticipated from shadow flicker.

15.5.10 Health and Safety at Work

There are various health and safety considerations particularly for workers during the decommissioning and construction phase of the Development. Workers are in closest proximity to the Development and as a result are considered to be the most at risk group.

Comprehensive health and safety assessments are an essential part of the construction process and would be carried out prior to the decommissioning and construction phase in accordance with legislation. A Construction, Design and Management (CDM) co-ordinator will be appointed and be responsible for the provision of a pre-decommissioning and construction phase information pack, as

[11] Excluding the effects of the Operational Rigged Hill Wind Farm, which will be decommissioned.

[12] Landscape Institute (2019). Technical Guidance Note 2/19 'Residential Visual Amenity Assessment (RVAA)

required under the Construction (Design and Management) Regulations (NI) 2016. The appointed main contractor will be required to provide a construction phase plan.

The decommissioning and construction phase of the Development would be managed in accordance with the Health and Safety at Work Act 1974 and would comply with all other relevant Health and Safety Regulations, including:

- Construction (Health, Safety and Welfare) Regulations (Northern Ireland) 1996;
- The Construction (Design and Management) Regulations (Northern Ireland) 2016; and,
- The Electricity Safety, Quality and Continuity Regulations (Northern Ireland) 2012.

The Development would operate to the Health and Safety Executive 'Health and safety in the new energy economy: Meeting the challenge of major change' published in December 2010.

During the operational phase there are potential risks to surrounding residents in the event of a turbine collapse. In general, it is extremely rare for wind turbines to collapse. However, two of the Zond Z40 turbines that comprise Owenreagh I Wind Farm have collapsed during periods of high wind speed in recent years, with one turbine having been decommissioned and the other turbine currently being decommissioned. As a result, access to the site by anyone is prohibited during periods of high wind speed (above 20 m/s forecast) and these will continue through the decommissioning and construction phase and the operational phase of the Development. There will be notices on all site access points to draw attention to this point for members of the public. Embedded mitigation in the site design (i.e. provision for adequate distance from public roads and residences) reduces the potential risks to human health from a turbine collapse during the operational phase of the Development to negligible and therefore **not significant**.

Following adoption of these measures, the risk to human health of decommissioning and construction and maintenance workers is low and **not significant** in terms of the EIA Regulations.

15.5.10.1 Accidents and Disasters

As detailed in Section 15.5.10 above, the potential for major accidents during the Development's lifecycle will be addressed through the adherence to best practice health and safety measures which align with the relevant policy and guidelines. These are outlined in **Technical Appendix A3.1: oDCEMP** and will be further refined prior to decommissioning and construction.

Section 4.8 of **Technical Appendix A3.1** also includes emergency response procedures to mitigate potential effects from natural disasters such as excessive peat movements, peat slide, and fire. These procedures will be consistently reviewed and updated where applicable throughout the Development's lifecycle to ensure worker safety is protected. By adopting these measures, the risk to human health from major accidents and disasters of decommissioning and construction and maintenance workers is considered to be low and **not significant** in terms of the EIA Regulations.

15.5.11 Cumulative Effects

The above assessments include the potential for cumulative effects on each of the topic areas and potential effects were determined to be not significant in accordance with the EIA Regulations. It is possible that the interrelationship between two or more of the above effects, where they act on the same receptor, may lead to in-combination effects. These are assessed in the "Interrelationships" Section 15.7 of this chapter.

15.5.12 Summary of Effects

Key determinants to the protection of human health, including mental health aspects associated with changes to amenity as a result of the Development, have been considered as part of this HHIA. The outcome of the HHIA indicates that the Development is unlikely to negatively affect people's health and wellbeing in its widest sense. There are no effects that:

- Cause potentially severe or irreversible negative effects;
- Affect a large number of people to an unacceptable level; or,
- Specifically, may affect groups of people who already suffer poor health or are socially excluded to an unacceptable level.

As a result, **no significant effects** are predicted for any phase of the Development.

15.6 Climate and Carbon Emissions

15.6.1 Scope

The aim of the Climate and Carbon Emissions section is to determine how the Development is likely to interact with a changing climate and whether any significant effects could arise. Climate Change Impact Assessment (CCIA) is a new form of environmental assessment required by the amended European Commission (EC) Directive 2014/52/EU[13] as transposed into the EIA Regulations.

The most recent climate projection iteration UK Climate Projections 2018 (UKCP18)[14], has identified the following climatic trends as a result of climate change:

- Increased temperatures;
- Sea level rise; and,
- Change in the frequency, intensity and distribution of rainfall events (e.g. an increase in the contribution of winter rainfall from heavy precipitation events and decreases in summer rainfall).

As none of the identified climate change trends listed above could affect the Development, the Development's vulnerabilities and resilience to climate change has been scoped out of the EIA.

The assessment of the Development's effects on climate change has been scoped into the EIA, given the associated carbon reduction properties of wind farms and the potential for peat disturbance and enhancement. Wind farms are low carbon forms of electricity generation, which is supported in general by UK energy policy as one of the means of reducing future climate change; these beneficial effects may be significant, and the net effect is assessed in this section.

The scope of the EIA in respect of climate change was set out in **Technical Appendix A2.1: Scoping Request** and this was agreed by the Council in its scoping response as noted in Table 15.6.

15.6.2 Assessment Methodology

The methodology uses the Scottish Government's Carbon Calculator Tool[15], in the absence of specific Northern Ireland guidance, to calculate the carbon savings and carbon losses over the lifetime of the Development. This is an industry standard tool and reasonable to use in the absence of a NI equivalent. It provides a mechanism by which carbon costs of the Development can be weighed against the carbon savings associated with the operation of the Development during its lifetime. The Development is proposed for a 40-year lifespan.

The data sources and assumptions used in the carbon balance assessment are detailed in **Technical Appendix A15.2: Carbon Balance Assessment**.

The assessment is a comparative one, comparing the effects on carbon with and without the Development.

15.6.3 Guidance

In order to establish a comprehensive assessment methodology, the following guidance has been followed:

- The Institute of Environmental Management and Assessment (IEMA) guidance document 'Environmental Impact Assessment Guide to Climate Change Resilience and Adaption' (2020)[16];

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[13] European Parliament and Council Directive 2014/52/EU amending Directive 2011/92/EU on the Assessment of the Effects of Certain Public and Private Projects on the Environment.

[14] Met Office (2018). UKCP18 Headline Findings. [online] Available at https://www.metoffice.gov.uk/research/collaboration/ukcp

[15] Scottish Government, 2016, Calculating Carbon Savings from Wind Farms on Scottish Peatlands - A New Approach [Online] Available at: http://informatics.sepa.org.uk/CarbonCalculator/

[16] IEMA (2020) IEMA Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation [Online] Available at: IEMA - IEMA EIA Guide to: Climate Change Resilience and Adaptation (2020)

- The IEMA guidance document 'Environmental Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance' (2017)[17]; and,
- European Commission 'Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment' (2013)[18].

15.6.4 Consultation

Consultation with the relevant organisations was initiated during the initial stages of the EIA to identify any climate change effects that could be initiated by the Development. A summary of the findings are detailed in Table 15.6.

Table 15.6. Summary of Consultation Responses on Climate Change

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Department of Agriculture, Environment, and Rural Affair – Northern Ireland Environment Agency (DAERA-NIEA)	Response to Scoping Request	Consultee note the proposed Climate Change Impact Assessment (CCIA) methodology proposed in the Scoping Request. The applicant should consider the release of stored soil carbon from peat soils resulting from Development, and may wish to include carbon retention resulting from habitat management if this can be reasonably measured.	Climate impacts of development are assessed in **Chapter 15: Other Issues** of this ES. This includes results of the Scottish Government's Carbon Calculator, which considers the release of stored soil carbon from peat soils. **Technical Appendix A3.2: DHMEP** details the habitat restoration proposed as part of the Development, including restoration of blanket bog habitat.

15.6.5 Assessment of Effects

The following section discusses the results of the Scottish Government's Carbon Calculator Tool when applied to the Development. **Technical Appendix A15.2: Carbon Balance Assessment** provides the full set of inputs and results produced by the Tool.

15.6.5.1 Carbon Savings

Every unit of electricity produced by a wind farm development displaces a unit of electricity which would otherwise have been produced elsewhere. The mix of electricity produced in the UK includes coal, oil and gas fired generation, and therefore displacing this represents carbon savings.

The electricity produced from the Development is assumed to substitute energy production by entirely coal-fired generation, or a mix of fossil fuels, or the national grid mix of energy generation. A renewable energy development would have a maximum potential to save carbon emissions when substituting coal fired generation. However, it is not appropriate to define the electricity source for which this renewable electricity project would substitute due to uncertainty in future grid mix. As a

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[17] IEMA (2017) IEMA Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance' [Online] Available at: https://www.iema.net/policy/ghg-in-eia-2017

[18] European Commission (2013) Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment. Available at http://ec.europa.eu/environment/eia/pdf/EIA%20Guidance.pdf

result, carbon emission savings are calculated for each scenario in the carbon calculator (see **Technical Appendix A15.2: Carbon Balance Assessment**).

Carbon savings for the expected scenario are summarised in Table 15.7. Carbon savings are expressed in terms of tonnes of carbon dioxide (equivalent) per year (t CO_2 y^{-1}).

Table 15.7. Carbon Savings for the Development (Expected Scenario)

Generation displaced	Expected CO_2 Saving (t CO^2y^{-1})
Coal fired electricity generation	156,546
Grid mix electricity generation	30,212
Fossil fuel mix electricity generation	67,493

15.6.5.2 Carbon Losses

The manufacturing, construction and installation of the wind turbines has an associated carbon cost, and carbon losses are also generated by the requirement for extra capacity to back up wind generation. Carbon losses associated with reduced carbon fixing potential and loss of soil organic matter occurs through excavation of peat for construction and drainage effects. Carbon losses may also be associated with felling of existing forestry; however, as no forestry is present on Site, this does not apply to this Development.

Peat-forming vegetation that leads to organic soils (peatlands) act as carbon sinks, whereby they absorb carbon dioxide and release it due to land use change. Wind farm developments on peatland may result in negative effects on these habitats if not appropriately considered during Development siting and design. Changes to the peatland habitat through development could result in a significant effect on its ability to store carbon, potentially reducing the carbon benefits of the Development.

The Development layout was determined through an iterative design process which involved careful consideration of the distribution of peat across the Site, with a focus on the reuse of existing infrastructure wherever possible, to minimise disturbance of peat.

The DHMEP (**Technical Appendix A3.2**) proposes management measures to restore or enhance the peat-forming potential of habitats in areas of the Site. Over time, this will lead to an increase in the carbon stored in peat at the Site, and thus a change in net emissions of carbon over the life of the Development.

Carbon losses for the expected scenario are summarised in Table 15.8.

Table 15.8. Carbon Losses for the Development (Expected Scenario). Carbon gains are expressed as a negative in this table.

Losses	t CO_2 over the wind farm lifetime
Losses due to turbine life (e.g., manufacture, construction, decommissioning)	58,233
Losses due to back-up	34,179
Losses due to carbon fixing potential	1,296
Losses from soil organic matter	144
Losses due to Dissolved Organic Carbon (DOC) and Particulate Organic Carbon (POC)	39
Change in emissions due to improvements of degraded bogs	-3,344

Change in emissions due to removal of drainage from foundations and hardstanding	-113
Net emissions of Carbon Dioxide	90,434

15.6.5.3 Payback Period

The carbon payback period is a measurement and an indicator to help assess a proposal. The shorter the payback the greater the benefit the Development will have in displacing emissions associated with electricity generated by burning fossil fuels.

The payback period is calculated taking the total carbon cost (carbon losses) and dividing by the annual carbon gains from displaced fossil fuel power generation and any site improvements.

The estimated payback period for the Development is 2.8 years based on the grid-mix electricity generation figures. In comparison to fossil fuel mix and coal fired electricity generation figures, the payback period of the Development reduces to 1.3 years and 0.5 years respectively. Table 15.9 provides further detail on payback periods for the Development.

Table 15.9. Payback in Years for each Scenario Used in the Carbon Calculator

Compared to…	Expected Scenario	Best Case Scenario	Worst Case Scenario
Coal fired electricity generation	0.6	0.2	1.6
Grid mix electricity generation	3.0	1.1	8.2
Fossil fuel mix electricity generation	1.3	0.5	3.6

On this basis, the CO_2 emissions of the whole lifetime of the Development are forecast to be cancelled out within c. 2.8 years of operation. The CO_2 emissions savings for the operational lifetime beyond that, up to the anticipated maximum lifetime of the Development of 40 years, would be a positive net benefit of the Development to reducing climate change. The longer the Development operates, the greater the benefit. The Development will have a moderate (and **significant**) beneficial effect on carbon emission savings which increases proportionally with the duration of the operational phase. In addition to the beneficial effects the Development will have on carbon emissions, it will also contribute to beneficial economic effects as detailed in **Chapter 14: Land Use, Socio-economics, Recreation, and Tourism** and net beneficial ecological effects, as detailed in **Chapter 10: Ecology**.

15.6.6 Cumulative Effects

The UK Government has set ambitious targets for reducing greenhouse gas emissions by 2050 as part of the UK Climate Change Act 2008[19]. The legally binding targets are for a reduction of at least 80% by 2050 against the 1990 baseline. Northern Ireland recently passed the Climate Change Act (Northern Ireland) 2022, which sets a target of net zero GHG emissions by 2050 and an interim target of at least a 48% reduction in GHG emissions by 2040.[20]

Table 5.4 of the Digest of UK Energy Statistics 2022[21] report details the sources used in generation of electricity throughout 2021 by major power producers. Renewable electricity represented 39.6% of

[19] UK Government (2008) UK Climate Change Act 2008. Available at http://www.legislation.gov.uk/ukpga/2008/27/part/1/crossheading/carbon-budgeting

[20] Norther Ireland Government (2022) Climate Change Act (Northern Ireland) 2022 [Online] Available at: Climate Change Act (Northern Ireland) 2022 (legislation.gov.uk)

[21] Department for Business, Energy & Industrial (2022) Digest of United Kingdom Energy Statistics (DUKES) (2022) [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1135950/DUKES_2022.pdf

total UK generation in 2021 and 43.6% of Northern Ireland's total electricity generation in 2023.[22] The Development is likely to comprise between approximately 48-67 MW of installed capacity, based on using turbines with generators between 3.45 and 4.8 MW (as are currently available for the V136 and/or N133 turbines).

The cumulative effect of the Development with other UK and Northern Ireland renewables generation is assessed as being a fundamental change in the climate effects of UK and Northern Ireland's energy supply, which is a major, positive, effect that is **significant** under EIA Regulations and will contribute to the UK's and Northern Ireland's legally binding emission reduction targets.

15.6.7 Mitigation Measures and Residual Effects

Sections 15.6.5.3 and 15.6.6 identify positive effects that are moderate and major respectively. Through the iterative design process, these positive effects have been maximised. As a result, the residual effects are as assessed above.

15.6.8 Summary of Effects

The Development will have a **significant** positive effect on carbon savings and a **significant** positive effect when considered cumulatively with UK-wide renewable energy deployment.

Whilst not affecting the significance of the assessed effect, the findings should be considered in the context of increasing importance in society and government of acting to address climate change. The UK Government recently passed a motion declaring a climate emergency[23], following substantial public pressure. The motion calls on the government to, "*increase the ambition of the UK's climate change targets under the Climate Change Act 2008 to achieve net zero emissions before 2050, to increase support for and set ambitious, short term targets for the roll-out of renewable and low carbon energy and transport, and to move swiftly to capture economic opportunities and green jobs in the low carbon economy while managing risks for workers and communities currently reliant on carbon intensive sectors*". Derry City and Strabane District Council also declared a climate emergency on the 27th of July 2019[24].

15.7 Interrelationship Effects

Schedule 5, Part 2, paragraph e of the EIA Regulations requires that the ES considers the interrelationships between aspects of the environment likely to be significantly affected by a development.

Interrelationships may occur where two or more effects arise that have the potential to have an effect on the same receptor during any particular phase of a development. An effect taken in isolation may not have a significant effect on a receptor, but where several effects are considered in an interrelated manner, the resultant combined effect may be considered significant, depending on the nature of the effects.

Typically, where one individual effect dominates, the assessment focuses on whether the addition of other effects on that receptor would make a material difference. Where individual effects are similar in magnitude, the assessment focuses on whether the combined effect could be significant.

15.7.1 Methodology

Residual effects assessed as "negligible" (with a magnitude described generally as "no detectable or material change", or "a barely discernible change") in other chapters of this ES are considered not to have the potential to contribute to interrelationship effects, and are not considered in this assessment. For the avoidance of doubt, all effects not explicitly assessed elsewhere in the ES are considered to be negligible and are therefore not assessed.

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[22] SONI (2023) Fuel Mix Disclosure. [Online] Available at: Fuel-Mix_2022.png (2213×1371) (soni.ltd.uk).

[23] Houses of Parliament (2019). Transcript of 1st May 2019. HC Deb, 1 May 2019, c225. Available at: https://www.theyworkforyou.com/debates/?id=2019-05-01c.225.0 [accessed on 08/07/2019].

[24] Derry City and Strabane District Council Minutes (2019) [Online]. Available at: http://meetings.derrycityandstrabanedistrict.com/documents/g1375/Printed%20minutes%20Thursday%2027-Jun-2019%2016.00%20Derry%20City%20and%20Strabane%20District%20Council.pdf?T=1

Only receptors that are predicted to be the subject of more than one potential effect have been included in the assessment. Receptors predicted to be the subject of only a single effect are excluded because there is considered to be no potential for a cumulative interrelationship effect to take place.

The rationale for receptor inclusion or exclusion has been explicitly detailed in Section 15.7.2.

A matrix has been used to detail which potential effects from different sources are predicted to impact each of the included receptors.

It should be noted that uncertainty in the assessment of effects, for most of the technical chapters in this ES, is dealt with by making conservative, or worst-case, assumptions. As this assessment considers the “in-combination” effects of multiple individual effects, it is based on there being multiple worst cases simultaneously, which in turn is likely to be overly conservative.

There are no specific guidelines on how the assessment of interrelationship effects should be undertaken, and so a qualitative approach has been used, using the results of the individual assessments, and based on professional judgement. Note that the assessment of the interaction effect may come to a different conclusion than the effect on the individual topic, as it is the combination of effects that are being assessed.

The sensitivity of receptors has been assessed as set out in the individual Chapters 6 to 15 of this ES, and therefore residents are considered to have a high sensitivity, although noting that this will be somewhat diminished by the presence of an operational wind farm in the baseline scenario. In-combination effects of moderate or major magnitude have been assessed as significant, based on professional judgement. Magnitude has been assessed in accordance with the generic guidance in **Chapter 2: Methodology**, which describes magnitude as:

- Negligible - no detectable change to a location, environment, species or sensitive receptor;
- Minor - a detectable but non-material change to a location, environment, species or sensitive receptor;
- Moderate - a material, but non-fundamental change to a location, environment, species or sensitive receptor; and,
- Major - a fundamental change to a location, environment, species or sensitive receptor.

15.7.2 Effect Interrelationship Matrix

A matrix, Table 15.10, has been used to detail which potential residual effects are predicted to impact each of the included receptors. Receptors are grouped at this stage to provide focus.

It is noted that noise effects (**Chapter 12: Noise**) are not sub-categorised into negligible, minor, moderate and major, and hence “not significant” effects could potentially contribute to interrelationship effects. Residential properties that lie within the 35 dB noise contour (the lower end of the range of daytime fixed lower noise limits as specified in reference guidance; in **Chapter 12: Noise**, Section 12.2.5) are shown on Figures 12.1 and 12.2.

Table 15.10 below identifies the potential relationships between the effects in one chapter and receptors in another. For some interrelationships, the in-combination effects are already described within individual chapters. Other interrelationships not described anywhere else in the ES are assessed below.

Table 15.10. Potential Interrelationships between ES chapters

	Chapter	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
	Receptor type	**Landscape and Visual**	**Cultural Heritage**	**Hydrology, Hydrogeology**	**Geology and Peat**	**Ecology**	**Ornithology**	**Noise**	**Traffic and Transport**	**Land Use, Socio-Economics, Tourism and**	**Other Issues**
6	Landscape and Visual	N/A									
7	Cultural Heritage		N/A								
8	Hydrology and Hydrogeology			N/A							
9	Geology and Peat				N/A						
10	Ecology					N/A					
11	Ornithology						N/A				
12	Noise							N/A			
13	Traffic and Transport								N/A		
14	Land Use, Socio-Economics, Tourism and Recreation									N/A	
15	Other Issues										N/A

15.7.3 Categories of Receptor Potentially Affected

The receptors of landscape and visual; heritage; noise; access, traffic and transport; recreation and tourism; and shadow flicker and human health are all people. The potential for certain groups of people to be affected by multiple environmental aspects is assessed in the sections below.

Hydrological receptors (principally waterbodies and private water supplies) have the potential to be affected by substantial changes in geology and peat, and from traffic and transport (e.g., fuel spills). The peat slide risk assessment (**Technical Appendix A9.1**) and private water supply risk assessment (**Technical Appendix A8.2**) takes account of hydrological receptors, and hence this potential interrelationship is already accounted for. The potential for pollution events to be caused by construction vehicles is explicitly assessed in **Chapter 8: Hydrogeology and Hydrology**, with mitigation proposed in **Technical Appendix A3.1: oDCEMP**, and hence this potential interrelationship is already accounted for.

Peat and other soils have the potential to be affected by erosion and changes in the water table. These are explicitly assessed in **Chapter 8: Hydrogeology and Hydrology**. Peat also has the potential to be affected by changes in habitat, as this can lead to the creation or degradation of peat soils. These are explicitly assessed in **Chapter 10: Ecology**. Hence, potential interrelationship effects on peat and soils are already accounted for.

Ecological receptors, principally active peat, has the potential to be affected by peat slides, and by erosion and changes in the water table and water quality. These are explicitly assessed in **Chapter 8: Hydrogeology and Hydrology**, **Chapter 9: Geology and Peat** and **Chapter 10: Ecology**. Hence, potential interrelationship effects on ecological receptors are already accounted for.

Ornithological receptors have the potential to be affected by changes in habitats and by construction or turbine noise (as disturbance). These are explicitly assessed in **Chapter 11: Ornithology**. Hence, potential interrelationship effects on ornithological receptors are already accounted for.

Climate change (in Other Issues) has the potential to be affected by substantial changes in peat, either via peat slide or via removal of peat, or by enhancement or degradation of peat-forming habitats. These are explicitly assessed in Section 15.6 of this chapter, in the CCIA, and in **Technical Appendix A3.2: DHMEP**, hence potential interrelationship effects on climate change are already accounted for.

15.7.4 Within the 35 dB Noise Contour and/or the Construction Noise Study Area

The only human receptors considered in this chapter that are within the 35 dB noise contour shown in Figure 12.2 and/or the construction noise study area shown in Figure 12.1 are residential properties and users of the Glenmornan, Koram, Napple, Hollyhill, Crokan, and Silverhill roads.

15.7.4.1 Residents

Decommissioning and Construction Phase

33 and 35 Koram Road, 51 Napple Road 10, 10A, and 12 Ballykeery Road lie within the 35 dB and 1000 m construction noise buffers. However, there are no significant effects expected with respect to noise effects at these properties, as assessed in **Chapter 12: Noise**. As these properties are not located on the main portion of the haul route that will be used to access the site (e.g. Glenmornan Road) and can choose alternative roads to use when travelling, they will not experience any effects resulting from traffic traveling to and from the site. As such, it is anticipated that there will be **no significant** interrelationships effects on this receptor for the decommissioning and construction phase.

Operational Phase

33 and 35 Koram Road, and 12 Ballykeery Road are expected to experience significant visual effects due to the magnitude in change from the existing visual baseline. While these properties lie within the 35 dB buffer for noise, there are no significant effects expected with respect to noise effects at these properties as assessed in **Chapter 12: Noise**.

33 and 35 Koram Road have been assessed in **Technical Appendix A15.1: Shadow Flicker Assessment** as likely to receive significant effects due to shadow flicker without the application of mitigation measures.

A significant visual effect and significant shadow flicker effect are expected during the operational phase of the Development. However, the implementation of the mitigation measures outlined in **Technical Appendix A15.1: Shadow Flicker Assessment** will reduce residual shadow flicker effects at these receptors to a negligible effect. As such, there will be **no significant** interrelationships effects for this receptor during the operational phase.

51 Napple Road, 10, 10A and 12 Ballykeery Road are not expected to experience any significant visual or noise effects due to the Development. These minor effects are unlikely to interact to such an extent as to lead to a material change to residential amenity at these locations, therefore there will be **no significant** interrelationships effects for these receptors.

15.7.4.2 Road Users

While residents have been considered separately in the preceding section, it is assumed that they will also be road users for the purposes of the following assessment.

Decommissioning and Construction Phase

Chapter 13: Traffic and Transport assessed the effects of the Development on the traffic and transport resource during the decommissioning and construction phase. **Chapters 12: Noise and Chapter 13: Traffic and Transport** identified roads that will be affected by the Development from visual and noise effects. It should be noted that motorised vehicle users of these roads would not be susceptible to noise effects; therefore, the potential construction noise effects would only be applicable to walkers, cyclists, and other non-motorised vehicle road users.

Koram Road lies within the 1000 m buffer for construction noise, however there are no significant effects expected with respect to noise. As this road is not located on the haul route and users can choose alternative roads to use when travelling, users will not experience any effects resulting from traffic traveling along local roads.

Potential traffic effects are negligible and noise effects are minor; therefore, **no significant** interrelationship effects are anticipated for these receptors during the decommissioning and construction phase.

Glenmornan Road also lies within the 1000 m buffer for construction noise and is part of the haul route that will be used to transport site infrastructure and abnormal loads. During these phases there will be an increase in traffic along the haul route as well as the presence of abnormal loads as turbines are transported to site.

Traffic and noise effects are considered minor for these receptors and temporary. As a result, it is expected that there will be **no significant** interrelationships that will impact the road users.

Napple Road falls within the 1000 m buffer for construction noise, but no significant effects are expected. As this road is not located on the major portion of the haul route, users can choose alternative roads to use when travelling and will not experience any effects resulting from traffic traveling along local roads. Hence, it is expected that there will be **no significant** interrelationship effects that may impact road users.

Holyhill Road lies within the 1000 m buffer for construction noise, however there are no significant effects expected with respect to noise effects on this route. As this road is not located on the haul route, it is expected that it will not experience any effects resulting from traffic traveling to and from the site; therefore, there are **no significant** interrelationships effects that will affect road users.

Chapter 13: Traffic and Transport considered the visual effect upon receptors within the 35 dB Buffer for noise as a result of the Abnormal Load Vehicles (ALVs) which is considered to result in a negligible magnitude of change on a receptor of low sensitivity. Thus, the effect of ALVs on severance is considered negligible and **not significant** in terms of the EIA Regulations.

Operational Phase

In the operational phase, road users will only experience significant visual impacts on Glenmornan, Koram, and Holyhill Roads. Since there are no heritage receptors or tourism/recreational routes/resources in this area, there is **no significant** interrelationship effects with these aspects. Road users traveling in motorised vehicles will not be affected by turbine noise, shadow flicker or residential amenity, therefore **no significant** interrelationship effects are anticipated with these aspects.

15.7.4.3 Within 5 km of the Nearest Turbine

Within 5 km of the nearest turbine, but outside the 35 dB noise contour shown in Figure 12.2 and/or the construction noise study area shown in Figure 12.1, lie various receptors, including residential, tourism and recreation, heritage assets as experienced by people and road users. These receptors lie outside the area with potential to receive noise or shadow flicker effects, so there are **no significant** interrelationship effects with these aspects.

15.7.5 Other Receptors

Other people, not considered above, are less likely to experience more than one effect considered in this ES, and therefore are less likely to experience interrelationship effects. Whilst it is possible, for example someone travelling to a recreational location by using the roads proposed for construction traffic, these are likely to be isolated events and effects would be sequential rather than simultaneous, and these effects are individually assessed in the relevant chapters of this ES.

No significant interrelationship effects beyond those assessed above are anticipated.

15.7.6 Summary

The majority of interrelationship effects are assessed in the separate technical chapters within this ES, such as **Chapter 13: Traffic and Transport**. Of those that are not, only the following receptors are assessed as having the potential to receive significant effects:

Residential visual receptors

- 33 and 35 Koram Road, and 12 Ballykeery Road

Residential shadow flicker receptors

- 33 and 35 Koram Road

While it is assessed that these receptors have the potential to experience significant effects, as has been noted in the preceding text, with the application of appropriate mitigation measures for shadow flicker, these effects will be **not significant** in terms of the EIA Regulations.

15.8 Statement of Significance

The Development will have **no significant** effects on aviation, telecommunications, television reception, shadow flicker, or human health after the implementation of the proposed mitigation measures described within this chapter.

The Development will have a positive, and **significant**, effect on carbon savings, by displacing electricity generation from other sources that emit carbon dioxide. The cumulative effect of the Development with other UK renewables generation is considered to be a fundamental change in the climate effects of UK energy supply, which is a major, positive, effect that is significant under EIA Regulations and will contribute to the UK's legally binding emission reduction targets.

In-combination effects associated with the interrelationships between effects assessed in other ES chapters that could act on a single receptor have been assessed as being not significant.

The Netherlands
New Zealand
Norway
Panama
Peru
Poland
Portugal
Puerto Rico
Romania
Singapore
South Africa
South Korea
Spain
Sweden
Switzerland
Taiwan
Tanzania
Thailand
UK
US
Vietnam

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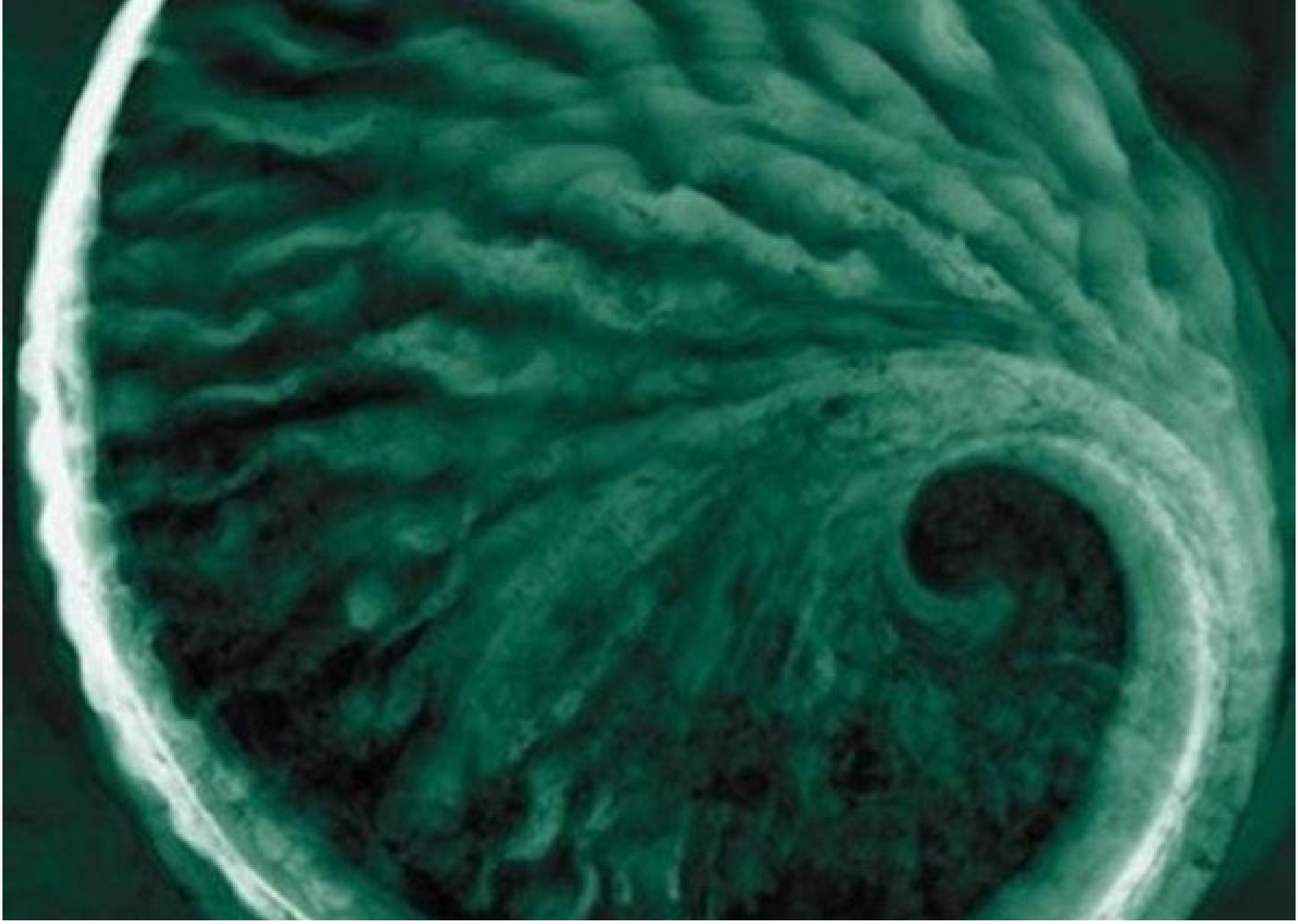

Owenreagh/Craignagapple Wind Farm

Ørsted Onshore Ireland Midco Limited

Environmental Statement – Chapter 16
Summary of Effects and Mitigation

12 September 2023

Project No.: 0696177

The business of sustainability

Signature Page

12 September 2023

Owenreagh/Craignagapple Wind Farm

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Acronyms and Abbreviations

Name	Description
CTMP	Construction Traffic Management Plan
DHMEP	Draft Habitat Management and Enhancement Plan
ES	Environmental Statement
oDCEMP	Outline Decommissioning and Construction Environment Management Plan
oPMP	Outline Peat Management Plan
SHMP	Snipe Habitat Management Plan

16. SUMMARY OF EFFECTS AND MITIGATION

16.1 Introduction

This chapter of the Environmental Statement (ES) summarises mitigation measures proposed elsewhere in this ES.

Chapters 6 to 15 of the ES report the findings of the assessments of the predicted effects of the Development on a topic-by-topic basis. The significance of these effects has been assessed using criteria defined in the topic chapters. Where appropriate, the significance of effects has been categorised as major, moderate, minor or negligible. In the context of The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 (the EIA Regulations), effects assessed as being of 'major' or 'moderate' significance are considered to be significant effects. For some of the assessments, effects are either considered to be significant or not significant in the context of the EIA Regulations, without sub-categorising.

16.2 Summary of Mitigation Measures

Table 16.1 summarises the predicted significant effects of the Development prior to, and following, the implementation of committed mitigation measures**,** to which the Applicant is committed, as proposed in order to reduce or eliminate significant adverse environmental effects. Only effects assessed as significant, prior to mitigation, are shown in this table. Summaries of all significant and non-significant effects can be found at the end of each assessment chapter.

16.3 Embedded Mitigation

Embedded mitigation includes design changes that were made in order to reduce or eliminate adverse effects, as well as normal good practice measures, and these have avoided the majority of potentially significant effects. Embedded mitigation is considered in the "Predicted Effect" column in Table 16.1 and is not treated as "Mitigation" for these purposes. These are set out in the following locations in the ES, and details are not repeated here:

- **Chapter 3: Development Description;**
- **Chapter 4: Site Selection and Design;**
- **Technical Appendix A3.1: Outline Decommissioning and Construction Environment Management Plan (oDCEMP);**
- **Technical Appendix A3.2: Draft Habitat Management and Enhancement Plan (DHMEP); and,**
- **Technical Appendix A3.3: Outline Peat Management Plan (oPMP).**

The process of applying the embedded mitigation is set out in **Chapter 4: Site Selection and Design**. The key design aspects comprising embedded mitigation are:

- The avoidance of inconsistent turbine spacing leading to relatively large gaps, outliers and excessive turbine overlapping to minimise visual confusion and ensure a balanced/compact array from key views;
- Achieving an appropriate scale of turbine, taking account of the landscape context, and containing turbines within the upland areas to avoid encroachment into the surrounding lowland landscapes;
- The utilisation of existing infrastructure and reuse of existing access tracks wherever possible;
- Consideration of the ground conditions and topography of the Site, utilising micrositing to avoid effects on active peat, mitigate peat slide risk, and minimise watercourse crossings where possible;

- Implementation of best practice construction methods to mitigate impacts on ornithological receptors and promote habitat enhancement;
- Due to the sloping topography at the Site, 3-D modelling was utilised to reduce cut and fill operations that would be required during construction;
- Maximising the separation from residential dwellings; and,
- Respecting other environmental constraints and associated buffer separations.

16.4 Specific Mitigation Measures

In addition to mitigation proposed to address significant adverse effects, as shown in Table 16.1, certain chapters have also proposed further measures to reduce effects that were assessed as not significant before mitigation. These are set out in Table 16.2.

Table 16.1. Summary of Significant Effects and Associated Mitigation Measures

Chapter	Receptor	Predicted Effect	Significance Prior to Mitigation	Mitigation	Residual Effect
Decommissioning and Construction Phase					
Chapter 7: Archaeology and Cultural Heritage	Known archaeological remains	Physical damage to or destruction of WS1 modern clearance cairn (non-designated) and Post Medieval/19th Century farm buildings (non-designated) along the off-road section of the abnormal load route	Negligible to moderate	■ Walkover survey of the final infrastructure layout; ■ A photographic survey of assets undertaken ahead of construction; and, ■ Barrier fencing. Should construction related activities require groundbreaking within 25m of any assets identified within the CSA, then these groundworks will be subject to archaeological monitoring by an archaeological clerk of works, as outlined in Section 4.15 of **Technical Appendix A3.1: oDCEMP**.	Negligible to minor
	Unknown (buried) archaeological remains	Physical damage to or destruction of unknown (buried) archaeological remains, with the greatest potential for disturbing unknown assets around Turbines, 1, 3, 4, 6, 7, 8, 9, 13 and 14, and their associated infrastructure.	Negligible to moderate	■ Walkover survey of the final infrastructure layout; ■ If warranted, a photographic survey of assets undertaken ahead of construction; and, ■ A watching brief overseen by the acrhaeological clerk of works during groundworks associated with construction of turbines T1, T3, T4, T6, T7, T8 , T9 , T13 and T14, and their associated infrastructure.	Negligible to minor
Chapter 9: Geology and Peat	Peat	Peat stability	Moderate	Micrositing of turbines located in deep peat within micrositing buffer to reduce peat disturbance. Additional peatland restoration is proposed in the **Technical Appendix A3.2: DHMEP**. These are detailed further in this table under **Chapter 10: Ecology**. Micrositing of turbines located in deep peat within 50 m micrositing buffer to further reduce peat disturbance and in turn lessen any risk of peat instability. Provision of a Geotechnical Risk Register to be maintained throughout the pre-construction, construction and operational phases of the Development. Details of these measures are included within **Technical Appendix A9.1: PSRA**. In accordance with Section 4.14 of **Technical Appendix A3.1: oDCEMP**, during construction a specialist geotechnical clerk of works will be appointed to oversee visual inspections and monitoring in areas with potential for peat slide. Works at the site should be postponed during and for a period after heavy rainfall events, the details of which should be confirmed prior to the beginning of construction, as defined in Section 4.11 of **Technical Appendix A3.1: oDCEMP.**	Negligible to minor
Chapter 10: Ecology	Peatland Habitats: 'Active Peat' - Blanket Bog (Includes 'Intact' and 'Recovering' Blanket Bog which corresponds with EU Annex I quality habitat	Habitat loss: Development infrastructure, hardstanding, access tracks, substation and construction compounds will all result in the direct loss of c. 11.886 ha of peatland habitats (of which c. 0.133 ha are EU Annex I habitats) within the Ecological ESA.	High	A DHMEP has been provided (**Technical Appendix A3.2**) which includes restoration, management and enhancement of peatland habitat across the ESA.	Post mitigation, short-term construction related adverse impacts which are of a Medium magnitude when compared with the existing baseline. Potentially overall long-term positive impact dependent upon success of DHMEP implementation and monitoring regime.

		Local hydrological dewatering effects which are likely to be significant at the local level and will likely affect a further c. 4.582 ha of peatland habitats (of which 0.094 ha are considered to be of EU Annex I habitat quality). Temporary disturbance of adjacent peatland habitats (e.g., through dust)			Long-term residual impact will depend on the success of the enhancement measures. With successful mitigation, there is potential for a long-term impact of low to High significance on features of Regional-National Importance. *c.* 94.367 ha of peatland will undergo management as part of the DHMEP.
Peatland Habitats: Dry Modified Bog (NI priority Habitat; and Wet Modified Bog (NI Priority Habitat)	Habitat loss: Development infrastructure, hardstanding, access tracks, substation and construction compounds will all result in the direct loss of c. 11.886 ha of peatland habitats (of which c. 0.133 ha are EU Annex I habitats) within the Ecological ESA. Local hydrological dewatering effects which are likely to be significant at the local level and will likely affect a further c. 4.582 ha of peatland habitats (of which 0.094 ha are considered to be of EU Annex I habitat quality). Temporary disturbance of adjacent peatland habitats (e.g., through dust)	Medium	Embedded mitigation to avoid effects upon peatland habitats as far as feasibly possible, concentrating works within Grassland Habitats and on existing wind farm infrastructure. A DHMEP has been provided (**Technical Appendix A3.2**) which includes restoration, management and enhancement of peatland habitat across the Ecological Study Area.	Post mitigation, short-term construction related adverse impacts which are of a Medium magnitude when compared with the existing baseline. Potentially overall long-term positive impact dependent upon success of DHMEP implementation and monitoring regime. Long-term residual impact will depend on the success of the enhancement measures. With successful mitigation, there is potential for a long-term impact of Low to High significance on features of Regional-National Importance. *c.* 94.367 ha of peatland will undergo management as part of the DHMEP.	
	Grassland Habitats: Species-poor Flush and Spring Grassland Habitat	Direct removal and indirect dewatering totalling *c.* 4.104 ha of species-poor flush and spring habitat is considered to be a significant effect on an IEF within the Ecological ESA at the local level and is permanent.	Medium	Proposed mitigation is detailed within the oDCEMP - **Technical Appendix A3.1**. **Technical Appendix A3.2: Draft Habitat Management and Enhancement Plan (DHMEP)** includes a snipe Habitat Management Plan for the management of c. 60 ha of acid grassland / species-poor flush and spring dominated habitat for breeding waders including the creation of wader scrapes within two identified territories. A focus on habitat enhancement for snipe and curlew.	Post mitigation, there are likely to be short-term adverse construction related impacts to this habitat type, which are considered to be of a Medium magnitude upon a feature of Local importance. In the long-term when compared with the existing baseline, it is considered that there will be a likely positive impact on a feature of Local (Higher) value as a result of re-wetting, dependent upon success of HMEP implementation and monitoring regime.
Operational Phase					
Chapter 15: Other issues	Climate	Reduction in emissions of greenhouse gases	Significant, beneficial (permanent)	None; the benefit was maximised through the design process	Significant, beneficial (permanent)

	Shadow Flicker	Shadow flicker effects at six residential properties within a ten rotor distance of the Development	Significant	If shadow flicker is, in practice, not acceptable to a resident, a range of mitigation measures is available to control the effects, including: ■ Control at Property: the provision of blinds, shutters, or curtains to affected properties; ■ Control on Pathway: for example, screening via planting close to an affected property; and, ■ Control at Source: for example, a shutdown of turbines at times when effects occur.	Negligible

Table 16.2. Summary of Additional Measures for Non-Significant Effects

Chapter	Receptor	Predicted Effect	Significance Prior to Mitigation	Mitigation	Residual Effect
Decommissioning/Construction Phase					
Chapter 8: Hydrology and Hydrogeology	Private Water Supplies	Chemical pollution, erosion and sedimentation, changes in groundwater interflow patterns.	Minor	A water quality monitoring programme will be implemented in accordance with the Section 4.7.1 of the oDCEMP (**Technical Appendix A3.1**) and in consultation with NIEA. A project hydrologist and ecological clerk of works will conduct visual inspections of surface watercourses during decommissioning and construction. It is anticipated that surface water sampling will also be conducted to supplement the visual inspections carried out by the project hydrologist and ecological clerk of works.	Negligible
Chapter 10: Ecology	Boundary Features: Species-poor hedgerow habitat (NI Priority Habitat)	Removal of *c.* 100 m of mature, species poor, hedgerow habitat. This is considered to be a receptor of Moderate significance at the Local (Higher) level and is permanent.	Low	Proposed compensatory planting of c. 700 m of native trees as a riparian buffer within the vicinity of the removed hedgerow which will enhance an existing linear feature and enhance foraging and commuting habitat away from infrastructure.	Short-term adverse construction related impacts, long-term likely positive impact on a feature of Local (Higher) value, dependent upon the success of replanting and monitoring of this as part of the DHMEP.
	Bats: Foraging / commuting - Leisler's and common pipistrelle bat species within the ESA	Loss of habitat - Removal of linear features (treeline / hedgerow south of T13) which has the potential to cause disconnect of commuting lines and loss of potential foraging area, leading to reduced foraging success and possible decline of local bat populations considered to represent a population of Local (Higher) significance.	Low	Compensatory planting of c. 700m native species along the riparian zone of watercourse south-east of T13.	There is the potential that in the longer term, and with the successful establishment of 700m of replacement planting, and habitat enhancements through land management and re-wetting – this would result in a net positive impact upon the local bat population.
	Reptiles – Common lizard	Low	Negligible	Construction works in areas holding common lizard have the potential to result in direct mortality and the Development can result in loss of foraging habitat or hibernacula. Direct mortality may occur from excavators tracking over vegetation during the active season or destroying hibernacula (which may occur within the existing infrastructure for example) during the hibernation period. The Development may result in a loss of foraging habitat but may simultaneously enhance areas in terms of hibernacula.	Works in potential hibernacula areas (adjacent to existing infrastructure) will commence outside the core hibernation period (October to March inclusive). Where this is not feasible, works will be preceded by a programme of capture and translocation of common lizards, under license, this will be

				Potential impact on common lizard, in terms of potential direct mortality are considered to be significant at the local scale, and temporary.	employed, in conjunction with the use of a reptile barrier to ensure non-return of individuals into the works area.
	Ecological Receptors along the Haul Route	Potential effects to ecological receptors from road works along the Development Haul Route and Abnormal Load Route due to the removal of hedges and felling of trees.	Low to Medium	A pre-construction survey will be carried out by the ecological clerk of works a year prior to construction commencing to determine the appropriate ecological mitigation measures that will be implemented during the haul rote and abnormal load route works. As detailed in **Technical Appendix A10.1: Ecological Impact Assessment** and **Technical Appendix A2.3: Abnormal Load Route Works**, this mitigation may include but will not be limited to: ■ Replacement of removed hedgerows with native species rich plant assemblage; ■ Endoscope surveys by the ecological clerk of works prior to tree felling; ■ Replacement of felled trees with native species; ■ Invasive/non-native species survey in the year prior to construction and use of chemical control to ensure the avoidance of identified invasive species from spreading; and, Potential Roost Features (PRF) survey of the non-designated heritage assets (Post-Medieval/19th Century farm buildings) adjacent to the off-road section of the abnormal load route.	Residual effects will be reduced to low.
Chapter 11: Ornithology	Red Grouse	Nest destruction and chick mortality, localised extinctions	Low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: ■ Timing of site preparation works to occur outside of the breeding bird season. ■ The HMEP includes a specific Snipe Habitat Management Plan (SHMP), notably including grazing management and creation of positive features and conditions (eg wader scrapes and water tables) to promote optimal conditions for foraging and breeding snipe. Water quality mitigation measures.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. The implementation of the RGHMP will reverse any potential loss of nesting and foraging habitat. These measures will result in residual impacts likely to be reduced to 'Very low', with likely positive impacts on the red grouse population in the longer term.
	Golden Plover	Risk of Disturbance and displacement	Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). No mitigation measures are proposed for potential temporary disturbance of foraging wintering birds.	The residual impact will remain at 'Very low'.
	Snipe	Risk of Disturbance and displacement	Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: ■ Timing of site preparation works to occur outside of the breeding bird season; ■ The HMEP includes a specific Snipe Habitat Management Plan (SHMP), notably including grazing management and creation of positive features and conditions (eg wader scrapes and water tables) to promote optimal conditions for foraging and breeding snipe; and, Water quality mitigation measures.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. The implementation of the SHMP will reverse any potential loss of nesting and foraging habitat. These measures will result in residual impacts likely to be reduced further within the 'Very low' significance category, with likely positive impacts

					on the snipe population in the longer term.
	Snipe	Risk of Disturbance and displacement	Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: ■ Timing of site preparation works to occur outside of the breeding bird season; ■ The HMEP includes a specific Snipe Habitat Management Plan (SHMP), notably including grazing management and creation of positive features and conditions (eg wader scrapes and water tables) to promote optimal conditions for foraging and breeding snipe; and, Water quality mitigation measures.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. The implementation of the SHMP will reverse any potential loss of nesting and foraging habitat. These measures will result in residual impacts likely to be reduced further within the 'Very low' significance category, with likely positive impacts on the snipe population in the longer term.
	Kestrel	Displacement	Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: ■ Timing of site preparation works outside of the breeding bird season.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. These measures will result in residual impacts likely to be reduced further within the 'Very low' significance category.
	Sparrowhawk	Indirect disturbance	Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: ■ Timing of site preparation works outside of the breeding bird season.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. These measures will result in residual impacts likely to be reduced further within the 'Very low' significance category.
	Buzzard	Indirect disturbance to nest sites.	Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: ■ Timing of site preparation works outside of the breeding bird season.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. These measures will result in residual impacts likely to be reduced further within the 'Very low' significance category.
	Riverine Species	Displacement	Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: ■ Timing of site preparation works outside of the breeding bird season; and,	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance.

				■ Water quality mitigation measures.	Mitigation measures to avoid any deterioration in water quality on watercourses will avoid any potential indirect impact on species relying on aquatic habitats and associated species. These measures will result in residual impacts likely to be reduced further within the 'Very low' significance category.
	Red Listed Ground Nested Passerine Species	Disturbance of nesting birds	Low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: ■ Timing of site preparation works outside of the breeding bird season; ■ Appropriate buffer zones will be set up around ground nesting species during works to avoid disturbance; and, ■ The HMEP states that skylark and meadow pipit will benefit from the red grouse management measures.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. Targeted surveys and buffer zones to nest sites will avoid disturbance on individual pairs during construction. The implementation of the SHMP will reverse any potential loss of nesting and foraging habitat. These measures will result in residual impacts likely to be reduced to within the 'Very low' significance category, with likely positive impacts on the ground nesting passerine populations in the longer term.
	Other Red Listed Passerines	Nesting and foraging habitat loss. Direct and indirect disturbance to nesting birds. Temporary disturbance to/displacement of foraging birds.	Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: ■ Timing of site preparation works outside of the breeding bird season.	The timing of site preparation works outside bird breeding season will avoid any direct impact on nesting birds and will reduce potential indirect impact though disturbance. These measures will result in residual impacts likely to be reduced to within the 'Very low' significance category.
	Other Bird Species	Disturbance	Minor – Negligible (temporary)	Avoidance by design and maintenance of the set back distance	Negligible (temporary)
	Other Bird Species	Displacement	Minor – Negligible (temporary)	Maintenance of set-back implementation as per the Construction Mitigation Strategy. To avoid direct and indirect disturbance to breeding birds, wherever feasible, the following restrictions on timings of construction works will be applied: ■ Construction will be timed to commence outside the bird breeding season (April to August inclusive). This does not preclude construction continuing during the breeding season but would allow sensitive bird species to choose nesting sites away from sources of potential disturbance; ■ Where removal of suitable nesting habitat is required to facilitate the works, including the infrastructural footprint, excavation of the grid connection route and temporary storage areas, wherever feasible, the preparatory clearance works will be undertaken prior to the 1st March in the construction year;	Negligible (temporary)

- Vegetation removal required for creation of bat feature buffers around turbines will be undertaken outside the bird breeding season (March to August inclusive);
- Once vegetation has been removed within the works corridor these areas will be retained in a condition that limits suitability for nesting birds for the remainder of the construction phase of the proposed development. Any areas of potential cover, particularly cover for ground nesting species, will be rendered unsuitable by cutting vegetation or tracking over with an excavator;
- There will be no clearance of vegetation suitable for nesting birds within the bird nesting season (March to August inclusive), unless checked for nesting birds by a suitably qualified ornithologist (performing the role of Ecological Clerk of Works - ECoW) and cleared by them for removal, taking account of both potential for direct nest destruction and disturbance to nesting birds in adjacent areas;
- Any construction works proposed during the nesting bird season (March to August inclusive) will be preceded by a nesting bird survey and associated reporting. The report will detail nesting or prospecting birds in the area and will detail buffer zones and measures required in order to avoid potential disturbance or impact, and will form part of any regular and final ECoW reporting as required for planning compliance. Particular attention will be given to sensitive bird species (including breeding raptors and waders); and,
- If works are scheduled to commence in February, a pre-construction visit will be required to monitor potential red grouse breeding habitat, as this species establishes breeding territories over the winter.

To avoid disturbance to breeding birds any site works occurring during the bird breeding season will require ongoing surveying, including:

- From the 1st March, weekly nesting bird surveys covering the upcoming works phase will be conducted;
- Surveys will be undertaken by an appropriately experienced ornithologists in order to ascertain constraints on the consented programme of works;
- Any breeding activity will be recorded and potential for active nests determined;
- Where an active nest is located or suspected for widespread species (including meadow pipit and skylark), an appropriate buffer zone will be applied, within which there will be no access or works permitted; and,
- Where an active nest is located for sensitive species that may be impacted by the works (for example breeding red grouse or snipe within or adjacent the works corridor), then works in that area will be delayed until after the bird nesting season, or NIEA-NED will be consulted on the application of an appropriate buffer distance.

The ornithologist appointed to the project will determine survey effort, taking an evidenced based approach. The survey schedule adopted must be fully documented and justified. Likewise, all actions must be fully documented and provided as any part of post-construction compliance monitoring requirements in the end of season report.

The ornithologist’s role, in conjunction with the ECoW will include:

- Providing advice to ensure legal compliance with respect to nesting birds;
- The application of appropriate buffers to ensure the protection of nesting birds from disturbance that are in line with current scientific understanding, e.g. as reviewed/published in Hötker et al.

				(2006) , Ruddock & Whittfield (2007) as updated by Goodship & Furness (2020) , Pearce-Higgins et al. (2009) and Tosh et al. (2014); ■ Ensuring that all required exclusion zones for nesting birds are adequately set out, protected and signed-off, and that all contractors working on the site abide by them; and, ■ Liaison with contractors and construction staff working on site as required, through the provision of Toolbox talks.	
Chapter 12: Noise	Residential: 101 Hollyhill Road 51 Napple Road 43 Koram Road Unlisted with access driveway adjacent to 7-13 Ballykeery Road	Decommissioning/Construction noise, specified noise limits will be met.	Not significant (temporary)	The good practice measures detailed below will be implemented to manage the effects of noise and will be required of all contractors: ■ Operations shall be limited to times agreed with CCGBC; ■ Deliveries of turbine components, plant and materials by HGV to site shall only take place by designated routes and within times agreed with CCGBC; ■ The site contractors shall be required to employ the best practicable means of reducing noise emissions from plant, machinery and activities, as advocated in BS 5228; ■ Where practicable, the work programme will be phased, which would help to reduce the combined effects arising from several noisy operations; ■ Where necessary and practicable, noise from fixed plant and equipment will be contained within suitable acoustic enclosures or behind acoustic screens; All sub-contractors appointed by the main contractor will be formally and legally obliged, and required through contract, to comply with all environmental noise conditions; ■ Where practicable, night-time working will not be carried out. Local residents shall be notified in advance of any night time construction activities likely to generate significant noise levels, e.g., turbine erection; and, ■ Any plant and equipment normally required for operation at night (23:00 - 07:00), e.g., generators or dewatering pumps, shall be silenced or suitably shielded to ensure that the night-time lower threshold of 45 dB, LAeq, night shall not be exceeded at the nearest noise-sensitive receptors.	Decommissioning/Construction noise, specified noise limits will be met.
Chapter 13: Traffic and Transportation	Road users	Accidents and Safety	Negligible	The Construction Traffic Management Plan (CTMP) will include measures to enhance existing road safety conditions during the construction phase. This CTMP would include, but not be limited to the following measures: ■ Advance warning signs shall be installed on the approaches to the affected road network. Temporary signage advising drivers that abnormal loads and construction traffic will be operating shall be erected on the local road sections of the route; ■ An advance escort shall be required to warn oncoming vehicles ahead of the abnormal loads convoy, with one escort staying with the convoy at all times. The escorts and convoy will remain in radio contact at all times where possible; ■ A police escort shall also be implemented, where necessary, to facilitate the delivery of the predicted loads; and, ■ The times in which convoys travel shall be agreed with the police. Typical delivery times for similar projects has seen the early morning periods used in constrained sections, as traffic levels are generally lighter than those found in the afternoon.	Negligible
	Non-motorised users	Pedestrian Amenity and Delay	Negligible	CTMP will set out a phasing and timing strategy for construction traffic movements. Where necessary construction traffic movements will be reduced during periods of increased pedestrian activity.	Negligible
	Road users	Driver Delay	Negligible	CTMP will set out a phasing and timing strategy for construction traffic movements. Where necessary construction traffic movements will be reduced during periods of increased baseline traffic.	Negligible

	Settlements along route	Severance	Minor	The CTMP will set out a phasing, timing and routing strategy for construction traffic movements. Where necessary construction traffic movements will be reduced during periods of increased baseline traffic.	Minor
	Road Users and Settlements along route (Abnormal Load Movements)	Combined effect of the above	Minor	Advance warning signs will be posted prior to abnormal load movements. Abnormal load movements will be scheduled to avoid periods of increased baseline traffic as well as school opening and closing periods. All abnormal load movements will be fully escorted to warn on-coming vehicles and advise other road users.	Minor
Chapter 14: Land Use, Socio-Economics, Tourism, and Recreation	Derry City and Strabane District Council	Direct employment opportunities and increased economic activity	Minor, positive	Where possible, the Applicant may hold meet the buyer events and offer and organise training and support for local businesses who wish to bid on the work for the Development.	Minor (positive)
	Northern Ireland	Direct employment opportunities and increased economic activity	Minor, positive	Where possible, the Applicant may hold meet the buyer events and offer and organise training and support for local businesses who wish to bid on the work for the Development.	Minor (positive)
	United Kingdom	Direct employment opportunities and increased economic activity	Minor, positive	Where possible, the Applicant may hold meet the buyer events and offer and organise training and support for local businesses who wish to bid on the work for the Development.	Minor (positive)
Chapter 15: Other Issues	Utilities	Damage to utilities infrastructure	Negligible – No known utilities infrastructure on site beyond the infrastructure associated with the operational Owenreagh Wind Farms.	Service checks to be carried out pre-construction to minimise potential effects and ensure relevant health and safety legislation is complied with	Negligible
Operational Phase					
Chapter 8: Hydrology and Hydrogeology	Private Water Supplies	Chemical pollution, erosion and sedimentation, changes in groundwater interflow patterns.	Minor	A water quality monitoring programme will be implemented in accordance with the Section 4.7.1 of the oDCEMP (**Technical Appendix A3.1**) and in consultation with NIEA. A project hydrologist and ecological clerk of works will conduct visual inspections of surface watercourses during decommissioning and construction. It is anticipated that surface water sampling will also be conducted to supplement the visual inspections carried out by the project hydrologist and ecological clerk of works.	Negligible
Chapter 10: Ecology	Bats: Foraging/commuting – Leislers and common pipistelle bat species within the ESA	Turbine collision / barotrauma with the potential to cause direct mortality or serious injury of bats in flight leading to a possible decline of local bats considered to represent a population of Local (Higher) significance.	Low	Post-construction monitoring, use of red lights on top of turbines, use of a buffer zone between any roosts / linear features and turbines to minimise chances of collision.	Long-term low impact on a feature of Local to Regional Importance. There is the potential that in the longer term, and with the successful establishment of replacement planting and habitat enhancements through land management and re-wetting– this would result in a net positive impact upon the local bat population.
Chapter 11: Ornithology	Red Grouse	Positive association with windfarm infrastructure. Collision risk low	Low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: ■ Fencing not permitted within key red grouse management areas under the DHMEP;	The implementation of the RGHMP is likely to result in positive impacts on the red grouse population. Management within areas distinct from infrastructure will reduce potential for collisions, further reduced by

				■ The HMEP includes a specific Red Grouse Habitat Management Plan (RGHMP), notably including heather management of currently 'rank' habitat to promote the optimal condition of heather habitat sutable for foraging and breeding red grouse; and, ■ RGHMP includes significant area remote from proposed wind farm infrastructure.	avoidance / marking of fencing where feasible. These measures will reduce impacts while resulting in likely population increases, with residual impacts on the population likely to be reduced to within the 'Very low' significance category.
	Golden Plover	Displacement	Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: Specific management measures within the DHMEP for red grouse will also create suitable conditions for golden plover.	These measures will enhance the suitability of the area for wintering golden plover. Residual impacts associated with direct mortality will remain within the 'Very low' significance category.
	Snipe	Density, distribution and breeding success. Displacement	Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: ■ The DHMEP includes a specific Snipe Habitat Management Plan (SHMP), notably including grazing management and creation of positive features and conditions (eg wader scrapes and raising water tables) to promote optimal conditions for foraging and breeding snipe; and, ■ Water quality mitigation measures.	These measures will reduce impacts while resulting in likely population increases, with residual impacts on the population likely to be reduced to within the 'Very low' significance category.
	Riverine Species	No impact	Very low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: ■ Water quality mitigation measures. ■ Provision of nest boxes for dipper and grey wagtail along the Legnahone Burn will be investigated.	These measures will reduce impacts while resulting in possible population increases through the provision of nest boxes, with residual impacts on the population likely to be reduced to within the 'Very low' significance category.
	Red Listed Ground Nesting Passerine Species	Displacement	Low-Very Low	Significance level below 'Medium' does not automatically trigger requirement for mitigation under Percival (2003). Measures to reduce impact are: ■ The DHMEP includes a specific SHMP and RGHMP, notably including grazing management, creation of positive features and conditions (eg wader scrapes and raising water tables), and fencing to promote optimal conditions for foraging and breeding snipe and will ensure more suitable habitat and nesting opportunities for ground nesting species such as red grouse.	These measures will result in possible population increases through the provision of improved habitat suitability, with residual impacts on the population likely to be reduced to within the 'Very low' significance category.
Chapter 14: Land-Use, Socio-Economics, Tourism and Recreation	Derry City and Strabane District Council (Northern Ireland and UK)	Direct employment opportunities and increased economic activity	Positive (minor)	Community benefit fund of £5,000 per MW installed capacity per year.	Minor (positive)
Chapter 15: Other Issues	Telecommunications and Television Reception	Disruption of television reception and radio waves	Negligible	Arqiva has telecommunication signal masts that have a Fresnel Zone which will pass within the vicinity of the Development. A 100m buffer from these links is required and the Development currently does not encroach on this buffer. If any effects to Arqiva's assets are identified after the construction of the Development, appropriate mitigation measures will be decided in consultation with Arqiva.	Negligible

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