RWE

Lorg Wind Farm
Section 36 Application
Volume 1 Main Report
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Report for

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Preface

Purpose of this report

This Environmental Impact Assessment Report ("EIA Report") has been prepared by WSP Environment & Infrastructure Solutions UK Limited ("WSP") on behalf of RWE Renewables UK Onshore Wind Limited (hereafter referred to as the "Applicant"), which has become a "super player" in the field of renewables. RWE is the global number two in development and operation of offshore wind and has a goal to become climate-neutral by 2040 (this involves reduction of greenhouse gas (GHG) emissions beyond just carbon and also involves some contribution /compensation for emissions caused). To achieve this goal, RWE is reducing its carbon dioxide (CO_2) emissions as quickly and drastically as possible, by phasing out or converting conventional power plants. RWE has already cut its greenhouse gas emissions by 60 million tonnes of CO_2 between 2012 and 2018, resulting in a 33% reduction. No other company in Germany has achieved more in the last few years and RWE is determined to continue this.

Lorg Wind Farm, located between the settlements of Sanquhar and Carsphairn in Dumfries and Galloway and East Ayrshire, was granted planning permission by Dumfries & Galloway Council on 18 July 2019 (reference: 15/P/2/0337). This "Consented Development" comprises up to six wind turbines of up to 130m to blade tip height and up to three wind turbines of up to 149.9m to blade tip height, together with ancillary infrastructure. Separate planning permission was granted by East Ayrshire Council on 09 February 2018 (reference: 15/0935/PP) for part of an access track and a single watercourse crossing located within the administrative boundary of East Ayrshire.

The Applicant is now proposing to optimise the site and develop a larger wind farm on the same site, although as shown in **Figure 1.2**, the site boundary has been slightly expanded. The proposed wind farm would have an installed capacity in excess of 50 MW, so it is necessary to make an application to the Scottish Ministers for consent under section 36 of the Electricity Act 1989. This EIA Report sets out the findings of an Environmental Impact Assessment (EIA) to accompany an application under section 36 of the Electricity Act 1989 and under section 57 (2) and section 57 (2) of the Town and Country Planning (Scotland) Act 1997 to construct and operate a greater number of turbines at increased height at the Lorg Wind Farm site ("the Proposed Development").

Chapter 3: Description of the Proposed Development of this EIA Report provides further information on the location of Lorg Wind Farm and a description of the proposed infrastructure. The proposed increase in the height and number of turbines would allow the installed capacity of Lorg Wind Farm to be increased by approximately 196% from an installed capacity of up to 32.4MW for the Consented Development to an estimated installed capacity of up to 96MW for the Proposed Development, thereby increasing the contribution towards Scotland's targets of renewable electricity production (see further information in Chapter 6: Renewable Energy Policy, Carbon Balance and Peat Management). This estimate is based on the installation of 15 turbines, each with an installed capacity of 6.4MW. It should however be noted that the final turbine model to be installed at the Development Site will not be known until a competitive tendering exercise has been undertaken, so there may be a slight variation in the generating capacity with turbines expected to have a capacity of 6.2 - 6.6MW, depending on the machines used.

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Non Technical summary

1. Introduction

1.1 History and Overview of the Proposed Development

1.1.1 In December 2015, a planning application for a 15 turbine wind farm, comprising a cluster of six turbines in the west portion of the Consented Site and nine turbines in the east portion of the [2015 Development Site] was submitted to Dumfries and Galloway Council (DGC) (reference 15/P/2/0337) and East Ayrshire Council (EAC) (reference 15/0935/PP/) under the Town and Country Planning (Scotland) Act 1997 (as amended). The current Development Site straddles the administrative boundary between the two council areas.

1.1.2 The Development Site is located ~12.3 kilometres (km) south west of Sanquhar and ~11km north east of Carsphairn. The National Grid Reference (NGR) for the Development Site centre is 266000 601400 and it encompasses land within Dumfries and Galloway and East Ayrshire. **Figure 1.1** shows a site location map in the wider landscape; and **Figure 1.2** shows the turbine locations.

1.1.3 In order to address issues raised by consultees and other stakeholders in response to the planning applications, which were primarily in relation to Landscape and Visual effects, the 15 turbine layout was amended. The western turbine cluster (6 no.) was deleted from the proposals and the positions of the remaining 9 turbines were amended to produce a more cohesive layout that avoided the constraints identified during the original 2015 Environmental Impact Assessment (EIA), and which reduced the environmental impacts that were of concern to key stakeholders as far as reasonably practicable. This 9-turbine layout was granted consent by DGC (reference: 15/P/2/0337) and EAC (reference: 15/0935/PP) in 2019 and 2018 respectively.

1.1.4 The DGC planning permission granted is for a wind farm generating station with a generating capacity not exceeding 50 Megawatts, with up to six wind turbines with a tip height of up to 130m and up to three turbines with a tip height of up to 149.9m, together with associated infrastructure.

1.1.5 The Applicant is now submitting an application under section 36 of the Electricity Act 1989, as amended, seeking consent to construct and operate a wind farm currently anticipated to comprise up to 15 wind turbines with a generating capacity in excess of 50 MW, together with access tracks, crane hard standings, two electricity sub-stations, two permanent anemometer masts and two temporary construction compounds (the "Proposed Development"). A maximum turbine blade tip height of 200m has been assumed. The turbines would have an increased rotor diameter compared to the Consented Development. With the exception of a slightly extended site area, the "Development Site" of the current "Proposed Development" would be unchanged from the Consented Development, although a development of 9 turbines was consented and a "Proposed Development" of 15 turbines is being applied for. A period of operation of 35 years is being applied for, which is an increase on the 25 years that was granted for the Consented Development.

1.2 The Applicant and the Project Team

1.2.1 RWE Renewables UK Onshore Wind Limited produces electricity from renewable energy sources and has become a "super player" in the field of renewables. RWE is the global number two in offshore wind, and has a goal to become climate-neutral by 2040 (this involves reduction of greenhouse gas (GHG) emissions beyond just carbon and also involves some contribution /compensation for emissions caused). In order to achieve this

goal, it is reducing its carbon dioxide (CO_2) emissions as quickly and drastically as possible, by phasing out or converting conventional power plants. RWE has already cut its greenhouse gas emissions by 60 million tonnes of CO_2 between 2012 and 2018, resulting in a 33% reduction. No other company in Germany has achieved more in the last few years and RWE is determined to continue this.

1.2.2 Together, RWE's employees drive forward new, innovative technologies and implement projects that significantly contribute to a global increase in renewable energy. RWE is planning to invest billions of pounds net annually in expanding renewables and developing storage technologies. RWE is focusing on the American continent and European core markets such as the UK, as well as new markets in Asia-Pacific. RWE has many projects in the pipeline, spanning all technologies including offshore and onshore wind, as well as photovoltaics. RWE is currently building the largest European onshore wind farm in Sweden and the largest solar power plant in Australia.

1.2.3 This Environmental Impact Assessment (EIA) Report has been prepared on behalf of the Applicant by WSP Environment & Infrastructure Solutions UK Limited[1] (hereafter referred to as WSP), with the support of Wind Power Aviation Consultants Ltd (aviation) and Pell Frischmann (traffic).

1.2.4 WSP is a global leader in multidisciplinary environmental and engineering consultancy and operates from a number of office locations in the UK. With skills ranging from development planning and design through an array of environmental and engineering disciplines, WSP has a comprehensive service portfolio and applied experience in a wide range of markets.

1.2.5 WSP is registered with the Institute of Environmental Management and Assessment (IEMA)'s EIA Quality Mark scheme. The scheme allows organisations that lead the co-ordination of EIAs in the UK to make a commitment to excellence in their EIA activities and have this commitment independently reviewed. The EIA has been carried out by WSP to standards that comply with IEMA's Quality Mark scheme.

1.2.6 Each year, IEMA registered organisations are required to comply with seven commitments relating to EIA management, team capabilities, regulatory compliance, EIA context and influence, EIA content, and improving EIA practice. Our approach to these matters is examined by IEMA through several methods, including reviewing the EIA reports WSP produces, interviewing staff, and publishing case studies provided for IEMA, and presentations made at conferences.

1.2.7 A statement outlining the relevant experience and qualifications of the competent experts who have prepared this EIA Report is provided in **Appendix 1A**.

1.3 Purpose of the Environmental Impact Assessment Report

1.3.1 This EIA Report has been prepared as part of an EIA relating to the Proposed Development. An EIA is required because the Proposed Development falls under Schedule 2 of The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (the "EIA Regulations") as a generating station (Schedule 2(1)). This EIA Report has been prepared for the purpose of meeting the requirements of the EIA Regulations that pertain to EIA Reports. The EIA Report provides the environmental information that will be used by the Scottish Ministers and consultees to inform the process of determining the application for section 36 consent under the Electricity Act 1989 for the Proposed Development.

[1] Previously Wood, Amec Foster Wheeler, Amec and Entec UK prior to acquisitions, with all of the previous EIA related work for Lorg Wind Farm undertaken by the same team.

1.3.2 This EIA Report is publicly available at the following locations:

- https://uk-ireland.rwe.com/project-proposals/lorg
- Carsphairn Shop & Tearoom;
- Hillview Leisure Centre;
- Dalmellington Area Centre; and
- New Cumnock Community Centre.

1.3.3 In accordance with good practice, a scoping report was prepared for the Proposed Development to identify its potential likely significant environmental effects. Effects that were assessed as being likely to be significant were proposed for further assessment in this EIA Report. This reflects the requirement of the EIA Regulations for the EIA Report to only consider those effects that are likely to be significant.

1.3.4 The Scoping Report (**Appendix 4A**) was issued to the Scottish Ministers by way of submission to the Energy Consents Unit (ECU) of the Scottish Government together with a request for a scoping opinion under the EIA Regulations. The Scoping Opinion is presented in (**Appendix 4B**).

1.3.5 Drawing upon the Scoping Opinion and subsequent scoping and assessment work, the EIA Report includes an assessment of the likely significant environmental effects of the Proposed Development, leading to a conclusion about which effects are assessed as being significant.

1.3.6 The overall approach that has been taken to defining significance, as well as further information about the approach to preparing the EIA Report, are outlined in **Chapter 4: Approach to preparing the EIA Report**.

1.4 Scope of the EIA Report

1.4.1 This EIA Report complies with the requirements set out in Regulation 5 and Schedule 4 of the EIA Regulations, which states that the following information should be included in an EIA Report:

- The location of the development;
- The description of the physical characteristics and land-use requirements of the proposed development, considering construction and operation (including requisite demolition works where relevant);
- Operational processes such as energy, materials and natural resources used;
- An estimate of any expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases);
- The reasonable alternatives that the developer has studied, which are relevant to the proposed development and its specific characteristics, with an indication of the main reasons for the chosen option and a comparison of their environmental effects;
- The baseline environment and an outline of its likely evolution (as far as natural changes to that baseline can be assessed with reasonable effort) in the absence of the proposed development;
- A description of the likely significant effects of the construction and operation of the proposed development on environmental factors - population, human health,

biodiversity, land, soil, water, air, climate, material assets, cultural heritage and landscape including the cumulation of effects with other existing and/ or approved development, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources, and the technologies and substances used;

- A description of the methods used in the assessment to determine whether significant effects are likely to occur;
- A description of measures and monitoring that have been identified to address likely adverse significant effects, during construction and/or operational phases;
- A description of any significant effects on the environment deriving from the proposed development's vulnerability to major accidents and / or disasters;
- A non-technical summary; and
- A list of references.

1.4.2 Regulation 4 and Schedule 4 of the EIA Regulations require that the environmental topics listed in column 1 of **Table 1.1** below must be considered when undertaking an EIA. Column 2 lists where these topics are included in this EIA Report, with reference to the relevant chapter numbers.

Table 1.1 Environmental Topics to be Addressed in the EIA Report and Chapter References

Topics[2] that need to be assessed under the EIA Regulations	Chapter titles in this EIA Report
Population	Visual effects [**Chapter 9**]; traffic and transport [**Chapter 14**]; noise [**Chapter 7**]; recreation and socio-economics [**Chapter 15**]
Human health	Human health [**Chapters 7 (noise), 8 (Shadow Flicker) and 9 (Landscape & Visual), 16 (Infrastructure and Other Issues)**]
Biodiversity	Biodiversity [**Chapter 11**]
Land	Land quality, geology and soils [**Chapter 13**]
Soil	Land quality, geology and soils [**Chapter 13**]
Water	Water [**Chapter 13**]
Air	Air quality (scoped out)
Climate	Climate [**Chapter 6 - Renewable Energy Policy, Carbon Balance and Peat Management**]
Material assets	Use of non-renewable resources (scoped out)
Cultural heritage	Historic environment [**Chapter 10**]

[2] In this EIA Report, the word 'topic' is used when referring to the elements of the environment that could be affected by the Proposed Development. Other words with the same general meaning are used in the EIA Regulations, notably 'factor' and 'aspect', but these are not used in the same context within this EIA Report.

Topics[2] that need to be assessed under the EIA Regulations	Chapter titles in this EIA Report
Landscape	Landscape & Visual [**Chapter 9**]
The inter-relationship between the above factors	These are discussed within each Chapter as relevant
Vulnerability to major accidents or disasters	Major accidents and disasters [**Chapter 16**]

1.5 Structure of this EIA Report

1.5.1 The EIA Report comprises 4 volumes:

- Volume 1 (i.e. this volume) is sub-divided into the following chapters:
  - **Chapter 2** - Scheme Need and Alternatives explains the need for Lorg Wind Farm, outlines the main alternatives considered for meeting this need and indicates the main reasons for the preferred choice;
  - **Chapter 3** - Description of the Proposed Development provides a detailed description of the Proposed Development;
  - **Chapter 4** - Approach to Preparing the EIA Report details the approach that has been adopted in preparing the EIA Report;
  - **Chapter 5** – Planning Policy provides an overview of the legislation and policies that are relevant to the EIA Report;
  - **Chapters 6 to 17** set out the technical assessments for the environmental topics considered in the EIA Report.
- **Volume 2** contains the figures referred to in the aforementioned volumes;
- **Volume 3** contains the appendices referred to in the EIA Report;
- **Volume 4** is a Non-Technical Summary (NTS), which is also available as a standalone document.

1.5.2 A glossary of technical terms is provided as **Appendix 1B** of the EIA Report in Volume 3.

1.6 Other documents

1.6.1 The section 36 application for the Proposed Development is informed by the EIA Report, but is also informed by two other documents, which are referenced in this EIA Report and the content of which should be read alongside the findings of the EIA Report. The following reports are included as part of the section 36 application:

- Pre-application consultation report; and
- Planning Statement.

2. Scheme Need and Alternatives

2.1 Need for the Project

2.1.1 In order to meet international obligations, both the UK government and the Scottish government have adopted legally binding commitments to reduce greenhouse gas emissions in an effort to reduce the level of future climate change. Further detail is provided in **Chapter 6: Renewable Energy Policy, Carbon Balance and Peat Management** of this EIA Report and in the Planning Statement which accompanies the Section 36 application. As the UK, and especially Scotland, has one of the windiest climates in Europe, it has great potential to generate electricity from wind power, and, if constructed, the Proposed Development would provide an important contribution towards renewable generation capacity. The Scottish Government have stated that onshore wind is now amongst the lowest cost forms of power generation of any kind and is a vital component of the huge industrial opportunity that renewables create for Scotland (Scottish Government Onshore Wind Policy Statement). Further, it states that energy and climate change goals mean that onshore wind must continue to play a vital role in Scotland's future (The Scottish Government, Onshore wind – policy statement refresh 2021: consultative draft).

2.1.2 Scottish renewable energy targets have increased in recent years in response to more ambitious greenhouse gas emission reduction targets. The Scottish Government's interim target is to reduce CO_2 emissions by 75 % by 2030, with a net zero target for all greenhouse gases to be achieved no later than 2045. In June 2022, the Scottish Government stated that in 2020, 25.4 % of total Scottish energy consumption came from renewable sources, against a target of 50% by 2030. Therefore, there is a recognised need to dramatically increase renewable electricity generation, with onshore wind identified by the Scottish Government as being of critical importance. A significant increase in wind energy capacity will be required if Scotland is to achieve its target of 50% consumption from renewable sources and in turn its ambition to reduce greenhouse gas emissions to a net-zero state by 2045. The Proposed Development would contribute substantially to achieving all these targets, and in particular the 2030 targets.

2.1.3 The Consented Development was predicted to have an installed generation capacity of up to 32.4 MW of renewable energy. The turbines are currently consented to have a tip height of up to 130m for six of the turbines and up to 149.9m tip height for the other three turbines. It has been calculated that an increase in height to up to 200m for the Proposed Development and with the addition of six turbines, the installed generation capacity at the Development Site can be approximately tripled to in the order of approximately 96 MW.

2.1.4 The Scottish Government's Onshore Wind Policy Statement (December 2017) supports the use of larger turbines where they are appropriately sited. The Applicant considers that the Development Site and the surrounding landscape can accommodate the larger turbines and the additional six turbines proposed. The Scottish Government published a draft version of a document titled *Onshore Wind – Policy Statement Refresh 2021: Consultative Draft* on the 28th of October 2021. The draft document affirms the Scottish Government support for wind farms and the important renewable energy resource they provide. The Dumfries and Galloway Local Development Plan 2 supports increases in turbine tip height on existing sites, stating that such developments could include: "…Improving the efficiency of existing wind farm schemes for example, through blade extensions, modifications to the turbines or repowering".

2.1.5 In April 2022, the UK Government published its British Energy Security Strategy. The strategy proposes to accelerate the UK towards a low-carbon, energy independent future. Of relevance to the Proposed Development, it states that there should be an *"approach to reduce global reliance on Russian fossil fuels whilst pivoting towards clean, affordable energy".* The Proposed Development would generate energy in the UK which would contribute to this approach.

2.1.6 A report published by the House of Commons Environmental Audit Committee in February 2021 (Growing back better: putting nature and net zero at the heart of the economic recovery) recommends that as the country recovers from the Covid-19 pandemic *"the focus must be on how to grow back better, creating a greener, healthier and more resilient economy"* and that *"It is essential that all decisions on infrastructure investment are considered with regard to UK net zero targets, impacts on biodiversity and future projections for changes in climate likely to affect the UK".* The Proposed Development would help towards creating a greener economy.

2.2 Consideration of Alternatives

Introduction

2.2.1 The EIA Regulations make two references to the consideration of alternatives, as follows.

- In paragraph 5(2)(d) of Part 1 it states that an EIA Report should include *"a description of the reasonable alternatives studied by the developer, which are relevant to the development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment";*
- Paragraph 2 of Schedule 4 states that an EIA Report should include "*A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects."*

2.2.2 This EIA Report complies with the requirements of the EIA Regulations relating to consideration of alternatives since it outlines the likely effects on the environment arising from an alternative to the Consented Development.

2.2.3 The Applicant has reassessed the potential of the Development Site in light of changes in available turbine technology since the original planning application was consented. The proposed increase in the number, height and rotor diameter of the turbines, along with an increase in the period of consent (from the 25 years of the Consented Development to 35 years for the Proposed Development) would result in a large increase in the renewable energy generation capacity at the Development Site. The Proposed Development would therefore make a greater contribution to UK and Scottish Government renewable energy targets than the Consented Development.

Site and Layout Design Iterations

2.2.4 As part of the EIA, various environmental and technical studies were carried out. The results from these studies indicated that some areas of the Development Site were better suited for wind farm infrastructure than other areas. Factors considered included sensitive ecological habitats, such as potentially Groundwater Dependent Terrestrial Ecosystems (GWDTEs), areas of deep peat, surface water and bats.

2.2.5 The evolution of the design took account of comments provided through various consultation discussions, desk studies and technical appraisals by the project team and was based around a constraints mapping exercise. Following a desktop based constraints mapping exercise in March 2021, an initial 12 turbine layout was considered and this was subsequently submitted to the ECU for EIA scoping (May 2021).

2.2.6 A further constraints mapping exercise took place between May and September 2021, this drawing on consultation with statutory bodies and members of the local community, detailed site assessments and potential cumulative effects arising from nearby wind farm developments. This culminated in a design workshop in September 2021, the results of which are reported in **Table 2.1**.

Table 2.1 Design Iterations

Design Iteration	Constraints Influencing Layout	Summary of Change
Layout 1 (Scoping)	'Hard constraints' such as existing infrastructure, residential properties, watercourses, roads, public rights of way, etc. were buffered as appropriate and were taken into account in the design of the initial 12 turbine scoping layout, along with other engineering considerations such as terrain (primarily slope). The layout was also informed by environmental constraints mapped throughout the EIA for the 9 turbine Consented Development such as peat depth, GWDTEs and the results of ecology and ornithology surveys. The design also took into account feedback from consultees including NatureScot and Historic Environment Scotland in terms of the effects on Landscape and Visual and Cultural Heritage Receptors.	The Scoping Layout involved the addition of two turbines in the western portion of the site, the addition of one turbine in the eastern part of the site and some minor changes to the 9 turbines of the consented layout in the eastern part of the site to produce a 12 turbine Scoping Layout.
Layout 2 (Final Layout)	A design workshop was held in September 2021 to optimise the 12 turbine Scoping Layout. The constraints identified for the scoping layout were avoided and wireframes were examined from various key viewpoints to minimise the effects on Landscape and Visual and Cultural Heritage Receptors. Turbine postions in the eastern cluster were optimised in terms of hard constraints. Three new turbines were added to the western cluster. Turbine positions were optimised in relation to 'soft' ecological constraints to reduce the effects on areas of deep peat, Ground Water Dependant Terrestrial Ecosystems (GWDTE), sensitive ecological areas and in relation to indirect Historic Environment constraints. Wireframes for the western turbines were examined from a number of viewpoints. T15 was identified as an outlier from some viewpoints, and so was moved in a north westerly direction. The locations of the 5 turbines in the western cluster were optimised to reduce turbine overlap and improve composition of the layout.	Three new turbines were added to the western cluster and the locations of turbines in both clusters were optimised in terms of ecological constraints (e.g. peat) to reduce turbine overlap and improve composition of the scoping layout. A 15 turbine layout as shown on **Figure 2.1** resulted.

2.2.7 Full details of environmental and planning constraints can be found in the relevant technical chapters of this EIA Report.

2.3 References

Dumfries and Galloway Council (2019). Local Development Plan 2. (Online) Available at: https://www.dumgal.gov.uk/article/16130/ldp2 [Accessed September 2022]

Energy Statistics for Scotland Q1 2022 Figures (June 2022) https://www.gov.scot/publications/quarterly-energy-statistics-bulletins/ [Accessed September 2022]

Scottish Government Onshore Wind Policy Statement (December 2017) https://www.gov.scot/Resource/0052/00529536.pdf [Accessed October 2022]

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The UK Government, British Energy Security Strategy (April 2021) Available via: https://www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy [Accessed November 2022]

Growing back better: putting nature and net zero at the heart of the economic recovery (February 2021) https://committees.parliament.uk/publications/4712/documents/47430/default/ [Accessed November 2022]

The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (the EIA Regulations). http://www.legislation.gov.uk/ssi/2017/101/pdfs/ssi_20170101_en.pdf [Accessed September 2022]

3. Description of the Proposed Development

3.1 Introduction

3.1.1 In writing the scheme description, consideration has been given to the requirements of Schedule 4 of the EIA Regulations in which paragraph 1 states that the description should include:

a) *"A description of the location of the development;*
b) *A description of the physical characteristics of the whole development, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases;*
c) *A description of the main characteristics of the operational phase of the development (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used;*
d) *An estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases."*

3.1.2 These requirements are addressed in the sub-sections below.

3.2 Development Description

Site Location

3.2.1 The location and wider geographical context of the Development Site is shown on **Figure 1.1** with the Development Site boundary and turbine locations shown in **Figure 1.2**. The Development Site is located mainly in Dumfries and Galloway with a small proportion of it being located in East Ayrshire between Carsphairn (located approximately 11km to the south west) and Sanquhar (located approximately 12.3km to the north east). The town of New Cumnock is located approximately 10.5km to the north. The nearest residential properties to the Development Site are at Polskeoch (approximately 700m from the Development Site boundary and approximately 1,190m from the nearest turbine) and at Upper Holm of Dalquhairn (approximately 740m from the Development Site boundary and approximately 2,150m from the nearest turbine). There is also a bothy located at Polskeoch, approximately 410m from the Development Site boundary.

Existing Site and Surroundings

3.2.2 The Development Site covers an area of approximately 1,243ha of mainly moorland with no tree cover, with the primary land use being grazing sheep. The elevation of the Development Site is approximately 255m to 640m above ordnance datum (AOD).

3.2.3 The Development Site is divided into two areas by the steep-sided valley formed by the Water of Ken, with Lorg Farmhouse located on the relatively flat land found north of the river and alongside the Lorg Burn. The valley of the Lorg Burn in the north-west of the

Development Site is steeply sloped and surrounded by a semi-circle of high ridges and peaks, including Ewe Hill, Alwhat, Meikledodd Hill and Lorg Hill.

3.2.4 The Water of Ken runs through the south-eastern portion of the Development Site from the north-east to the south-west, it continues to run southwards roughly parallel with the C class road between the Development Site boundary and the B729. The south-east of the Development Site is defined by the north-flowing Pulmulloch Burn and surrounding peaks of Altry Hill, Craigstewart, Coranbae Hill, Cairn Hill, Black Hill, High Countam and Fortypenny Hill. This valley is less steep than that of Lorg Burn.

3.2.5 The 'Lorg Trail' footpath joins the Southern Upland Way (SUW) just north of the Development Site. The SUW continues to the east of the Development Site, before running along part of the eastern and southern site boundaries.

3.2.6 In addition to the Water of Ken and the Lorg Burn, a number of other small burns cross the Development Site.

Development Proposals

3.2.7 The Proposed Development comprises the following principal infrastructure:

- Up to 15 wind turbines of up to 200m to blade tip height;
- Access tracks and ancillary development connecting infrastructure elements;
- Access from B729 and C class road (Lorg road) for HGVs only (no turbine deliveries);
- Hard standing areas e.g. crane pads and storage areas;
- Borrow pit (s) (to be located within the borrow pit search areas);
- Two 'permanent' anemometer mast of up to 100m to monitor weather conditions;
- Temporary works i.e. two construction compounds and gatehouse; and
- On-site electrical infrastructure including a wind farm control building and a Scottish Power Energy Networks (SPEN) 132/33kV substation A and a SPEN 33kV substation B and underground cabling between these buildings and the turbines.

3.2.8 In practice the generating capacity will be limited by the size of available turbines which can be accommodated within the physical turbine parameters for the Proposed Development. It is therefore considered unnecessary to impose any specific upper limit on the MW capacity of any individual turbines or on the Proposed Development as a whole. The overall generation capacity of the Proposed Development would exceed 50MW and as such a Section 36 consent under the Electricity Act 1989 is being applied for.

3.2.9 **Table 3.1** provides a summary of the key features of the Proposed Development, with the infrastructure layout as described in the following sections shown on **Figure 3.1a - c**.

Table 3.1 Key Development Features of the Proposed Development

Component	Description
Wind Turbines	Number: up to 15 (see Table 3.2 for grid references). Turbine Heights (to blade tip): up to 200m[1].
Turbine Foundations	Number: up to 15 Footprint per Turbine: ~0.05ha based on a 25m diameter foundation. Foundation Depth: 2-3m dependent on ground conditions.
Turbine Crane Pads	Number: up to 15 Dimensions: 25m by 70m – main pad 2 number 12m x 20m Auxiliary pads 15m x 150m Blade storage areas Footprint per Crane Pad: ~ 0.4ha
'Permanent' Anemometer Mast	Maximum number: 2 (located at National Grid Reference (NGR) E 267987, N 600212 and E 264487, N 601891) Mast Height: up to 100m Crane Pad Dimensions: 20m x 20m Footprint per Crane Pad: ~0.045ha
Wind Farm Control Building and Compound & SPEN Substation and Compound **Substation A**	Location: Approximately centred on NGR E 267684, N 599659 Compound Dimensions: 100m by 50m Building Dimensions 20 x 30m Control Building Height: up to 5.5m Maximum Height of Substation: up to 13m Maximum Compound Footprint: 0.5ha
Substation B	Location: Approximately centred on NGR E 264,410, N 601,594 Compound Dimensions: 25m by 20m Building Dimensions 18 x 6m Control Building Height: up to 5.5m Maximum Height of Substation: up to 13m Maximum Compound Footprint: 0.05ha
Access Tracks (including turning heads)	Length: ~18.1km / Running Width: up to 6m (wider on bends). Footprint: ~ 10.87ha, including turning heads and widening.
Passing Places	Number: up to 36 Dimensions: 30m in length, up to 5m wide Footprint: ~0.54ha
Watercourse Crossings	Maximum number: up to 15.
Borrow Pit	Number: up to 2

[1] Note a range of turbines of different dimensions are under consideration for the Development Site. It should be noted that a hub height would never be combined with a rotor diameter which would exceed the maximum height to blade tip of 200m for which consent is sought.

Component	Description
Temporary Construction Compound	Number: 2 Locations: centred on E 266946, N 600412, and E 263,325, N 602,097 Dimensions: ~ 50m by 50m, Total footprint: ~0. 5ha
Cable Trenches	Depth: ~1m / Width: ~1.2m Cables will be installed alongside access tracks.

Turbine Layout

3.2.10 The layout of the Proposed Development is shown on **Figure 3.1 a- c**. The turbine locations, along with the location of the 'permanent' on-site anemometry masts, is presented in **Table 3.2**.

Table 3.2 Wind Turbine and 'Permanent' Anemometry Mast Locations

Component	Maximum Height (m)	Location (NGR)
Turbine 1	200	E267619, N 599928
Turbine 2	200	E 268060, N 599026
Turbine 3	200	E 268013, N 600532
Turbine 4	200	E 268286, N 600143
Turbine 5	200	E 268087, N 599579
Turbine 6	200	E 268712, N 599660
Turbine 7	200	E 268672, N 600667
Turbine 8	200	E 268735, N 599187
Turbine 9	200	E 268812, N 600230
Turbine 10	200	E 268500, N 601112
Turbine 11	200	E 264331, N 601314
Turbine 12	200	E 264252, N 602022
Turbine 13	200	E 263670, N 601037
Turbine 14	200	E 264872, N 602170
Turbine 15	200	E 264703, N 602170
Anemometry Mast	100m	E 267987, N 600212
Anemometry Mast	100m	E 264488, N 601891.

Micrositing

3.2.11 Micrositing refers to the precise locating of wind farm infrastructure, following more detailed ground investigations that would be carried out post consent. This allows the location of infrastructure to be revised within a specified distance in response to the findings of the more detailed ground investigations that would be carried out as part of the preparations for construction. It is proposed that a micro siting allowance of 50m is permitted for the wind turbine and met mast locations and 50m from the extremities of all other infrastructure (access tracks, substation etc). These micrositing distances have been taken into account within the technical assessments.

3.2.12 Any such repositioning will be controlled so as to avoid or minimise so far as possible encroachment into any environmentally or technically constrained areas. In addition, micrositing provides scope to mitigate potential geo-environmental and geotechnical constraints which may only be identified during detailed site investigation works or preparatory ground works. The following can potentially be achieved through carefully designed micrositing:

- Reduction of peat disturbance;
- Avoidance of the most sensitive habitats;
- Avoidance of need for foundation piling; and
- Avoidance of currently undetected archaeological remains.

3.2.13 Where environmental and technical constraints may fall within a micrositing area, further encroachment on such areas can be restricted in any condition attached to the grant of consent (e.g. micrositing may be restricted in a particular direction if this encroaches upon a buffer around a watercourse for example).

Wind Turbine Parameters

3.2.14 A number of turbine manufacturers and models would be suitable for installation at the Proposed Development. The final choice of turbine would depend upon technical and commercial considerations, and would be decided by the Applicant following planning consent.

3.2.15 **Figure 3.2** (illustrative) shows the structure of a typical wind turbine. This is a typical modern horizontal axis, upwind design comprising four main components: a rotor (consisting of a hub and three blades), a nacelle (containing the generator and also often a gearbox) to which the rotor is mounted, a tower, and a foundation. Infrared aviation lighting of the specification required by the MoD would be installed on each turbine and on each 'permanent' anemometry mast.

3.2.16 A transformer / switchgear steps up the voltage generated by turbines (typically 690V) to 33kV and the generated power at this voltage is fed to the control building via underground electrical cabling. The transformer / switchgear is located within the nacelle or tower of the turbine, or immediately adjacent to it in a small kiosk such that they are generally indistinct from the tower base unless viewed close up or in silhouette against the skyline at greater distances. For the purpose of the EIA of this application, it is assumed that external kiosks, which are typically 5m x 3m x 3m, will be required, but either internal or external options may be taken forward.

3.2.17 The electricity generated by the Proposed Development will be metered and fed into the electricity transmission system to which it will be connected. The Proposed Development will be connected into the transmission system at 132kV (Substation A**, Figure 3.3**) and at 33kV (Substation B, 33 kV, **Figure 3.4**) and consent is also sought by the Applicant in this

application for the construction of two new substations 132/33kV SPEN substation and compound at the Proposed Development, NGR E 267684, N 599659 and E 264,410, N 601,594, including the control /switch room, as shown on **Figure 3.3** and **Figure 3.4**. The maximum height of the substation buildings will be 5.5m with equipment height of up to 13m.

3.2.18 The turbine used to inform the EIA is based on a tip height of up to 200m which represents a likely development scenario. Where specific operational turbine details are required to carry out the assessment (see for example **Chapter 7: Noise**), different representative turbines have been used to represent a worst-case scenario.

On-site Access Tracks

3.2.19 A total of approximately 18.1km of new on-site access tracks will be constructed, with approximately 4.8km being located in East Ayrshire and approximately 13.3km being located in Dumfries and Galloway.

3.2.20 Owing to the size of some of the turbine components, all on-site access tracks will be up to 6m wide, with some additional localised bend widening and passing places to a maximum of approximately 12-14m. It is, however, noted that tracks are more likely to be 5m wide for most of their length. For the purposes of this EIA, an average width of 6m has been assumed. Access tracks will be constructed to a depth and quality suitable to bear the load of all envisaged traffic.

3.2.21 The proposed alignment of access tracks was developed, initially, through desk study and then refined following site walkovers by Civil Engineers with wind farm construction experience, to assess buildability, mainly to:

- Minimise the overall track length;
- Ensure track gradients can be kept within specification for site vehicles; and
- Avoid identified constraints (ecologically sensitive areas, areas of deep peat, waterbodies etc).

3.2.22 Depending on the ground conditions encountered on the Development Site, a range of road construction methods may be used, for example floating roads where peat deeper than 1m has been identified as being present. Based on current knowledge of the Development Site, approximately 4,960m of floating tracks will be required. The construction methodology for the onsite track types are illustrated in **Figure 3.5**.

Infrastructure Layout

Crane Pads

3.2.23 Each proposed wind turbine requires an area of hardstanding to be built adjacent to the turbine foundation. This provides a stable base on which to lay down turbine components ready for assembly and erection, and to site the cranes necessary to lift the tower sections, nacelle and rotor into place. Auxiliary crane pads are also required to accommodate the erection of the crane lattice boom used from erection. An indicative crane hardstanding is shown in **Figure 3.6**.

3.2.24 The crane hardstandings will be left in place following construction, to allow for future use of similar plant, should major components need replacing during the operation of the Proposed Development. These crane pads could also be utilised during decommissioning. The total area of hardstanding at each turbine location will be approximately 4,500m^2.

Temporary Construction Compound and Laydown Area

3.2.25 Two temporary main site compounds will be constructed for the Development Site, each within an area measuring approximately 50m x 50m, which will be enclosed by appropriate security fencing of 2.0m in height. The location of the construction compounds is shown on **Figure 3.1a - c**, and an additional construction compound for the SPEN substation, of similar size, will be located either within the nearest one of these compounds or within the compound which houses the substation and control building.

3.2.26 A concrete batching plant will be installed either adjacent to the borrow pit or adjacent to one of the site compounds, with its final location to be determined following ground investigation. The approximate area being 100m x 50m, a typical batching compound configuration is shown in **Figure 3.7**. The final location of this batching plant would not alter the EIA findings of significant effects, taking into account the adoption of standard mitigation and best practice, detailed in the Construction Environmental Management Plan (CEMP) and other relevant documents.

3.2.27 Surface vegetation and soil/peat will be removed from the area of the compounds and laid on geogrid over the surrounding undisturbed vegetation until required for reinstatement during or following construction. The construction compound areas will then be overlain with compacted stone to approximately 500mm depth, depending on ground conditions.

'Permanent' Anemometry Masts

3.2.28 Meteorological conditions will be monitored by two 'permanent', free standing anemometry masts, located as shown in **Figure 3.1**. Their height will be up to 100m. The design of this structure would be of a steel lattice type (an example of a steel lattice type design is shown in **Figure 3.8**), which would have an adjacent crane pad of a similar type to the turbines with dimensions 20m x 20m, and which would be left in situ for the operational period.

On-site Electrical Connections

3.2.29 Wind turbines generally produce electricity at 690V which is typically transformed to 33kV via the turbine transformers. As previously stated, the turbine transformer may be located inside the turbine tower, or nacelle, or it may be installed in a small external kiosk located adjacent to the turbine.

3.2.30 Underground cables will link the turbines to the on-site control building. Detailed construction and trenching specifications will depend on the ground conditions encountered at the time, but typically, cables will be laid in a trench approximately 1,000mm deep and up to approximately 1,200mm wide. Cables will be laid in coarse sand or other granular material, and the trenches will then be backfilled with excavated soil/peat and sub-soil which has been sieved and graded to remove stones. **Figure 3.9** shows a typical cable trench detail.

3.2.31 To minimise ground disturbance, cables will be routed along the side of the access tracks wherever practicable. Approximately 54km of 33kV underground cable (trefoil cable in 18.1km of trenches) will be required on-site to connect the turbines and the control building.

Control Buildings and Substations

3.2.32 The turbines will be connected through suitable switchgear to be installed in a control building on-site. The control building will be approximately 20m x30m. SPEN will construct

a 132/33kV substation adjacent to the wind farm control building on the same platform and the two will be connected.

3.2.33 The new SPEN substation A, and onsite wind farm control building will be located in the eastern part of the Development Site and will sit together within a compound with maximum dimensions of up to approximately 100m x 50m and up to two storey buildings (likely to be single storey, but this depends on SPEN requirements) of approximately 30m x 20m which will house switchgear, metering, protection, control equipment, as well as welfare facilities.

3.2.34 There will be an additional wind farm control building / 33kV substation B located in the western part of the Development Site.

3.2.35 **Figures 3.3 and 3.4** provides an illustration of the control buildings and compounds. Final details including external finishes and screen planting will be agreed with Dumfries and Galloway Council (Substation A) and East Ayrshire Council (Substation B), as applicable.

Operational Land Take

3.2.36 The total operational land take (i.e. the Proposed Development footprint post-construction) is shown in **Table 3.3.**

Table 3.3 Footprint Area by Component

Component	Area (~ha)
Tracks (including turning heads) located only in Dumfries and Galloway	8.02
Tracks (including turning heads) located only in East Ayrshire	2.86
Passing places	0.54
Turbine Crane Pads	6.0
Control Building, SPEN Substation and Compounds - A	0.5
Control Building, and Compounds - B	0.05
Turbine Bases	0.75
Met Mast foundations and crane pads located only in Dumfries and Galloway	0.045
Met Mast foundations and crane pads located only in East Ayrshire	0.045
TOTAL OPERATIONAL LAND-TAKE	18.80
Temporary Construction Compounds	2
Temporary Borrow Pit	2

Off-site Electrical Connection

3.2.37 SPEN will establish 1 x 90MVA 132/33kV transformer arrangement with associated switchgear in a substation located on the Development Site within the area shown in **Figure 3.3**. The connection point to the National Grid is likely to be by either underground cable or overhead line to either the Black Hill or Glen Glass substations.

3.3 Proposed Site Access

Site Entrance

3.3.1 The primary Development Site access will be created off/from the existing access tracks to/used by the consented Afton Wind Farm to the north of the Proposed Development. Abnormal Indivisible Loads (AIL) would access the Development Site via this route and it is also proposed that ~25% of the construction traffic would utilise this access. It is also proposed that ~75% of the construction traffic, but not AILs, would be delivered via Lorg Road from the B729 entering the Development Site from the public road to the south of the Development Site.

Abnormal Indivisible Loads

3.3.2 Due to the abnormal size and loading of wind turbine delivery vehicles, it is necessary to review the public highways that will provide access to the Development Site to ensure they are suitable, and to identify any modifications required to facilitate access for delivery vehicles.

3.3.3 Access studies incorporating swept path analysis (see **Appendix 14A** for further information) have been carried out to review potential access routes. The proposed route for abnormal loads (shown on Figure 14.2) is from the Port of Ayr, and would follow the designated 'wind farm access route' from the Jura Terminal along Waggon Road. From here the proposed access route would follow via the A719, A77, A76, B741, Afton Road and the operational Afton Wind Farm, entering the north eastern part of the Development Site at a new junction that would be created off Afton Wind Farm's access tracks. As the turbine delivery vehicles are abnormal indivisible loads, a Special Order is required under The Road Vehicles (Authorisation of Special Types) (General) Order 2003, which will be obtained prior to any deliveries taking place.

3.3.4 A swept path analysis has been undertaken (**Appendix 14.A**) to identify any areas of road widening and street furniture realignment works that would be required.

3.3.5 A Traffic Management Plan (TMP) would be developed in discussion with East Ayrshire Council (EAC) and Dumfries and Galloway Council (DGC) if required, following award of consent and would set out all traffic management measures including diversions, programming, stacking areas and vehicle movements on and off-site etc.

General Construction Traffic

3.3.6 The general construction traffic would include flat bed trucks and Heavy Goods Vehicles (HGVs) delivering plant and equipment (e.g. excavators, bull dozers and cranes), as well as vans and cars associated with construction staff movement. This traffic will access the Development Site from the north via the access off the operational Afton Wind Farm and / or the south via Lorg Road. The access point to the Development Site and the routes of these vehicles prior to this will vary, depending on the origin of the contractors and materials (depending on location of any quarries used to source stone in the event the on-site borrow pit(s) are not sufficient, for example).

3.4 Construction Process

Proposed Programme

3.4.1 The construction period for the Proposed Development will be approximately 24 months in duration for on-site works, and will comprise the following activities broadly listed in anticipated sequence:

- Construction of the Development Site access points off the track of the operational Afton Wind Farm and Lorg Road;
- Formation of the temporary construction compounds including hard standing and temporary site office facilities;
- Construction of on-site access tracks and passing places (as required), inter-linking the turbine locations and control building compound;
- Construction and upgrade of culverts under roads to facilitate drainage and maintain existing hydrology;
- Opening and operating of on-site borrow pit(s);
- Operation of on-site concrete batching plant;
- Construction of crane hardstanding areas;
- Construction of turbine and 'permanent' anemometry mast foundations;
- Construction of site control building and associated substation;
- Excavation of trenches and cable laying adjacent to site roads;
- Connection of on-site distribution and signal cables;
- Delivery and erection of wind turbines and 'permanent' anemometry masts;
- Commissioning of site equipment; and
- Development Site restoration.

3.4.2 Where possible, construction activities will be carried out concurrently (thus minimising the overall length of the construction programme). In addition, the Proposed Development will be phased to allow civil engineering works to continue in part of the Development Site, whilst the proposed turbines are being erected elsewhere for example. Development Site restoration will be programmed and carried out to allow restoration of disturbed areas as early as possible and in a progressive manner.

3.4.3 An indicative programme for construction activities is shown in **Figure 3.10**. The starting date for construction activities is largely dependent upon the date that consent might be granted and the grid connection date (which is largely outside the Applicant's control); subsequently the programme will be influenced by constraints on the timing and duration of any mitigation measures confirmed in this EIA Report and/or the planning conditions.

3.4.4 The final length of the programme will be dependent on seasonal working and weather conditions. Summer months are favoured for construction due to longer periods of daylight allowing longer working days. Summer months are generally also drier which aids the construction progress and reduces the amount of site debris (e.g. mud) reaching the public highway (and a watching brief will be maintained on the cleanliness of the public highways, with cleaning carried out by contracted road sweepers if required). Weather, particularly wind, has a major influence on the timing of construction activities.

Crane lifting activities are generally limited during strong winds (>11 m/s) and erection during these weather conditions may be avoided for safety reasons. The actual limiting conditions will be reviewed as part of the crane lifting plan. During periods of cold weather, concrete pouring for the turbine bases may be prohibited (temperatures <4°C) or subject to specific cold weather working practices.

Hours of Working

3.4.5 For the purposes of this EIA Report, construction activities have been assumed to take place between 07:00 to 19:00 hours on week days (Monday to Friday) and 07:00 to 13:00 hours on Saturdays. Quiet on-site working activities such as electrical commissioning have been assumed to extend outside the core working times noted (where required). Working hours may be reduced at times due to seasonal or weather restrictions. Some works such as delivery of the components of turbines may take place outside the core working hours to reduce disturbance to other users of the road network.

3.4.6 Work outside the hours noted is not usual, though if required to meet specific demands (e.g. during foundation pours and highly weather dependent activities), permission for short term extensions to these hours would be sought from DGC and EAC as required.

Standard Construction Working Practices

3.4.7 Contractors' working areas will be clearly delineated on-site to ensure that no unnecessary disturbance is caused to any potentially sensitive areas.

3.4.8 Particular attention will be given to the storage and use of fuels for the plant on-site. Oil will be stored in accordance with the applicable general binding rules under the Water Environment (Controlled Activities)(Scotland) Regulations 2011 . Drainage within the temporary construction compounds, where construction vehicles will park and where any diesel fuel will be stored, will be directed to an oil interceptor to prevent pollution in the event of any spillage occurring. Storage of diesel fuel will be within a bunded area or self-bunded tank in accordance with the Scottish Environment Protection Agency (SEPA) Pollution Prevention Guidelines. Standard construction working practices will be implemented during construction, operation and decommissioning in order to ensure adherence to Construction Industry Research and Information Association (CIRIA) guidance and other current best practice, including the following SEPA Guidance for Pollution Prevention (GPP) Notes and former (now discontinued) Pollution Prevention Guidance (PPG) Notes:

- PPG 1 Understanding your Environmental Responsibilities – Good Environmental Practices (October 2020);
- GPP 2: Above Ground Oil Storage Tanks (January 2018);
- PPG 3: Use and Design of Oil Separators in Surface Water Drainage Systems (April 2006);
- GPP 4: Treatment and Disposal of Wastewater where there is no Connection to the Public Foul Sewer (November 2017);
- GPP 5: Works and Maintenance in or near Water (January 2017);
- PPG 6: Working at Construction and Demolition Sites (2012);
- GPP 8: Safe Storage and Disposal of Used Oils (July 2017);
- GPP 13: Vehicle Washing and Cleaning (April 2017);

- PPG 18: Managing Fire Water and Major Spillages (June 2000);
- GPP 20: Dewatering of Underground Ducts and Chambers (January 2018);
- GPP 21: Pollution Incident Response Planning (July 2017); and
- GPP 26: Safe Storage of Drums and Intermediate Bulk Containers (February 2019).

3.4.9 Due consideration will also be given to the following guidance documents:

- *Scottish Renewables, Scottish Natural Heritage, SEPA, Forestry Commission, Historic Environment Scotland, Marine Scotland Science, AECoW (2019) Good Practice During Wind Farm Construction, 4th Edition*;
- *Control of Water Pollution from Linear Construction Projects* (CIRIA C648, 2006), produced by CIRIA;
- *Scottish Natural Heritage, SNH* (now NatureScot)*, (2015). Constructed Tracks in the Scottish Uplands. 2nd Edition*; and
- *Forestry Civil Engineering and Scottish Natural Heritage (2010) Floating Roads on Peat*.

Health and Safety during Construction

3.4.10 Health and Safety is of vital importance to the Applicant and the requirements of the Construction (Design and Management) Regulations 2015 (CDM 2015) will be addressed throughout the development stages. If planning consent is granted, the Principal Contractor will be required to produce a Construction Phase Health and Safety Plan in accordance with CDM 2015 to outline and define the approach to Health and Safety that will be adopted specifically for the Proposed Development. In addition to CDM 2015, the Applicant and their Contractors will also adhere to other relevant UK Health and Safety legislation and relevant guidelines including:

- Health and Safety at Work Act 1974;
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR); and
- Onshore Wind Health & Safety Guidelines, Renewable UK, 2015.

3.4.11 Method statements and risk assessments will also be undertaken for each work package prior to activities taking place.

3.4.12 The Applicant will directly appoint suitably experienced Contractors for the detailed design, procurement and construction of the Proposed Development. Selection will be based partly upon a Contractors' record in dealing with HSSE issues and on the provision of evidence that the Contractor has incorporated HSSE considerations into its method statements, staffing and budgetary provisions.

3.4.13 The Applicant will also appoint a Project Manager for the duration of these phases to act as an interface between them and the Contractors. The Project Manager will also monitor the construction works and undertake the duties as defined in the CDM Regulations 2015. A Principal Designer (PD) will be appointed by the Applicant to undertake the PD duties as defined in the CDM Regulations 2015.

3.4.14 Appropriate signage will be provided on the Development Site to indicate any hazards, those areas which should be avoided or where unauthorised entry is prohibited. During the construction phase, public access on-site would be restricted for health and safety reasons.

Construction Method Statement (CMS)

3.4.15 The Applicant will engage a Contractor to construct the Proposed Development. During the construction process, the Applicant will retain the services of any specialist advisers that may be required, for example on archaeology, ecology and peat restoration, to be called on as required to advise on specific issues, including micrositing. More detailed information on the role of such specialist advisors during construction is provided in the relevant EIA Report chapters.

3.4.16 The final range of measures to be taken to reduce or mitigate the environmental impact of the construction process will be captured in the Construction Environmental Management Plan (CEMP), Pollution Prevention Plan (PPP), Site Waste Management Plan (SWMP) and emergency procedures that will all fall under the wider Construction Method Statement (CMS). The Contractor will employ an Environmental Clerk of Works (ECoW) during the construction phase, who may take a key role in the preparation of the CEMP. The CEMP would ensure that the mitigation measures outlined in this EIA Report are fully implemented and environmental specialists will support the ECoW as required.

3.4.17 The CEMP, will as a minimum, include all of the mitigation measures required during construction which are identified as being necessary within this EIA Report to mitigate any likely significant adverse effects, and will outline a suite of control measures to manage the potential environmental impacts during this phase (including noise, pollution, surface water runoff and waste). It would draw on the standard construction practices outlined in **Paragraphs 3.4.7 to 3.4.9.**

3.4.18 The CMS and supporting documents will be submitted for approval by DGC and EAC and (in respect of works within or affecting their area) EAC following consultation with bodies such as SEPA prior to construction and development. In order to ensure that they are being suitably adhered to by the appointed contractors, an independent and suitably qualified engineer, who will also liaise with the various environmental advisers employed during the construction phase, will be appointed by the Applicant to monitor implementation and provide specialist advice.

Dust and Air Quality

3.4.19 There is the potential for an increase in dust during construction. However, as well established and effective dust control measures are used during the construction of wind farms, it is not expected that air quality will be affected by dust. The main measures for managing dust that will be used where necessary are:

- Adequate dust suppression facilities will be used on-site. This will include the provision of on-site water bowsers with sufficient capacity and range to dampen down all areas that may lead to dust escape;
- Any on-site storage of aggregate or fine materials prone to dust generation will be managed using enclosures and screening if required so that dust escape from the site is avoided. Sheeting can also be provided for the finer materials that are prone to *'wind whipping'*;
- HGVs entering and exiting the Development Site will be fitted with adequate sheeting to totally cover any load carried that has the potential to be *'wind whipped'* from the vehicle;
- Vehicles used on-site will be regularly inspected and maintained, to minimise vehicle emissions and the risk of leaking diesel or hydraulic fluids;

- Good housekeeping or *'clean up'* arrangements will be employed so that the Development Site is kept as clean as possible. There will be regular inspections of the working areas and immediate surrounding areas to ensure that any dust accumulation, litter or spillages are removed/cleaned up as soon as possible; and
- A site liaison person will investigate and take appropriate action where complaints or queries about construction arise.

3.4.20 These measures would be included in the CEMP.

Site Waste Management

3.4.21 Where possible, and subject to geotechnical testing, any topsoil material generated by excavation of foundations is expected to be re-used on site. This would be re-used on the working areas or allocated for restoration purposes in cutover areas of the Development Site. Excavated material will (depending on type) be used to backfill excavations and for general restoration purposes where appropriate. It is not expected that any material will be unsuitable for re-use in this way, though in the unlikely event that such material arise, they would be disposed off-site in line with relevant waste disposal regulations.

3.4.22 Soil movement would be undertaken with reference to best practice guidelines available in the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra, 2009). Soil excavation should be undertaken during dry periods with backacters and dump trucks wherever possible. Topsoil and subsoil should not be mixed or stored together.

3.4.23 The stockpiling of materials would be minimised and any essential stockpiles would be located as far away as possible from watercourses.

3.4.24 Steps will be taken to minimise the extraction of peat as per the Peat Management Plan (PMP) described in **Chapter 6 - Renewable Energy Policy, Carbon Balance and Peat Management**. The PMP would ensure that peat excavated during construction is safely and suitably re-used within the extent of the Development Site wherever possible.

3.4.25 Construction waste is expected to be restricted to normal non-hazardous materials such as off-cuts of timber, wire, fibreglass, cleaning cloths, paper and similar materials. These will be sorted and recycled if possible, or disposed of to an appropriately licensed landfill by the relevant contractor.

3.5 Construction Details

Infrastructure Construction

3.5.1 Construction of the Proposed Development would consist of two main elements. Firstly, civil and electrical construction of the infrastructure and secondly, erection and commissioning of turbines. Construction of the control building, SPEN substation and the grid connection are lengthy processes which will commence early in the construction programme to allow a live grid connection to coincide with the commissioning of the turbines (the responsibility for substation and grid connection would rest with SPEN). As previously noted and shown on the indicative construction programme, many individual construction processes will run partly or fully concurrent whilst others will progress in a sequence with or without some overlap in time.

On-site Access Tracks

3.5.2 The design of any particular length of Development Site access track will depend on local geological, topographical and drainage conditions. In terms of design, the primary objectives that have informed the access tracks are:

- Requirements to maintain water flows across tracks and minimise disruption to the current hydrology;
- Minimisation of peat spoil by routing tracks through areas of shallow or no peat where possible;
- Mitigate and manage silt run off and surface water;
- Serviceability requirements for construction and wind turbine delivery vehicles; and
- Constructability considerations.

3.5.3 The alignment of the on-site tracks has already been subject to initial review by an experienced Civil Engineer and re-routed to respond to readily identifiable constraints. The final decision on alignment (within the micrositing allowance noted above) and on the appropriate type of access track design to adopt for a particular length of track will be made in advance of construction and may involve input from the ECoW as well as site engineers (and any other environmental specialists as required).

3.5.4 To achieve a track structure that meets the conditions encountered on the Development Site, whilst meeting the primary track design objectives, two different designs have been developed (each with associated construction techniques) as summarised in **Table 3.4**.

Table3.4 Typical Access Track Construction Techniques

Design	Construction Method	Typical Site Conditions	Peat Depth (m)
1	Floating road	Deep, flat, stable areas of peat (track thickness estimated 600mm to 1,000mm)	>1 m
2	Excavated road	Flat with simple drainage condition (track thickness estimated 450mm to 600mm)	<1 m

3.5.5 A peat depth survey, utilising a Russian sampler which extracts peat samples, has been carried out across all of the proposed infrastructure areas (see Peat Management Plan **Appendix 6.B**). The survey identified several areas of deep peat, so some sections of track have the potential to require floating roads. In a floating road, the weight of the road is supported by the peat beneath, thereby avoiding the need for construction foundations to extend through to the underlying solid bedrock. Based on current knowledge of the Development Site, approximately 4,960m of floating tracks will be required, and they will be constructed in line with the good practice guidance produced by the Forestry Commission Scotland (FCS) and SNH2 (2010), and SNH2 (2015) and will include the use of geogrids.

3.5.6 It is anticipated that approximately 18.1km of on-site access track will be required for the Proposed Development. All access tracks will be unpaved and constructed from material sourced from the on-site borrow pit(s) where possible.

[2] (now NatureScot)

3.5.7 As previously noted, the running width of all on-site access tracks will be a maximum of up to 6m wide, with some additional localised bend widening and passing places to a maximum of approximately 12-14m (For the purposes of this EIA, a maximum running width of 6m has been assumed).

3.5.8 In general terms, the construction method will see the topsoil being removed to expose a suitable sub-soil horizon on which a track can be constructed (the stripped topsoil will be laid on the surrounding undisturbed vegetation until required for reinstatement). A geogrid layer will then be placed to minimise the need for construction stone and to reduce the impact on the sub-soils. The track will then be built up on the geo-grid by laying and compacting crushed rock to an estimated depth of 450-600mm, dependent on ground conditions and load capacity. Post-construction, the stripped topsoil will be re-laid along the edges of the access track allowing the edges of the access track to re-vegetate whilst maintaining a suitable width throughout the operational period of generally up to 6m.

3.5.9 The detailed drainage design would be developed following consent being granted, but for the purpose of this EIA, the basic principles are that the drainage system would be developed:

- Based on Sustainable Drainage Systems (SuDS) principles; and
- In accordance with the Water Environment (Controlled Activities) Regulations 2011, as amended ("CAR" regulations).

Watercourse Crossings

3.5.10 Watercourse crossings were considered during the iterative design process, with these being avoided in the Development Site layout as far as possible. The resulting final layout requires 15 watercourse crossings, 14 with culverts and one bridge crossing, in order to provide access to wind turbine locations. The water crossing locations are detailed in **Table 3.5** and shown on **Figure 13.4**.

Table3.5 Watercourse Crossing Locations

Watercourse	Anticipated Crossing Type	Grid Reference
TWC01	Culvert	E 263775, N 601517
WC02	Culvert	E 265966, N 601842
WC03	Culvert	E 266354, N 601520
WC04	Culvert	E 266634, N 601398
WC05	Culvert	E 266694, N 601331
WC06	Culvert	E 266770, N 601210
WC07	Culvert	E 266765, N 601074
WC08	Culvert	E 266770, N 600966
WC09	Culvert	E 266770, N 600938
WC10	Bridge	E 266860, N 600640
WC11	Culvert	E 266826, N 599476

Watercourse	Anticipated Crossing Type	Grid Reference
WC12	Culvert	E 268226, N 599660
WC13	Culvert	E 268564, N 599530
WC14	Culvert	E 268450, N 599770
WC15	Culvert	E 268577, N 600124

Culverts

3.5.11 At this stage, it is proposed that a simple culvert type construction will be employed, using a cross sectional area that will not impede flow of water. Design of culverts shall be to at least CIRIA Culvert Design and Operation Guide (C689) standard. A typical culvert detail is shown in **Figure 3.11**. All crossings would be designed to accommodate 1 in 200 year peak flows (with an allowance for climate change) to reduce the risk of flooding, and would be developed in accordance with Engineering in the Water Environment Good Practice Guide - River Crossings: Second Edition (SEPA, 2010) and River Crossings and Migratory Fish: Design Guidance (Scottish Executive 2000). Watercourse crossings will be subject to detailed design following the granting of consent.

3.5.12 The need for drainage will be established on-site during pre-construction surveys. The access tracks will have a suitable cross-fall to allow rainwater to be shed and, where gradients are present, lateral drains will intercept any flow along the road. Where ground conditions are of a permeable nature, swales will be utilised for drainage to allow natural filtering of surface water into the ground. Where areas are less free draining, land drains or drainage ditches will be installed where the topography and ground conditions dictate.

3.5.13 To prevent silt entering watercourses, an ongoing scheme of silt mitigation will be carried out, which will include use of: silt traps; silt fences; silt mats etc, all installed to suit the local conditions. The silt mitigation measures will be monitored throughout the construction period by the Contractor and ECoW.

Bridges

3.5.14 Bridges are the preferred solution for larger crossings due to their lesser hydrological and ecological effects, and are particularly suited to higher flow watercourses. Bridge construction is unlikely to interfere with the watercourse to the same extent as culvert construction and can be built over the existing alignment of the river without the need for diversion. The Water of Ken (WC10) is a larger watercourse than others on-site and therefore requires a bridge to cross. Foundations will be required on both banks (down to a competent bearing stratum) in order to support the bridge deck. A typical bridge section is shown in **Figure 3.12**.

3.5.15 Local widening of the access track will be required on one side of the bridge; if necessary the road will need to be strengthened to allow a hardstanding area for the crane when the beams are lifted into place. The size of this area will be determined by factors governing the size of the crane, for instance the bridge span.

Service Crossings

3.5.16 No service crossings are anticipated at this site.

Temporary Works: Construction Compound and Lay Down Area

3.5.17 It is proposed that two temporary construction compounds with a maximum area of 2,500m2 each will be constructed. An additional construction compound for the SPEN substation will be located either in the nearest of these compounds, or in the compound which houses the substation and control building.

3.5.18 Surface vegetation and topsoil will be removed from the area of the construction compounds and laid on the surrounding undisturbed vegetation until required for reinstatement, post-construction. Geogrid will be laid on the exposed ground and stone added to an approximate depth of 500mm and compacted to a suitable engineering specification.

3.5.19 The compounds will be located inside an area contained by 2.0m security fencing (if required by the Contractor). During periods of darkness, directional security lighting would be used. This lighting would conform to the institute of lighting professionals guidance for Zone E1 (Guidance Notes for the Reduction of Obtrusive Light GN01:2011) and would use a shielded downwards pointing installation.

3.5.20 The temporary compounds will include: an area for portacabins (to be used as site offices and for the storage of various materials and small components); car parking; and welfare facilities including toilets, a kitchen, drying room and a mess room; storage and laydown areas for equipment, plant and construction vehicles; areas for storage of oils and fuel; and facilities for aggregate recycling and concrete batching (may be located adjacent to one of the borrow pits). Foul drainage will either be collected in a holding tank for regular collection and disposal off-site or by using an on-site septic tank. Areas of the compound which represent an increased pollution risk, e.g. oil or fuel storage and vehicle refuelling would be self double bunded or bunded and drained into an isolated holding tank for treatment and disposal. The bund would ensure that a protected volume of 110% of the stored capacity is provided. Drainage would be directed to an oil interceptor to prevent pollution if any spillage occurred.

3.5.21 Where a mains supply is not available, water will be provided by a bowser or smaller containers. Compliant drinking water arrangements will be put in place.

3.5.22 The construction compounds will be reinstated at the end of the Proposed Development construction period. The aggregate forming the surface of the compounds will be removed from the Development Site and the stored topsoil laid onto the exposed natural formation.

3.5.23 The precise configuration, layout and size of the temporary compounds would be finalised post consent and after appointment of a construction contractor.

3.5.24 The construction compounds may also have areas set aside for the batching plant, along with general materials storage (though the batching plant may be located next to one of the borrow pits).

General Plant and Equipment

3.5.25 A range of plant and equipment is expected to be delivered to the Development Site near the onset of the works and will be removed as soon as practical at the end of the activity for which the equipment relates.

Turbine Foundations

3.5.26 The final foundation design will be informed by the choice of turbine and detailed geotechnical investigation prior to construction. Foundation design will be undertaken by

geotechnical engineers and structural designers, once ground conditions are established and the final turbine model selected.

3.5.27 Where ground conditions permit, turbine foundations will be constructed from reinforced concrete using a 'submerged gravity base' approach. If, following intrusive geotechnical investigation works, ground conditions are proven to be unsuitable for this approach, other forms of foundation will be used, such as piled turbine foundations (though this is considered to be unlikely at this stage).

3.5.28 A diagram showing typical gravity foundations is presented in **Figure 3.13**. Construction of gravity base foundations will involve the excavation of soil/peat and subsoil to expose the underlying load bearing strata or bedrock. Any topsoil and other vegetation removed will be laid on the surrounding undisturbed vegetation until required for reinstatement once the turbine is installed.

3.5.29 The load bearing strata or bedrock will be levelled off and blinded[3] prior to the in-situ casting of the steel-reinforced concrete slab that will be approximately 25m in diameter. The depth of the excavation will be approximately 3-4m, depending on the depth of the load bearing strata or bedrock, and the sides will be battered back to ensure that they remain stable during construction. Each foundation is made up from approximately 750m^3 of concrete and approximately 100 tonnes of reinforcing steel.

3.5.30 On top of the slab, a concrete up-stand will then be cast, to which the turbine tower will later be bolted. The excavated area will be backfilled with compacted layers of graded material from the original excavation, and capped with topsoil. The exact details of each foundation will vary across the Development Site in response to the actual ground conditions encountered. A detailed ground investigation will be undertaken prior to construction to establish the requirement at each foundation.

3.5.31 Turbine excavations may be open for four to eight weeks during the construction programme. During this time, excavations will be kept free from water (rainwater and run-off). If local topography permits, the excavations will be free draining. If not, excavations may be mechanically pumped, with all dewatering works carried out in accordance with SEPA's Guidance for Pollution Prevention Notes and Pollution Prevention Guidelines including discharges through either settling ponds, swales or mechanical silt traps.

3.5.32 Alternative methods of turbine foundation construction will be considered based upon the results of a detailed geotechnical site investigation.

Crane Pads

3.5.33 Each wind turbine requires an area of hardstanding to be built adjacent to the turbine foundation. The total area of hardstanding at each turbine location, including the turbine foundations and the crane pad will be approximately 4,500m^2.

3.5.34 Surface vegetation and soil/peat will be removed from the area of the crane pad and laid on the surrounding undisturbed vegetation until required for reinstatement. The area will then be covered with geo-grid overlain with compacted stone to approximately 500mm depth, dependent on ground conditions and load capacity.

3.5.35 As noted, crane hardstandings will be left in place following construction in order to allow for the use of similar plant should major components need replacing during the operation of the Proposed Development. These could also be utilised during decommissioning at the end of the Proposed Development's life.

[3] A process whereby a 50mm layer of low grade concrete is placed directly onto the bedrock to provide a level and firm working base to support the foundation reinforcing cage.

'Permanent' Anemometry Mast Foundation and Crane Pad

3.5.36 The two 'permanent' anemometry masts will have reinforced concrete foundations of ~5m x 5m to ensure that each would withstand severe weather conditions, and each will have an adjacent crane pad of a similar type to the turbines with dimensions 20m x 20m.

Control Buildings and Substations

3.5.37 The control buildings will comprise a single storey building which will house switchgear and metering, DC battery power supply unit, Low Voltage (LV) auxiliary supply and distribution consumer unit, protection and control equipment and also welfare facilities, a typical control building is shown on **Figure 3.3**. Concrete foundations will be required to take the weight of the components. The control building compound will be a secure steel palisade fenced, the compound will consist of a hardstanding for parking, waste storage etc. Adjacent to the control building compound will be the 33kv to 132kV SPEN substation and associated compliance plant. There will also be allocated areas used for storage and maintenance purposes.

3.5.38 Foul drainage will be collected in a septic tank with soakaway. Water for welfare facilities will be provided via a water harvesting and UV filter system. Drinking water arrangements will be put in place using a 15l water dispenser or similar.

3.5.39 The external finishes/materials of the control buildings would be chosen to blend in with the local vernacular of the area. Final details including external finishes would be agreed with DGC and EAC as a condition following consent being granted.

3.5.40 Surface vegetation and soil/peat will be removed from the area of the compound and laid on the surrounding undisturbed vegetation until required for reinstatement, post-construction. The area will then be overlain with compacted stone to approximately 500mm depth depending on ground conditions.

Power Cabling

3.5.41 Detailed construction and trenching specifications of the underground cables that will link the turbines to the on-site control building and substation will depend on the ground conditions encountered at the time, but typically cables will be laid in a trench approximately 1,000mm deep and up to approximately 1,200mm wide. To minimise ground disturbance, cables will be routed alongside the access tracks wherever practicable and, if not, the total footprint of construction activity will be stated within the CMS. Approximately 18.1km of cable trenches will be required to connect the turbines to the on-site control building, with installation methods potentially including burial in ducts across the tracks, burial in trenches and mole-ploughing.

3.5.42 Any excavations will be cordoned off and marked clearly. Cable hauling operations will be coordinated with traffic movements, especially when hauling is being carried out from the roadway. Cable off-cuts and waste from terminations will be systematically collected, stored and recycled or disposed of properly.

3.5.43 The trenches would be dug during periods of relatively dry weather. The electric cables would be placed within the trenches and soils quickly replaced to minimise the ingress of water into the trenches. Regularly spaced clay bunds may be required in the trench backfill to prevent the introduction of preferential flow paths within the cable trenches.

Peat Management During Construction

3.5.44 The Development Site is situated in an area where peat deposits are present. The wind farm layout, design and construction methodology has been refined to minimise peat

excavation from tracks and turbine infrastructure, but it has not been possible to avoid it entirely.

3.5.45 Peat is likely to be excavated during the construction of tracks, foundations, hardstandings, control building, SPEN Substation and temporary compounds. The majority of peat spoil will come from foundations, hardstandings and track construction and, to a lesser extent, temporary compounds.

3.5.46 A draft Peat Management Plan (PMP) has been prepared (**Appendix 6.B**) and it will be finalised prior to construction and following completion of detailed ground investigations and micrositing. The PMP will be further refined and detailed methods and specifications agreed with SEPA and NatureScot. This will address methods in respect of peat excavation, haulage, storage, re-use and degraded habitat restoration. The PMP will ensure that peat excavated during construction is safely and suitably re-used within the extent of the Development Site wherever possible.

3.5.47 Details of the draft PMP and peat slide risk assessment are provided in **Chapter 6: Renewable Energy, Carbon Balance and Peat Management.**

Track Drainage

3.5.48 The need for drainage on the access track network will be considered for all parts of the network separately, since slope and wetness vary considerably across the Development Site. In flat areas, drainage of floating tracks is not required as it can be assumed that rainfall on the road will infiltrate to the ground beneath the tracks or along the verges. Track-side drainage will be avoided where possible, in order to prevent any local reductions in the water table or influences on the structure and compression of the tracks (the latter can occur where a lower water table reduces the ability of the peat to bear weight, increasing compression).

3.5.49 Where tracks are to be placed on slopes, lateral drainage will be installed on the upslope side of the track. The length of drains will be minimised, to prevent either pooling on the upslope side or, at the other extreme, creating long flow paths along which rapid runoff could occur. Regular cross-drains will be required to allow flow to pass across the track (as recommended in SEPA's Position Statement WAT-PS-06-02 Culverting of Watercourses (June 2015), with a preference for subsequent re-infiltration on the downslope side, rather than direct discharge to the drainage network.

Drainage Ditches along Excavated Tracks

3.5.50 Excavated tracks can impede the natural drainage across them and consequently drainage ditches are required. It is anticipated that at times, the water in the ditches will contain high concentrations of sediment from excavations, track construction and possible other accidental pollutants from construction activities. Therefore no water from a drainage ditch will be discharged directly to a watercourse. Instead it will pass through silt traps or other best practice pollution control features. Drains will not be discharged directly into natural channels, ephemeral streams or old ditches.

3.5.51 If required, any discharge, once sediment has been removed as described above, would occur under the appropriate SEPA consent.

3.5.52 The ditch design will be considered in line with the recommendations of the FCS and SNH (now NatureScot) guidance (2013), including the use of flat-bottomed ditches to reduce the depth of disturbance.

3.5.53 In instances of drainage close to surface watercourses, discharge from the drainage may be to surface water rather than re-infiltration. In these situations, best practice control

measures including sediment settlement will be undertaken before the water is discharged into surface water systems. The discharges will be small and collect from only a limited area, rather than draining a large area to the same location.

3.5.54 Although drainage will be provided in areas of disturbance as required, areas of hardstanding will be minimised so that this need is reduced. This includes careful design of construction compounds, and minimising the size of crane pads at each turbine location.

Cross Drainage

3.5.55 Where tracks are to be placed on slopes, lateral drainage will be required on the upslope side of the road. The length of drains should be minimised, to prevent either pooling on the upslope side or, at the other extreme, creating long flow paths along which rapid runoff could occur. The spacing of cross drains will depend on the area draining to the cross drain, gradient, choice of material for the drain and design objective. Where cross drains are required, depending on site conditions, the aim will be for subsequent re-infiltration on the downslope side rather than direct discharge to the drainage network.

3.5.56 Cross-drainage may be achieved using culverts or pipes beneath the track, again in line with the FCS and SNH (now NatureScot) guidance (2013). Drainage will be installed before or during track construction, rather than afterwards, to ensure that the track design is not compromised. The cross drainage will flow out into shallow drainage, which will allow diffuse re-infiltration to the peat on the downslope side. The cross drains will flow out at ground level and will not be hanging culverts: the avoidance of steep gradients for the tracks will also reduce the risk of erosion occurring at cross-drain outflows.

Check Dams

3.5.57 Check dams (small dams built across channels or ditches) may be required at regular intervals in the drainage ditches alongside an excavated track. They are required for two principal reasons. Firstly, they act as a silt/pollution trap slowing the flow of water so allowing sediment to settle out. Secondly, they help to direct water into the cross drains and so allow natural drainage paths to be maintained as much as possible. The spacing of the check dams will depend on the following factors:

- The gradient of the track;
- The spacing of cross-drains; and
- The depth of excavation.

3.5.58 Regular maintenance and clearing of the check dams is imperative to ensure their effectiveness is maintained.

Interface Between Different Types of Road Drainage

3.5.59 Where the track construction method changes, the drainage methods will also change. If this results in an end point for a drainage ditch, the ditch will be piped across the road and allowed to discharge to land on the down side of the slope (taking into account the precautions against pollution and erosion).

Materials Import

Rock Requirements

3.5.60 Construction of access tracks, hardstandings, foundations, and compounds within the Proposed Development will require approximately 77,471m^3 of rock. **Table 3.6** below provides a breakdown of the required rock volumes for each construction element.

Table 3.6 Summary of Rock Volumes Required During Construction

Infrastructure	Total Rock Volume (m^3)
Hardstandings and foundations	3,756
Access tracks	68,465
Temporary compounds x2	2,500
Substation compounds (A+B)	2,750
Total Rock Volume	**77,471**

On-site Rock Source Areas & Borrow Pits

3.5.61 Two borrow pit search areas have been identified based on geological information from a high level desk study, along with knowledge of the Site gained from surveys and walkovers. The final location of the borrow pit(s) within the search areas and the estimate of material to be won, will be determined once full ground investigation works and testing have been completed. The search areas shown in **Figure 3.1 a- c** represents a suitable area on-site in which a borrow pit could be excavated.

3.5.62 It is recognised that the borrow pits have the potential to give rise to a range of environmental effects which would need to be managed. As noted above, the extraction requirement, and thus the potential specific environmental effects, cannot be confirmed quantitatively until detailed intrusive investigations are undertaken. Once these are completed detailed plans for the borrow pit(s) would be developed and agreed with key consultees, i.e. DGC, EAC, SEPA and NatureScot. The plans would address establishment, extraction and restoration phases with the management protocols for the borrow pit(s) included in the CMS, which is envisaged to be subject to an appropriate planning condition. Any quarrying activities will also follow the Approved Code of Practice, Health and Safety at Quarries Regulations 1999. Nonetheless the likely effects and proposed mitigation that would be anticipated to address effects is likely to include:

- Traffic – the majority of traffic moving stone will use on-site access tracks. Any requirement to access highways will be addressed through a Traffic Management Plan (TMP);
- Blasting – effects from blasting will be controlled through use of relevant protocols, blast mats and through appropriate communication and publicity about blasting occurrence. Blasts at the borrow pits can be expected to be infrequent, being approximately 2km from residential receptors and are therefore not anticipated to be of any substantive concern, nor likely to give rise to significant effects;
- Noise / vibration – potential effects arise from blasting itself, as well as the use of excavation and stone crushing equipment. Use of appropriately silenced equipment, publicity over blasting, adherence to operational hours (10.00 to 16.00 on Monday to

Friday and 10.00 to 12.00 on Saturdays for the borrow pits as per the anticipated planning conditions) and the distance to residential receptors (~2km) provide the main mitigation for such effects which are anticipated to be well within limits of acceptability established by guidance;

- Dust – residential receptors are at a considerable distance from the potential borrow pit areas (closest at ~2km) and thus no dust effects on them are expected. Some potential for dust to be deposited on adjacent vegetation exists, though with damping down of surfaces or use of mist sprays as appropriate, this should avoid any significant effects (and this would be assessed by the appointed ECoW);
- Visual intrusion – construction effects will be discernible through the presence of construction machinery. Long term, an appropriate restoration plan for the borrow pits will be developed in agreement with consultees (SEPA, NatureScot, DGC. EAC) which is expected to include some re-grading of the final profile and measures to encourage re-vegetation and potentially peat habitat restoration;
- Water - the potential for sediment laden water to be released will be controlled through appropriate design and treatment facilities at the borrow pits. Design will be specific to the location and where possible will encourage natural infiltration. Furthermore, the potential for ingress of water to excavations will be controlled by gravity drainage to settlement lagoons, and encouraging natural infiltration. Where dewatering is required, giving rise to additional potential effects of excavations on the surrounding groundwater levels, the re-use of filtrated water from the settlement ponds may be used to provide a compensatory water source for any groundwater-dependent features by discharging to a vegetated surface just upgradient of their location; and
- Waste – any waste arisings will be handled as per other construction wastes as described in **Paragraphs 3.4.21 to 3.4.25**.

Concrete Batching Plants

3.5.63 Due the volume of concrete required and to minimise HGV activity on the public highway a concrete batching plant is proposed. The batching plant will require the import of sand and cement, as well as a supply of water in order to produce concrete. For the vehicle movements we have assumed a worst case that all aggregates will need to be imported. A water extraction license under CAR will be required, assuming up to 50m^3 per day.

3.5.64 In the unlikely event that site batching is not possible concrete will be imported from local suppliers, this has been reviewed as part of the traffic and transport assessment.

3.5.65 The batching plant would contain conveyor belts, hoppers and a loading area where the concrete mixers will be filled up from above. Concrete mixers would travel between the batching plant and the wind turbine foundations and would thus stay within the confines of the Development Site during the construction phase. The raw material storage area within the batching plant would comprise water silos, sand and processed rock bays and cement silos.

3.5.66 The majority of the concrete is required for turbine foundations with additional material for control building, transformers and ‘permanent’ anemometry mast foundations. **Table 3.7** provides an estimate for each.

Table 3.7 Estimated Volume of Concrete

Infrastructure	Total Volume of Concrete (m^3)
Wind turbine foundation x 15	Up to 11,250
Control building foundation x2	288
Substation HV Plinths	135
Anemometry mast foundations x 2	50
Turbine kiosk foundations	375
Total Concrete Volume	Up to **12,098**

Post-Construction Development, Site Restoration and Commissioning

3.5.67 If required for major maintenance works during operation of the Proposed Development, the crane hardstanding can be re-used in its entirety. Excavated material which does not have a viable and suitably identified use will be classified as waste material, and would be managed and removed from the Development Site and disposed of in accordance with the relevant legislation (including the Environmental Protection Act 1990, Landfill (Scotland) Regulations 2003 and the Waste Management Licensing (Scotland) Regulations 2011).

3.5.68 The temporary construction compounds and associated facilities will be removed and fully re-instated with vegetation/peat displaced from elsewhere on the Development Site and landscaped having regard to the local topography.

3.5.69 There will be a period of commissioning and testing prior to the start of the full operational phase of the Proposed Development.

3.5.70 As expected to be required by planning conditions, the Applicant would employ a Planning Monitoring Officer to monitor the condition of the site and carry out monthly photographic reporting during construction and decommissioning. These activities would be carried out on a quarterly basis during the construction and decommissioning of the Proposed Development.

3.6 Operational Details

Land Management

3.6.1 It is anticipated that long term land management practices will continue unaffected by the Proposed Development with existing agricultural practices continuing unimpeded after completion of construction.

3.6.2 On-site access tracks have been located where possible to minimise effects on such continued management.

Meteorological Effects and Turbine Control

3.6.3 A Supervisory Control and Data Acquisition (SCADA) system will be implemented which would obtain information from each of the turbines on their performance, and would allow

them to be controlled remotely. This would allow any faults with the equipment at the Proposed Development to be highlighted.

3.6.4 Although wind turbines are designed to stop generating at wind speeds over 25m/s, they are built to withstand very high wind speeds and are normally certified against structural failure for wind speeds up to 60m/s (in excess of 120mph).

3.6.5 Turbines are fitted with a lightning protection system as part of their design and snow does not generally pose problems other than for gaining access to the Development Site. Occasionally very heavy snow and ice may affect anemometers or the aerodynamics of the turbine blades resulting in temporary automatic shutdown. After shutdown due to icing, the turbine can be restarted remotely further to a manual, visual or technical inspection to ensure that the turbine blades are free of ice, thereby eliminating the potential for 'ice-throw'. The wind turbines will also be fitted with vibration sensors which would detect any imbalance which might be caused by icing, which would allow the turbines to be shut down automatically.

3.6.6 While ice-throw is unlikely for the reasons described, notices would be installed at access points to the Proposed Development to warn visitors and members of the public of the possible risk of ice throw in colder weather.

Turbine Maintenance

3.6.7 Each manufacturer has specific maintenance requirements, but typically routine maintenance or servicing of turbines is carried out twice a year, with a main service at twelve monthly intervals and a minor service at 6 months. In the first year, there is also an initial three month service after commissioning. The turbine being serviced is switched off for the duration of its service.

3.6.8 Teams of two people with a 4x4 vehicle would carry out the servicing. It takes two people (on average) one day to service each turbine.

3.6.9 At regular periods through the project life, oils and components will require changing, which will increase the service time. Gearbox oil changes are required approximately every 18 months. Changing the oil and worn components will extend each turbine service by one day.

3.6.10 Blade inspections will occur as required (somewhere between two and five years) using a Cherry Picker or similar, but may also be performed with a 50T crane and a man-basket. It could take up to three weeks to inspect all of the turbines at the Proposed Development. Repairs to blades would utilise the same equipment.

3.6.11 Blade inspection and repair work is especially weather-dependent. Light winds and warm, dry conditions are required for blade repairs. Hence summer months (June, July and August) are typically the most appropriate period for this work.

Environmental Management during Operation

3.6.12 The Applicant's wind energy developments are operated in accordance with documented ISO 14001 environmental management procedures which ensure compliance with applicable environmental legislation and best practice.

3.6.13 Although activity at the Development Site will be limited during the operational period, the measures outlined in site and task specific risk assessments and method statements, including control measures in relation to surface water runoff, dust, pollution control and waste, will remain in place to cover any maintenance works which may be required.

3.6.14 The Proposed Development will be managed by a team of wind energy engineers whose duties will include compliance with statutory HSE requirements. Where potential environmental or health and safety hazards are identified, a site specific risk assessment is completed and control measures implemented to ensure that the risks are minimised as far as possible.

3.6.15 The operational phase of the Proposed Development would be managed under the requirement of the Operators internal Environmental Management Systems (EMS).

Site Waste Management

3.6.16 Operational waste will generally be restricted to small volumes of waste associated with machinery repair and maintenance and this would be disposed of by the maintenance contractors in line with normal waste disposal practices.

3.7 Decommissioning Details

Wind Farm Decommissioning Requirements

3.7.1 At the end of the Proposed Development's operational lifetime, there are two options available:

- To re-power the Development Site with new turbines, which would require a new application and further environmental assessment; or
- To remove the wind turbines, 'permanent' anemometry masts, kiosks, control building and re-instate the Development Site.

3.7.2 The latter option of decommissioning at the end of the 35 years operational lifespan forms part of the application for the Proposed Development and has informed this EIA. It is generally proposed that the above ground structures will be removed (as per any condition relating to this topic upon the granting of permission) and the hardstanding areas re-instated where appropriate.

3.7.3 The access tracks are unlikely to be removed. The current view is that the disturbance associated with their removal and the disposal of the resulting material would have much a greater environmental effect than leaving them in place. Upon decommissioning the tracks would therefore likely be left in situ for future use by landowner and other stakeholders.

3.7.4 Prior to wind turbine removal, due consideration will be given to any potential impacts arising from these operations. Some of the potential issues could include:

- Potential disturbance by the presence of cranes, HGVs and engineers on-site;
- On-site temporary construction compound(s) would need to be located appropriately; and
- Time of year and time-scale (to be outside sensitive periods).

3.7.5 A comprehensive plan for the work will be drawn up in advance of decommissioning to ensure safety of the public and workforce and the use of the best available techniques at that time.

3.7.6 The wind turbines (towers, nacelle, hub, blades and electrical kiosk) and 'permanent' anemometry masts will be completely removed using a crane and taken off-site for recycling. The only parts of the turbines which are currently difficult to recycle are the

composite blades. Most items will be broken down so that specialist vehicles are not required unless there is a potential follow on use for the components in one piece. The control building and associated equipment will also be removed and the components reused or recycled.

3.7.7 During decommissioning, the bases/foundations will be broken out to below ground level and covered by soil/peat, which will be reinstated and re-vegetated (this is considered to be less environmentally damaging than removing the bases completely). All cables would be cut off below ground level, de-energised and left in the ground (if it is considered to be viable at the time, cables may be recovered for recycling where appropriate).

3.7.8 A Restoration and Decommissioning Plan (RDP) would be submitted and agreed with the relevant authorities close to the Proposed Development's end-of-life. Any applicable new legislation or guidelines published prior to decommissioning would be considered and taken into account in relation to any design of mitigation prior to decommissioning taking place.

3.8 References

Approved Code of Practice, Health and Safety at Quarries Regulations, Health And Safety Executive (HSE), (1999).

Control of Water Pollution from Linear Construction Projects,CIRIA, (C648, 2006)

Construction Code of Practice for the Sustainable Use of Soils on Construction Sites, Defra, (2009)

Culvert Design and Operation Guide (C689) (CIRIA), 2010.

Constructed tracks in the Scottish Uplands, 2nd Edition SNH, 2015.

Engineering in the Water Environment Good Practice Guide - River Crossings: Second Edition, SEPA, 2010.

Environmental Protection Act 1990, Landfill (Scotland) Regulations 2003 and the Waste Management Licensing (Scotland) Regulations 2011.

Floating Roads on Peat, A Report into Good Practice in Design, Construction and Use of Floating Roads on Peat with particular reference to Wind Farm Developments in Scotland, Prepared by: Forestry Civil Engineering & Scottish Natural Heritage, August 2010.

Good practice during wind farm construction – A joint publication by Scottish Renewables, Scottish Natural Heritage, Scottish Environment Protection Agency, Forestry Commission Scotland, Historic Environment Scotland, Marine Scotland Science, AECoW, 4th edition 2019.

Health and Safety at Work Act, (1974).

Reporting of Injuries, Diseases and Dangerous Occurrences Regulations, RIDDOR (2013).

Guidance Note GS6 – Avoiding Danger from Overhead Lines, HSE, (2013).

Guidance Notes for the Reduction of Obtrusive Light GN01, Institute of Lighting Professionals, (2011).

Onshore Wind Health & Safety Guidelines, Renewable UK, (2015).

Pollution Prevention Guidelines: PPG 1 Understanding your Environmental Responsibilities – Good Environmental Practices (October 2020);

Guidance for Pollution Prevention: GPP 2: Above Ground Oil Storage Tanks (January 2018);

Pollution Prevention Guidelines: PPG 3, Use and design of oil separators in surface water drainage systems. SEPA, (2006).

Guidance for Pollution Prevention: GPP 4: Treatment and Disposal of Wastewater where there is no Connection to the Public Foul Sewer, SEPA, (2017).

Guidance for Pollution Prevention: GPP 5: Works and Maintenance in or near Water, SEPA, (2017).

Pollution Prevention Guidelines: PPG 6, Working at Construction and Demolition Sites, SEPA, (2012).

Guidance for Pollution Prevention: GPP 8: Safe Storage and Disposal of Used Oils, SEPA, (2017).

Guidance for Pollution Prevention: GPP 13: Vehicle Washing and Cleaning, SEPA, (2017).

Pollution Prevention Guidelines: PPG 18: Managing Fire Water and Major Spillages, SEPA, (2000).

Guidance for Pollution Prevention: GPP 20: Dewatering of Underground Ducts and Chambers, SEPA, (2018).

Guidance for Pollution Prevention: GPP 21: Pollution Incident Response Planning, SEPA, 2017;

Guidance for Pollution Prevention: GPP 26: Safe Storage of Drums and Intermediate Bulk Containers, SEPA, (2021).

Position Statement WAT-PS-06-02 Culverting of Watercourses, SEPA, (2015).

River Crossings and Migratory Fish: Design Guidance, Scottish Executive, (2000).

Sustainable Use of Soils on Construction Sites, Defra, (2009).

Water Environment (Controlled Activities) (Scotland) Regulations, (2011).

4. Approach to Preparing the Environmental Impact Assessment Report

4.1 The Environmental Impact Assessment Process

4.1.1 The preparation of the EIA Report is one of the key stages in the EIA process. It reports information about any significant environmental effects which the determining authority will use to inform its decision about whether the Proposed Development should be allowed to proceed.

4.2 EIA terminology

Impacts and effects

4.2.1 In some EIA Reports, the terms 'impacts' and 'effects' are used interchangeably, whilst in others the terms are given different meanings. Some use ‘impact’ to mean the cause of an ‘effect’, whilst others use ‘effect’ to mean the cause of an impact. This inconsistent use of definitions has led to a great deal of confusion over the terms, both among the authors and the readers of EIA Reports.

4.2.2 The convention used in this EIA Report is to use 'impacts' only within the context of the term ‘EIA’, which describes the process from scoping through to EIA Report preparation to subsequent monitoring and other work. Otherwise, this document uses the word 'effects' when describing the environmental consequences of the Proposed Development which may for example come about as a result of physical activities that would take place if the Proposed Development were to proceed (e.g. vehicle movements during construction operations). The environmental changes that occur as a result of these activities (e.g. damage/loss of vegetation or an increase in noise levels as a result of construction vehicle movements) may in some cases cause another change, which in turn results in another environmental effect. The predicted environmental effects are the consequences of the environmental changes for specific environmental receptors. For example, with respect to a species of bats, the loss of roosting sites or foraging areas (the change) could affect the bats’ population size (the effect); with regard to people, an increase in noise levels (the change) could affect people’s amenity, reducing their enjoyment of the local area (the effect).

4.2.3 This EIA Report is concerned with assessing the significance of the environmental effects of the Proposed Development, which requires the activities that will be undertaken to be understood and the resultant changes identified and quantified, often based on predictive assessment work.

Spatial and temporal scope

4.2.4 In this EIA Report, the spatial scope varies between environmental topics and is therefore described in each of the topic chapters. For example, the spatial effects of a proposed development on landscape and visual amenity will cover a much greater area to that affected by noise.

4.2.5 The temporal scope covers the time period over which changes to the environment and the resultant effects are predicted to occur, and are typically defined as either being temporary or permanent.

4.3 EIA scoping

4.3.1 Scoping involves identifying the following:

- The people and environmental resources (collectively known as 'receptors') that could be significantly affected by the Proposed Development.
- The work required to assess those effects identified as being potentially significant. Our approach to this involves starting the scoping process at the outset of our EIA work, with the initial conclusions about the potentially significant effects of a proposed development being set out in a scoping report. The preparation of the scoping report is informed by information about the legislative and policy context that will influence the scheme. It is also informed by the simple rule that, to be significant, an effect must be of sufficient importance that it should influence the process of decision-making about whether or not consent should be granted for a proposed development or an element of it. In this EIA Report, this is referred to as the 'significance test'.

4.3.2 At the scoping report stage, the conclusion that is made using the significance test is based upon professional judgement, with reference to the project description, and available information about:

- The magnitude and other characteristics of the potential changes that are expected to be caused by a proposed development;
- The sensitivity of receptors to these changes;
- The effects of these changes on relevant receptors; and
- The value of receptors.

4.3.3 A precautionary approach is taken such that if the information that is available at the scoping report stage does not enable a robust conclusion that a potential effect is not likely to be significant, the effect is taken forward for further assessment.

4.3.4 The scoping report for the Proposed Development (the "Scoping Report") was submitted for comment to the Scottish Government Energy Consents Unit (ECU) along with a request for a Scoping Opinion in May 2021 and is attached at **Appendix 4A**. Subsequent to the issuing of the Scoping Report, the scope of the assessment has been progressively refined in response to comments from the ECU and from consultees (see **Section 4.4**), together with environmental information that has been obtained from survey or assessment work carried out as part of the EIA, and the evolution of the project proposals (see the sub section below). A summary of further consultation undertaken is provided in **Table 4.2**.

4.3.5 The environmental topic chapters (6-17) detail the final scope of the assessment in relation to effects that it was assessed could be significant; and therefore needed to be subject to more detailed assessment. All other effects (i.e. those that are not referred to in the environmental topic chapters 6-17) are not likely to be significant.

4.4 Consultation

Scoping Opinion

4.4.1 The ECU issued a formal Scoping Opinion in October 2021 and this is presented in full in **Appendix 4B**. The scoping responses and the chapters of this EIA Report where consultee comments are considered are summarised in **Table 4.1**.

Table 4.1 Summary of Issues Highlighted within the Scoping Opinion

Consultee	Key issues / Points raised during consultations	Chapter where considered in this EIA Report
BT	Indicative turbine locations should not cause interference to current and planned network.	Noted
Crown Estate Scotland	Assets not affected and no comments to make.	Noted
Dalmellington Community Council	State that it has not received any comments from the local community and it has no comment to make.	Noted
East Ayrshire Council (EAC)	A further viewpoint is requested, from the Afton valley. EAC would expect a cumulative assessment of night-time lighting to form part of the EIA Report too. Stated that there is potential risk of displacement and collision risk of some raptor species with turbines. EAC would recommend that a discussion is undertaken with its noise consultant to agree the methodology for noise assessment. State that the EIA Report should risk assess any Private Water Supplies potentially affected by the Proposed Development. The Ayrshire Rivers Trust should be contacted to discuss their expectations and requirements regarding the extent of hydrological assessment required. EAC noted that there is an absence of established rights of way or core paths within the EAC part of the site.	**Chapter 7- Noise** **Chapter 9 – LVIA** **Chapter 12 – Ornithology** **Chapter 12 – Geology, Hydrology and Hydrogeology** **Chapter 15 – Socio-economics**
Glasgow Airport	State the site is located out-with the obstacle limitation surfaces for Glasgow Airport. It is out-with the radar consultation area for Glasgow Airport. It is within the Instrument Flight Procedure area for Glasgow Airport and may impact upon procedures. Request that the Applicant engages with it to establish fully if the Proposed Development is likely to have any impact on its published Instrument Flight Procedures (IFP's).	**Chapter 17 – Aviation**
Glasgow Prestwick Airport (GPA)	Interested in how the Applicant proposes to address the aviation warning obstruction lighting scheme as required by the UK Civil Aviation Authority (UK CAA) for obstacles greater than 150m in height above local ground level. State that it will be necessary that further detailed radar modelling assessments/flight trials are undertaken to confirm the exact	**Chapter 17 - Aviation**

Consultee	Key issues / Points raised during consultations	Chapter where considered in this EIA Report
	number of turbines visible to GPA's primary radars. GPA want the Applicant to engage with GPA to allow more detailed radar Line of Sight modelling to establish visibility (or otherwise) of the proposed scheme to GPA's primary radars. State that this is an area of airspace where GPA provide an air traffic service, and as such if some of the turbines are visible to GPA's primary radar then mitigation will be required.	
John Muir Trust	Confirmed it will not be making any comments at the scoping stage.	Noted
Joint Radio Company (JRC)	Proposal is cleared with respect to radio link infrastructure operated by Scottish Power and Scotia Gas Networks. JRC does not foresee any potential problems based on known interference scenarios and the data provided by the Applicant.	**Chapter 16 – Infrastructure and Other Issues**
Ministry of Defence (MOD) (Wind)	The MOD has no concerns in relation to the application. However, the MOD states that the addition of turbines in this location has the potential to introduce a physical obstruction to low flying aircraft operating in this area. As a minimum the MOD would require that that the Proposed Development should be fitted with MOD accredited aviation safety lighting in accordance with the Air Navigation Order 2016.	**Chapter 17 - Aviation**
NATS Safeguarding	Object to the Proposed Development based on unacceptable effects on the Lowther Hill and Great Dun Fell Radar systems. State that the failure to consult NATS, or to take into account NATS's comments when determining a planning application, could cause serious safety risks for air traffic.	**Chapter 17 – Aviation**
New Galloway & Kells Community Council	State that to date, they have not received any comments on this application.	Noted
Office for Nuclear Regulation	It makes no comment on the Proposed Development as it does not lie within a consultation zone around a GB nuclear site.	Noted
Royal Burgh of Sanquhar Community Council	No comments to make.	Noted

Consultee	Key issues / Points raised during consultations	Chapter where considered in this EIA Report
Scottish Wild Land Group	State that is has no comments to submit for the Scoping Opinion.	Noted
Scotways	Provided a map showing that rights of way DS13/SCD101, DS14 and DS15, DN159 (part of the Southern Upland Way SUW), heritage Paths Sanquhar to Stroanpatrick Path [HP368] and Old Road from New Cumnock to Dalquhairn [HP366] and Scottish Hill Tracks 83 St John's Town of Dalry to Sanquhar [HT84] 84 New Cumnock to St John's Town of Dalry by Glen Afton [HT85] cross or are close to the site. Provided references to relevant guidance and general comments on recreational Amenity and cumulative impact.	**Chapter 9 – LVIA**
Tynron Community Council	Have submitted a limited response prior to the 26th September 2021 extension. State that Lorg Wind Farm would form a continuous development of wind farms of almost 80 turbines up to 200 metres and higher in this area should Sanquhar II and Euchanhead wind farms be consented. Restate points in its objection to the Section 42 Application submitted to Dumfries and Galloway Council in 2020, i.e. concerns in relation to: • Cumulative visual effects; • Increase in operational noise and infrasound on properties close to the wind farm. • Unacceptable visual impact on: Thornhill Uplands Regional Scenic Area, particularly in combination with the existing windfarms of Whiteside and Sanquhar I, the [in construction] Twentyshilling Hill, and the proposed Sanquhar II and Euchanhead wind farms; designated Galloway and Southern Ayrshire Biosphere; Southern Upland Way, Polskeoch & Dalgonnar, Striding Arches, Core Paths, Sanquhar to Stroanpatrick Heritage Path and Old Road from New Cumnock to Dalquhairn. State concerns in relation to screening from forestry, impacts on Covenanters Martyrs' Memorial of Allan's Cairn, impacts on peat, impacts on various birds species and bats and noise impacts on adjacent properties.	**Chapter 6 – Renewable Energy, Carbon Balance and Peat Management** **Chapter 7 - Noise** **Chapter 9 – LVIA** **Chapter 10 – Historic Environment** **Chapter 11 – Ecology** **Chapter 12 – Ornithology** **Chapter 13 – Geology, Hydrology and Hydrogeology** **Chapter 15 - Socio-economics**
Member of public (Karin Coltart)	States that the time span allowed between any document issue and required responses should be significantly longer. States clarifications that should be provided for the noise and LVIA assessments. States that all individual residential properties that will have sight of the night-time lights on the turbines should be included in the visualisations provided. States that that Allan's Cairn (grid ref 698009) should be included in the cultural heritage assessment. Assumes that details of checking and doing water testing of private water supplies will be given in the EIA Report. States that traffic for the decommissioning phase of the Proposed Development should not be scoped out of the EIA. States that effects on	**Chapter 7 - Noise** **Chapter 9 – LVIA** **Chapter 10 – Historic Environment** **Chapter 13 – Geology, Hydrology and Hydrogeology** **Chapter 14 – Traffic and Transport** **Chapter 15 - Socio-economics**

Consultee	Key issues / Points raised during consultations	Chapter where considered in this EIA Report
	recreation and tourism should not be scoped out of the assessment. States that landline telecoms, mobile telecoms, broadband and TV should be added to the Major Accidents and Disasters Table.	**Chapter 16 – Infrastructure and Other Issues**
Socio-economics		
Visit Scotland	No response	Noted
British Horse Society (BHS)	Stresses importance of off-road riding, active travel and sustainable infrastructure. BHS expects developers to work with representatives of local horse riding community	Chapter 9 – LVIA
LVIA		
Scottish Ministers (ECU)	State that the final list of viewpoints and visualisations should be agreed following discussion between the Applicant, Dumfries and Galloway Council ("DGC"), EAC and Historic Environment Scotland.	Chapter 9 – LVIA
Historic Environment		
Historic Environment Scotland (HES)	HES recommend adding Craigengillan GDL to the list of assets identified as potential receptors. Note that the Scoping Report does not contain a very detailed assessment methodology for the historic environment but presume that this would be made available once a cultural heritage consultant is engaged.. Note that the Applicant still refers to the Historic Environment Scotland Policy Statement (2016), which has now been replaced by the Historic Environment Policy for Scotland (2019).	Chapter 10 - Historic Environment
Ecology and Ornithology		
NatureScot	State that there is no information presented on flight duration of the 14 target species identified by the Applicant, however, are satisfied with the survey and proposed assessment methodology. State that their Geographic Information System (GIS) data suggests that this area (propose development site) is comprised almost entirely of class 1 peatland, although it appears from aerial imagery that the site has an abundance of drains. NatureScot advises the Applicant to access links to peatland mitigation & restoration measures. Also suggest/request that an Outline Habitat Management Plan is presented in the EIA Report which reflects the importance of all peatlands in addressing the climate and biodiversity emergencies.	Chapter 11 – Ecology Chapter 12 - Ornithology
Fisheries Management Scotland (FMS)	Request that the Nith District Salmon Fishery Board and Galloway Fisheries Trust are contacted, as they do not have the appropriate local knowledge. State concern of the 'fisheries watercourse evaluation survey' with no explanation	Chapter 11 - Ecology

Consultee	Key issues / Points raised during consultations	Chapter where considered in this EIA Report
	to the methodology. FMS would appreciate opportunity to comment on the Habitat Management Plan ("HMP").	
Galloway Fisheries Trust (GFT)	State that generally, they agree with the Scoping Report outline. State that GFT and Kirkcudbrightshire Dee District Salmon Fishery Board ("KDDSFB"), should be included in the consultation list as the Water of Ken will potentially be impacted by the Proposed Development	Chapter 11 - Ecology
Nith District Salmon Fishery Board (NDSFB)	State that they can confirm the presence of fish in most of the upper tributaries within the Afton catchment which includes part of the footprint of the Proposed Development. State that a full aquatic audit should be undertaken as part of the environmental information ingathered to protect the environment in the vicinity of any wind farm development.	Chapter 11 - Ecology
RSPB	Note high levels of flight activity detected for red kite and peregrine and state that as part of the EIA they would expect a detailed analysis of impacts, potentially including a population viability assessment. RSPB are aware of potential Schedule 1 Species which may be nesting within the wind farm boundary, that may not have been detected by the desk study carried out in 2019 so it is recommend that a new data request made to the Dumfries and Galloway Raptor Study Group.	Chapter 12 - Ornithology
Traffic and Transport		
Transport Scotland	Agree with operational and decommissioning phases of the Proposed Development being scoped out and baseline traffic being extracted from Department for Transport ("DfT") traffic counts, or from Automatic Traffic Counts if no DfT data is available. Require to be satisfied that the size of turbines proposed can negotiate the selected route and that their transportation will not have any detrimental effect on structures within the trunk road route path. State that a full Abnormal Loads Assessment Report should be provided with the EIA Report that identifies key pinch points on the trunk road network. Swept path analysis should be undertaken and details should be provided with regard to any required changes to street furniture or structures along the route.	Chapter 14 - Traffic & Transport
Hydrology		
DGC Flood Risk Management Team	State the requirement to manage surface runoff during and after construction, consider rate of runoff into watercourses within the Site and that measures should be in place regarding future maintenance of drains and culverts.	Chapter 13 - Geology, Hydrology & Hydrogeology

Consultee	Key issues / Points raised during consultations	Chapter where considered in this EIA Report
Galloway & Southern Ayrshire Biosphere	Will not be submitting a response to the scoping consultation as the Proposed Development is out-with the Core and Buffer Zones of the Biosphere and there is no capacity at present to respond to proposals in the transition area.	Noted
Scottish Water	State the Site is within the drinking water catchments within which Scottish Water abstractions from Afton reservoir and Carsfad Loch are located. State the intakes within these catchments are sufficient distance such that it is likely to be low risk, however care should be taken and water quality protection measures must be implemented.	Chapter 13 - Geology, Hydrology & Hydrogeology
Scottish Ministers (ECU)	Scottish Ministers request that the Applicant investigates the presence of any private water supplies which may be impacted by the Proposed Development and liaise with Scottish Water. Scottish Ministers request that the company now review Marine Scotland's generic scoping guidelines for both onshore wind farm and overhead line development which outline how fish populations can be impacted throughout the Proposed Development. Scottish Ministers request that the Applicant now review SEPA's Standing advice. This has been produced to allow SEPA to "prioritise, simplify and accelerate our engagement with the planning system in a manner which reinforces the role and responsibilities of planning authorities and developers" and is available here: https://www.sepa.org.uk/media/535237/sepa-standing-advice-for-planning-authorities-and-developers-lups-gu8-v11-web.pdf Scottish Ministers are aware that the Proposed Development falls within Group 2 and Group 3 Peatlands and advise the Applicant to take on board the advice from NatureScot.	Chapter 13 - Geology, Hydrology & Hydrogeology
SEPA	Have considered the Scoping Report and recommend that the Applicant refers to online scoping advice for wind farms (available here: https://www.sepa.org.uk/media/144547/lups-l-14-windfarm-scoping-letter.pdf) which sets out its requirements. State that no survey information (e.g. for peat, groundwater dependent terrestrial ecosystems (GWDTE) etc) is available at this stage. Understand from previous involvement that there are deep peat deposits, GWDTE and numerous watercourses on the site. The site should be designed to avoid these features and incorporate appropriate buffer distances as set out in our scoping advice (e.g. 50m buffer to water features). Would be pleased to offer further pre application advice as draft assessments and proposals are made available.	Chapter 13 - Geology, Hydrology & Hydrogeology

4.4.2 Topic specific refinements to the work scope following additional post-scoping report consultation are summarised in **Table 4.2**.

Table 4.2 Summary of consultation following issue of the Scoping Opinion

Consultee	Key issues / Points raised during consultations	Chapter where considered in this EIA Report
Scottish Power Energy Networks (SPEN)	No Objection	Chapter 16: Infrastructure & Other Issues
Scotia Gas Networks	No Objection	Chapter 16: Infrastructure & Other Issues
City Fibre	Confirmed no known assets fell within the vicinity of the proposed Lorg Wind Farm	Chapter 16: Infrastructure & Other Issues
Colt	Confirm that Colt Technology Services do not have apparatus near the Proposed Development	Chapter 16: Infrastructure & Other Issues
Engie	We can confirm that, based on the details provided to us, we have no buried plant or equipment in the identified area.	Chapter 16: Infrastructure & Other Issues
GTC	Confirm that we have no apparatus in the vicinity.	Chapter 16: Infrastructure & Other Issues
Lumen Technologies	Confirmed that Lumen Technologies do not have any apparatus within the indicated works area.	Chapter 16: Infrastructure & Other Issues
Mobile Broadband Network Ltd.	There are no infringement issues with the EE/3UK mobile microwave network from the Proposed Development	Chapter 16: Infrastructure & Other Issues
Sky UK Ltd.	Confirmed that Sky Telecommunications Services Ltd will not be affected by the Proposed Development	Chapter 16: Infrastructure & Other Issues
Utility Assets Ltd.	No response and therefore no objection	Chapter 16: Infrastructure & Other Issues
Verizon Business	Confirmed that Verizon (Formally known as MCI WorldCom, MFS) has no apparatus in the areas concerned.	Chapter 16: Infrastructure & Other Issues

Consultee	Key issues / Points raised during consultations	Chapter where considered in this EIA Report
Vodafone	Confirmed that no links will be impacted by the Proposed Development	Chapter 16: Infrastructure & Other Issues
BT	Confirmed that the Proposed Development should not cause interference to BT's current and presently planned radio network	Chapter 16: Infrastructure & Other Issues
JRC	Confirmed that the Proposed Development is *cleared* with respect to radio link infrastructure operated by:	Chapter 16: Infrastructure & Other Issues
Arqiva/National Grid Wireless	Confirmed no objection to the Proposed Development.	Chapter 16: Infrastructure & Other Issues
CSS Spectrum Management Services Ltd.	Confirmed no objection to the Proposed Development.	Chapter 16: Infrastructure & Other Issues
MLL	Confirmed no objection to the Proposed Development.	Chapter 16: Infrastructure & Other Issues
Atkins	Confirmed no objection to the Proposed Development.	Chapter 16: Infrastructure & Other Issues
MOD	Confirmed that the MOD may be impacted by the Proposed Development.	Chapter 17: Aviation
NATS	Confirmed that NATS may be impacted by the Proposed Development.	Chapter 17: Aviation

4.5 Overview of assessment methodology

Introduction

4.5.1 All topic assessments presented in the EIA Report have been undertaken on the basis of a common understanding of the nature of the Proposed Development, as described in Chapter 3: Project Description.

4.5.2 For each topic, the assessment of likely significant effects has been undertaken by competent experts with relevant specialist skills, drawing on their experience from other projects, good practice in EIA and on relevant published information. A list of these experts and their qualifications has been provided in **Appendix 1A**. For some topics, use has been made of modelling or other methodologies, as appropriate.

4.5.3 With certain exceptions, each topic considered in this EIA Report uses the following common chapter format:

1. Introduction;
2. Limitations of this assessment;
3. Legislative and policy context;
4. Data gathering methodology;
5. Overall baseline (where appropriate), with the detailed baseline being set out under sub-section 9 below;
6. Scope of the assessment;
7. Environmental measures embedded into the scheme;
8. Assessment methodology;
9. Assessment of effects - this sub-section excludes cumulative effects and deals separately with each receptor or category of receptors that could be significantly affected. The assessment is made against the predicted future baseline (see **Section 4.**6 below);
10. Assessment of cumulative effects;
11. Additional mitigation;
12. Conclusions of significance evaluation;
13. Implementation of environmental measures; and
14. References.

4.6 Identification of baseline conditions

4.6.1 The various elements of the Proposed Development would be built over a period of approximately 24 months from a start date yet to be determined and then it is proposed to be operated for 35 years. Therefore, future baseline conditions during construction and operation may not be the same as the current baseline conditions. Where relevant, the technical chapters (6-17) of this EIA Report also provide a description of the potential changes to the baseline conditions in the absence of the Proposed Development.

4.6.2 To determine the baseline conditions that should be used for the assessment of the likely significant effects of the Proposed Development, it is necessary to define the current baseline conditions and then to decide whether the baseline conditions are likely to have changed by the 'assessment years' that are selected for the construction and operation periods. If this predicted future baseline is more likely to occur than the existing baseline conditions, the former is used for the assessment of effects. Where it is concluded that the existing baseline conditions are just as likely, or even more likely, to occur in the construction and operation assessment years, these existing baseline conditions are used for the assessment.

4.6.3 The baseline is determined for the *'Study Area'* for each environmental topic by a combination of desk-based research, including consultation with the relevant statutory and non-statutory authorities, together with field survey work (where required). In its simplest form, the Study Area comprises the site of the Proposed Development. However, as for most developments, the Study Area also includes land outside the site, especially where effects are likely to extend beyond such geographical limits. 'Zones of Influence' (ZoIs)

where the Proposed Development could affect off-site areas are therefore considered for each technical topic considered in the EIA.

4.6.4 Details of the relevant ZoIs are discussed in the baseline section of each environmental topic chapter. These chapters also explain the basis for defining the future baseline conditions, where this is appropriate. This is based on the following:

- Changes to the baseline that can be predicted based on reasonable assumptions and modelling calculations, e.g. the application of traffic growth factors based on relevant guidance.
- Information relating to other likely and predictable changes, e.g. climate change, which could affect current prevailing environmental conditions.
- Information about other relevant developments, including the nature of the development proposals, their likely timing and their location relative to the Proposed Development.

4.7 Overview to approach to significance evaluation methodology

Introduction

4.7.1 One of the requirements of an EIA Report is to set out the conclusions that have been reached about the likely significant environmental effects that it is predicted will result from the Proposed Development. Reaching a conclusion about which effects, if any, are likely to be significant is the culmination of an iterative process that involves the following stages:

- Identifying those effects that could be likely to be significant (see Section 4.3 of this chapter on scoping); and
- Assessing the effects of the Proposed Development against the baseline (current or future, as appropriate); and concluding whether these are likely to be significant.

4.7.2 Chapters 6 to 17 describe the approaches that have been used, in relation to the stages outlined in the bullet points above, for each of the environmental topics that are considered in this EIA Report.

Identification of likely significant effects

4.7.3 To inform the identification of likely significant effects, all of those involved in the preparation of the EIA Report were supplied with information about the proposals for constructing and operating the Proposed Development.

4.7.4 As the proposals evolved, more detail became available about construction and operational activities. This enabled a progressively more refined understanding to be developed about the environmental changes that could be caused by the project, including information about their spatial extent and other characteristics (e.g. their magnitude, frequency etc.).

4.7.5 The identification of receptors that need to be considered draws on available information about environmental changes, which in some cases can be translated into ZoIs outside of which the environmental changes are predicted to be sufficiently small that receptors are not likely to be significantly affected. In addition, for some environmental topics (e.g. biodiversity and historic environment), a valuation is undertaken to define those receptors

that are of sufficient importance or value that they could be significantly affected. Only those receptors that are of sufficient importance or value and that are located within the defined ZoIs where the effects could be significant, are taken forward for further assessment.

4.7.6 The technical assessments, undertaken in Chapters 6 to 17 of this EIA Report, describe how environmental changes and resulting effects for different environmental topics are assessed, together with the topic specific approaches that have been used to identify the receptors that could be significantly affected by the Proposed Development.

Types of effects

4.7.7 Paragraph 4 of Schedule 4 of the EIA Regulations states that "*The description of the likely significant effects on the factors specified in regulation 4(3) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development.*"

4.7.8 Where appropriate, this EIA Report considers all these types of effects where they are relevant to different environmental topic chapters, and a description of these types of effect is set out below with the exception of cumulative effects, which are dealt with separately in Section 4.8.

Direct effects

4.7.9 Direct effects are those that result directly from a proposed development. For example, where a machine traverses an area of habitat, the associated physical activity could result in damage/destruction of this receptor.

Indirect and secondary effects

4.7.10 Indirect and secondary effects are those that result from consequential change caused by a proposed development. As such, they would normally occur on a different receptor, later in time or at locations farther away than direct effects. For example where an area of habitat traversed by machinery results in loss of vegetation and soil compaction, silted run-off rates into nearby watercourses could increase, smothering downstream gravel beds used by spawning salmon. These are identified where relevant in each technical chapter as appropriate.

Transboundary effects

4.7.11 Transboundary effects are those that would affect the environment in another state within the European Economic Area (EEA).

Temporal effects

4.7.12 As discussed in Section 4.3 of this chapter (EIA scoping), temporal effects are typically defined as being permanent or temporary as follows:

- Permanent - these are effects that will remain even when a proposed development is complete, although these effects may be caused by environmental changes that are permanent or temporary. For example, an excavator that is temporarily driven over an area of valuable habitat could cause so much damage that the effect on this vegetation would be permanent.

- Temporary – these are effects that are related to environmental changes associated with a particular activity and that will cease when that activity finishes. For example, an increase in noise levels during construction may affect nearby residential receptors, but any effects would cease on completion of this phase of a proposed development. Where effects are temporary, they may be defined as short, medium or long-term, the duration of which may depend on the receptor in question and would therefore be defined in technical chapters as appropriate.

Significance evaluation

Overview

4.7.13 The receptors that could be significantly affected are identified within each topic chapter. The approach that is adopted to determine whether the effects on these receptors are significant is to apply a combination of professional judgement and a topic-specific significance evaluation methodology that draws on the results of the assessment work that has been carried out.

4.7.14 In applying this approach to significance evaluation, it is necessary to ensure that there is consistency between each environmental topic in the level at which effects are considered to be significant. Therefore, it is inappropriate for the assessment of one topic to conclude that minor effects are significant, when, for another topic, only comparatively major effects are significant.

4.7.15 In order to achieve the desired level of consistency, each environmental topic lead has been guided in their decision-making about likely significance by the *'significance test'* that informed the preparation of the Scoping Report (see Section 4.3 of this chapter (EIA scoping)), as well as the relevant topic-specific significance evaluation methodology.

4.7.16 The conclusion about significance is arrived at using professional judgement, with reference to the project description, and available information about the magnitude and other characteristics of the potential changes that are expected to be caused by the Proposed Development, receptors' sensitivity to these changes and the effects of these changes on relevant receptors.

4.7.17 In some cases, use of the 'significance test' alone will enable a conclusion to be reached in the 'Scope of the assessment' section of the topic chapter that a potential effect is not likely to be significant (i.e. without the need for more detailed assessment). However, in other cases, effects identified in the 'Scope of the assessment' section are subject to further assessment in the subsequent section(s) of each topic chapter.

4.7.18 For some of these effects, relatively little assessment work may be required to reach a conclusion that an effect is not significant, whereas in other cases, more extensive assessment work is required. Sometimes the application of the 'significance test' is sufficient to support this conclusion but, in other cases, the relevant topic-specific significance evaluation methodology is used to inform the evaluation of significance (to determine whether an effect is or is not significant).

4.7.19 Having applied the relevant topic-specific significance evaluation methodology, the topic specialists check the conclusions against the significance test. If this test results in a different conclusion to that reached using the significance evaluation methodology, a detailed justification is provided as to why this different conclusion is valid.

4.7.20 For some of the topics that are assessed in the EIA Report, there is published guidance available about significance evaluation. Where such guidance exists, even if in draft, it has been used to inform the development of the significance evaluation methodologies that

are used in this EIA Report. For other topics, it has been necessary to develop methodologies without the benefit of guidance. This has involved technical specialists drawing on their previous experience of significance evaluation in EIA.

4.7.21 While there may be variation depending on the technical topic being considered, significance evaluation generally involves combining information about the sensitivity, importance or value of a receptor, and the magnitude and other characteristics of the changes that affect the receptor. The approach to using this information for significance evaluation is outlined below.

Receptor sensitivity, importance, or value

4.7.22 The sensitivity or value of a receptor is largely a product of its importance as informed by legislation and policy, and as qualified by professional judgement. For example, receptors for landscape, biodiversity or the historic environment may be defined as being of international or national importance. Lower value receptors may be defined as being sensitive or important at a county or district level. For each environmental topic, it is necessary to provide a detailed rationale that explains how the categories of sensitivity/importance/value have been used.

4.7.23 The use of a location or physical element that may be representative of receptors, e.g. people, would also play a part in its classification in terms of sensitivity, importance, or value. For example, when considering effects on the amenity of people, a location used for recreational purposes may be valued more than a place of work.

Magnitude of change

4.7.24 The magnitude of change for a receptor that would be affected by a proposed development would be identified on a scale from very low to very high. As with receptor sensitivity or value, a rationale is provided in each topic chapter that explains how the categories of environmental change are defined. For certain topics, the magnitude of change would be related to guidance on what levels of change are acceptable (e.g. for air quality or noise), and be based on numerical parameters. For other changes, it will be a matter of professional judgement to determine the magnitude of change, using descriptive terms.

Determination of significance

4.7.25 The significance of an effect is determined with reference to the nature of the development, the receptors affected and their sensitivity, importance or value, together with the magnitude of environmental change that is likely to occur.

4.7.26 Significance evaluation for many environmental topics can be guided by the use of matrices that combine sensitivity/importance/value and the characteristics of environmental changes as shown in the example in **Table 4.3**. In addition, professional judgement is applied because, for certain environmental topics, the lines between the sensitivities or magnitude of change may not be clearly defined and the resulting assessment conclusions may need clarifying.

Table 4.3 Significance evaluation matrix

Sensitivity/importance/value	Magnitude of change: Very high	High	Medium	Low	Very low
Very high	Major (Significant)	Major (Significant)	Major (Significant)	Major (Significant)	Moderate (Probably significant)
High	Major (Significant)	Major (Significant)	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)
Medium	Major (Significant)	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)
Low	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)
Very Low	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)	Negligible (Not significant)

4.7.27 Where this matrix is used in the significance evaluation exercises, reference is made to:

- Major effects, which will always be determined as being significant in EIA terms;
- Moderate effects are likely to be significant, although there may be circumstances where such effects are considered not significant on the basis of professional judgement; and
- Minor or negligible effects, which will always be determined as not significant.

4.7.28 Variations to this approach, which may be applicable to specific environmental topics, will be detailed in the relevant 'Significance evaluation methodology' sub-section contained in each environmental topic chapter.

4.7.29 Definitions of how the categories that are used in the matrix are derived for each topic are also set out in each environmental topic chapter, along with the relevant explanation and descriptions of receptor sensitivity, magnitude of change and levels of effect that are considered significant under the EIA Regulations.

4.8 Assessment of cumulative effects

4.8.1 For each environmental topic that is dealt with in this EIA Report, an assessment is undertaken of how the environmental effects resulting from the Proposed Development could combine with the same topic-related effects generated by other developments to affect a common receptor. To do this, it is important to first identify which other developments need to be included in the cumulative effects assessment (CEA) under each environmental topic assessment undertaken. The starting point for this is to determine the ZoIs from the Proposed Development for each receptor that could be significantly affected under each environmental topic considered.

4.8.2 Identifying the other developments that should be considered in the CEA involves first acknowledging that the availability of information necessary to conduct this will partly depend on the prevailing status of the other relevant developments.

4.8.3 In the context of the Proposed Development, the relevant NatureScot guidance[1] states that the CEA should be undertaken only for operational and consented wind energy development and other applications for wind energy development. In addition, paragraph 5 of Schedule 4 of the EIA Regulations states that consideration should be given to *"cumulation of effects with other existing and/or approved development"*. Therefore, such developments, where they are located within the ZoI for a given environmental topic, have been subject to CEA. These other developments are discussed, as appropriate, in the sub-section of each environmental topic chapter that deals with the assessment of cumulative effects.

[1] Scottish Natural Heritage, March 2012, Guidance: Assessing the Cumulative Impacts of Onshore Wind Energy Developments.

5. Planning Policy

5.1 Introduction

5.1.1 This chapter details the legislative planning context and summarises national and local planning policy relevant to the Proposed Development.

5.2 Legislative context

The Electricity Act 1989

5.2.1 Section 36 of the Electricity Act 19891 (the 'Electricity Act') requires that that a generating station with a capacity in excess of 50 megawatts (MW) shall not be constructed, extended, or operated except in accordance with a consent granted by the Scottish Ministers. The Proposed Development is a wind farm generating station that will have a generating capacity in excess of 50 MW and requires section 36 consent.

5.2.2 The Electricity Act, at Schedule 9, Paragraph 3 requires the Scottish Ministers, to have regard to the desirability of preserving natural beauty, conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings, and objects of architectural, historical, or archaeological interest (paragraph 3(1)(a)), and where the person who formulates the proposals is a licence-holder, there is a requirement for them to do what they reasonably can to mitigate any effect that the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings, or objects (paragraph 3(1)(b)). A licence-holder is also required to avoid, so far as possible, causing injuries to fisheries or to the stock of fish in any waters (paragraph 3(3)).

The Town and Country Planning (Scotland) Act 1997

5.2.3 The primary planning legislation in Scotland is the Town and Country Planning Act (Scotland) 1997[2] (the 'Planning Act') as amended.

5.2.4 Section 57(2) of the Planning Act addresses development with Government authorisation, and states that "On granting or varying a consent under section 36 or 37 of the Electricity Act 1989, the Scottish Ministers may give a direction for planning permission to be deemed to be granted, subject to such conditions (if any) as may be specified in the direction, for – (a) so much of the operation or change of use to which the consent relates as constitutes development; (b) any development ancillary to the operational change of use to which the consent relates".

5.2.5 As the Application is made under the Electricity Act, the duty under Section 25 of the Planning Act, to determine the application in accordance with the provisions of the Development Plan unless material considerations indicate otherwise, does not apply.

5.2.6 Whilst not afforded the same level of primacy in the decision-making process, the relevant policy within the applicable Development Plan is considered to be a material consideration in the determination of an application under Section 36 of the Electricity Act. The level of

[1] Electricity Act 1989 (legislation.gov.uk) [Accessed October 2022]
[2] Town and Country Planning (Scotland) Act 1997 (legislation.gov.uk) [Accessed October 2022]

weight apportioned to it as a material consideration will be determined by the Scottish Ministers.

5.3 National planning policy context

5.1.1 This section provides an overview of relevant national planning policy, guidance and advice.

5.1.2 National planning policy is contained within the current National Planning Framework[3] (NPF3) and the Scottish Planning Policy (SPP), both of which were published on 23rd June 2014. A consultation draft NPF4 was published on the 10th November 2021, with the consultation period closed on the 31st March 2022. The Revised Draft NPF4 was published and laid in Parliament on 8th November 2022 and will be subject to scrutiny for a period of 120 days. Once in force the NPF4 will become the single national planning policy document, replacing both NPF3 and SPP and it will form part of and have the same status as the Development Plan for applications which are subject to section 25 of the Planning Acts.

5.1.3 Subject specific national planning policies of potential relevance to the Proposed Development, as well as relevant National Planning Advice and Circulars, are also included within this Chapter.

Scottish Planning Policy

5.1.4 Scottish Planning Policy[4] (2014) (SPP) is Scottish Government policy on how nationally important land use planning matters should be addressed, and contains several principal policies, one of which expresses "a presumption in favour of development that contributes to sustainable development". Paragraph 28 states that "The planning system should support economically, environmentally and socially sustainable places by enabling development that balances the costs and benefits of a proposal over the longer term. The aim is to achieve the right development in the right place; it is not to allow development at any cost".

5.3.1 Paragraph 29 sets out the following general principles to guide decision making with regard to sustainability:

- *"giving due weight to net economic benefit;*
- *responding to economic issues, challenges and opportunities, as outlined in local economic strategies;*
- *supporting good design and the six qualities of successful places;*
- *supporting delivery of infrastructure, for example transport, education, energy, digital and water;*
- *supporting climate change mitigation and adaptation including taking account of flood risk;*
- *improving health and well-being by offering opportunities for social interaction and physical activity, including sport and recreation;*
- *having regard to the principles for sustainable land use set out in the Land Use Strategy;*

[3] Scotland's Third National Planning Framework (www.gov.scot) [Accessed October 2022]
[4] https://www.gov.scot/publications/scottish-planning-policy/[Accessed October 2022]

- *protecting, enhancing and promoting access to cultural heritage, including the historic environment;*
- *protecting, enhancing and promoting access to natural heritage, including green infrastructure, landscape and the wider environment;*
- *reducing waste, facilitating its management and promoting resource recovery; and*
- *avoiding over development, protecting the amenity of new and existing development and considering the implications of development for water, air and soil quality.*

5.3.2 The SPP sets out four planning outcomes to explain how planning should support Scotland's vision of achieving sustainable economic growth:

1. A successful, sustainable place;
2. A low carbon place;
3. A natural, resilient place; and
4. A more connected place.

5.3.3 The SPP recognises that renewable energy generation, including onshore wind, will contribute to more secure and diverse energy supplies and support sustainable economic growth. The commitment to increase the amount of electricity generated from renewable sources including onshore wind is a vital part of the response to climate change.

5.3.4 Onshore wind is addressed by SPP at paragraphs 161 – 166. Paragraph 161 requires planning authorities to set out a spatial framework identifying appropriate areas for onshore wind farms, and "*development plans to indicate the minimum scale of onshore wind development that their spatial framework is intended to apply to*".

5.3.5 SPP provides guidance on how spatial frameworks should be set out at Table 1, identifying three area types, as follows:

- *Group 1: Areas where wind farms will not be acceptable* (National Parks and National Scenic Areas);
- *Group 2: Areas of significant protection… wind farms may be appropriate in some circumstances* (national and international designations, nationally important mapped environmental interests, community separation for considering visual impact); and
- *Group 3: Areas with potential for wind farm development* (wind farms are likely to be acceptable, subject to detail)

5.3.6 Paragraph 161 also requires development plans to: "*set out the criteria that will be considered in deciding all applications for wind farms of different scales – including extensions and re-powering – taking account of the considerations set out at paragraph 169".*

5.3.7 Paragraph 169 sets out criteria which must be taken into account for energy infrastructure developments, in addition to the spatial framework, including:

- *"net economic impact, including local and community socio-economic benefits such as employment, associated business and supply chain opportunities;*
- *the scale of contribution to renewable energy generation targets;*
- *effect on greenhouse gas emissions;*
- *cumulative impacts – planning authorities should be clear about likely cumulative impacts arising from all of the considerations below, recognising that in some areas*

the cumulative impact of existing and consented energy development may limit the capacity for further development;

- *impacts on communities and individual dwellings, including visual impact, residential amenity, noise and shadow flicker;*
- *landscape and visual impacts, including effects on wild land;*
- *effects on the natural heritage, including birds;*
- *impacts on carbon rich soils, using the carbon calculator;*
- *public access, including impact on long distance walking and cycling routes and scenic routes identified in the NPF;*
- *impacts on the historic environment, including scheduled monuments, listed buildings and their settings;*
- *impacts on tourism and recreation;*
- *impacts on aviation and defence interests and seismological recording;*
- *impacts on telecommunications and broadcasting installations, particularly ensuring that transmission links are not compromised;*
- *impacts on road traffic;*
- *impacts on adjacent trunk roads;*
- *effects on hydrology, the water environment and flood risk;*
- *the need for conditions relating to the decommissioning of developments, including ancillary infrastructure, and site restoration;*
- *opportunities for energy storage; and*
- *the need for a robust planning obligation to ensure that operators achieve site restoration."*

5.3.8 In relation to the natural environment, SPP advises at paragraph 202, that the "siting and design of development should take account of local landscape character". It states that decisions should "*take account of potential effects on landscapes and the natural and water environment, including cumulative effects. Developers should seek to minimise adverse impacts through careful planning and design*."

5.3.9 Paragraph 203 indicates that planning permission should be refused "*where the nature or scale of a development would have an unacceptable impact on the natural environment*."

The National Planning Framework

National Planning Framework 3[5]

5.1.5 Scotland's Third National Planning Framework (NPF3 – Scottish Government, 2014) provides a statutory framework for Scotland's long-term spatial development.

5.1.6 The NPF states an ambition to achieve at least an 80% reduction in greenhouse gas emissions by 2050, aiming to help achieve the Scottish Government's climate change and renewable energy targets.

[5] 00453683 (6).pdf [Accessed October 2022]

5.1.7 NPF3's vision for Scotland as a low carbon place notes that Scotland has *"seized the opportunities arising from our ambition to be a world leader in low carbon energy generation, both onshore and offshore*".

Scotland's Revised Draft National Planning Framework Draft (NPF4)[6]

5.3.10 The draft fourth National Planning Policy Framework (NPF4) was published 10 November 2021. The consultation closed on 31 March 2022. The Revised Draft NPF4 was published and laid in Parliament on 8th November 2022 and will be subject to scrutiny for a period of 120 days. The current NPF3 and SPP, both published in 2014 and over 8 years old, remain in place until NPF4 is adopted by Scottish Ministers. NPF4 will then replace both NPF3 and SPP, becoming the single national planning policy document, forming part of the Development Plan and having equivalent status for applications subject to Section 25 of the Planning Acts.

5.3.11 The Town and Country Planning (Scotland) Act 1997 as amended, directs that the NPF must contribute to a series of six outcomes, including meeting targets for emissions of greenhouse gases. The plan sets a target of net zero emissions by 2045 and must make significant progress towards this by 2030.

5.3.12 NPF4 supports development which helps to meet Scotland's greenhouse gas emissions targets and states "*The global climate emergency and the nature crisis have formed the foundations for the spatial strategy as a whole. The regional priorities share opportunities and challenges for reducing emissions and adapting to the long-term impacts of climate change, in a way which protects and enhances our natural environment."*

5.3.13 The guidance states that on and off shore electricity generation from renewables exceeding 50 megawatts capacity is designated a national development.

5.3.14 Policy 1 requires significant weight to be given to the global climate and nature crises. Policy 2 aims to encourage, promote and facilitate development that minimises emissions and adapts to the current and future impacts of climate change.

5.3.15 By supporting the transition of key emissions generating activities, Policy 11 Energy supports renewable energy development, and aims to "*encourage, promote and facilitate all forms of renewable energy development onshore and offshore*."

5.3.16 It states that "a) D*evelopment proposals for all forms of renewable, low carbon and zero emissions technologies will be supported. These include (i) wind farms, including repowering, expanding and extending the life of existing wind farms."*

5.3.17 The policy only supports proposals which maximise net economic impact, including local and community socio-economic benefits, and requires the design and mitigation of projects to demonstrate how impacts are addressed against a range of criteria, as follows:

i. "impacts on communities and individual dwellings, including, residential amenity, visual impact, noise and shadow flicker;

ii. significant landscape and visual impacts, ***recognising that such impacts are to be expected for some forms of renewable energy.*** *Where impacts are localised and/ or appropriate design mitigation has been applied, they will generally be considered to be acceptable;*

iii. public access, including impact on long distance walking and cycling routes and scenic routes;

[6] Revised Draft NPF4 | Transforming Planning [Accessed November 2022]

iv. impacts on aviation and defence interests including seismological recording;

v. impacts on telecommunications and broadcasting installations, particularly ensuring that transmission links are not compromised;

vi. impacts on road traffic and on adjacent trunk roads, including during construction;

vii. impacts on historic environment;

viii. effects on hydrology, the water environment and flood risk;

ix. biodiversity including impacts on birds;

x. impacts on trees, woods and forests;

xi. proposals for the decommissioning of developments, including ancillary infrastructure, and site restoration;

xii. the quality of site restoration plans including the measures in place to safeguard or guarantee availability of finances to effectively implement those plans; and

xiii. cumulative impacts."

5.3.18 The policy places *"significant weight on the contribution of the proposal to renewable energy generation targets and on greenhouse gas emissions reduction targets"* in considering these impacts.

5.3.19 The policy goes on to state that *"f) Consents for development proposals may be time-limited. Areas identified for wind farms are, however, expected to be suitable for use in perpetuity."*

National Planning Advice

5.3.20 National planning policy is supported by a range of planning advice notes (PANs) and Circulars, produced by the Scottish Government, providing best practice advice on development. Planning Circulars contain policy on the implementation of legislation or procedures. Those of relevance are set out in **Table 5.1** below:

Table 5.1 Planning Advice Notes and Online Guidance Notes

Title	Summary of Document
PAN 1/2013 Environmental Impact Assessment	Information on the role local authorities and consultees play as part of the EIA process, and how the EIA can inform development management
PAN 60 (2000) Planning for Natural Heritage	Provides advice for developers on the importance of discussing their proposals with the planning authority and NatureScot and use of the EIA process to identify the environmental effects of development proposals and seek to prevent, reduce, and offset any adverse effects in ecology and biodiversity.
PAN 61 (2001) Sustainable Urban Drainage Systems	Good practice drainage guidance.
PAN 68 (2003) Design Statements	PAN 68 covers the importance of design statements, providing flexible guidance on their preparation, structure, and content. The PAN also outlines the principles underpinning the production of design statements, as expected by the Scottish Government.

Title	Summary of Document
PAN 75 (2005) Planning for Transport	The objective of PAN 75 is to integrate Development Plans and transport strategies to optimise opportunities for sustainable development and create successful transport outcomes.
PAN 3/2010 Community Engagement	Provides advice on how to engage with local communities through the planning process.
PAN 1/2011 Planning and Noise	Provides advice on the role of the planning system in helping to prevent and/ or mitigate any potential adverse effects of noise. It promotes the principles of good acoustic design and promotes a sensitive approach to the location of new development.
PAN 2/2011 Planning and Archaeology	The PAN is intended to inform local authorities and other organisations of how to process any archaeological scope of works within the planning process.
PAN 51 Planning, Environmental Protection and Regulation (Revised 2006)	Details the role of the planning system in relation to the environmental protection regimes.
Online Planning Advice on Flood Risk (2015)	Provides advice on the role of the planning system and the assessment and management of flood risk.

5.3.21 In addition, the following documents produced by the Scottish Government and Scottish Natural Heritage are also considered relevant.

Onshore wind planning: frequently asked questions[7]

5.3.22 This online guidance published in February 2016, is a series of questions and answers. Of particular relevance, the guidance notes that:

- deep peat and carbon rich soil mapping prepared by SNH (now NatureScot) is available online and maps these resources for inclusion within wind energy spatial frameworks;
- landscape capacity does not form part of the spatial frameworks for wind as defined in the SPP. However there can be supportive studies relevant to development management and for planning policy related to natural heritage and the landscape.
- community separation distances should be applied within the spatial development frameworks, noting that the application of a separation distance on a wind energy spatial framework *"is not a ban on wind farm development in the identified area"* and separation distances should be defined by taking account of local topography, landscape and built environment features;
- sites of proposed wind farms should be suitable for use in perpetuity, noting that *"the permanent suitability of a site for wind farm use is important as it has a relationship to the potential repowering of a site and the expectation that a wind farm in use today will in principle be acceptable in the long term if reconfigured."*

[7] Onshore wind planning: frequently asked questions - gov.scot (www.gov.scot)

5.3.23 the term 'wild land' refers specifically to the SNH (now NatureScot) map of wild land areas (2014).

Historic Environment Policy for Scotland[8] (HEPS)

5.3.24 This Historic Environment Scotland document (2019) is a non-statutory policy document which directs decision making affecting the historic environment, alongside national policy. The document sets out six policies for managing the historic environment, of which the following are considered relevant:

- *"HEP1 Decisions affecting any part of the historic environment should be informed by an inclusive understanding of its breadth and cultural significance;*
- *HEP2 Decisions affecting the historic environment should ensure that its understanding and enjoyment as well as its benefits are secured for present and future generations; and*
- *HEP4 Changes to specific assets and their context should be managed in a way that protects the historic environment. Opportunities for enhancement should be identified where appropriate. If detrimental impact on the historic environment is unavoidable, it should be minimised. Steps should be taken to demonstrate that alternatives have been explored, and mitigation measures should be put in place."*

Spatial Planning for Onshore Wind Turbines – Natural Heritage Considerations[9] (SNH, June 2015)

5.3.25 Part 3 Development Management within this document identifies natural heritage considerations relevant to the determination of applications for wind energy developments. It reiterates the importance of relevant natural heritage factors set out in SPP and NPF3 being covered in development plans, in particular paragraph 169.

5.3.26 In relation to the impacts of wind energy development on carbon rich soils, deep peat and priority peatland habitat, the document states carbon rich soils, deep peat and priority peatland habitat maps within wind farm spatial frameworks *"cannot (and should not) be used in isolation to determine the impacts of a specific development proposal on peat. This should be based on a detailed, site specific survey of peatland habitats and peat depths across the site using existing methods…".*

5.4 Local planning policy context

5.4.1 The Site falls within the two administrative areas of Dumfries and Galloway, and East Ayrshire. The relevant Development Plans for the Proposed Development are:

- The Dumfries and Galloway Local Development Plan 2 (LDP2)[10], adopted on 3 October 2019, and its associated Supplementary Guidance.
- The East Ayrshire Local Development Plan (EALDP)[11], adopted on 3rd April 2017, and its supplementary guidance. Work on the second LDP for East Ayrshire is currently underway.

5.4.2 The relevant policies from each LDP are set out below under the relevant EIA topic headings. An assessment of the Proposed Development against these policies is

[8] historic-environment-policy-for-scotland (1).pdf [Accessed October 2022]
[9] Guidance - Spatial Planning for Onshore Wind Turbines - natural heritage considerations - June 2015.pdf (nature.scot) [Accessed October 2022]
[10] https://www.dumgal.gov.uk/ldp2 [Accessed October 2022]
[11] EALDP Adopted 2017 Vol 1 (east-ayrshire.gov.uk) [Accessed October 2022]

provided within the accompanying Planning Statement submitted in support of this application.

5.4.3 Policies referenced from LDP2 below are as follows:

- OP1: Development Considerations;
- OP2: Design Quality and Placemaking;
- ED10: Galloway and Southern Ayrshire Biosphere.
- ED11: Dark Skies
- IN1: Renewable Energy;
- IN2: Wind Energy;
- IN7: Flooding and Development
- IN8: Surface Water Drainage and Sustainable Drainage Systems
- NE2: Regional Scenic Areas;
- NE11: Supporting the Water Environment;
- NE12: Protection of Water Margins;
- NE14: Carbon Rich Soils;
- NE15: Protection and Restoration of Peat Deposits as Carbon Sinks;
- HE1: Listed Buildings;
- HE3: Archaeology;
- HE6: Gardens and Designated Landscapes;
- CF4: Access Routes;

5.4.4 Polices referenced from EALDP below are as follows:

- Policy OP1: Overarching Policy;
- Policy IND 3: Business and Industrial Development in the Rural Area;
- Policy TOUR4: The Dark Sky Park
- Policy TOUR5: Galloway and Southern Ayrshire Biosphere;
- Policy RE3: Wind energy proposals over 50 metres in height;
- Policy RE5: Financial Guarantees;
- Policy T4: Development and Protection of Core Paths and Natural Routes;
- Policy ENV1: Listed Buildings;
- Policy ENV2: Scheduled Monuments and Archaeological Resources;
- Policy ENV6: Nature Conservation;
- Policy ENV7: Wild Land and Sensitive Landscape Areas;
- Policy ENV8: Protecting and Enhancing the Landscape;
- Policy ENV10: Carbon rich soils;

- Policy ENV11: Flood Prevention;
- Policy ENV12: Water, air and light and noise pollution.

General Policy Considerations

Dumfries and Galloway

5.4.5 **Policy OP1: Development Considerations** sets out how development will be assessed against considerations under the following headings, where relevant to the scale, nature and location of the proposal:

a) general amenity,

b) historic environment,

c) landscape,

d) biodiversity and geodiversity,

e) transport and travel,

f) sustainability and the water environment, where relevant to the scale, nature and location of the proposal,

g) water environment.

5.4.6 The policy also states that the Dumfries and Galloway Landscape Assessment will be a material consideration in the assessment of proposals.

5.4.7 **Policy OP2: Design Quality and Placemaking** states that: "*Development proposals should achieve high quality design in terms of their contribution to the existing built and natural environment contributing positively to a sense of place and local distinctiveness*…".

5.4.8 **Policy ED10: Galloway and Southern Ayrshire Biosphere** supports the aims of the UNESCO Biosphere and encourages development that demonstrates *"innovative approaches to sustainable communities and the economy, and supports the enhancement, understanding and enjoyment of the area as a world class environment. Development must be appropriate to the role of the different zones within the Biosphere."* The Site is located within the 'transition area' of the Biosphere. "*The Biosphere was created to protect the biological and cultural diversity of this area whilst promoting sustainable economic development."*

5.4.9 **Policy ED11: Dark Skies** supports the Galloway Forest Dark Sky Park and seeks to secure levels of lighting that are "*appropriate to the nature of the development, contribute to sustainable development, and do not adversely affect the objectives of the Dark Sky Park designation*".

East Ayrshire

5.4.10 **Policy OP1: Overarching Policy** sets out criteria which all development proposals are expected to meet where relevant, including

(i) Comply with the provisions and principles of the LDP vision and spatial strategy, all relevant LDP policies and associated supplementary guidance and non-statutory guidance;

(ii) Be fully compatible with surrounding established uses and have no unacceptable impacts on the environmental quality of the area;

(iii) *Ensure that the size, scale, layout, and design enhances the character and amenity of the area and creates a clear sense of place;*

(iv) *Where possible, reuse vacant previously developed land in preference to greenfield land;*

(v) *Be of the highest quality design by meeting with the provisions of SPP, the Scottish Government's policy statement Designing Streets, the Council's Design Guidance and any master plan/design brief prepared for the site;*

(vi) *Prepare Master Plans/Design Statements in line with Planning Advice Notes 83 and 68 respectively where requested by the Council and/or where this is set out as a requirement in Volume 2 of the LDP;*

(vii) *Be compatible with, and where possible implement, projects shown on the LDP placemaking maps;*

(viii) *Ensure that there is no unacceptable loss of safeguarded areas of open space/green infrastructure and prime quality agricultural land;*

(ix) *Protect and enhance natural and built heritage designations and link to and integrate with green infrastructure where possible;*

(x) *Ensure that there are no unacceptable impacts on the landscape character or tourism offer of the area;*

(xi) *Meet with the requirements of all relevant service providers and the Ayrshire Roads Alliance; and (xii) Be accessible to all.*

5.4.11 **Policy TOUR4: The Dark Sky Park** states support for the Galloway Forest Dark Sky Park and will presume against proposals within the boundaries of the park that would produce levels of lighting that would adversely affect its "dark sky" status. Out with the Dark Sky Park, and in particular within the 10 mile radius of the Park known as the transition zone, the Council will take measures to limit light pollution.

5.4.12 **Policy TOUR5: Galloway and Southern Ayrshire Biosphere** states that the "*Council will encourage developments and proposals that support the aims of the Biosphere, particularly where they provide an innovative approach to sustainable living and the economy. Developments which support and improve the understanding and enjoyment of the area as a world class environment will also be supported.*"

Renewable Energy

Dumfries and Galloway

5.4.13 **Policy IN1: Renewable Energy** provides the framework for assessment of all forms of renewable energy and gives support for *"all renewable energy generation and/or storage which are located, sited and designed appropriately*." The policy sets out requirements for detailed information to be submitted with a planning application, and states that the *"acceptability of any proposed development will be assessed against:*

- *landscape and visual impact;*
- *cumulative impact;*
- *impact on local communities and individual dwellings, including visual impact, residential amenity, noise and shadow flicker;*
- *the impact on natural and historic environment (including cultural heritage and biodiversity);*

- *the impact on forestry and woodlands;*
- *the impact on tourism, recreational interests and public access."*

5.4.14 The policy requires sufficient details to be submitted to enable this assessment, to include the following where relevant to the proposal:

- *"Any associated infrastructure requirements including road and grid connections (where subject to planning consent);*
- *Environmental and other impacts associated with the construction and operational phases of the development including details of any visual impact, noise, and odour issues;*
- *Relevant provisions for the restoration of the site;*
- *the scale of contribution to renewable energy generation targets;*
- *effect on greenhouse gas emissions; and*
- *net economic impact, including local and community socio-economic benefits such as employment, associated business and supply chain opportunities.*

** Acceptability will be determined through an assessment of the details of the proposal including its benefits and the extent to which its environmental and cumulative impacts can be satisfactorily addressed."*

5.4.15 Under the heading of '**Wind Energy**' it is noted that the Council has developed a Spatial Framework, taking into account SPP. It is stated that the purpose of the Spatial Framework is to identify those areas that are likely to be most appropriate for onshore wind farms, noting that further information is provided in the Supplementary Guidance (SG), supported by the Dumfries and Galloway Wind Farm Landscape Capacity Study (DGWLCS) which is an appendix to the SG. The DGWLCS assesses landscape sensitivity, the capacity of individual landscape units to accommodate change and provides advice on how the scale, siting and design of development should be informed by local landscape character.

5.4.16 The Site is shown within the 'Wind Energy Spatial Framework' map to be located both within an area with potential for wind energy development (subject to detailed consideration against relevant plan policy) and partially within an area of significant protection, where, "*recognising the need for significant protection, in these areas wind farms may be* appropriate *in some circumstances. Further consideration will be required to demonstrate that any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation."*

5.4.17 The Spatial Framework includes:

- Group 1: Areas where wind farms will not be acceptable:
- Group 2: Areas of Significant Protection, where wind farms may be appropriate in some circumstances and it will be required to demonstrate that any significant effects on the qualities of these areas can be substantially overcome by siting, design, or other mitigation.
- Group 3: Areas with potential for wind farm development, where wind farms are likely to be acceptable, subject to detailed consideration against all relevant plan policies.

5.4.18 **Policy IN2: Wind Energy** supports wind energy proposals that are located, sited and designed appropriately. The policy sets out details of how the acceptability of any proposed wind energy development will be assessed against the following:

- Renewable energy benefits;
- Socio-economic benefits;
- Landscape and visual impacts;
- Cumulative impact;
- Impact on local communities and residential interests;
- Impact on infrastructure;
- Impact on aviation and defence interests;
- Other impacts and considerations including the natural environment, biodiversity, forests and woodland, carbon-rich soils, hydrology, water environment and flood risk, the historic environment, cultural heritage, tourism and recreational interests and public access.

5.4.19 Further details on these development considerations are set out in supplementary guidance set out below.

East Ayrshire

5.4.20 **Policy RE3: Wind energy proposals over 50 metres in height**, states that wind proposals over 50m high are to be assessed against the 'spatial framework for wind development' and other relevant policy.

5.4.21 The policy states that within areas shown on the Spatial Framework (Map 12) as 'Group 3 - Areas with Potential for Wind Energy Development', proposals for wind energy over 50m will be supported if it can be demonstrated that they are acceptable in terms of the assessment criteria set out in Schedule 1 as follows:

"• *Landscape and visual impacts;*

• *Cumulative impacts - likely cumulative impacts arising from all of the considerations below, recognising that in some areas the cumulative impact of existing and consented energy development may limit the capacity for further development;*

• *Impacts on carbon rich soils, deep peat and peatland habitats; using the carbon calculator;*

• *Effects on the natural heritage, including birds. Renewable energy proposals will only be approved where the Council has ascertained that they would not have an adverse effect on the integrity of a Natura 2000 site;*

• *Impacts on wild land;*

• *Impacts on all aspects of the historic environment;*

• *Effects on hydrology, the water environment, flood risk and groundwater dependent terrestrial ecosystems;*

• *Re-use of excavated peat, forest removal and forest waste;*

• *Impacts on forestry and woodlands, with reference to the Ayrshire and Arran Forestry and Woodland Strategy (2013);*

• *Effect on greenhouse gas emissions;*

• *Impacts on communities and individual dwellings, including visual impact, residential amenity, noise and shadow flicker;*

- *Impacts on tourism and recreation;*
- *Public access, including impact on long distance walking and cycling routes and scenic routes identified in National Planning Framework 3;*
- *Net economic impact, including local and community socio-economic benefits such as employment, associated business and supply chain opportunities;*
- *Impacts on aviation and defence interests and seismological recording;*
- *Impacts on road traffic including during construction and decommissioning;*
- *Impacts on adjacent trunk roads;*
- *Impacts on telecommunications and broadcasting installations, particularly ensuring that transmission links are not compromised;*
- *The appropriate siting and design of turbines and ancillary works;*
- *The need for conditions relating to the decommissioning of developments, including ancillary infrastructure, and site restoration;*
- *The need for a robust planning obligation to ensure that operators achieve site restoration;*
- *The scale of contribution to renewable energy generation targets;*
- *Opportunities for energy storage."*

5.4.22 **Policy IND 3: Business and Industrial Development in the Rural Area** sets out the types of development which the Council will encourage and support, out with settlement boundaries, including;

"(vii) Renewable energy developments within the Rural Area that have been subject to detailed consideration against identified policy criteria."

Landscape and Visual Amenity

Dumfries and Galloway

5.4.23 The site is located between two Regional Scenic Areas on the proposals map. **Policy NE2: Regional Scenic Areas** (RSAs) supports development within or affecting Regional Scenic Areas, where the factors taken into account in designating the area would not be significantly adversely affected; or there's a need for the development in that location.

East Ayrshire

5.4.24 **Policy ENV7: Wild Land and Sensitive Landscape Areas** states that *"The Council will give priority and prime consideration to the protection and enhancement of the landscape in its consideration of development proposals within the Sensitive Landscape Areas identified on the LDP maps. Any development deemed to have unacceptable impacts on wild land and SLAs will not be supported by the Council. All development proposals within these areas will also require to be assessed against policy ENV 8…"*

5.4.25 **Policy ENV8: Protecting and Enhancing the Landscape** requires development proposals to be;

"(i) sited and designed to respect the nature and landscape character of the area and to minimise visual impact. Particular attention will be paid to size, scale, layout, materials, design, finish and colour.

(ii) Where visual impacts are unavoidable, development proposals should include adequate mitigation measures to minimise such impacts on the landscape.

(iii) Particular features that contribute to the value, quality and character of the landscape are conserved and enhanced. Development that would result in the loss of valuable landscape features, to such an extent that character and value of the landscape, are unacceptably diminished, will not be supported." The relevant landscape features include settings of settlements and building; skylines, landmarks and views; woodland, hedgerows and trees; rights of way and footpaths; and the landscape character.

Hydrology, Hydrogeology, Geology, Peat and Contaminated Land

Dumfries and Galloway

5.4.26 **Policy NE11: Supporting the Water Environment** states that: "*The Council will not permit development which would result in deterioration in the status of a waterbody, or which would likely impede the improvements in waterbody status as set out in the Solway Tweed River Basin Management Plan (2015) or any update or adopted review of it, unless there are exceptional justifying circumstances...*"

5.4.27 The policy also states that "*development proposals should not normally include the culverting of any waterbody. If culverting would be the only way to enable a proposed development, then permission could be granted if the Council is satisfied that there would be acceptable mitigation measures to protect habitats, passage of fauna, and river form and flow."*

5.4.28 **Policy NE12: Protection of Water Margins** requires protection subject to NE11 and section 18 of the Flood Risk Management (Scotland) Act 2009, where new development is proposed in the vicinity of waterbodies.

5.4.29 **Policy NE14: Carbon Rich Soil** states that support for the role of soils as natural carbon sinks will be material in development decisions. "*Developments proposed on areas of carbon rich soil will need to clearly justify the loss of the carbon sink. Development may be permitted if it can be demonstrated that in accordance with the Scottish Government's 'carbon calculator' or other equivalent independent evidence the balance of advantage in terms of climate change mitigation lies with the development proposal. All developments should take account of soil carbon content and, as appropriate, should adopt:*

- *means of minimising impact on carbon rich soil; and*
- *management measures relative to carbon rich soil."*

5.4.30 **Policy NE15: Protection and Restoration of Peat Deposits as Carbon Sinks**, seeks to maintain the role of natural carbon sinks in retaining carbon dioxide, including those not designated for habitat conservation. The policy sets out circumstances when development may be permitted, including "*where renewable energy generating development is proposed and it can be demonstrated (in accordance with the Scottish Government's 'carbon calculator' or other equivalent independent evidence) that the balance of advantage in terms of climate change mitigation lies with the energy generation proposal."*

5.4.31 **Policy IN7: Flooding and Development** does not permit development where it could lead to an unacceptable on or off-site flood risk. Where a proposed development could lead to an unacceptable flood risk, it may be that a Flood Risk Assessment (FRA) is able to clarify an acceptable risk to the Council and SEPA. For any site a Drainage Impact Assessment (DIA) may be required to ensure that surface water flows are properly taken into account in the development design. Consideration should be given to pluvial flows,

especially those which exceed the capacity of the proposed drainage systems. Design of development must avoid flood risk from exceedance flows.

5.4.32 **Policy IN8: Surface Water Drainage and Sustainable Drainage Systems** states that Sustainable Drainage Systems (SuDS) will be a required part of all proposed development as a means of treating the surface water and managing flow rates. Consideration of drainage issues is a planning requirement for every planning proposal, and should progressively inform the generation of schemes as they develop. For any site a Drainage Impact Assessment (DIA) at the appropriate level may be required to ensure that surface water flows are properly taken into account in the development design.

East Ayrshire

5.4.33 **Policy ENV10: Carbon rich soils** seeks to minimise adverse impacts from development on peatland soils including by the release of CO2 to the atmosphere and promotes the restoration of peatland habitats with potential to become active carbon stores, reducing net carbon emissions. Energy generating developments may be permitted where a greater advantage in terms of climate change mitigation can be demonstrated, and that any significant effects on these areas can be substantially overcome by siting, design or other mitigation.

5.4.34 **Policy ENV11: Flood Prevention** states a precautionary approach to flood risk and promotes flood avoidance, directing development away from functional flood pains and undeveloped areas of medium to high flood risk. The Flood Risk Framework contained in SPP will be used in the assessment of development proposals.

5.4.35 **Policy ENV12: Water, air and light and noise pollution** gives priority to maintaining and improving the quality of waterbodies and ground water, and sets a presumption against development having an adverse impact on the water environment. The policy also requires minimal adverse impact on air quality, light pollution and noise impacts, requiring the relevant assessments where Proposed Development may have adverse impacts.

5.4.36 There are applicable supplementary guidance documents in the LDP Supplementary Guidance, in particular Planning for Wind Energy, adopted in December 2017.

Ecology and Ornithology

Dumfries and Galloway

5.4.37 The LDP2 shows the boundaries of important sites for biodiversity to which the policies relate, on the proposals maps. The Proposed Development does not fall within one of these areas.

5.4.38 The LDP2 recognises that the region's biodiversity and geodiversity are critical components of ecosystems and represent an economic asset and a community resource, as well as being of historic importance. Maintaining and enhancing biodiversity and geodiversity, habitats and wildlife which occurs within them is an important aim of the LDP2. The LDP2 notes that several species receive statutory protection through international and national legislation, whether they are found within protected sites or not. The LDP states that all proposals will be assessed for their impact on European Protected Species and other nationally protected species.

5.4.39 The LDP2 notes that several of Local Nature Conservation Sites have been identified and assessed as being of known local importance for biodiversity or geodiversity, and development proposals being submitted in relation to any of these aspects will be considered against **Policy OP1**, which states:

5.4.40 *"d) Biodiversity and Geodiversity Development proposals should respect, protect and/or enhance the region's rich and distinct biodiversity, geodiversity and sites identified for their contribution to the natural environment at any level including ancient and semi-natural woodland. The guidance contained within the Local Biodiversity Action Plan, and any subsequent revised or amended document, will be a material consideration in the assessment of proposals."*

East Ayrshire

5.4.41 **Policy ENV6: Nature Conservation** seeks to recognise the importance of nature conservation and biodiversity in assessment of development proposals, as follows:

"(i) Any development likely to have a significant effect on a Natura 2000 site which is not directly connected with or necessary to its conservation management must be subject to a "Habitats Regulations Appraisal". Such development will only be approved if the appraisal shows that there will be no adverse effect on the integrity of the site;

(ii) Any development affecting a SSSI will only be permitted where it will not adversely affect the integrity of the area or the qualities for which it has been designated or where any significant adverse effects on the qualities for which it is designated are clearly outweighed by social, environmental or economic benefits of national importance.

(iii) Any development that may adversely impact on areas of local importance for nature conservation, including provisional wildlife sites, local geodiversity sites and local nature reserves, will be expected to demonstrate how any impact can be avoided or mitigated.

(iv) If there is evidence that protected species may be affected by a development, steps must be taken to establish their presence. The planning and design of any development which has the potential to impact on a protected species will require to take into account the level of protection afforded by legislation and any impacts must be fully considered prior to the submission of any planning application.

(v) Any new development must protect, and where appropriate incorporate and/or extend, existing habitat networks, helping to further develop the Central Scotland Green Network in Ayrshire.

The Council will apply 'the precautionary principle' where the impacts of a proposed development on nationally or internationally significant natural heritage resources are uncertain but there is sound evidence indicating that significant irreversible damage could occur."

Cultural Heritage

Dumfries and Galloway

5.4.42 **Policy HE1: Listed Buildings** supports development that "*makes effective, efficient and sustainable use of listed buildings."* The policy sets out requirements for development that impacts on the character or appearance of a listed building or its setting.

5.4.43 **Policy HE3: Archaeology** supports development which *"protects significant archaeological and historic assets, and the wider historic environment from adverse effects*", and sets out requirements in relation to development proposals affecting such assets.

5.4.44 **Policy HE6: Gardens and Designed Landscape** gives support for development which "*protects or enhances the significant elements, specific qualities, character, integrity and setting, including key views to and from, gardens and designated landscapes included in the Inventory of Gardens and Designed Landscapes or the Non-Inventory List."*

5.4.45 The Council requires to be satisfied that the Proposed Development protects or enhances the significant elements of the garden or landscape in-situ, and an assessment of the impact of proposals on the sites and their settings plus details of any potential mitigation measures.

East Ayrshire

5.4.46 **Policy ENV1: Listed Buildings** supports the retention and preservation of all listed buildings and buildings within conservation areas.

5.4.47 **Policy ENV2: Scheduled Monuments and Archaeological Resources** states that *"development that would have an adverse effect on Scheduled Monuments or on their settings shall not be supported unless there are exceptional overriding circumstances,"* and sets out requirements for developers where archaeological preservation is necessary.

Noise

Dumfries and Galloway

5.4.48 There is no specific policy relating to noise impact in LDP2, however, **Policy IN2: Wind Energy** under the heading of "Impact on local communities", states that the Council will assess the acceptability of any proposed wind energy development against several considerations, including the assessment of the impact of noise on communities and local amenity, and the potential for associated mitigation.

East Ayrshire

5.4.49 **Policy ENV12: Water, air and light and noise pollution** requires minimal adverse impact on air quality, light pollution and noise impacts, requiring the relevant assessments where the Proposed Development may have adverse impacts.

5.4.50 **Policy RE3** also requires impacts on communities and individual dwellings, including noise, to be considered.

Access, Traffic and Transport

Dumfries and Galloway

5.4.51 **Policy CF4: Access Routes**, in relation to proposals affecting existing routes, seeks to "*protect and keep open and free from obstruction any route, waterway or other means by which access rights may reasonably be exercised. Development proposals should not impact adversely on any of the aforementioned access routes and Core Path. The Council will not grant planning permission to development proposals which would result in the loss of such access routes unless a satisfactory alternative route or mitigating measures can be secured…"*

5.4.52 The policy also states in relation to the Provision of New Access Routes that "*development should consider access issues at an early stage of the design process and, where appropriate, incorporate new and enhanced access opportunities, linked to wider access networks and green networks.*" For major developments, an "*Access Route Plan demonstrating how access routes will be incorporated may be required. New or alternative access routes and enhancements to existing routes will be supported, especially if these can form part of green networks. The Council will seek reasonable opportunities from developers to create, manage, maintain and improve access through planning conditions or legal agreements".*

East Ayrshire

5.4.53 **Policy T4: Development and Protection of Core Paths and Natural Routes** states that "*the Council will not be supportive of development which disrupts or adversely impacts on any existing or potential core path, right of way, bridle path, or footpath used by the general public for recreational or other purposes, particularly where the route concerned forms, or has the potential to form, part of the network of circular routes or footpath links between settlements, actively promoted by the Council."* Where disruption is unavoidable, the policy requires an appropriate diversion to be provided, or appropriate mitigation to overcome the adverse impact.

Socio-economics (Including Recreation and Tourism)

Dumfries and Galloway

5.4.54 Tourism is identified in the LDP2 as a key sector within the Dumfries and Galloway economy. The LDP2 states that planning has an important role of supporting the tourism economy throughout Dumfries and Galloway, whilst safeguarding the tourism assets of the region.

5.4.55 **Policy IN2: Wind Energy** includes, under the heading of Other Impacts and considerations: "*a) the extent to which the proposal avoids or adequately resolves any other significant adverse impact including…tourism and recreational interests".*

East Ayrshire

5.4.56 **Policy RE5: Financial Guarantees**, states that the Council will, where appropriate, require a financial guarantee via either appropriate conditions and/or legal obligation, to ensure that all decommissioning, restoration, aftercare and mitigation can be met.

5.4.57 **Policy RE3: Wind energy proposals over 50 metres in height,** requires "*Net economic impact, including local and community socio-economic benefits such as employment, associated business and supply chain opportunities"* to be assessed as part of the proposal.

Adopted Supplementary Guidance

Dumfries and Galloway

Wind Energy Development: Development Management Considerations' (February 2020)[12]

5.4.58 This Supplementary Guidance (SG) provides further detail to support Policy IN2: Wind Energy. The guidance notes that *"Applications for wind farms of over 50MW generating capacity are determined by the Energy Consents Unit of the Scottish Government under Section 36 of the Electricity (Scotland) Act 1989. Dumfries and Galloway Council should be consulted on such applications as the relevant planning authority, LDP2 and this SG will be used to inform the Council's consultation response."*

5.4.59 The SG sets out detailed development considerations which applications will be assessed against, specifically; renewable energy benefits, socio-economic benefits, landscape and visual impacts and design of proposals, cumulative impact, impact on local communities and residential interests impact on infrastructure, aviation and defence, biodiversity, forest and woodlands, carbon rich soils, hydrology, the water environment and flood risk, historic environment and cultural heritage, tourism and recreational interests, public access, physical site constraints, decommissioning and restoration, ancillary developments,

12 Wind_Energy_SG_Final_PDF_February_2020_Version.pdf (dumgal.gov.uk)

repowering, up-powering and life extension, legal obligations and bonds, and supporting information.

Dumfries and Galloway Wind Farm Capacity Study' (February 2020)[13]

5.4.60 This Study provides a strategic assessment of landscape sensitivity, the relative capacity of individual landscape units to accommodate change and provides advice on how the scale, siting and design of development should be informed by local landscape character and supports the Wind Energy Development SG.

East Ayrshire

Supplementary Guidance: Planning for Wind Energy, December 2017[14]

5.4.61 The SG notes that in East Ayrshire, renewable energy production demand is seen in relation to onshore wind energy and "*wind turbines are a notable feature in the landscape*".

5.4.62 The SG sets out the council's approach to wind energy development and provides further detail on criteria against which all medium and large scale wind energy proposals will be assessed, underpinning policy RE3 of the Local Development Plan.

13 Wind_Energy_Appendix_C_Landscape_SG_LDP2_Adopted.pdf (dumgal.gov.uk)
14 Planning SG Planning for Wind Energy (east-ayrshire.gov.uk) [Accessed October 2022]

6. Renewable Energy, Carbon Balance and Peat Management

6.1 Introduction

6.1.1 This chapter summarises renewable energy policy relevant to the Proposed Development, provides information in relation to renewable energy generation and carbon balance figures and peat management and landslide risk.

6.1.2 The legislative context in terms of the Electricity Act 1989 and the Town and Country Planning (Scotland) Act 1997 is set out in **Chapter 5: Planning Policy**.

6.2 Renewable energy policy context

6.2.1 This section provides an overview of applicable renewable energy policy, and strategies, starting with the international context and then details UK policy and targets, followed by Scotland policy and targets.

International Context

International Agreements and Obligations – The Conference of the Parties (COP) 21 Paris Agreement

6.2.2 The Paris Agreement[1] was adopted on 12th December 2015 by 196 parties to the United Nations (UN) Framework Convention on Climate Change, creating a legally-binding, international agreement towards tackling climate change. The UK is one of the signatories and is legally bound to the Paris Agreement.

6.2.3 The Paris Agreement came into force on November 4th, 2016, having been ratified by at least 55% (the point which triggers ratification) of the 196 countries. The meeting in Paris was considered a make-or-break opportunity to secure an international agreement on the approach to tackling climate change, commitment to a longer-term goal or near zero emissions in the second half of the century and supporting the transition to a clean economy and low carbon security.

6.2.4 The member governments agreed:

- A long-term goal of keeping the increase in global average temperature to well below 2 degrees Celsius above pre-industrial levels;
- To aim to limit the increase to 1.5 degrees Celsius since this would significantly reduce risks and the impacts of climate change;
- On the need for global emissions to peak as soon as possible, recognising that this will take longer for developing countries;
- To undertake rapid reductions thereafter in accordance with the best scientific guidance available; and

[1] https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement [Accessed October 2022]

- Countries are legally obliged to make new post-2030 commitments to reduce emissions every five years.

COP26 – The Glasgow Climate Pact[2]

6.2.5 The COP26 was held in Glasgow in November 2021, agreeing the Glasgow Climate Pact. As a result, over 90% of world gross domestic product (GDP) and around 90% of global emissions are now covered by net zero commitments. 153 countries put forward new or updated emissions targets which cover around 80% of the world's greenhouse gas emissions. The UN projects greenhouse gas emissions will as a result be around 5 billion tonnes lower by 2030 – equivalent to more than ten years of current UK emissions.

6.2.6 Not all countries are compatible with net zero, and as part of the Glasgow Climate Pact, have agreed to revisit and strengthen their current emissions targets to 2030 in 2022. A programme on mitigation ambition was created and countries agreed to hold an annual high-level event on 2030 ambition. The Glasgow Climate Pact has also driven further action on long-term strategies. It only keeps 1.5C in sight if countries take immediate action to deliver on their commitments - including phasing down coal power, halting and reversing deforestation, speeding up the switch to electric vehicles and reducing methane emissions.

6.2.7 COP26: Key Outcomes and next steps for the UK[3], December 2021, sets out what COP26 delivered and how the UK can help deliver the Glasgow Climate Pact by identifying key actions in response, both at home and internationally. The Glasgow Climate Pact requires countries to revisit and strengthen the 2030 targets in their Nationally Determined Contributions (NDCs) to align with the Paris Agreement temperature goal. '*The UK should focus its efforts on strengthening delivery rather than increasing its headline target, and seek ways to supplement current plans, including by taking more action to tackle its consumption emissions.'* The document notes that the UK does not yet have all the policies in place to deliver the Paris Agreement temperature goal. *'The Net Zero Strategy provides a strong foundation for delivery and needs to proceed at pace; a change in ambition would risk slowing this process down.'*

Special Report on Global Warming of 1.5°C[4] (2018)

6.2.8 Contained within the Decision of the 21st Conference of Parties of the United Nations Framework Convention on Climate Change to adopt the Paris Agreement was an invitation for the Intergovernmental Panel on Climate Change (IPCC) *'…to provide a Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways'*.

6.2.9 The IPCC published the 'Special Report on the impacts of global warming of 1.5°C', in October 2018. The report presents a study on the impacts and possible methods of keeping temperature from warming by more than 1.5°C. It points out the differences between allowing temperatures to rise towards 2°C above pre-industrial times, or keeping them nearer to 1.5°C.

6.2.10 The report finds that a rise by 1.5°C could be reached in as little as 11 years – and almost certainly within 20 years without major cuts in carbon dioxide (CO2) emissions) if global warming continues to increase at the current rate. To limit the temperature rise to 1.5°C, global net human-caused emissions of carbon dioxide (CO2) would need to fall by about 45% from 2010 levels by 2030 in order to reach 'net-zero' around 2050. However, to

[2] COP26-Presidency-Outcomes-The-Climate-Pact.pdf (ukcop26.org) [Accessed October 2022]
[3] COP26-Key-outcomes-and-next-steps-for-the-UK-Final.pdf [Accessed October 2022]
[4] https://www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SR15_Full_Report_HR.pdf [Accessed October 2022]

achieve these emissions reductions, “rapid and far-reaching” transitions in land, energy, industry, buildings, transport, and cities and “unprecedented change” would be required.

6.2.11 The report sets out mitigation strategies to achieve the net emissions reductions that would be required to follow a pathway that limits global warming to 1.5°C with no or limited overshoot, and states that this “*would require rapid and far-reaching transitions in energy, land, urban and infrastructure (including transport and buildings), and industrial systems (high confidence). These systems transitions are unprecedented in terms of scale, but not necessarily in terms of speed, and imply deep emissions reductions in all sectors”.*

6.2.12 The report finds that “In 1.5°C pathways with no or limited overshoot, renewables are projected to supply 70–85% (interquartile range) of electricity in 2050.” Making this monumental shift in energy production would require substantial new investment in low-carbon technologies and energy efficiency.

AR6 Climate Change 2022: Impacts, Adaptation and Vulnerability[5] (February 2022)

6.2.13 This sixth assessment report by the IPCC has been published in stages between August 2021 and September 2022. The Working Group 2 report looks at the impacts of climate change, looking at ecosystems, biodiversity, and human communities at global and regional levels. It also reviews vulnerabilities and the capacities and limits of the natural world and human societies to adapt to climate change.

6.2.14 The headline findings[6] from the report are, in summary:

Observed and Projected Impacts and Risks

- *“Human-induced climate change, has caused widespread adverse impacts and related losses and damages to nature and people, beyond natural climate variability. Some development and adaptation efforts have reduced vulnerability.*
- *Vulnerability of ecosystems and people to climate change differs substantially among and within regions driven by patterns of intersecting socio-economic development, unsustainable ocean and land use, inequity, marginalization, historical and ongoing patterns of inequity. A high proportion of species is vulnerable to climate change. Current unsustainable development patterns are increasing exposure of ecosystems and people to climate hazards.*
- *Global warming, reaching 1.5°C in the near-term, would cause unavoidable increases in multiple climate hazards and present multiple risks to ecosystems and humans.*
- *Beyond 2040 and depending on the level of global warming, climate change will lead to numerous risks to natural and human systems. The magnitude and rate of climate change and associated risks depend strongly on near-term mitigation and adaptation actions.*
- *Climate change impacts and risks are becoming increasingly complex and more difficult to manage. Some responses to climate change result in new impacts and risks.*
- *If global warming transiently exceeds 1.5°C in the coming decades or later, then many human and natural systems will face additional severe risks, compared to remaining below 1.5°C.*

[5] WGII Summary for Policymakers Headline Statements | Climate Change 2022: Impacts, Adaptation and Vulnerability (ipcc.ch) [Accessed October 2022]
[6] WGII Summary for Policymakers Headline Statements | Climate Change 2022: Impacts, Adaptation and Vulnerability (ipcc.ch) [Accessed October 2022]

Current Adaptation and its Benefits

- *Progress in adaptation planning and implementation has been observed across all sectors and regions, generating multiple benefits. However, adaptation progress is unevenly distributed.*
- *There are feasible and effective adaptation options which can reduce risks to people and nature.*
- *Soft limits to some human adaptation have been reached, but can be overcome by addressing a range of constraints, primarily financial, governance, institutional and policy constraints. With increasing global warming, losses and damages will increase and additional human and natural systems will reach adaptation limits.*
- *There is increased evidence of maladaptation across many sectors and regions since the AR5.*
- *Enabling conditions are key for implementing, accelerating and sustaining adaptation in human systems and ecosystems. These include political commitment and follow-through, institutional frameworks, policies and instruments with clear goals and priorities.*

Climate Resilient Development

- *Evidence of observed impacts, projected risks, levels and trends in vulnerability, and adaptation limits, demonstrate that worldwide climate resilient development action is more urgent than previously assessed in AR5.*
- *Climate resilient development is enabled when governments, civil society and the private sector make inclusive development choices that prioritise risk reduction, equity and justice, and when decision-making processes, finance and actions are integrated across governance levels, sectors and timeframes.*
- *Interactions between changing urban form, exposure and vulnerability can create climate change induced risks and losses for cities and settlements. However, the global trend of urbanisation also offers a critical opportunity in the near-term, to advance climate resilient development.*
- *Safeguarding biodiversity and ecosystems is fundamental to climate resilient development, in light of the threats climate change poses to them and their roles in adaptation and mitigation. Recent analyses, drawing on a range of lines of evidence, suggest that maintaining the resilience of biodiversity and ecosystem services at a global scale depends on effective and equitable conservation of approximately 30% to 50% of Earth's land, freshwater and ocean areas, including currently near-natural ecosystems (high confidence).*
- *It is unequivocal that climate change has already disrupted human and natural systems. Past and current development trends (past emissions, development and climate change) have not advanced global climate resilient development (very high confidence). Societal choices and actions implemented in the next decade determine the extent to which medium- and long-term pathways will deliver higher or lower climate resilient development (high confidence). Importantly climate resilient development prospects are increasingly limited if current greenhouse gas emissions do not rapidly decline, especially if 1.5°C global warming is exceeded in the near term (high confidence). These prospects are constrained by past development, emissions and climate change, and enabled by inclusive governance, adequate and appropriate human and technological resources, information, capacities and finance (high confidence)."*

6.3 UK Policy and Targets

Climate Change Act[7] 2008

6.3.1 The Climate Change Act is the basis for the UK's approach to tackling and responding to climate change. This Act committed the UK to reducing greenhouse gas emissions by at least 80% of 1990 levels by 2050. It also requires the Government to set legally-binding 'carbon budgets' to act as stepping stones towards the 2050 target. Carbon budgets cover a five-year period and currently run to 2032. The UK is currently in the third carbon budget period (2018 to 2022).

6.3.2 A Climate Change Committee (CCC) was set up to ensure emissions targets are set based on expert independent assessment of the evidence and to monitor the UK's progress towards meeting the targets.

6.3.3 The CCC's 2022 Progress Report to Parliament[8], was presented pursuant to Section 36(1) of the Climate Change Act 2008, in June 2022. This report notes (p437) "The UK Government's Energy Security Strategy includes plans to ramp up onshore wind, with the implication that most of this will be located in Scotland."

6.3.4 Key messages in the report are as follows:

- "*The UK Government now has a solid Net Zero strategy in place, but important policy gaps remain… Strategies and detailed plans are still needed for achieving full electricity decarbonisation by 2035*.
- *Tangible progress is lagging the policy ambition. With an emissions path set for the UK and the Net Zero Strategy published, greater emphasis and focus must be placed on delivery*
- *Successful delivery of changes on the ground requires active management of delivery risks. Not all policies will deliver as planned. Some may be more successful than expected, while others will fall behind.*
- *Action to address the rising cost of living should be aligned with Net Zero… There remains an urgent need for equivalent action to reduce demand for fossil fuels to reduce emissions and limit energy bills. There remain further opportunities to reduce fossil fuel consumption on a timescale that will help people cope with current very high prices. These include a sustained push for both energy efficiency improvements and electrification, especially in the buildings sector, as well as deployment of onshore wind and solar, which can occur significantly quicker than offshore wind deployment".*
- *Slow progress on wider enablers. The Net Zero Strategy contained warm words on many of the cross-cutting enablers of the transition, but there has been little concrete progress.*
- *The UK must build on a successful COP26. The UK presidency of the UN COP26 climate summit in Glasgow in November 2021 successfully strengthened long-term global ambition and introduced new mechanisms to support delivery. It should prioritise making those new mechanisms work in practice and strengthening global 2030 ambition, while preparing for a focus on climate finance and adaptation at COP27 in 2022 and COP28 in 2023.*

[7] https://www.legislation.gov.uk/ukpga/2008/27/contents [Accessed October 2022]
[8] 2022 Progress Report to Parliament - Climate Change Committee (theccc.org.uk) [Accessed October 2022]

Climate Change Act 2008 (2050 Target Amendment) Order 2019

6.3.5 The UK adopted a 2050 net zero emissions reduction target in June 2019, strengthening its previous 2050 goal of at least an 80% greenhouse gas emission reduction below 1990 levels by 2050. As part of this net zero 2050 target, the Climate Change Committee recommended that Scotland should achieve net zero by 2045.

6.3.6 In light of this net zero emissions reduction target future carbon budgets are set to be revised.

The Sixth Carbon Budget Report[9] (December 2020)

6.3.7 The UK's Sixth Carbon Budget, The UK's path to Net-Zero recommends the UK sets a budget to "*require a reduction in greenhouse gas emissions of 78% by 2035 relative to 1990, a 63% reduction from 2019",* noting the importance of reducing emissions early, as cumulative global emissions drive climate outcomes.

6.3.8 The report refers to an intent to incorporate the UK's share of international aviation and shipping emissions for the first time, to bring the UK more than three-quarters of the way to net zero by 2050, and states that the Committee "*do not consider the previous approach of allowing 'headroom' for aviation and shipping emissions to be sufficient, given the importance of these emissions and the risk of different treatments in UK legislation being seen as unfair".*

6.3.9 The recommended pathway of the Budget is a 78% reduction in UK territorial emissions between 1990 and 2035, bringing forward the UK's previous target by nearly 15 years. This can be met through the following steps:

- "*Reducing demand for carbon-intensive activities;*
- *Take up of low-carbon solution;*
- *Expansion of low-carbon energy supplies; and*
- *Land (and removals)."*

6.3.10 The report states that "*Where powers are reserved to the UK level, the devolved administrations have an important role in ensuring that the emissions reductions take place. In particular, the devolved administrations should focus on the following areas:*

- *Planning;*
- *Procurement;*
- *Convening Role;*
- *Working with the UK Government;*
- *Access to UK wide funding; and*
- *Communication and public engagement."*

6.3.11 Particularly in relation to planning, it states that "*planning frameworks are another useful lever over infrastructure that needs to be well aligned to objectives for emissions reduction in devolved administrations (e.g. through encouraging walking, cycling and use of public transport, ensuring readiness for or installation of electric vehicle charging points in new developments,* ***and a favourable planning regime for low-cost onshore wind).*****"**

[9] Sixth Carbon Budget - Climate Change Committee (theccc.org.uk) [Accessed October 2022]

The Carbon Budget Order 2021[10]

6.3.12 The UK has enshrined a new target in law (the Carbon Budget Order 2021) to slash emissions by 78% by 2035.

6.3.13 The first carbon budget (2008 to 2012) was met, as was the second (2013 to 2017) and at the date of the report, the UK was on track to outperform the third (2018 to 2022). Delivering the Net Zero Pathway would imply considerably greater action than expected when the Fourth and Fifth Carbon Budgets were set (covering 2023-2027 and 2028-2032 respectively).

6.3.14 Through the Climate Change Act, the UK government has committed to reduce emissions by at least 100% of 1990 levels (Net Zero) by 2050 which is a very challenging target which may not be met without significant intervention.

The UK Clean Growth Strategy (2017)

6.3.15 In October 2017, the UK Government published the Clean Growth Strategy (CGS) 'Leading the Way to a Low Carbon Future'[11]. The key message of the Strategy is that clean growth means growing our national income while cutting greenhouse gas emissions. The CGS states that it "*sets out a comprehensive set of policies and proposals that aim to accelerate the pace of 'clean growth' i.e., deliver increased economic growth and decreased emissions*". It states that "*in order to meet these objectives, the UK will need to nurture low carbon technologies, processes and systems that are as cheap as possible".* In particular the strategy notes that the cost of onshore wind power has been driven down by 50% since 2009.

6.3.16 The Strategy draws on the UK's commitments under the Climate Change Act 2008, which at publication of the Strategy committed the UK to reducing greenhouse gas emissions and the associated 'Carbon Budgets' relative to 1990 levels by at least 80% by 2050, a target now increased to 100%. The Strategy considered that to meet the fourth and fifth carbon budgets (covering the period 2023 to 2027 and 2028 to 2032) "*we will need to drive a significant acceleration in the pace of decarbonisation and in this strategy, we have set out stretching domestic policies that keep us on track to meet our carbon budgets*".

6.3.17 The Strategy references the 2015 Paris Agreement and states that "t*he actions and investments that will be needed to meet the Paris commitments will ensure the shift to clean growth will be at the forefront of policy and economic decisions made by governments and businesses in the coming decades*".

Progress in Reducing Emissions and Adapting to Climate Change (2021)

6.3.18 These reports[12] were prepared by the Committee on Climate Change and provides the latest review of the UK's progress on reducing greenhouse gas emissions and its progress towards adapting to climate change. The report on emissions calls for policies to be developed quicker in order to ensure the necessary policies are in place sooner in order to address greenhouse gas emissions. Both reports highlight the continued need to phase-out gas reliant energy generating facilities.

6.3.19 The reports joint recommendations highlight the need for further low-carbon generation facilities (such as wind farm developments) to be provided for on a large scale in order to

[10] https://www.legislation.gov.uk/uksi/2021/750/contents/made [Accessed October 2022]
[11] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/700496/clean-growth-strategy-correction-april-2018.pdf [Accessed October 2022]
[12] https://www.theccc.org.uk/publication/2021-progress-report-to-parliament/ [Accessed October 2022]

ensure the more polluting forms of energy generation can be removed, whilst also ensuring the security of the energy supply.

The Energy White Paper: Powering our Net Zero Future[13] (December 2020)

6.3.20 Following on from the Prime Minister's Ten Point Plan for a Green Industrial Revolution published in November 2020, the Energy White Paper provides further clarity on the Prime Minister's measures and puts in place a strategy for the wider energy system that: transforms energy, supports a green recovery, and creates a fair deal for consumers. It identifies that clean electricity should become the predominant form of energy, entailing a potential doubling of electricity demand and consequently a fourfold increase in low-carbon electricity generation. This transition should be secured while retaining the essential reliability, resilience and affordability of energy.

British Energy Security Strategy (updated 7 April 2022)

6.3.21 This strategy is the latest Government strategy on energy, which looks to secure clean and affordable British energy for the long-term.

6.3.22 The strategy notes that "*accelerating the transition away from oil and gas then depends critically on how quickly we can roll out new renewables…. The growing proportion of our electricity coming from renewables reduces our exposure to volatile fossil fuel markets."*

6.3.23 Onshore wind is noted as being one of the cheapest forms of renewable power "*with a strong pipeline of future projects in Scotland".* The strategy states "*we will work with the Scottish Government to ensure communities and landscape issues are considered for future projects."*

Scottish Climate Change and Energy Policy

6.3.24 The Scottish Government has published several policy documents and legislation in recent years dealing with climate change and renewable energy. The documents summarised below set out the Scottish Government's commitment to reducing carbon emissions via the promotion and development of renewable energy and the contribution this can make to energy generation throughout Scotland.

Climate Change (Scotland) Act 2009[14]

6.3.25 The Climate Change (Scotland) Act 2009 provides a long-term framework to ensure a reduction in greenhouse gas emissions by 80% by 2050, with an interim milestone of 42% by 2020.

6.3.26 Whilst successive bills and legislation have increased the target to net zero emissions, as reported below, the Climate Change (Scotland) Act 2009 provides the wider context for Scotland's ambitious targets for the reduction of carbon emissions. However, advance toward net zero within the Act has now been superseded by the 2045 net zero target set out within the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019[15]; which commits to Scotland becoming a net zero society five years before the rest of the UK and in line with advice from the UK Committee on Climate Change.

[13] https://www.gov.uk/government/publications/energy-white-paper-powering-our-net-zero-future [Accessed October 2022]
[14] http://www.legislation.gov.uk/asp/2009/12/contents [Accessed October 2022]
[15] Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 (legislation.gov.uk) [Accessed October 2022]

Climate Change Emergency

6.3.27 In April 2019 the Scottish Government declared a climate change emergency, which instigated a commitment to enforcing stronger climate change proposals and targets whilst delivering support to the transition to a low carbon economy. The Scottish Government within its climate emergency declaration also highlighted how the planning system has an important role to play in terms of supporting the Scottish Governments climate change goals.

6.3.28 Dumfries and Galloway Full Council also declared a climate emergency on 27 June 2019, in order to respond to climate change and transition to a carbon neutral region. "*In agreeing the Declaration, the Council recognised that this represented a radical and comprehensive step change in the Council's approach."* A 12-point action plan was agreed by the Council, to be implemented and overseen by a Climate Emergency Cross Working Party Group.

Climate Change (Emissions Reduction Targets) (Scotland) Act 2019[16]

6.3.29 The Act, which received Royal Assent on 31 October 2019, raises the ambition of further reducing greenhouse gas emissions by amending the targets set out within the Climate Change (Scotland) Act 2009 and sets a legally binding net zero target for all greenhouse gases emissions by 2045, in response to the Climate Change Emergency. This target date is five years ahead of the current date set for the rest of the UK and aims to ensure Scotland contributes to the worldwide efforts to deliver on the Paris Agreement.

6.3.30 Setting a net-zero target by 2045 is an ambitious target and places Scotland at the forefront of efforts to combat climate change. Through this Act and other associated Government strategies and policies, the Scottish Government aim to provide certainty and credibility to businesses, industries and investors that are vital partners in Scotland's transition to a low carbon economy.

6.3.31 Importantly, the Act also modified the interim targets for 2030 (75% reduction) and 2040 (90% reduction) – and a 56% reduction in 2020 to 75% in 2030 – which is considered to be particularly challenging.

6.3.32 The CCC's report to Parliament[17] notes that the 2045 net zero target in Scotland is in line with the CCC's advice, however "*Scotland's 2030 target is considerably more ambitious than we advised and has major delivery risks."*

6.3.33 The report further notes that the Energy Security Strategy (ESS) "*was almost entirely supply-focused and much of it will not be delivered until well after the immediate crisis has passed. There remains an urgent need for equivalent action to reduce demand for fossil fuels to reduce emissions and limit energy bills over the longer term*."

6.3.34 The report further notes that the ESS increased ambition on renewables "*aims to improve the planning process for onshore wind. This is a welcome move that will help reduce dependence on fossil gas, whether for electricity generation or hydrogen production, while accelerating progress towards the Government's objective to fully decarbonise electricity supply by 2035*" and "t*he ESS aims to speed-up delivery of strategic network infrastructure*", including to "*halve the time for delivering onshore transmission infrastructure.*"

6.3.35 It is further noted that "T*he UK Government's Energy Security Strategy includes plans to ramp up onshore wind, with the implication that most of this will be located in Scotland*".

[16] http://www.legislation.gov.uk/asp/2019/15/enacted [Accessed October 2022]
[17] Progress-in-reducing-emissions-2022-Report-to-Parliament.pdf (theccc.org.uk)

The Planning (Scotland) Act 2019[18]

6.3.36 The Act notes at Part 1ZA the "*purpose of planning is to manage the development and use of land in the long-term public interest", and highlights that this includes "anything which contributes to sustainable development… is to be considered in the long term public interest*."

Scottish Government Climate Change Adaptation Programme 2 (SCCAP2): Progress Report 2021[19]

6.3.37 This is the second annual progress report on the SCCAP2 programme and it has been impacted by the pandemic. The Scottish Ministers' assessment of progress towards implementing the objectives, proposals and policies set out in SCCAP2 is that whilst the past twelve months have clearly been an exceptional period in many ways with the pandemic, the overall assessment of Scottish Ministers is that good progress continues to be made in implementing SCCAP2.

6.3.38 In particular, the announcements of enhanced funding commitments for flood risk management and coastal change adaptation will support the accelerated delivery of several of the key SCCAP2 outcomes as part of a green recovery from COVID-19.

Climate Ready Scotland: Climate Change Adaptation Programme 2019 – 2024[20]

6.3.39 Published in September 2019 and following on from the first programme published in 2014, the Climate Change Adaptation Programme 2019 – 2024 sets out a five-year programme to prepare Scotland for the challenges likely to be faced as our climate continues to change. The programme aims to ensure 'that Scotland is a place where its built and natural places, supporting systems, economy and societies are climate ready, adaptable and resilient to climate change.'

6.3.40 The programme responds to the urgent requirement for action to cut emissions and the stronger net-zero target of 2045 and sets the goal of ending Scotland's contribution to climate change within a generation. Setting out an outcome-based approach derived from the UN sustainable goals and Scotland's National Performance Framework, the programme promotes collaboration between sectors to achieve climate change adaptation.

Climate Change Plan – Third Report on Proposals and Policies 2018-2032[21]

6.3.41 Published in September 2018 the Climate Change Plan – Third Report on Proposals and Policies provides an overview of the Scottish Government's climate change plan between 2018 and 2032. The report includes statistics on renewable energy generation, stating: "In 2015, Scotland had reduced its emissions by 41% from the 1990 baseline, and in 2017 Scotland has generated 68.1% of its electricity requirements from renewables. Scotland's success in decarbonising electricity paves the way for transformational change across all sectors of the economy and society, particularly as electricity will be increasingly important as a power source for heat and transport."

6.3.42 The Climate Change Plan anticipates that by 2032 Scotland will have reduced its emissions by 66% (relative to baseline) while growing the economy, increasing the

[18] http://www.legislation.gov.uk/asp/2019/13/contents/enacted [Accessed October 2022]
[19] Climate change - adaptation programme: progress report 2021 - gov.scot (www.gov.scot)] [Accessed October 2022]
[20] https://www.gov.scot/publications/climate-ready-scotland-second-scottish-climate-change-adaptation-programme-2019-2024/ [Accessed October 2022]
[21] https://www.gov.scot/publications/scottish-governments-climate-change-plan-third-report-proposals-policies-2018-9781788516488/ [Accessed October 2022]

wellbeing of the people of Scotland, and enhancing the natural environment. Additionally, the plan anticipates that by 2032 Scotland's electricity system will be largely decarbonised and increasingly important as a power source for transport and heat.

Protecting Scotland's Future: The Government's Programme for Scotland 2019-2020[22]

6.3.43 Published in September 2019, Protecting Scotland's Future: The Government's Programme for Scotland 2019-2020 sets out these key actions and legislative programme for the next parliamentary year. One of the key focus areas for the programme is outlining the next steps for tackling climate change to meet the challenge posed by the climate emergency, and a range of actions are proposed to achieve this.

6.3.44 One of the notable actions within the programme is a target that by 2024 all new homes constructed must be heated via renewable sources or low carbon heat.

6.3.45 Continued investment in renewable energy projects is targeted and the Government are committed to accelerating the effort to use 100% renewable energy on the Scottish public estate. Furthermore, the programme states the importance of ensuring we generate sufficient levels of renewable energy to reach the target of net-zero greenhouse gas emissions by 2045.

A Fairer, Greener Scotland: Programme for Government 2021 – 2022[23]

6.3.46 Published in September 2021, A Fairer, Greener Scotland sets out the Scottish Government's programme for actions in the years 2021- 2022 and includes within it the legislative programme for the parliamentary year. The programme also acknowledges the impact of the COVID-19 global pandemic and reiterates that green economic recovery is critical to Scotland's ambitions to become a net-zero nation. The programme "recognises the need...to use every tool at our disposal to secure a green economic recovery, investing in restoring our environment and the green technologies and industries of the future". The programme underpins the Scottish Government's commitment to a net-zero Scotland by delivering an ambitious package of measure to decarbonise and provide a credible pathway to meeting targets out to 2032. To demonstrate this pathway toward achieving the interim 2030 target and beyond, the Scottish Government confirms within the programme that it will deliver a draft of the next Climate Change Plan for consideration within the first half of the 2021 – 2022 parliamentary session.

A Stronger & More Resilient Scotland: The Programme for Government 2022 to 2023[24]

6.3.47 The programme for Government sets out the actions in the coming year and beyond and includes the legislative programme for this parliamentary year. Focussing on the cost crisis, the programme states that "in the coming months we will set out the future of Scotland's energy system: how we will meet future demand, realise the economic opportunities of moving to a net zero energy system, and secure a just transition, while continuing to engage with the UK Government, regulators and energy companies on improvements that can be made now. We will prepare an updated Climate Change Plan, keeping Scotland on track to meet our target of net zero by 2045".

6.3.48 The report notes that the increase in renewable energy development and the transition to a net zero economy "is just one significant economic opportunity we will work to capture for Scotland's benefit in the year ahead". A key action of the programme is to publish the

[22] https://www.gov.scot/publications/protecting-scotlands-future-governments-programme-scotland-2019-20/ [Accessed October 2022]
[23] A Fairer, Greener Scotland: Programme for Government 2021-22 - gov.scot (www.gov.scot) - [Accessed October 2022]
[24] A stronger and more resilient Scotland: the Programme for Government 2022 to 2023 - gov.scot (www.gov.scot) [Accessed October 2022]

final Onshore Wind Policy Statement and a Vision for Onshore Wind in Scotland enabling up to 12 Giga Watts (GW) of onshore wind to be developed.

Scottish Energy Strategy[25]

6.3.49 The Scottish Energy Strategy: The Future of Energy in Scotland, December 2017 outlines the vision for the future energy system in Scotland, up until 2050. Among the key priorities are the development of an integrated approach that considers both the use and supply of energy for heat, power and transport.

6.3.50 The Energy Strategy aims to strengthen the development of local energy projects, protect consumers and support Scotland's climate change ambitions.

6.3.51 The document introduced the '2030 Whole-System Target' which sets two new targets for the Scottish energy system by 2030, "The equivalent of 50% of the energy for Scotland's heat, transport and electricity consumption to be supplied from renewable sources, and an increase by 30% in the productivity of energy use across the Scottish economy."

Onshore Wind Policy Statement[26]

6.3.52 In December 2017 the Scottish Government published its Onshore Wind Policy Statement to sit alongside the Scottish Energy Strategy. The ministerial foreword highlights the "*vital" role that onshore wind will continue to play in Scotland's future*, "helping to substantively decarbonise our electricity supplies, heat and transport systems, thereby boosting our economy and meeting local and national demand." It goes on to state that this important role "means we must support development in the right places, and increasingly – the extension and replacement of existing sites, where acceptable, with new and larger turbines, based on an appropriate, case by case assessment of their effects and impacts."

6.3.53 Specifically, in relation to the use of larger turbines, the policy statement makes the following points:

> *"In order for onshore wind to play its vital role in meeting Scotland's energy needs, and a material role in growing our economy, its contribution must continue to grow. Onshore wind generation will remain crucial in terms of our goals for a decarbonised energy system, helping to meet the greater demand from our heat and transport sectors, as well as making further progress towards the ambitious renewable targets which the Scottish Government has set.*
>
> *This means that Scotland will continue to need more onshore wind development and capacity, in locations across our landscapes where it can be accommodated.*
>
> *We know that new projects face a highly uncertain route to market. The arrangements which have enabled onshore wind to expand and to reduce its costs so successfully are no longer in place. Continued innovation and cost reduction, a supportive and well-resourced planning system, and continued advances in turbine and blade technology will help close the gap that currently exists – but not sufficiently, and not for all developments.*
>
> *We acknowledge that onshore wind technology and equipment manufacturers in the market are moving towards larger and more powerful (i.e., higher capacity) turbines, and that these – by necessity – will mean taller towers and blade tip heights.*

[25] https://www.gov.scot/publications/scottish-energy-strategy-future-energy-scotland-9781788515276/ [Accessed October 2022]
[26] https://www.gov.scot/publications/onshore-wind-policy-statement-9781788515283/ [Accessed October 2022]

The technology shift towards larger turbines may present challenges when identifying landscapes with the capacity to accommodate larger scale development, as not all will be suitable. However, fewer but larger wind turbines may also present an opportunity for landscape improvement, as well as increasing the amount of electricity generated.

The Scottish Government acknowledges the way in which wind turbine technology and design is evolving, and fully supports the delivery of large wind turbines in landscapes judged to be capable of accommodating them without significant adverse impacts…"

6.3.54 The Onshore Wind Policy Statement clearly states the Scottish Government's policy and support towards onshore wind, whilst ensuring suitable protection is afforded to the environment and residential amenity. There is also continued support for good practice in providing community benefits albeit the change in the support mechanisms and investment conditions for onshore wind projects is acknowledged.

6.3.55 Within the Policy Statement, onshore wind is recognised as a mature technology which is expected to remain at the centre of a clean, reliable, and low carbon energy future. To facilitate the role of onshore wind in meeting Scotland's future energy needs, it is considered that the installed capacity needs to continue to grow in locations where it can be suitably accommodated throughout the country.

Onshore Wind – Policy Statement Refresh 2021: Consultative Draft[27]

6.3.56 The Scottish Government published the draft version of the policy statement refresh on 28th October 2021. The consultation document affirms the Scottish Government support for wind farms and the important renewable energy resource they provide.

6.3.57 The draft document seeks to ensure Scotland secures an additional 8-12GW of installed onshore wind capacity by 2030 so as to maximise the many economic benefits wind development brings to the country, as well as how to tackle the barriers to deployment, and how to secure maximum economic benefit from these developments. The draft document clearly states that in order for net zero to be achieved a consistently higher rate of onshore wind, and other renewables capacity, will be required year on year.

6.3.58 The consultation period for this policy document ended in January 2022. The finalised policy will incorporate changes based on the consultation received, though it is anticipated that it will still seek to drastically increase the amount of onshore wind capacity within Scotland.

The Chief Planner Letter to all Heads of Planning (2015)

6.3.59 The Scottish Government's Chief Planner issued a letter[28] to all Heads of Planning in Scotland on 11 November 2015 titled 'Energy Targets and Scottish Planning Policy'. It outlines the continued support of the Scottish Government in supporting new onshore renewable energy developments and that even once the target of 100% of gross consumption from renewables by 2020 has been reached, a cap will not be placed on supporting such developments.

6.4 Carbon Balance and Payback

6.4.1 **Appendix 6A** provides information in relation to:

27 https://www.gov.scot/publications/onshore-wind-policy-statement-refresh-2021-consultative-draft/ [Accessed October 2022]
28 https://www.gov.scot/publications/energy-targets-and-scottish-planning-policy-chief-planner-letter/ [Accessed October 2022]

- Potential Energy Contribution of the Proposed Development to Government Objectives;
- Carbon Balance of the Proposed Development; and
- Carbon Payback of the Proposed Development.

6.4.2 It is predicted that the carbon loss in developing the Proposed Development will be paid back in ~1.4 years (4% of the 35 year operational life) based upon the fossil fuel mix and the expected outcome. Even considering the maximum scenario against the fossil fuel mix, the Proposed Development would have achieved the carbon balance within ~2.6 years (~7% of the 35 year operational life). See **Appendix 6A** for further detail.

6.4.3 Based on potential annual CO_2 savings of 135,872 tonnes/year (based on figure of 432 tonnes of CO_2 savings per GWh and a capacity factor of 37.4%), the Proposed Development could result in a total carbon saving of approximately 4.8M tonnes over its 35 year operational life and generate electricity to annually supply the equivalent of 81,062 homes. See **Appendix 6A** for further detail.

6.4.4 It is concluded that the GHG impact of the Proposed Development is a significant beneficial effect. The Proposed Development causes an indirect reduction in atmospheric GHG emissions which has a positive impact on achievement of carbon budgets and targets for Scotland and the UK, and a 1.5°C compatible trajectory. See **Appendix 6A** for further detail.

6.5 Peat Management

Peat Management Plan

6.5.1 Peatlands are a high conservation priority because of their function in storing carbon in addition to their biodiversity value. The Proposed Development has been designed to minimise the excavation of peat as far as possible. Nevertheless, the construction will involve disturbance of a volume of peat. This is quantified within a Peat Management Plan (PMP) (**Appendix 6B**), which also demonstrates how all excavated peat can be reinstated within the Site following construction. In addition to setting out a range of control measures for in-situ peat protection, peat stripping and excavation, temporary peat stockpiling and reinstatement, the PMP also sets out methods for monitoring and inspection to maintain the integrity of the excavated peat.

Peat Hazard Landslide Risk Assessment

6.5.2 A peat hazard landslide risk assessment (PHLRA) conducted in accordance with the Scottish Government best practice has been undertaken and is presented in **Appendix 6C**.

6.5.3 The PHLRA indicates that the Proposed Development is predominantly within areas of Negligible or Unlikely peat slide susceptibility. However, areas of Likely or greater peat slide susceptibility have been identified along some access tracks in the northwest and southeast, at borrow pit A and at the turbine and/or the crane pads for T1, T2, T3, T6, T7, T9, T10, T11 and T14. These generally relate to areas with factor of safety values <1.4 and/or slopes with susceptible peat depths and slope angles, the presence of, or conditions likely to be conducive to, the presence of hazardous natural drainage.

6.5.4 The result of the peat landslide risk assessment indicate that the Proposed Development is predominantly in areas of Negligible to Low Risk of peat slide failure. However, areas of Moderate and High risk have been identified throughout the mid and upper slopes of the

Afton Water catchment in the northwest of the Development Site. This includes at temporary compound A, borrow pit A, the blade laydowns for T11 and T13 and along the access tracks to T11, T13 and T15. In the southeast areas of Moderate risk have been identified along some of the access tracks and at the blade laydown for T3. In addition a number of small areas of High risk have been identified at the head of the Alhang Burn to the east of T13 and upslope of temporary compound A. In general, the Moderate and High risks in the northwest of the Development Site are principally driven by the higher consequence of a slide on the Afton Reservoir which is a source of public drinking water. In the southeast the Moderate risks are generally driven by the presence of susceptible slopes including those with natural drainage and pre-failure indicators. However, it should be noted that the PSRA presents a conservative assessment of the peat landslide risks and in reality the risks to potable water supplies are likely to be lower. This is due to the reservoir being located more than 1.5km downstream of the Development Site as well as the peat depth being relatively shallow. A slide is therefore likely to be localised and any peat entering a watercourse within the Afton Water catchment is likely to be dispersed rapidly. A direct slide into the Afton Reservoir is highly unlikely due to the distance from the nearest infrastructure and the topography, that generally comprises a wide, relatively flat valley that flattens further towards the reservoir.

6.5.5 Mitigation recommendations include post-consent detailed ground investigation in the most sensitive areas of the Proposed Development, relocation of infrastructure within micrositing allowances following on-site investigations, design to minimise additional loading or undercutting of susceptible peat, maintenance of current drainage of peat, avoid ponding of surface water, redirection of drainage to a purpose-built drainage network where necessary, monitoring as required, production of a geotechnical risk register and a Geotechnical Clerk of Works on site. **Chapter 13: Geology, Hydrology (including flood risk) and Hydrogeology** concludes that with embedded and additional mitigation in place, standalone and cumulative effects of the Proposed Development on all water receptors are not significant.

7. Noise

7.1 Introduction and Overview

7.1.1 This chapter of the EIA Report assesses the likely significant effects of the Proposed Development with respect to noise on noise sensitive receptors (NSRs). The chapter should be read in conjunction with the development description provided in **Chapter 3: Description of the Proposed Development**.

7.1.2 A full noise impact assessment was undertaken and reported in the 2015 Environmental Statement (ES) (on the basis of a 15-turbine layout) and this was updated in respect of operational noise[1] for the 9 turbine Consented Development as reported in the 2017 Further Environmental Information (FEI).

7.1.3 As a result of market and technology changes since consent was granted, the Applicant is now seeking consent to develop a larger, 15 turbine wind farm of greater than 50 MW generation capacity on the same site (although the site boundary has been slightly expanded).

7.1.4 The Proposed Development which includes an increase in the number of turbines, the turbine maximum tip height and rotor diameter compared to the Consented Development, will allow a different range of higher generation capacity turbines to be considered for the Development Site. Consequently, this may result in higher predicted noise levels at the nearest NSRs.

7.1.5 The candidate turbine for the Proposed Development and this noise assessment is a Vestas V162 5.6MW turbine.

7.1.6 This chapter describes:

- consultation and engagement that has been undertaken and how comments from consultees relating to noise have been addressed (**Section 7.3**);
- the legislation, policy and technical guidance that has informed the assessment (**Section 7.4**);
- the data gathering methodology (**Section 7.5**);
- the overall baseline (**Section 7.6**);
- the scope of the assessment for noise (**Section 7.7**);
- the methods used for the assessment (**Section 7.8**);
- the assessment of noise effects (**Section 7.9**);
- the assessment of cumulative (inter-project) effects (**Section 7.10**); and
- a summary of the significance conclusions (**Section 7.11**).

[1] Traffic and construction related noise did not require to be reconsidered in the **2017 FEI**. The traffic and constructed noise effects were assessed as being not significant for the 15-turbine layout as reported in the **2015 ES**. Therefore, with the reduction in turbine numbers and access track length, the noise effects during construction and decommissioning would have been reduced in comparison for the **2017 FEI** and not requiring further assessment.

7.2 Limitations to this assessment

7.2.1 No limitations relating to noise have been identified that affect the robustness of the assessment of the potential significant effects during the operation of the Proposed Development.

7.3 Consultation

7.3.1 The assessment has been informed by consultation responses and ongoing stakeholder engagement. An overview of the approach to consultation is provided in **Section 4.4** of **Chapter 4: Approach to the EIA**.

7.3.2 **Table 7.1** below provides a summary of the noise pertinent issues raised in the Scoping Opinion, the associated consultees and the subsequent considerations within this chapter.

Table 7.1 Summary of issues raised during consultation regarding noise

Issue raised	Consultee(s)	Response and how considered in this chapter	Section Reference
Reiteration of the concerns of the increase in operational noise and infrasound on properties close to the Proposed Development.	Tynron Community Council	An assessment of operational noise from the Proposed Development has been carried out in accordance with the ETSU-R-97 methodology, and the guidance advocated within the Institute of Acoustics 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise' (2013). The assessment has taken into account noise impacts at the closest NSRs from the Proposed Development in isolation and cumulatively with adjacent application, consented and operational wind developments. Infrasound is the fluctuation of atmospheric pressure at frequencies lower than the range of human hearing. However, this may be perceptible if the magnitude of the fluctuation is sufficiently large. This level of infrasound would not be experienced except in close proximity to a turbine and not at the distances of the closest residences. Furthermore, studies have not reliably demonstrated physiological or psychological effects due to the exposure to infrasound from wind turbines.	Section 7.10
Clarifications have been requested on how the noise assessment will be undertaken.	Member of the public	An assessment of operational noise from the Proposed Development has been carried out in accordance with the ETSU-R-97 methodology, and the guidance advocated within the Institute of Acoustics 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise' (2013). The assessment has taken into account noise impacts at the closest NSRs from the Proposed Development in isolation and cumulatively with adjacent application, consented and operational wind developments.	Section 7.8

7.4 Relevant legislation, planning policy and technical guidance

7.4.1 This section identifies the legislation, planning policy and technical guidance that has informed the assessment of effects with respect to noise. Further information on policies relevant to the Project is provided in Chapter 5: Planning Policy.

Legislative context

7.4.2 A summary of the relevant legislation is given in **Table 7.2**.

Table 7.2 Legislation relevant to the noise assessment

Legislation	Legislative context
Environmental Protection Act 1990, Part III[2]	An Act to make provision for the improved control of pollution arising from certain industrial and other processes, including noise pollution.
Control of Pollution Act 1974[3]	An Act to make further provision with respect to waste disposal, water pollution, noise, atmospheric pollution, and public health; and for the purposes connected with the matters aforesaid.

Planning policy context

7.4.3 A summary of the relevant planning policies is given in **Table 7.3**.

Table 7.3 Planning policies relevant to the noise assessment

Policy reference	Policy context
National planning policies	
Planning Advice Note 1/2011 (PAN 1/2011) 'Planning and Noise'[4]	PAN 1/2011 provides guidance on the assessment of noise in Scotland. PAN 1/2011 does not aim to provide a definitive source of guidance on noise issues; however, it does set out the range of noise issues that determining authorities need to be aware of in formulating development plans and making decisions on planning applications. With regards to the noise effects of wind farms it states: *"Good acoustical design and siting of turbines is essential to minimise the potential to generate noise".*

[2] UK Government (1990), Environmental Protection Act 1990. (Online) Available at: https://www.legislation.gov.uk/ukpga/1990/43/contents (Accessed 16 October 2022).
[3] UK Government (1974). Control of Pollution Act 1974. (Online) Available at: https://www.legislation.gov.uk/ukpga/1974/40 (Accessed 16 October 2022).
[4] Scottish Government (2011). Planning Advice Note 1/2011 (PAN 1/2011) 'Planning and Noise'. (Online) Available at: https://www.gov.scot/publications/planning-advice-note-1-2011-planning-noise/ (Accessed 16 October 2022).

Policy reference	Policy context
	The web-based renewables advice, referred to within PAN 1/2011, gives specific advice in relation to noise emanating from on-shore wind turbines, stating that the applicant's assessment of noise from the operation of the wind turbines should use ETSU-R-97[5], taking account of the latest industry good practice. Consequently, the assessment methodology adopted for the assessment of operational noise was that found in ETSU-R-97.
Scottish Planning Policy (2014)[6]	**Principal Policy (Sustainability) states:** *"The Scottish Government's central purpose is to focus government and public services on creating a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable economic growth."* *"The Scottish Government's commitment to the concept of sustainable development is reflected in its Purpose. It is also reflected in the continued support for the five guiding principles set out in the UK's shared framework for sustainable development. Achieving a sustainable economy, promoting good governance, and using sound science responsibly are essential to the creation and maintenance of a strong, healthy and just society capable of living within environmental limits."* **Paragraph 169 (Development Management) states:** *"Proposals for energy infrastructure developments should always take account of spatial frameworks for wind farms and heat maps where these are relevant. Considerations will vary relative to the scale of the proposal and area characteristics but are likely to include:* *…* *Impacts on communities and individual dwellings, including visual impact, residential amenity, noise and shadow flicker;* *…"*
Development plan policies	
Dumfries and Galloway Local Development Plan 2 (2019)[7]	The Local Development Plan policies relevant to this EIA Report Chapter are: • Policy IN1: Renewable Energy; • Policy IN2: Wind Energy; and • Policy OP1: Development Considerations.
Dumfries and Galloway Local Development Plan 2 Statutory Supplementary Guidance (various)[8]	Further details in relation to Policy IN2: Wind Energy are provided in Wind Energy Development: Development Management Considerations Supplementary Guidance – February 2020. This document outlines the factors to be considered in reaching planning decisions, and with regards to

[5] The Working Group on Noise from Wind Turbines (1996). ETSU-R-97 The assessment and rating of noise from wind farms. (Online) Available at: https://regmedia.co.uk/2011/08/02/etsu_r_97.pdf (Accessed 16 October 2022).
[6] Scottish Government (2014). Scottish Planning Policy. (Online) Available at: https://www.gov.scot/publications/scottish-planning-policy/ (Accessed 16 October 2022).
[7] Dumfries and Galloway Council (2019). Local Development Plan 2. (Online) Available at: https://www.dumgal.gov.uk/media/21885/Adopted-Local-Development-Plan-2/pdf/Adopted_LDP2_OCTOBER_2019_web_version.pdf?m=637771647699370000 (Accessed 16 October 2022).
[8] Dumfries and Galloway Council (Various). Local Development Plan 2 Supplementary Guidance. (Online) Available at: https://www.dumgal.gov.uk/article/17034/LDP2-Supplementary-Guidance (Accessed 16 October 2022).

Policy reference	Policy context
	noise, is consistent with the approach adopted within this EIA Report chapter.
East Ayrshire Council Local Development Plan (2017)[9]	The Local Development Plan policies relevant to this EIA Report Chapter are: • Policy OP1: Overarching Policy • Policy ENV12: Water, air, light and noise pollution. • Policy RE3: Wind Energy proposals over 50 metres in height
East Ayrshire Council Local Development Plan 2 – Proposed Plan (2022)[10]	The Local Development Plan policies relevant to this EIA Report Chapter are: • Policy SS2: Overarching Policy • Policy NE12: Water, air, light and noise pollution. Policy RE1: Renewable Energy

Technical guidance

A summary of the relevant technical guidance is given in **Table 7.4**.

Table 7.4 Technical guidance relevant to the noise assessment

Technical guidance document	Context
ETSU-R-97 The Assessment and Rating of Noise from Wind Farms, The Working Group on Noise from Wind Turbines (1996)[11]	Information and advice to developers and planners on the environmental assessment of noise from wind turbines. The guidance offers a framework for the measurement of wind farm noise and gives indicative noise levels thought to offer a reasonable degree of protection to wind farm neighbours.
A Good Practice Guide ('IOA GPG') to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise, Institute of Acoustics (2013)[12]	Presents current good practice in the application of ETSU-R-97[5] for all wind turbine developments above 50kW. The good practice guide gives information to assist consultants, developers and local planning authorities in using the correct technical and procedural methods for the assessment and determination of wind farm applications, reflecting the original principles within ETSU-R-97 and the results of research carried out and experience gained since its publication.
BS 5228-1:2009 + A1:2014 Code of practice for noise and vibration	Detailed guidance on assessing noise from construction sites.

[9] East Ayrshire Council (2017) Local Development Plan.(Online) Available at: Local development plan 2017 · East Ayrshire Council (east-ayrshire.gov.uk) (Accessed 16 October 2022).
[10] East Ayrshire Council (2022) Local Development Plan 2. Proposed Plan. Volume 1. (Online) Available at: https://www.east-ayrshire.gov.uk/Resources/PDF/L/LDP2-Volume-1.pdf (Accessed 16 October 2022).
[11] The Working Group on Noise from Wind Turbines (1996). ETSU-R-97 The assessment and rating of noise from wind farms. (Online) Available at: https://regmedia.co.uk/2011/08/02/etsu_r_97.pdf (Accessed 28 July 2022).
[12] Institute of Acoustics (2013). A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise. (Online) Available at: https://www.ioa.org.uk/sites/default/files/IOA%20Good%20Practice%20Guide%20on%20Wind%20Turbine%20Noise%20-%20May%202013.pdf (Accessed 13 January 2022).

Technical guidance document	Context
control on construction and open sites – Part 1: Noise, BSI (2014)[13]	

7.5 Data gathering methodology

Study area

7.5.1 The study area for this assessment is based on a radius of 10km from the Proposed Development.

7.5.2 Within the 10km study area, other wind farm developments, including those that are consented but not built, or at planning stage, have been considered as part of the assessment of cumulative effects.

Desk study

7.5.3 The information within this chapter is largely based upon data used within the 2017 FEI, the exception being data for the candidate wind turbine that is used in this operational noise assessment, and any changes to turbine selection at other sites following the consenting and construction process. Sources of information used for turbine sound power levels in the noise assessment are listed in **Table 7.5**.

Table 7.5 Sources of turbine information

Site	Turbine type	Source
Afton	Gamesa G80-2000	Wether Hill Wind Farm Extension, Technical Appendix 12.1[14]
South Kyle Wind Farm	Vestas V90 3MW	South Kyle Environmental Statement[15]
Windy Standard	Nordtank NTK600/43	Sanquhar II Community Windfarm. Volume 1a – EIA Report[16]
Pencloe Wind Farm	Siemens SWT-3.2-101	Pencloe Wind Farm Variation EIA Report[17]
Windy Rig	Vestas V112/3450	Broadband data from Performance Specification V112-3.45MW 50/60 Hz[18] and Octave band data from V112-3.45-Mk-50/60 Hz Third Octaves according to General Specification DMS 0049-1551_V01[19]

[13] British Standards Institution (2014). British Standard BS 5228-1:2009 + A1:2014 Code of practice for noise and vibration control on construction and open sites, Part 1: Noise. BSI, London.
[14] Wether Hill Wind Farm Extension, Technical Appendix 12.1 (Hoare Lea, 2015).
[15] South Kyle Environmental Statement (Vattenfall, August 2013).
[16] Sanquhar II Community Windfarm EIA Report. Volume 1a – EIA Report. (Community Windpower, 2019)
[17] Pencloe Wind Farm Variation EIA Report (SWECO, 2019)
[18] Performance Specification V112-3.45MW 50/60 Hz (0053-3710 V05, Vestas, 2016)
[19] General Specification (DMS 0049-1551_V01, Vestas, 2015)

Site	Turbine type	Source
Windy Standard Phase III	Siemens SWT-3.2-113 & Siemens SWT-3.2-82	Windy Standard III Environmental Statement[20]
Enoch Hill Wind Farm	Assessment envelope	Enoch Hill Wind Farm Variation Application Environmental Statement[21]
Overhill Wind Farm	Senvion 3.4M114	East Ayrshire Environmental Assessment[22]
Whiteside Hill	GE 2.85 MW	Technical Documentation Wind Turbine Generator Systems 2.x-103 – 50 and 60 Hz Product Acoustic Specifications Rev.01[23]
Wether Hill	Siemens SWT-1.3-62	Broadband data from Wether Hill Wind Farm Extension, Technical Appendix 12.1[24] and octave band data from SWT-1.3-62 Acoustic Emission rev 1[25]
Wether Hill Extension	Gamesa G80-2000	Wether Hill Wind Farm Extension, Technical Appendix 12.1
Sanquhar	Vestas V112/3450	Broadband data from Performance Specification V112-3.45MW 50/60 Hz and Octave band data from V112-3.45-Mk-50/60 Hz Third Octaves according to General Specification DMS 0049-1551_V01
Sanquhar 6	Senvion MM92 3.0 MW	Sandy Knowe Environmental Statement Technical Appendix 11.2[26]
Hare Hill	Vestas V47/660	Sandy Knowe Environmental Statement Technical Appendix 11.2
Hare Hill Extension	G52 850kw	Sandy Knowe Environmental Statement Technical Appendix 11.2
Sandy Knowe	Siemens SWT3.4-101	Sandy Knowe Environmental Statement Technical Appendix 11.2
Twentyshilling Hill	Nordex N90 HS	Technical Report Octave sound power levels Nordex N90/2500 HS[27]
Cornharrow	Nordex N1173 MW	Cornharrow Wind Farm, Operational Noise Assessment Technical Appendix[28]
Sanquhar II	Enercon E-138 EP3 4MW	Sanquhar II Community Windfarm. Volume 1a – EIA Report

[20] Windy Standard III Environmental Statement. Technical Appendix 11.2: Operational Noise Assessment (TNEI Services Ltd, July 2015)
[21] Enoch Hill Wind Farm Variation Application Environmental Statement, Volume 1: Main Report (Wood PLC, June 2020)
[22] East Ayrshire Environmental Assessment, 16/05/2017 Revision 3 Noise & Vibration (Hoare Lea, 2017)
[23] Technical Documentation Wind Turbine Generator Systems 2.x-103 – 50 and 60 Hz Product Acoustic Specifications Rev.01 (GE Power and Water, 2014)
[24] Wether Hill Wind Farm Extension, Technical Appendix 12.1 (Hoare Lea, 2015)
[25] SWT-1.3-62 Acoustic Emission rev 1 (Siemens, 2005)
[26] Sandy Knowe Environmental Statement Technical Appendix 11.2 (ERG, 2018)
[27] Technical Report Octave sound power levels Nordex N90/2500 HS (K-0818_011730_EN, Nordex, 2010)
[28] Cornharrow Wind Farm, Operational Noise Assessment Technical Appendix (Hoare Lea, 2018)

Site	Turbine type	Source
Euchanhead	Vestas EnVentus V150-5.6 MW	Euchanhead Renewable Energy Development. Technical Appendix 13.1 – Environmental noise assessment[29]
Shepherds' Rig	Vestas 117 4.2 MW	Shepherds' Rig Wind Farm EIA Report. Volume 1[30]
Windy Standard Extension	Senivon MM82 2.05	Sanquhar II Community Windfarm. Volume 1a – EIA Report
High Park Farm	Vestas V52-850 kW	Broadband data and octave band data from Performance Specification V52-850 kW 50/60 Hz[31]
Troston Loch	Nordex N133 4.8 MW	Broadband data and octave band data from Performance Specification Nordex N133/4.8[32]

7.5.4 Further non-turbine related information sources that informed the assessment are listed in **Table 7.6**.

Table 7.6 Data sources

Organisation	Data source	Data provided
Google	Google Earth Pro 7.3.4.8248[33]	Aerial imagery
British Standard Institute	BS 5228-1: 2009+A1:2014	Noise data for construction noise and vibration predictions.
Ordnance Survey	OS Terrain 50[34]	Terrain data

Survey work

7.5.5 The data sources most relevant to the assessment of noise from the Proposed Development remain those detailed within the 2015 ES, namely the comprehensive baseline noise survey undertaken in 2013 to inform the noise impact assessment.

7.5.6 With the exception of wind farm developments, there is no evidence of substantive changes to the Development Site and surrounding areas where noise monitoring was undertaken. The monitoring undertaken in 2013 was prior to wind farm development in the area and consequently the baseline is without wind farm noise. Therefore, it is not considered that the relevant baseline would have changed since 2013 and further baseline noise monitoring was considered unnecessary.

[29] Euchanhead Renewable Energy Development. Technical Appendix 13.1 – Environmental noise assessment (Hoare Lea, 2020)
[30] Shepherds' Rig Wind Farm EIA Report. Volume 1 (Infinergy, 2018)
[31] Performance Specification V52-850 kW 50/60 Hz (946506.R9, Vestas, 2006)
[32] Performance Specification Nordex N133/4.8 (F008_272_A14_EN Revision 01, 2018)
[33] Google (2022). Google Earth Pro, version 7.3.4.8248. (Online) Available at: https://www.google.com/earth/download/gep/agree.html?hl=en-GB (Accessed 20 July 2022).
[34] Ordnance Survey (2022). OS Terrain 50 (Free OS Open Data). (Online) Available at: https://osdatahub.os.uk/downloads/open/Terrain50 (Accessed 20 July 2022).

7.5.7 The baseline data and subsequent criteria as presented in the 2015 ES have been used in this assessment. The full baseline noise survey methodology and results is reported in **Section 7.4** of the 2015 ES.

Turbine data

7.5.8 A range of turbine models would be appropriate for the Proposed Development. The final turbine selection would follow a competitive tendering process and thus the actual model of turbine installed at the Development Site may differ from those upon which the assessment has been based. However, the final choice of turbine would be required to comply with the noise criterion levels which have been established within the noise assessment for the Proposed Development.

7.5.9 It is understood that the candidate turbine proposed for the development is a Vestas V162 5.6MW. **Table 7.7** below provides the candidate turbine sound power level referenced to 10m height with a +2dB uncertainty correction included.

Table 7.7 Sound power levels used for the 'assessment envelope' (+2dB uncertainty correction)

Candidate turbine	Sound power levels (dB L_{WA}) at standardised 10m height wind speed (V_{10}) ms^{-1}								
	4	5	6	7	8	9	10	11	12
Vestas V162 5.6MW	100.8	104.9	108.1	108.8	108.8	108.8	108.8	108.8	108.8

Table 7.8 Octave band wind turbine sound power data for the Proposed Development at $6ms^{-1}$

Candidate turbine	Sound power levels (dB L_{WA}) by octave band (Hz)							
	63	125	250	500	1000	2000	4000	8000
Vestas V162 5.6MW	86.1	94.8	100.5	103.2	102.7	99.2	92.7	83.1

7.5.10 In addition to considering the noise effects from the Proposed Development in isolation, cumulative noise effects taking the closest existing, consented and application wind turbines within 10 km of the Development Site have also been considered.

7.5.11 **Table 7.9** below outlines the identified wind farms for the cumulative assessment with sound power levels for associated turbine types presented in **Table 7.10**. Where turbine sound power data is unavailable, the closest match has been used.

Table 7.9 Cumulative wind developments

Wind development name	Status	Number of turbines	Assumed turbine type
Euchanhead	Application	21	Vestas EnVentus V150-5.6 MW
Sanquhar II	Application	50	Enercon E-138 EP3 4MW

Wind development name	Status	Number of turbines	Assumed turbine type
Shepherds Rig	Application	19	Vestas 117 4.2 MW / Vestas V105 3.6MW
Afton	Operational	25	Gamesa G80
Windy Standard	Operational	36	Nordtank NTK600/43
Windy Standard Extension	Operational	30	Senivon MM82 2.05
Windy Rig	Operational	12	Vestas V112/3450
Whiteside Hill	Operational	10	GE 2.85MW
Wether Hill	Operational	14	Siemens SWT-1.3-62
Sanquhar	Operational	9	Vestas V112/3450
South Kyle Wind Farm	Operational	50	Vestas V90 3MW
Hare Hill	Operational	20	Vestas V47/660
Hare Hill Extension	Operational	35	Gamesa G52 850kW
Sandy Knowe	Operational	24	Siemens SWT-3.4-101
High Park Farm	Operational	1	Vestas V52
Twentyshilling Hill	Operational	9	Nordex N90 HS
Sanquhar Six	Consented	6	Senvion MM92 3.0 MW
Cornharrow	Consented	8	Nordex N117 3.6 MW
Pencloe Wind Farm	Consented	19	Siemens SWT-DD-130
Windy Standard Phase III	Consented	20	Siemens SWT-3.2-113 & Siemens SWT-3.2-82
Enoch Hill Wind Farm	Consented	16	Nordex N117 3MW, Nordex N133, Siemens 120DD, Vestas V136 4.2MW & Vestas V117 3.45MW
Troston Loch Wind Farm	Consented	14	Nordex N133 4.8 MW

Table 7.10 Sound power levels for cumulative wind farm assessment

Candidate turbine	Standardised 10m height wind speed (V_{10}) ms^{-1}								
	4	5	6	7	8	9	10	11	12
Vestas EnVentus V150-5.6 MW	101.1	105.6	108.9	108.9	108.9	108.9	108.9	108.9	108.9

Candidate turbine	Standardised 10m height wind speed (V_{10}) ms^{-1}								
	4	5	6	7	8	9	10	11	12
Enercon E-138 EP3 4 MW	101.8	103.1	104.1	104.7	105.3	106.0	106.0	106.0	106.0
Nordex N117 3.6 MW	98.0	103.5	106.5	107.0	107.0	107.0	107.0	107.0	107.0
Vestas 117 4.2 MW	94.8	96.7	102.0	104.8	107.1	108.0	108.0	108.0	108.0
Gamesa G80	97.9	102.7	105.0	105.1	105.1	105.1	105.1	105.1	105.1
Nordtank NTK600/43	100.0	101.0	102.1	103.1	104.2	105.2	106.3	107.3	108.4
Senivon MM82 2.05	96.6	102.2	105.7	106.0	106.0	106.0	106.0	106.0	106.0
GE 2.85MW	92.8	96.7	101.8	105	105	105	105	105	105
Siemens SWT-1.3-62	98	101	102	103	104	105.5	107.5	109.5	111.5
Gamesa G52	97.6	102	105.8	107.1	107.8	107.8	107.8	107.8	107.8
Vestas V112/3450	95.9	96.7	99.6	102.9	105.8	108	108.7	108.7	108.7
Vestas V90 3 MW	100.2	103.6	107	108.4	109	108.7	107.3	107.2	107.4
Vestas V47 660kW	101	101.5	101.9	102.4	102.8	103.3	103.7	104.2	104.6
Siemens SWT-3.4-101	106.3	108.5	109	109	109	109	109	109	109
Vestas V52	93	96	100	103.8	104.2	104.5	104.5	104.5	104.5
Nordex N90 HS	99.5	103	106	107	107.5	107.5	107.5	107.5	107.5
Senvion MM92	94.1	98.6	102.3	104.6	104.8	104.8	104.8	104.8	104.8
Siemens SWT-3.2-113	97.2	101.8	106.6	108.5	109	109	109	109	109
Nordex N133 4.8 MW	103.7	107.4	107.5	107.5	107.5	107.5	107.5	107.5	107.5
Siemens SWT-DD-130	99.1	104.2	107.4	108	108	108	108	108	108
Vestas V105 3.6MW	95.0	95.5	97.6	100.6	103.5	105.9	106.7	106.9	106.9
Enoch Hill Assessment Envelope	101.1	105.3	108.3	109	109	109	109	109	109
Windy Standard Phase III Envelope	100.7	105.4	108.0	108.1	108.1	108.1	108.1	108.1	108.1

+2 dB Uncertainty correction applied either included within the data or to be added additionally to data provided in the sound level columns.

7.6 Overall baseline

7.6.1 For the reasons set out in **Paragraph 7.5.6** above, it is considered reasonable and precautionary to assume that the prevailing baseline noise conditions are as presented within the **2015 ES** and **2017 FEI**. The results of background noise monitoring therefore

remain applicable for this noise assessment, however some adjustments are needed due to a difference in hub height between previous assessments and this current assessment.

Wind shear

7.6.2 The level of wind shear at a particular location defines the relationship between wind speeds at different heights. A low level of wind shear means that the wind speed at the hub height of the turbines is not much greater than that near the ground, whereas a high level of wind shear means that the wind speed at hub height is significantly greater than that near the ground.

7.6.3 Wind turbine manufacturers reference their turbine noise emissions to a 10m height wind speed, assuming a standard level of wind shear in their calculations, the implication being that should the site experience a high level of wind shear, for a particular 10m height wind speed, the wind speed at hub height might be greater than assumed within the noise modelling, and thus wind turbine noise levels would be greater for the same background noise level.

7.6.4 The moderately complex terrain of the development site is such that the potentially for a high level of wind shear is relatively low compared to other sites which are in lowland areas. Nevertheless, to ensure that the assessment fully addressed the issue and complied with the IoA GPG, simultaneous 10 minute averaged wind speed and direction data was recorded on the development site at 20m, 40m, 61m and 80m.

7.6.5 As the hub height for the candidate turbine is now proposed to be 122.5m compared to 80m within previous assessments, the wind speeds at 10m (and therefore the baseline background data measured in 2013) are required to be adjusted to satisfy the issue of wind shear.

7.6.6 Supplementary Guidance Note 4: Wind Shear[35] to the IoA GPG presents two methods of calculating wind shear; Method A: direct measurements and Method B: calculations from other heights. As the wind speed was not measured at a height of 122.5m, Method B has been implemented in the wind shear calculations. This difference in wind shear calculations has therefore led to the derivation of a new background noise curve for this assessment compared to the **2015 ES** and **2017 FEI**. **Appendix 7A** presents the wind shear calculations.

Future baseline

7.6.7 Due to the semi-rural character of the area, it is likely that no significant changes to the baseline would occur in the foreseeable future in the absence of the Proposed Development. Over time, background noise levels due to road traffic movements may increase somewhat as a consequence of natural road traffic growth, however, these changes are unlikely to be significant, and would serve to increase (not decrease) noise emission limits at the NSR properties in the vicinity of the Proposed Development.

7.6.8 Background noise levels may increase due to the proposed and consented wind farms but would not be considered for any future wind farm assessment as per ETSU-R-97 requirements. This assessment considered the likely cumulative noise impacts at receptors in the event that all sites identified for the cumulative impact assessment were operating concurrently.

[35] Institute of Acoustics (2014). A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise Supplementary Guidance Note 4: Wind Shear. (Online) Available at: https://www.ioa.org.uk/sites/default/files/IOA%20GPG%20SGN%20No%204%20Final%20July%202014.pdf (Accessed 7 November 2022)

7.7 Scope of the assessment

The Proposed Development

7.7.1 Wind farm noise assessment is part of an iterative design process, the aim of which is to achieve a design from which noise emissions meet limits derived following the approach given in ETSU-R-97[5]. Consequently, the design of the scheme is such that relevant operational noise limits are met and no environmental mitigation measures are necessary. By way of separation between receptors and turbines resulting from this process, construction noise is also limited, thus only general good-practice noise control measures are required, and no specific mitigation is necessary.

7.7.2 The EIA Regulations 2017 require that all 'significant' effects be identified. The majority of noise related guidance and standards (including ETSU-R-97[5]) are not directly related to the concepts of 'significant' and 'not significant' that underpin the EIA process. However, for the purposes of this assessment, the determination of effect significance is based upon compliance with the applicable noise limits; i.e. breach of the noise limits indicates a 'significant' effect, whereas compliance with noise limits indicates a 'not significant' effect.

7.7.3 The approach and scope for this chapter (in accordance with the noise and vibration chapter within the Scoping Report[36]) is the construction (piling only, if required) and operational noise assessment of predicted turbine noise against measured background noise levels. The noise assessment addresses the operational noise from existing wind turbines within 10km of the Proposed Development. The noise impacts of construction traffic on the local road network have also been considered.

7.7.4 Due to the magnitude of separation distances involved, the potential for vibration impacts during construction and operation of the Proposed Development have been scoped out and no assessment has been undertaken. In addition, it was agreed at scoping stage that noise emissions from construction activities other than piling (if required) and construction traffic could be scoped out of the assessment.

7.7.5 It is assumed that decommissioning noise would be generally less than or, at most, similar to that experienced during the construction period. It is therefore considered that noise impacts relating to the decommissioning of wind turbines would be no worse than those experienced during construction, provided similar restrictions on working hours and transport routes are applied. Noise from decommissioning has therefore been scoped out of further assessment.

Temporal Scope

7.7.6 The temporal scope of the assessment of noise is consistent with the period over which the Project would be carried out and therefore covers the 35 years of operation.

Potential Receptors

7.7.7 The principal noise receptors that have been identified as being potentially subject to effects are summarised in **Table 7.11**.

[36] See Appendix 4B

Table 7.11 Noise receptors subject to potential effects

Receptor	Reason for consideration
Residential receptors	Considered of high sensitivity in respect to noise.
Ecological receptors	Have the potential to be affected by changes in the ambient noise level. These receptors are considered further in **Chapter 11: Ecology** and **Chapter 12: Ornithology.**

7.7.8 The residential receptors considered further in this assessment are detailed in **Table 7.12**. A review of the Development Site using current Ordnance Survey mapping and Aerial Photography has not identified any new receptors from the **2015 ES** and **2017 FEI**. The easting and northing references provided in Table 7.12 are based on the OSBG36 British National Grid co-ordinate system.

Table 7.12 Potential residential receptors

Reference	Receptor name	Easting	Northing	Representative monitoring location
R1	Upper Holm of Dalquhairn	265553	599319	M1 – Upper Holm of Dalquhairn
R2	Nether Holm of Dalquhairn	265529	599064	M2 – Nether Holm of Dalquhairn
R3	Corlae	265835	597727	M1 – Upper Holm of Dalquhairn
R4	Cairnhead	270133	597200	M1 – Upper Holm of Dalquhairn
R5	Polskeoch	268660	602300	M3 – Polskeoch

Likely significant effects

7.7.9 The effects on noise receptors which have the potential to be significant and have been taken forward for detailed assessment are summarised in **Table 7.13**.

Table 7.13 Summary of effects scoped in for further assessment

Activity	Likely significant effects
Impact piling (if required as part of the construction of the Proposed Development)	Noise disturbance to receptors in the area of activities
Construction traffic	Noise disturbance to receptors in the area of activities
Operational turbine noise	Noise disturbance from wind turbines

7.7.10 The receptors/effects detailed in **Table 7.14** have been scoped out from being subject to further assessment because the potential effects are not considered likely to be significant.

Table 7.14 Summary of effects scoped out of the noise assessment

Receptors / potential effects	Justification
Blasting	Blasting would be very unlikely to be undertaken as part of the construction of the Proposed Development, however if any blasting is to occur it would be controlled via a blasting management plan as part of a planning condition requirement.
Construction activities other than piling	Noise and vibration emissions from construction activities other than piling are unlikely to be high enough, given the distance of the Proposed Development to NSRs, to warrant a noise assessment. However, planning conditions regarding standard times of work should apply. Furthermore, a full assessment of construction activities other than piling was undertaken in the **2015 ES** on the basis of very similar proposed activities. The conclusions of this assessment predicted **no significant effects**.
Operational traffic	Operation traffic noise during the operation of the Proposed Development is scoped out as the amount of traffic associated during the operational phase would be minimal. See **Chapter 14: Traffic and Transport** for further details.
Decommissioning	The effects of decommissioning on any NSRs are likely to be similar in nature but of a lower magnitude than those during the construction phase. As a result, it is not proposed to assess the decommissioning phase of the Proposed Development in addition to that of the construction phase.
Construction of the grid connection and on-site electrical infrastructure	Noise emissions from construction activities associated with the grid connection and on-site electrical infrastructure are unlikely to be high enough, given the distance of the Proposed Development to NSRs, to warrant a noise assessment. Noise emissions from the operation of the proposed on-site electrical infrastructure, including a 132/33kV substation, are unlikely to be high enough, given the distance of the Proposed Development to NSRs, to warrant a noise assessment.

7.8 Assessment methodology

7.8.1 The generic project-wide approach to the assessment methodology is set out in **Chapter 4: Approach to the EIA**. However, whilst this has informed the approach that has been used in this noise assessment, it is necessary to set out how this methodology has been applied, and adapted as appropriate, to address the specific needs of this noise assessment.

Proposed Development construction assessment methodology

Site works

7.8.2 As established at the scoping stage and explained in **Table 7.14** noise emissions from construction activities other than piling are unlikely to be high enough to result in

significant effects given the distance of the Proposed Development to NSRs. Therefore, only noise effects due to piling have been considered in this assessment.

7.8.3 BS 5228-1:2009+A1:2014 includes guidelines relating to the acceptability of noise from construction sites. The appropriate noise limit for a project in an area such as the Proposed Development would be 65dB $L_{Aeq,T}$ during the daytime (07:00 – 19:00 weekdays, 07:00 – 13:00 Saturdays).

7.8.4 The precise construction methodology for the Proposed Development will not be finalised until such a time as a contractor is commissioned to build the wind farm and as such the actual plant to be used is not yet known. The plant list given in **Table 7.15** is based upon experience of other wind farm construction projects. The noise emission data quoted is taken from BS 5228-1:2009 + A1:2014.

Table 7.15 Construction plant source data (piling only)

Plant	$L_{Aeq,T}$ dB at 10m	Number of plant	% on time	Typical sound power level dB(A)	Data source
Hydraulic hammer rig	89	1	100	117	BS 5228-1:2009 + A1:2014 Table C.3 Reference 1

7.8.5 A spreadsheet calculation in accordance with Annex F of BS 5228-1:2009+A1:2014 will be undertaken to assess potential significant effects.

Site traffic

7.8.6 The Noise and Vibration scoping chapter proposed to assess the potential impact from traffic on the road network by following the guidance outlined in the 'Design Manual for Roads and Bridges, LA 111 Noise and Vibration' where the impacts are assessed by comparing noise levels from the baseline traffic flows against noise levels during period of the works for the Proposed Scheme when traffic flows will be greatest.

7.8.7 In order to take this approach, baseline noise levels are required. It was proposed to determine the baseline noise levels for the relevant road sections by using the 'Basic Noise Level' approach set out within the 'Calculation of Road Traffic Noise' (CRTN). However, the available traffic flow data for the pertinent traffic routes were not suitable for this calculation method. Furthermore, the assumed construction traffic associated with the site is below the CRTN low flow criteria (less than 1000 vehicles per 18-hour period).

7.8.8 Consequently, the assessment methodology for haul roads from Section F.2.5.2 of BS 5228-1:2009+A1:2014 has been utilised. This method predicts an equivalent continuous sound level of construction traffic noise from the available construction traffic flow data and is assessed against absolute criteria.

Proposed development operational assessment methodology

7.8.9 Planning Advice Note 1/2011 (PAN 1/2011) refers to ETSU-R-97 for guidance on the assessment of noise from wind farms.

7.8.10 Consequently, the assessment methodology adopted is that found in ETSU-R-97. The advice presented in the document was produced by The Working Group on Noise from Wind Turbines, a body comprising a number of interested parties including, amongst others, wind farm operators, environmental health officers, acoustic consultants and legal experts. The assessment approach was developed to address the shortcomings of other standards in addressing wind farm noise.

Noise Limits

7.8.11 Acceptable limits for wind turbine operational noise are defined in ETSU-R-97. The test for operational noise is therefore whether the calculated wind turbine noise levels at receptor properties lie at or below the noise limits derived in accordance with ETSU-R-97.

7.8.12 Modelling for the Proposed Development indicated that operational noise was likely to exceed this threshold at a number of surrounding NSRs. The ETSU-R-97 Guidance therefore recommends that wind farm noise limits should be set relative to existing background noise levels, subject to a fixed minimum limit, and that these limits should reflect the variation in background noise with wind speed. The wind speeds that should be considered range from the cut-in speed up to 12 ms^{-1}, the point at which turbines are usually at or above 95% of their rated power and thus no significant increases in noise emissions are expected. Wind speeds are referenced to a 10-metre measurement height (V_{10}) on the wind farm site.

7.8.13 The daytime noise limit is derived from background noise data measured at residential properties during the 'quiet daytime', as defined in ETSU-R-97, which comprises:

- weekday evenings from 18:00 – 23:00;
- Saturday afternoons from 13:00 – 23:00; and
- all day Sunday 07:00 – 23:00.

7.8.14 The noise measurements are plotted against the concurrent wind speed data measured at the Development Site and a 'best fit' correlation is established.

7.8.15 In low noise environments (i.e. where background noise levels are less than 30 – 35dB(A)), the ETSU-R-97 Guidance recommends that wind farm noise for quiet daytime periods should be limited to a lower fixed level within the range 35 – 40dB $L_{A90,10min}$ or 5 dB(A) above the prevailing background, whichever is the greater. The choice of which lower fixed level to use within the range is based upon a number of factors as outlined in Paragraph 22 of the ETSU-R-97 Guidance. These include:

- the number of dwellings in the neighbourhood of the Proposed Development;
- the effect of noise limits on the amount of electricity generated; and
- the duration and level of exposure.

7.8.16 On the above basis, the cumulative assessment will be based on a daytime lower fixed noise limit of 40dB $L_{A90,10min}$, based on the level of power provided by all the wind farms together, and the low number of dwellings in the surrounding area, factors advocated within ETSU-R-97.

7.8.17 The night-time noise limit is derived from the background noise data measured during the night-time period (23:00 – 07:00) every day. As with the daytime data, this is plotted against the concurrent wind speed data and a 'best fit' correlation established. For night-time periods, the ETSU-R-97 recommended limits are 43dB $L_{A90,10min}$ or 5dB(A) above prevailing background, whichever is the greater.

7.8.18 The only exception to the daytime and night-time limits outlined above is for properties with a financial involvement in the Proposed Development where ETSU-R-97 limits can be increased to 45dB $L_{A90,10min}$ (or 5dB above the prevailing background, whichever is greater). However, this is not applicable for the Proposed Development as the NSRs are not financially involved.

7.8.19 The ETSU-R-97 noise criteria assume that the wind turbine noise contains no audible tones. Where tones are present, a correction is added to the measured or predicted noise

level before comparison with the recommended limits. The level of correction will depend on how audible the tone is. A warranty will be sought from the manufacturers of the turbine selected for the Proposed Development such that the noise output will either not require a tonal correction (under the ETSU-R-97 Guidance) or, where tonal corrections are required, the noise criteria will be met having made the appropriate correction for any tonal component.

7.8.20 The ETSU-R-97 Guidance states the $L_{A90,10min}$ descriptor should be used for both the background noise and wind farm noise when setting limits.

Research Background

7.8.21 The Institute of Acoustics (IoA) published 'A Good Practice Guide (GPG) to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise'. The use of the IoA GPG in the assessment of wind turbine noise has been endorsed by Scottish Government. John Swinney MSP, Cabinet Secretary for Finance, Employment and Sustainable Growth, stated in a letter to the IoA on 29th May 2013:

"In the view of the careful, expert work and consultation that has informed the Good Practice Guide, I am happy to accept that it represents current industry good practice."

7.8.22 In line with the IoA GPG, the model used in this assessment is based upon that found in ISO 9613-2 *Acoustics – Attenuation of sound during propagation outdoors*[37]. The model takes account of:

- geometric divergence (attenuation with distance);
- air absorption;
- barriers (including buildings or topography);
- screening (including vegetation); and
- ground absorption and reflection.

7.8.23 The ISO 9613-2 algorithm has been chosen as being the most robust prediction method, based on the findings of a joint European Commission research project[38] into wind farm noise propagation over large distances. According to this research, this model (like all others considered in the research) tends to over-estimate noise levels at nearby dwellings, rather than under-estimate them. The conclusion of the study was that the ISO 9613-2 algorithm tended to predict noise levels that would generally occur under downwind propagation conditions.

7.8.24 Another important outcome of the research demonstrated that under upwind propagation conditions between a given receiver and the wind farm, the wind farm noise level at that receiver will be as much as 10dB(A) to 15dB(A) lower than the level predicted using the ISO 9613-2 algorithm.

Operational Noise Modelling

7.8.25 For the purposes of the present assessment, noise level predictions have been based upon the following assumed model parameters:

[37] International Standards Organization (1996). ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation. ISO, Geneva.
[38] European Commission (1998). Development of a Wind Farm Noise Prediction Model. Joule Project JOR3-CT95-0051.

- a receiver height of 4.0 metres above local ground level – to represent the height of a typical bedroom window;
- mixed ground (G = 0.5) – this represents a ground cover that has equal amounts of fully reflective and fully absorptive character. For the purposes of this assessment, mixed ground represents a ground cover that is as equally absorptive of noise as it is reflective;
- air absorption based on a temperature of 10°C and 70% relative humidity;
- $L_{A90,10min}$ is 2dB less than $L_{Aeq,10min}$ for wind farm noise; and
- predicted turbine noise levels are inclusive of any 'valley effect' correction (discussed below).

Valley Effect

7.8.26 The IoA GPG recommends that a noise correction is applied in circumstances where the intervening terrain height between a proposed wind development and sensitive receptors drops away significantly. Where a 'valley effect' is shown to occur, a correction of 3dB (or 1.5dB if a ground absorption factor of 0 is being used) is applied to the overall predicted noise level at receptors.

Significance Evaluation Methodology

7.8.27 The assessment of significant operational noise effects is based upon compliance with the ETSU-R-97 i.e. a breach of the noise limits indicates a 'significant' effect, whereas compliance with noise limits indicates a 'not significant' effect. It is acknowledged that the ETSU-R-97 approach does not directly aim to determine significance in an EIA context, rather it represents a balance between the need for wind energy and the need to protect residential amenities. Since the purpose of identifying significant effect during EIA is to ensure they are taken into account in the 'planning balance', for the purposes of this assessment it is assumed that noise effects up to the ETSU-R-97 noise limits have already been taken into account and thus only noise levels exceeding the ETSU-R-97 noise limits are deemed to be 'significant' and require further consideration.

7.9 Assessment of Noise Effects

Construction of Proposed Development (piling only)

7.9.1 Predictions of the noise levels from piling have been undertaken to find the distance at which 65dB $L_{Aeq,T}$ would no longer be experienced, as summarised in **Table 7.16**.

Table 7.16 Predicted noise levels during construction phase (piling only)

Plant item	$L_{Aeq,T}$ at 10m	Distance at which resultant $L_{Aeq,T}$ is below 65dB (m)
Hydraulic hammer rig	89	220

7.9.2 As no NSRs fall within 220m of the construction area where piling could take place, it is considered highly unlikely that an exceedance of 65dB $L_{Aeq,T}$ would be experienced at the NSRs due to piling. Therefore, the noise effects as a result of construction are considered to be **not significant**.

Construction of Proposed Development (construction traffic)

7.9.3 All aggregate material, plant and equipment will be brought to site by road. Heavy Goods Vehicles (HGVs) and flatbed trucks (transporting excavators, bulldozers and cranes) will be required to follow preferred routes to and from the strategic road network.

7.9.4 The traffic assessment, as provided in **Table 14.17** in **Chapter 14: Traffic and Transport**, assumes a 75% to 25% HGV distribution between the B729 to the south, and Afton Road to the north respectively.

7.9.5 As discussed in **Section 7.8**, the assessment methodology for haul roads from Section F.2.5.2 of BS 5228-1:2009+A1:2014 has been utilised. This method predicts an equivalent continuous sound level of construction traffic noise from the available construction traffic flow data and is assessed against the absolute criterion of 65 dB (i.e. the minimum threshold value based on the existing ambient noise levels, of which an exceedance may result in significant effect).

7.9.6 BS 5228-1:2009+A1:2014 states the following:

"The general expression for predicting the L_{Aeq} alongside a haul road used by single engined items of mobile plant is:

L_{Aeq} = LWA − 33 + 10log10Q − 10log10V − 10log10d (F.6) Where:

LWA is the sound power level of the plant, in decibels (dB);

Q is the number of vehicles per hour;

V is the average vehicle speed, in kilometres per hour (km/h); and

D is the distance of receiving position from the centre of haul road, in metres (m).

7.9.7 The sound power level used is based on a 32-tonne lorry in transit on an access road, taken from BS 5228-1:2009+A1:2014 Table C.11 ref 9. The average vehicle speed is assumed to be 30 km/h.

7.9.8 On the basis of the assumed HGV distribution, the worst case predicted flows have been used in the assessment representative of the 75% distribution link from the south along the B729. Consequently, the minimum distance from the centre of the road to the nearest residential adjacent receptor along the B729 is approximately 10m.

7.9.9 The above values are considered representative of a worst-case scenario.

7.9.10 **Table 7.17**Table 7.16 Predicted noise levels during construction phase (piling only) below provides a summary of the predicted noise level at the worst effected NSRs along the pertinent roads.

Table 7.17 Predicted noise levels during construction (construction traffic)

Activity	Receptor	Worst case predicted sound pressure level (SPL), dB $L_{Aeq,18hr}$
HGV traffic along the B729	Cairnhead	**60**

7.9.11 As shown in Table 7.17, the predicted sound pressure level due to construction traffic noise at the nearest residential NSRs adjacent to the B729 is 60 dB $L_{Aeq,18hr}$. This is 5 dB

below the minimum criterion for potential significant effect as provided by the assessment methodology in BS 5228-1:2009+A1:2014. Therefore construction traffic noise is considered **not significant**.

Operation of Proposed Development

7.9.12 Noise levels have been predicted in accordance with the methodology outlined in **Section 7.8** for the nearest residential properties to the wind farm, as listed in **Table 7.12**.

7.9.13 **Table 7.18** and **Table 7.19** present the following information for each wind speed for each of the four properties assessed for daytime and night-time respectively:

- values of the quiet daytime amenity and night-time background noise curve at the integer wind speeds, measured and adjusted for wind shear;
- the quiet daytime amenity and night-time noise limits derived from the background noise curve, in accordance with the ETSU-R-97 Guidance;
- the predicted turbine noise levels from the Proposed Development based on worst-case downwind noise propagation at receptors, assuming turbines are operating simultaneously and inclusive of a 'valley effect' correction where applicable;
- the margin by which the predicted turbine noise (inclusive of any 'valley effect' correction) meets the noise limits at each wind speed using the worst-case downwind noise predictions (negative values indicate the predicted noise levels are lower than the noise limits, shown in blue, whilst positive values indicate the predicted noise levels exceed the noise limits, shown in red); and
- the predicted turbine noise accounts for a 2 dB correction if a turbine is obscured by a landform relative to the receiver.

7.9.14 It should be noted that the predicted turbine noise was equal for both the day and night-time periods and the assessments have been presented separately to take account of the different applicable noise limits.

Table 7.18 Daytime noise assessment – proposed development only

Noise parameter, $L_{A90,10\ mins}$, dB	**Standardised 10m wind speed (ms^{-1})**								
	4	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
R1 – Upper Holm of Dalquhairn									
Background noise curve	36.2	37.6	39.0	40.4	41.5	42.4	42.9	42.9	42.9
ETSU-R-97 derived noise limit	41.2	42.6	44.0	45.4	46.5	47.4	47.9	47.9	47.9
Predicted wind farm turbine noise	25.9	30.1	33.4	34.1	34.2	34.2	34.2	34.1	34.1
Margin under / over noise limit	-15.3	-12.5	-10.6	-11.3	-12.3	-13.2	-13.7	-13.8	-13.8
R2 – Nether Holm of Dalquhairn									

Noise parameter, $L_{A90,10\ mins}$, dB	Standardised 10m wind speed (ms^{-1})								
	4	5	6	7	8	9	10	11	12
Background noise curve	34.2	35.2	36.0	36.9	37.9	39.0	40.5	40.5	40.5
ETSU-R-97 derived noise limit	39.2	40.2	41.0	41.9	42.9	44.0	45.5	45.5	45.5
Predicted wind farm turbine noise	25.4	29.5	32.8	33.6	33.6	33.7	33.7	33.6	33.6
Margin under / over noise limit	-13.8	-10.7	-8.2	-8.3	-9.3	-10.3	-11.8	-11.9	-11.9
R3 – Corlae									
Background noise curve	36.2	37.6	39.0	40.4	41.5	42.4	42.9	42.9	42.9
ETSU-R-97 derived noise limit	41.2	42.6	44.0	45.4	46.5	47.4	47.9	47.9	47.9
Predicted wind farm turbine noise	22.6	26.8	30.1	30.9	30.9	31.0	31.0	30.9	30.9
Margin under / over noise limit	-18.6	-15.8	-13.9	-14.5	-15.6	-16.4	-16.9	-17.0	-17.0
R4 – Cairnhead									
Background noise curve	36.2	37.6	39.0	40.4	41.5	42.4	42.9	42.9	42.9
ETSU-R-97 derived noise limit	41.2	42.6	44.0	45.4	46.5	47.4	47.9	47.9	47.9
Predicted wind farm turbine noise	20.0	24.2	27.4	28.2	28.3	28.3	28.3	28.2	28.2
Margin under / over noise limit	-21.2	-18.4	-16.6	-17.2	-18.2	-19.1	-19.6	-19.7	-19.7
R5 - Polskeoch									
Background noise curve	31.4	32.9	34.0	34.5	34.5	34.0	33.0	33.0	33.0
ETSU-R-97 derived noise limit	36.4	37.9	39.0	39.5	39.5	39.0	38.0	38.0	38.0
Predicted wind farm turbine noise	28.2	32.4	35.6	36.4	36.4	36.4	36.4	36.4	36.4
Margin under / over noise limit	-8.2	-5.5	-3.4	-3.1	-3.1	-2.6	-1.6	-1.6	-1.6

Table 7.19 Night-time noise assessment – proposed development only

Noise parameter, $L_{A90,10\ mins}$, dB	Standardised 10m wind speed (ms^{-1})								
	4	5	6	7	8	9	10	11	12
R1 – Upper Holm of Dalquhairn									
Background noise curve	34.3	35.3	36.5	37.7	39.0	40.2	41.3	41.3	41.3
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	44.0	45.2	46.3	46.3	46.3
Predicted wind farm turbine noise	25.9	30.1	33.4	34.1	34.2	34.2	34.2	34.1	34.1
Margin under / over noise limit	-17.1	-12.9	-9.6	-8.9	-9.8	-11.0	-12.1	-12.2	-12.2
R2 – Nether Holm of Dalquhairn									
Background noise curve	31.0	32.0	33.2	34.6	36.1	37.8	39.6	39.6	39.6
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	43.0	43.0	44.6	44.6	44.6
Predicted wind farm turbine noise	25.4	29.5	32.8	33.6	33.6	33.7	33.7	33.6	33.6
Margin under / over noise limit	-17.6	-13.5	-10.2	-9.4	-9.4	-9.3	-10.9	-11.0	-11.0
R3 – Corlae									
Background noise curve	34.3	35.3	36.5	37.7	39.0	40.2	41.3	41.3	41.3
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	44.0	45.2	46.3	46.3	46.3
Predicted wind farm turbine noise	22.6	26.8	30.1	30.9	30.9	31.0	31.0	30.9	30.9
Margin under / over noise limit	-20.4	-16.2	-12.9	-12.1	-13.1	-14.2	-15.3	-15.4	-15.4
R4 – Cairnhead									
Background noise curve	34.3	35.3	36.5	37.7	39.0	40.2	41.3	41.3	41.3
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	44.0	45.2	46.3	46.3	46.3
Predicted wind farm turbine noise	20.0	24.2	27.4	28.2	28.3	28.3	28.3	28.2	28.2
Margin under / over noise limit	-23.0	-18.8	-15.6	-14.8	-15.7	-16.9	-18.0	-18.1	-18.1

Noise parameter, $L_{A90,10\ mins}$, dB	Standardised 10m wind speed (ms^{-1})								
	4	5	6	7	8	9	10	11	12
R5 - Polskeoch									
Background noise curve	27.3	28.2	29.1	30.3	31.7	33.5	35.8	35.8	35.8
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Predicted wind farm turbine noise	28.2	32.4	35.6	36.4	36.4	36.4	36.4	36.4	36.4
Margin under / over noise limit	-14.8	-10.6	-7.4	-6.6	-6.6	-6.6	-6.6	-6.6	-6.6

7.9.15 The results show compliance at all receptors during both the daytime and night-time periods. Consequently, this constitutes a **not significant** effect.

Other Operational Noise Issues

Infrasound and low frequency noise

7.9.16 Infrasound is generally defined as pressure waves with a frequency below 20Hz. The human hearing threshold is much reduced below 20Hz compared to higher frequencies. The exact definition of low frequency noise varies, but generally spans the infrasonic and audible ranges from around 10Hz to 200Hz.

7.9.17 Information published by the British Wind Energy Association (BWEA, now RenewableUK) 'Low Frequency Noise and Wind Turbines'[39] presents a review of a number of sources of information on low frequency noise. Based upon these sources, it is concluded that levels for wind turbines lie below the threshold of perception even for those who are particularly sensitive to such noise.

7.9.18 The report 'The Measurement of Low Frequency Noise at three UK Wind Farms'[40] presents the results of several measurements taken at wind farm sites throughout the UK. The study concluded that modern wind turbines are not sources of infrasound at levels which could be injurious to the health of a wind farm neighbour. At all the measurement sites, low frequency noise associated with traffic movement along local roads was greater than that associated with the wind farm.

7.9.19 Furthermore, in its discussions of wind farm noise, Technical Advice Note (TAN) 8[41] states in paragraph 2.17:

7.9.20 *"There is no evidence that ground transmitted low frequency from wind turbines is at a sufficient level to be harmful to human health."*

[39] The British Wind Energy Association (2005). Low Frequency Noise and Wind Turbines. (Online) Available at: http://www.windmeasurementinternational.com/Info/bwea_low_frequency_noise_report.pdf (Accessed 25 January 2022).
[40] Hayes McKenzie Partnership (2006). The Measurement of Low Frequency Noise at Three UK Wind Farms. Department of Trade and Industry, London.
[41] https://lle.gov.wales/catalogue/item/TechnicalAdviceNote8PlanningForRenewableEnergyStrategicSearchAreas/?lang=en

Other Amplitude Modulation (OAM)

7.9.21 Amplitude Modulation (AM) is a normal characteristic of noise from a rotating turbine when stood close to it. AM is a variation in noise level over time, often described by observers as a repeating 'blade swish' noise. The AM of the aerodynamic noise observed close to the turbine is principally caused by trailing-edge noise from the rotating blades and is termed 'Normal' Amplitude Modulation (NAM).

7.9.22 The noise limits derived following the procedure recommended by the ETSU-R-97 Guidance considers the phenomenon of NAM and thus afford receptors some protection. However, in unusual and rare occurrences where AM occurs outside the definition and mechanisms of NAM, this is known as 'Other' Amplitude Modulation (OAM). Examples of OAM include circumstances where AM is detected in the far-field downwind from the wind turbines or resulting in greater than expected variations in magnitude. Observers of OAM often describe the noise as a 'thump' in character rather than a 'swish'.

7.9.23 The DTI (Department of Trade and Industry) (later Department for Business, Enterprise and Regulatory Reform (BERR), now Department of Energy and Climate Change (DECC)) study undertaken by Hayes McKenzie into low frequency noise[40] referred to above also investigated the phenomenon of OAM. It was found that internal noise levels associated with aerodynamic modulation were above the threshold of audibility at some properties. While measurements within the report indicated these were not high enough to wake occupiers of a room, they could result in difficulties returning to sleep once awoken.

7.9.24 Following publication of the report in 2005, the DTI published a guidance note in 2006 to advise planning authorities on the issue[42]. It states that concerns apparently relating to the phenomenon have been expressed at five out of the (then) 126 operational wind farms throughout the UK. It is categorically stated that the ETSU-R-97 Guidance should continue to be used for the assessment of noise from wind farms and it was not considered necessary to further consider the issue of OAM for the Proposed Development.

7.9.25 The DTI Noise Working Group commissioned Salford University to investigate the occurrence of the phenomenon in more detail[43]. A survey was conducted of local authorities to investigate the extent of OAM, and compliant histories were analysed to determine the number of complainants. The phenomenon was considered to be a factor in four of the sites at which there had been complaints and a possible factor at eight further sites. It was found that meteorological conditions were such that the effect would prevail for between 7 – 15% of the time and could persist for several days. The report concluded that given the low incidence of OAM and the low numbers of people involved it is difficult to justify further research; however, they do state it may be prudent to attempt to improve our understanding as the phenomenon cannot be predicted at present.

7.9.26 Following publication of the report in 2007, BERR released a statement as follows:

7.9.27 *"Based on these findings, Government does not consider there to be a compelling case for further work into AM and will not carry out any further research at this time; however it will continue to keep the issue under review."*

7.9.28 It is noted that the Institute of Acoustics Noise Working Group (IoA NWG) tasked with putting together the IoA GPG at the time of publication were unwilling to propose a method for predicting OAM. In relation to OAM, the IoA GPG states:

[42] Department of Trade and Industry (2006). Advice on findings of the Hayes McKenzie report on noise arising from wind farms. DTI, London.
[43] University of Salford (2007). Research into aerodynamic modulation of wind turbine noise. Department of Business Enterprise and Regulatory Reform, Salford.

7.9.29 *"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."*

7.9.30 In December 2013, RenewableUK published *Wind Turbine Amplitude Modulation: Research to Improve Understanding as to its Cause and Effects*[44]. The RenewableUK report comprises detailed scientific research into the identification of occurrence and mitigation of OAM. The mechanisms for the occurrence of OAM were found to be generally site specific, therefore any proposed mitigation would likely have to be tailored on a site-by-site basis. As part of the research, members of the IoA developed a proposed planning condition that could be used by Local Authorities and tools for confirming its detection.

7.9.31 More recently, BS 8233:2014 Guide on sound insulation and noise reduction for buildings[45] states:

7.9.32 *"Excess AM can sometimes occur. However it cannot be predicted at the planning stage with the current state of the art."*

7.9.33 Given that the current understanding of the mechanisms of OAM are still in development and that an exact choice of turbine is yet to be determined for the Proposed Development, accurate predictions of the likelihood of its occurrence are not possible. It has therefore been determined that it is not necessary to apply a penalty for OAM at the planning stage.

7.9.34 Should an occurrence of OAM occur that gives rise to a Statutory Nuisance, then remedies remain available to the Local Authority under the Environmental Protection Act 1990[46].

7.10 Assessment of Cumulative (inter-project)

7.10.1 A cumulative effects assessment (CEA) has been undertaken for the Proposed Development which considers the combined impacts with other developments on the same single receptor or resource (inter-project effects), including future consented developments and application developments. It has been assumed that the turbines associated with the developments considered within the cumulative assessment are operating at their default modes.

7.10.2 It is stated in Table 2 of the Euchanhead Environmental Noise Assessment[47] that during the construction and operation of Euchanhead Wind Farm, the receptor location of R5 – Polskeoch will be under the ownership and management of ScottishPower Renewables and will be removed from residential use for the life of Euchanhead Windfarm based on the current project programme and contracted grid connection dates, therefore this location was not considered within the Euchanhead Environmental Noise Assessment.

7.10.3 On this basis, the following cumulative situations have been considered:

- all cumulative developments listed in **Table 7.9**, where Euchanhead Wind Farm is included and R5 - Polskeoch is not considered as a receptor; and

[44] RenewableUK (2013). Wind Turbine Amplitude Modulation: Research to Improve Understanding as to its Cause and Effects. (Online) Available at: https://cdn.ymaws.com/www.renewableuk.com/resource/collection/4E7CC744-FEF2-473B-AF2B-135FF2AA3A43/ruk_wind_turbine_amplitude_modulation_dec_2013_v2_(1).pdf (Accessed 25 January 2022).
[45] British Standards Institution (2014). BS 8233:2014 Guide on sound insulation and noise reduction for buildings. BSI, London.
[46] UK Government (1990), Environmental Protection Act 1990. (Online) Available at: https://www.legislation.gov.uk/ukpga/1990/43/contents (Accessed 13 January 2022).
[47] Euchanhead Renewable Energy Development. Technical Appendix 13.1 – Environmental noise assessment (Hoare Lea, 2020)

- all cumulative developments listed in **Table 7.9** excluding Euchanhead Wind Farm, where R5 - Polskeoch is considered as a receptor.

7.10.4 **Table 7.20** and

7.10.6 Table 7.21 present the information summarised in the modelling approach when including all wind farms listed in **Table 7.9**. For the reasons explained in paragraph 7.10.2, R5 – Polskeoch has not been included as a receptor in this scenario.

7.10.7 The modelling results assume all wind turbines are acting directly downwind of all receptors at the same time, showing an absolute worst-case scenario.

Table 7.20 Daytime noise assessment – cumulative including Euchanhead

Noise parameter, $L_{A90,10\ mins}$, dB	Standardised 10m wind speed (ms^{-1})								
	4	5	6	7	8	9	10	11	12
R1 – Upper Holm of Dalquhairn									
Background noise curve	36.2	37.6	39.0	40.4	41.5	42.4	42.9	42.9	42.9
ETSU-R-97 derived noise limit	41.2	42.6	44.0	45.4	46.5	47.4	47.9	47.9	47.9
Predicted wind farm turbine noise	30.2	33.5	36	37.1	37.6	38	38.3	38.5	38.8
Margin under / over noise limit	-11.0	-9.1	-7.6	-8.3	-8.9	-9.4	-9.6	-9.4	-9.1
R2 – Nether Holm of Dalquhairn									
Background noise curve	34.2	35.2	36.0	36.9	37.9	39.0	40.5	40.5	40.5
ETSU-R-97 derived noise limit	40.0	40.2	41.0	41.9	42.9	44.0	45.5	45.5	45.5
Predicted wind farm turbine noise	29.8	33.1	35.9	36.7	37.1	37.6	37.8	38.1	38.4
Margin under / over noise limit	-10.2	-7.1	-5.1	-5.2	-5.8	-6.4	-7.7	-7.4	-7.1
R3 – Corlae									
Background noise curve	36.2	37.6	39.0	40.4	41.5	42.4	42.9	42.9	42.9
ETSU-R-97 derived noise limit	41.2	42.6	44.0	45.4	46.5	47.4	47.9	47.9	47.9
Predicted wind farm turbine noise	28.1	31.3	34.2	35.0	35.5	36.0	36.3	36.6	37.1
Margin under / over noise limit	-13.1	-11.3	-9.8	-10.4	-11.0	-11.4	-11.6	-11.3	-10.8
R4 – Cairnhead									
Background noise curve	36.2	37.6	39.0	40.4	41.5	42.4	42.9	42.9	42.9
ETSU-R-97 derived noise limit	41.2	42.6	44.0	45.4	46.5	47.4	47.9	47.9	47.9
Predicted wind farm turbine noise	28.4	31.8	34.8	35.2	35.5	35.8	36.2	36.8	37.5
Margin under / over noise limit	-12.8	-10.8	-9.2	-10.2	-11.0	-11.6	-11.7	-11.1	-10.4

Table 7.21 Night-time noise assessment – cumulative including Euchanhead

Noise parameter, $L_{A90,10\ mins}$, dB	Standardised 10m wind speed (ms^{-1})								
	4	5	6	7	8	9	10	11	12
R1 – Upper Holm of Dalquhairn									
Background noise curve	34.3	35.3	36.5	37.7	39.0	40.2	41.3	41.3	41.3
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	44.0	45.2	46.3	46.3	46.3
Predicted wind farm turbine noise	30.2	33.5	36.4	37.1	37.6	38.0	38.3	38.5	38.8
Margin under / over noise limit	-12.8	-9.5	-6.6	-5.9	-6.4	-7.2	-8.0	-7.8	-7.5
R2 – Nether Holm of Dalquhairn									
Background noise curve	31.0	32.0	33.2	34.6	36.1	37.8	39.6	39.6	39.6
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	43.0	43.0	44.6	44.6	44.6
Predicted wind farm turbine noise	29.8	33.1	35.9	36.7	37.1	37.6	37.8	38.1	38.4
Margin under / over noise limit	-13.2	-9.9	-7.1	-6.3	-5.9	-5.4	-6.8	-6.5	-6.2
R3 – Corlae									
Background noise curve	34.3	35.3	36.5	37.7	39.0	40.2	41.3	41.3	41.3
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	44.0	45.2	46.3	46.3	46.3
Predicted wind farm turbine noise	28.1	31.3	34.2	35.0	35.5	36.0	36.3	36.6	37.1
Margin under / over noise limit	-14.9	-11.7	-8.8	-8.0	-8.5	-9.2	-10.0	-9.7	-9.2
R4 – Cairnhead									
Background noise curve	34.3	35.3	36.5	37.7	39.0	40.2	41.3	41.3	41.3
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	44.0	45.2	46.3	46.3	46.3
Predicted wind farm turbine noise	28.4	31.8	34.8	35.2	35.5	35.8	36.2	36.8	37.5
Margin under / over noise limit	-14.6	-11.2	-8.2	-7.8	-8.5	-9.4	-10.1	-9.5	-8.8

7.10.8 **Table 7.20** and

7.10.10 Table 7.21 show compliance at R1 – R4 during both the daytime and night-time periods and consequently constitutes a **not significant** effect at these receptors.

7.10.11

7.10.12 **Table** 7.22 and **Table 7.23** present the information summarised in the modelling approach when including all wind farms listed in **Table 7.9**, with the exception of Euchanhead Wind Farm. R5 - Polskeoch has been included as a receptor in this scenario, as it would remain in residential use if Euchanhead Wind Farm is not built or ceases operating before Lorg Wind Farm.

Table 7.22 Daytime noise assessment – cumulative excluding Euchanhead

Noise parameter, $L_{A90,10\ mins}$, dB	Standardised 10m wind speed (ms^{-1})								
	4	5	6	7	8	9	10	11	12
R1 – Upper Holm of Dalquhairn									
Background noise curve	36.2	37.6	39.0	40.4	41.5	42.4	42.9	42.9	42.9
ETSU-R-97 derived noise limit	41.2	42.6	44.0	45.4	46.5	47.4	47.9	47.9	47.9
Predicted wind farm turbine noise	29.6	32.8	35.6	36.5	37.0	37.5	37.8	38.0	38.3
Margin under / over noise limit	-11.6	-9.8	-8.4	-8.9	-9.5	-9.9	-10.1	-9.9	-9.6
R2 – Nether Holm of Dalquhairn									
Background noise curve	34.2	35.2	36.0	36.9	37.9	39.0	40.5	40.5	40.5
ETSU-R-97 derived noise limit	40.0	40.2	41.0	41.9	42.9	44.0	45.5	45.5	45.5
Predicted wind farm turbine noise	29.2	32.4	35.1	36.0	36.5	37.0	37.3	37.6	38.0
Margin under / over noise limit	-10.8	-7.8	-5.9	-5.9	-6.4	-7.0	-8.2	-7.9	-7.5
R3 – Corlae									
Background noise curve	36.2	37.6	39.0	40.4	41.5	42.4	42.9	42.9	42.9
ETSU-R-97 derived noise limit	41.2	42.6	44.0	45.4	46.5	47.4	47.9	47.9	47.9
Predicted wind farm turbine noise	27.4	30.4	33.2	34.2	34.8	35.3	35.7	36.0	36.5
Margin under / over noise limit	-13.8	-12.2	-10.8	-11.2	-11.7	-12.1	-12.2	-11.9	-11.4
R4 – Cairnhead									
Background noise curve	36.2	37.6	39.0	40.4	41.5	42.4	42.9	42.9	42.9
ETSU-R-97 derived noise limit	41.2	42.6	44.0	45.4	46.5	47.4	47.9	47.9	47.9
Predicted wind farm turbine noise	26.8	29.5	32.2	33.0	33.4	34.0	34.6	35.3	36.4
Margin under / over noise limit	-14.4	-13.1	-11.8	-12.4	-13.1	-13.4	-13.3	-12.6	-11.5
R5 – Polskeoch									
Background noise curve	31.4	32.9	34.0	34.5	34.5	34.0	33.0	33.0	33.0
ETSU-R-97 derived noise limit	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Predicted wind farm turbine noise	34.0	36.4	38.7	39.5	39.8	40.1	40.2	40.2	40.2
Margin under / over noise limit	-6.0	-3.6	-1.3	-0.5	-0.2	0.1	0.2	0.2	0.2

Table 7.23 Night-time noise assessment – cumulative excluding Euchanhead

Noise parameter, $L_{A90,10\ mins}$, dB	Standardised 10m wind speed (ms^{-1})								
	4	5	6	7	8	9	10	11	12
R1 – Upper Holm of Dalquhairn									
Background noise curve	34.3	35.3	36.5	37.7	39.0	40.2	41.3	41.3	41.3
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	44.0	45.2	46.3	46.3	46.3
Predicted wind farm turbine noise	29.6	32.8	35.6	36.5	37.0	37.5	37.8	38.0	38.3
Margin under / over noise limit	-13.4	-10.2	-7.4	-6.5	-7.0	-7.7	-8.5	-8.3	-8.0
R2 – Nether Holm of Dalquhairn									
Background noise curve	31.0	32.0	33.2	34.6	36.1	37.8	39.6	39.6	39.6
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	43.0	43.0	44.6	44.6	44.6
Predicted wind farm turbine noise	29.2	32.4	35.1	36.0	36.5	37.0	37.3	37.6	38.0
Margin under / over noise limit	-13.8	-10.6	-7.9	-7.0	-6.5	-6.0	-7.3	-7.0	-6.6
R3 – Corlae									
Background noise curve	34.3	35.3	36.5	37.7	39.0	40.2	41.3	41.3	41.3
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	44.0	45.2	46.3	46.3	46.3
Predicted wind farm turbine noise	27.4	30.4	33.2	34.2	34.8	35.3	35.7	36.0	36.5
Margin under / over noise limit	-15.6	-12.6	-9.8	-8.8	-9.2	-9.9	-10.6	-10.3	-9.8
R4 – Cairnhead									
Background noise curve	34.3	35.3	36.5	37.7	39.0	40.2	41.3	41.3	41.3
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	44.0	45.2	46.3	46.3	46.3
Predicted wind farm turbine noise	26.8	29.5	32.2	33.0	33.4	34.0	34.6	35.3	36.4
Margin under / over noise limit	-16.2	-13.5	-10.8	-10.0	-10.6	-11.2	-11.7	-11.0	-9.9
R5 – Polskeoch									
Background noise curve	27.3	28.2	29.1	30.3	31.7	33.5	35.8	35.8	35.8
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Predicted wind farm turbine noise	34.0	36.4	38.7	39.5	39.8	40.1	40.2	40.2	40.2
Margin under / over noise limit	-9.0	-6.6	-4.3	-3.5	-3.2	-2.9	-2.8	-2.8	-2.8

7.10.13 **Table 7.22** shows a minor exceedance at 9 m/s onwards at R5 – Polskeoch to a maximum of 0.2dB(A). With reference to the significance criteria outlined in paragraph 7.7.2, noise levels from the Proposed Development when considered along with other

consented and built wind farm developments in the area are considered **significant** at wind speeds of 9 m/s and above during the daytime period. At all other times the effects are considered **not significant**.

7.10.14 **Table 7.23** shows compliance at all receptors during the night-time period and consequently constitutes a **not significant** effect at these receptors.

Required mitigation

7.10.15 In order for the significant effects outlined in paragraph 7.10.13 to become not significant, a suitable reduced operating mode, different blad type (serrated) or alternative turbine would need to be sought.

7.10.16 The reductions in turbine broadband sound power level that would be required to meet the ETSU-R-97 noise limits at each wind speed is listed in **Table 7.24**. This is an indicative reduction across all turbines to show the small reduction required. It would also be possible to just reduce the nearest turbine to R5 by slightly more than the levels below to provide the same mitigation. These small reductions would readily be made using a reduced mode or serrated edge blade. It should be noted that the reduction will be dependent on the exact octave bands of the final turbine machine chosen. The requirements have been calculated on the basis that Euchanhead Wind Farm would not be built or would cease operation before Lorg Wind Farm, and therefore R5 - Polskeoch is considered as a residential receptor.

Table 7.24 Required reductions in sound power level (dB)

Time period	Standardised 10m wind speed (ms^{-1})								
	4	5	6	7	8	9	10	11	12
Daytime	-	-	-	-	-	-0.1	-0.2	-0.2	-0.2
Night-time	-	-	-	-	-	-	-	-	-

7.11 Predicted Effects and their Significance

7.11.1 The following situations have been tested through noise modelling to determine compliance with ETSU-R-97 derived noise limits, assuming a worst-case scenario of all receptors downwind of turbines:

- a situation consisting of just the Proposed Development turbines;
- a situation consisting of all developments listed within **Table 7.9**, but not considering receptor R5 from **Table 7.12** as this would be taken out of residential use;
- a situation consisting of all developments listed within **Table 7.9** with the exception of Euchanhead Wind Farm, reintroducing receptor R5 from **Table 7.12**; and
- a situation consisting of all developments listed within **Table 7.9** with the exception of Euchanhead Wind Farm if the maximum permissible sound power levels listed in **Table 7.24** were implemented at the Proposed Development.

7.11.2 A summary of the results of the cumulative noise assessment with the candidate turbine in place is provided in **Table 7.25.**

Table 7.25 Summary of significance of adverse effects

Receptors and summary of predicted effects	Sensitivity / importance / value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Construction daytime: All NSRs	High	Negligible	Not Significant	BS 5228-1:2009 + A1:2014 limits are not exceeded during the daytime period due to piling noise.
Operational daytime with candidate turbine in place and Euchanhead Wind Farm included in cumulative assessment: R1 – R4	High	Negligible	Not Significant	ETSU-R-97 cumulative noise limits are not exceeded during the daytime period.
Operational daytime with candidate turbine in place and Euchanhead Wind Farm not included in cumulative assessment: R1 – R4	High	Negligible	Not Significant	ETSU-R-97 cumulative noise limits are not exceeded during the daytime period.
Operational daytime with candidate turbine in place and Euchanhead Wind Farm not included in cumulative assessment: R5 at wind speeds below 9 m/s	High	Negligible	Not Significant	ETSU-R-97 cumulative noise limits are not exceeded during the daytime period.
Operational daytime with candidate turbine in place and Euchanhead Wind Farm not included in cumulative assessment: R5 at wind speeds of 9 m/s or above	High	High	Significant	ETSU-R-97 cumulative noise limits are exceeded slightly during the daytime period.
Operational daytime with mitigated sound power levels and Euchanhead Wind Farm not included in cumulative assessment: All NSRs	High	Negligible	Not Significant	ETSU-R-97 cumulative noise limits are not exceeded during the daytime period.
Operational night-time: All NSRs in all scenarios	High	Negligible	Not Significant	ETSU-R-97 cumulative noise limits are not exceeded during the night-time period.

1. The sensitivity of a receptor is defined in **Table 7.11** above and is defined as low, medium or high.
2. The magnitude of change on a receptor resulting from activities relating to the Proposed Development is defined as negligible or high.
3. The significance of the environmental effects is based on the combination of the sensitivity of a receptor and the magnitude of change and is expressed as major (significant), moderate (probably significant) or minor/negligible (not significant), subject to the evaluation methodology outlined in **Section 7.8.**

8. Shadow Flicker

8.1 Introduction

8.1.1 This Environmental Impact Assessment Report (EIAR) chapter has been prepared on behalf of RWE Renewables UK Onshore Wind Limited ("Applicant"), in respect of a proposal for the development, 35 year operation and subsequent decommissioning of a wind farm comprising of up to 15 wind turbines and associated infrastructure ("Proposed Development"). The Proposed Development is located mainly in Dumfries and Galloway, with a small proportion of it being located in East Ayrshire, between Carsphairn (located approximately 11km to the south west) and Sanquhar (located approximately 12.3km to the north east) ("the Development Site").

8.1.2 This chapter of the EIAR assesses the likely significant effects of the Proposed Development with respect to shadow flicker.

8.1.3 Prior to assessing the likely significant effects, this chapter summarises the relevant legislative and policy background, the methods used to determine likely significant environmental effects and the baseline conditions currently present on the Development Site. The likely significant effects associated with the Proposed Development are then established by comparison to the baseline conditions, along with proposed mitigation measures and the subsequent anticipated residual impacts.

8.1.4 This chapter is not intended to be read as a standalone assessment and should be read in conjunction with the complete EIAR.

8.2 Relevant legislation, planning policy, technical guidance

8.2.1 Planning policy at the national and local level and its relevance to environmental design and assessment is discussed in **Chapter 5: Planning Policy** and **Chapter 6: Renewable Energy Policy, Carbon Balance and Peat Management**, which includes a summary of the principal planning policies relevant to this chapter as listed below:

- The National Planning Framework 3 2014 (NPF3);
- The Draft National Planning Framework 4 2022 (NPF4);
- Scottish Planning Policy 2014 (SPP);
- Scottish Government Online Renewables Planning Advice: Onshore Wind Turbines (2014);
- Scottish Government, Onshore Wind: Policy Statement Refresh 2021: Consultative Draft;
- Dumfries and Galloway Council Local Development Plan 2 (LDP2) (2019);
- Dumfries and Galloway Council LDP2 Wind Energy Development: Development Management Considerations (2020);
- East Ayrshire Local Development Plan 2017; and
- East Ayrshire Council Local Development Plan 2 – Proposed Plan (2022).

8.2.2 Paragraph 169 of the SPP lists shadow flicker as an assessment criterion for wind farm developments. Further advice is provided in the Scottish Government's Online Renewables Planning Advice: Onshore Wind Turbines (2014), which identifies that, under certain combinations of geographical position, time of day and time of year, the sun may pass behind the rotor and cast a shadow over neighbouring properties, and the shadow flicks on and off as the blades rotate – this effect is known as shadow flicker. The Online Renewables Planning Advice goes on to state that it occurs only within buildings where the flicker appears through a narrow window opening, and in most cases where separation is provided between wind turbines and nearby dwellings (as a general rule 10 rotor diameters), shadow flicker should not be a problem.

8.2.3 Policy IN2 of the Dumfries and Galloway LDP2, requires renewable energy proposals to be assessed against the extent of any detrimental impact on communities, including assessment of shadow flicker. The Dumfries and Galloway Wind Energy Development Management Considerations, requires that proposals for onshore wind turbines demonstrate mitigation measures, including maintaining a separation distance of at least 10 times turbine rotor blade. As such, careful wind turbine siting has been properly considered and addressed as far as practicable.

8.2.4 Schedule 1: Renewable Energy Assessment Criteria of the East Ayrshire Local Development Plan (2014) includes 'impacts on communities and individual dwellings, including visual impact, residential amenity, noise and shadow flicker.'

8.2.5 Policy RE1 of the East Ayrshire Local Development Plan 2, requires renewable energy proposals to assess impacts on communities and individual dwellings, including visual impact, residential amenity, noise and shadow flicker.

8.2.6 Further advice and guidance are given in the following documents:

- Update of UK Shadow Flicker Evidence Base (2011), Department of Energy and Climate Change (DECC).
- Northern Ireland Department for Infrastructure (DfI) - Best Practice Guidance to Planning Policy Statement (PPS) 18 Renewable Energy (2009, updated 2019).

8.3 Assessment Methodology and Significance Criteria

8.3.1 In order to predict and quantify the effects that would result from the Proposed Development, this assessment has considered:

- Baseline Conditions – a review of existing information in relation to dwellings within the local area.
- Significance of Effects – an assessment of the effects of the Proposed Development against the baseline conditions and assessment of the cumulative effects of the Proposed Development with any other existing, consented or proposed wind turbine development in the area.
- Mitigation Measures – details of the proposed mitigation measures to be incorporated into the Proposed Development that would be implemented to avoid any significant impacts.
- Residual Effects – an assessment of residual effects following the implementation of mitigation measures.

Significance Evaluation

8.3.2 It remains the case, as set out by the DECC Report (2011), that there is no standard Scottish or UK-wide guidance on a threshold for shadow flicker at which effects may be significant for the purposes of the EIA Regulations. Recommendations are found within the Northern Irish PPS 18 (2009, updated 2019) guidance which recommends that for properties within 500 m of turbines, shadow flicker should not exceed 30 hours per year or 30 minutes per day, although PPS 18 does not advise that shadow flicker exceeding this level is necessarily significant.

Software Parameters

8.3.3 The shadow flicker analysis was conducted using the Shadow Flicker module of the ReSoft © WindFarm software.

8.3.4 The WindFarm analysis reports the 'worst case' scenario, that is, a situation where there is always sunshine, the wind is always blowing, and the wind and the wind turbine rotor track the sun by yawing the wind turbine exactly as the sun moves. In addition, the model does not include consideration of any screening effects of existing vegetation and buildings.

Analysis Parameters

Turbine Data and Layout

8.3.5 The modelling was undertaken based on the proposed turbine layout comprising up to 15 turbines each with a candidate wind turbine with a rotor diameter of 162 m and a hub height of 119 m.

Potential Receptors

8.3.6 The identification of potential shadow flicker receptors was based on inspection of OS maps alongside input from the LVIA field work.

8.3.7 Each receptor was modelled as one window (2 m by 2 m in dimension), directly orientated towards the Proposed Development.

Study Area

8.3.8 Current published advice and guidance (identified in paragraphs 8.2.1 -8.2.6 above) was used to determine the study area of 10 x rotor diameter. This provided an initial study area of 1,670 m (162 m rotor diameter x 10 plus 50 m micrositing allowance). Properties located beyond 130 degrees either side of north relative to the wind turbines were excluded.

8.4 Baseline Conditions and Identification and Evaluation of Key Impacts

8.4.1 Shadow flicker happens only when a certain combination of conditions coincides at particular times of the day and year, mainly in the winter months when the sun is low in the sky (Northern Irish PPS 18). The occurrence of shadow flicker and the extent of its impacts are dependent on a number of factors, namely:

- distance from the wind turbine;

- turbine hub height and rotor diameter;
- speed of blade rotation;
- the proportion of sunny weather during the months when flicker can occur; and
- the size, shape and orientation of any windows or doors of neighbouring properties.

8.4.2 Using the WindFarm software, a potential shadow flicker impact area map was produced based on the study area.

8.4.3 Receptors identified from the LVIA field work were mapped. Only one property (Polskeoch) was identified within the study area. The study area and identified receptors are shown on **Figure 8.1**.

8.4.4 It is stated in Table 2 of the Euchanhead Environmental Noise Assessment[1] that during the construction and operation of Euchanhead Wind Farm, the receptor location of R5 – Polskeoch will be under the ownership and management of ScottishPower Renewables and will be removed from residential use for the life of Euchanhead Windfarm based on the current project programme and contracted grid connection dates, therefore this location was not considered within the Euchanhead Environmental Shadow Flicker Assessment.

8.4.5 Based on WindFarm software analysis, only Polskeoch is predicted to potentially experience any shadow flicker based upon a worst-case scenario model. The model results predict that this property may experience shadow flicker up to 38 hours/year, up to a maximum of 0.44 hours per day. The guidelines (Northern Irish PPs 18) recommend that shadow flicker does not exceed 30 hours per year or 30 minutes per day for dwellings within 500m from a wind turbine. The dwelling Polskeoch is located approximately 1,200m from the nearest turbine (T10).

8.4.6 As the receptor is well in excess of 500m from the nearest wind turbine, the assessment is based upon worst-case modelling, and taking into account the amount of sunny daylight hours per year, it is considered that the realistic scenario impact will be below 30 hours a year and 30 minutes a day.

Future baseline

8.4.7 On the basis of the information currently available, no changes to the baseline conditions are anticipated in the event that the Proposed Development does not proceed.

8.5 Cumulative Effects and Interaction of Effects

8.5.1 In the event that Euchanhead Wind Farm is consented and built, in which case the dwelling will be acquired by Scottish Power Renewables and removed from residential use, no significant cumulative effects will occur. In the event that Euchanhead Wind Farm is not consented/built there will be no cumulative effects.

8.5.2 There is therefore no potential for significant cumulative impacts in relation to shadow flicker when considered alongside other proposed developments in the local area.

[1] Euchanhead Renewable Energy Development. Technical Appendix 13.1 – Environmental noise assessment (Hoare Lea, 2020)

8.6 Mitigation Measures

8.6.1 Mitigation has been incorporated thorough design, to appropriately site the Proposed Development away from constraints that may be adversely impacted.

8.6.2 The shadow flicker assessment represents a theoretical worst-case scenario. In practice, therefore, the potential impact is likely to be substantially less. There may be some shadow flicker experienced at one property (Polskeoch), therefore in the event that complaints of shadow flicker from the owner/occupant of Polskeoch are received by the Applicant, Dumfries and Galloway Council and/or East Ayrshire Council, an appropriate investigation would be undertaken to confirm the occurrence, following which mitigation measures could be used to mitigate the re-occurrence if required. This could, for example, involve the provision of screening planting, the installation of blinds within the affected property, or the programming of the wind turbines to automatically shut down at times when shadow flicker effects could occur. This could be secured through a planning condition. Application of these measures would ensure that potential effects are minimised or removed entirely.

8.7 Residual Effects

8.7.1 Following implementation of mitigation through design and best practice and the mitigation measures identified above, it is considered that there would be no significant effects in terms of the EIA regulations in relation to shadow flicker.

8.8 Summary

8.8.1 This chapter has considered the potential for likely significant environmental effects on shadow flicker. The design evolution process has taken into account the potential effects and has sought to minimise these as much as possible. There is the potential for one property to be theoretically affected by shadow flicker, but this theoretical worst case would be only fractionally above the duration identified in the guidelines and the potential impact is likely to be substantially less, and mitigation could be put in place if required.

8.8.2 Overall therefore, no significant effects are predicted.

8.9 References

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Northern Ireland Department for Infrastructure (DfI) - Best Practice Guidance to PPS 18 Renewable Energy (2009, updated 2019). Available at https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/Best%20Practice%20Guidance%20to%20PPS%2018%20-%20Renewable%20Energy_0.pdf Accessed [Accessed on October 2022].

9. Landscape and Visual Impact Assessment

9.1 Introduction

9.1.1 This chapter assesses the landscape and visual effects of the Proposed Development. It should be read with reference to the project description in **Chapter 3: Description of the Proposed Development**.

9.1.2 Landscape and Visual Impact Assessment (LVIA) is one of the key components of the EIA for wind farms due to the introduction of tall elements into the environment. The Proposed Development has been considered against the requirements of The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 and any relevant planning policies, relating to the landscape resource and visual amenity.

9.1.3 The LVIA and cumulative assessment (CLVIA) reported in this chapter has been produced by chartered landscape architects at WSP Environment and Infrastructure Solutions UK Limited who undertook the previous assessment of the Consented Development. The objective of this assessment has been to determine the landscape and visual effects of the Proposed Development on the existing landscape resource and visual amenity. The following landscape and visual receptors have been assessed:

- Landscape character, key characteristics, and landscape elements;
- Designated landscapes
- Wild Land Areas; and
- Views and visual amenity experienced by residents, tourists, visitors, recreational and transport users.

9.1.4 The Proposed Development comprises up to 15 wind turbines, in two groups (described as the Eastern group of ten turbines and the Western group of five turbines) with a maximum height of 200m to blade tip and associated infrastructure. The Eastern group (T1 to T10) and T14 of the Western group are located within an undesignated area of the *Southern Uplands with Forest* landscape character (Ken Unit) in Dumfries and Galloway T13 is located within an undesignated area of the *Southern Uplands* landscape character (Carsphairn Unit) in Dumfries and Galloway. The Western group (with the exception to T13 and T14) is located within the locally designated Uplands and Moorlands Local Landscape Area of the *Southern Uplands* landscape character in East Ayrshire.

9.1.5 Infrastructure associated with the Proposed Development includes two site accesses (a new / upgraded vehicular access point that would be created off the existing access tracks for Afton Wind Farm's, allowing access from the north via the B741 and along Afton Road, access from the south, via the B729 and C class road (Lorg Road)), internal access tracks and hardstanding areas, crane pads, up to two borrow pits, two temporary construction compounds, two permanent met masts and grid connection infrastructure (including a control building and two on-site substations and underground cables linking the turbines to the substations).

9.1.6 The assessment process has encompassed time limited periods for the construction, operation, and decommissioning of the Proposed Development which entails a reversal of many of the landscape and visual effects. Although the operational period for the Proposed Development is for the duration of 35 years (described in the assessment as

'long-term' and reversible), it has been assessed in the same manner as permanent development.

- The chapter is supported by a number of Technical Appendices, comprising:
- **Appendix 9A**: Methodology and Glossary;
- **Appendix 9B**: Viewpoint Analysis;
- **Appendix 9C**: Residential Visual Amenity Assessment; and
- **Appendix 9D**: Night-time Assessment.

9.1.7 Figures illustrating this chapter are contained within Volume 2 and include plans and visualisations of the Proposed Development. Further figures illustrating plans and visualisations in support of **Appendix 9C-9D** are also contained in Volume 2.

9.1.8 Given Scottish Natural Heritage (SNH) has been recently rebranded to NatureScot (NS), all references in this chapter that are published by SNH are accredited.

Variations

9.1.9 The specific turbine model used for the Site will be chosen post consent and will be subject to a competitive tendering process. As a result, the exact hub height and rotor dimensions may vary slightly within (but would not exceed) the overall maximum blade tip height of 200m which would be agreed with the local planning authority. The LVIA has used the turbine parameters of 119m hub height, 162m rotor diameter and an overall blade tip height of 200m.

9.1.10 Variations up to approximately +/- 5m the turbine blade length/hub height within the overall blade tip height of 200m are unlikely to alter the results of the LVIA and its conclusion. Greater variability of turbine dimensions, within the overall maximum blade tip height of 200m, could however affect the overall proportion of the turbines and their appearance and each case would need to be considered on a case by case basis.

9.1.11 The location of the proposed 15 turbines has been assessed on the basis of the final wind turbine layout, which would be subject to micrositing of up to +/-50m. Viewpoint analysis confirms that a horizonal micrositing allowance of up to +/-50m would not alter the ZTV pattern or change the results of the LVIA and its conclusions.

9.2 Landscape Planning Policy and Guidance

9.2.1 The LVIA process has taken account of legislation and national and local planning policy in relation to wind farm development as well as the *Dumfries and Galloway Council Local Development Plan 2, Part 1 Wind Energy Development: Development Management Considerations, Appendix 'C' Dumfries and Galloway Wind Farm Landscape Capacity Study Supplementary Guidance*, February 2020 (referred to hereafter as the 'DGWLCS') and the Dumfries and Galloway Council Local Development Plan 2 (LDP2), *Dark Skies Friendly Lighting Supplementary Guidance,* February 2020 (referred to hereafter as the 'DSFL'). The LVIA has also taken account of the *East Ayrshire Council* (EAC) *Local Development Plan, April 2017,* the *East Ayrshire Council Local Development Plan, Supplementary Guidance: Planning for Wind Energy* December 2017 and the *East Ayrshire Council Local Development Plan, Non-Statutory Planning Guidance: East Ayrshire Landscape Wind Capacity Study* (EALWCS) (June 2018).

9.2.2 Further information on Planning Policy is provided in **Chapter 5: Planning Policy**. An appraisal of the Proposed Development in policy terms is contained in the Planning Statement.

Wind Farm Capacity Studies

9.2.3 The DGWLCS and EALWCS provide a broad and strategic level assessment of the sensitivity of landscape to wind farm development within Dumfries and Galloway and East Ayrshire respectively. In making this assessment, both wind farm capacity studies take account of different landscape character types (LCTs) and a range of landscape constraints and opportunities for wind farm development that are relevant to particular LCTs.

9.2.4 In their recent guidance[1], NatureScot state:

"*Wind energy studies should not be referred to as 'capacity studies' as no local or regional targets are available on which to determine the 'capacity' for development. Landscape Sensitivity Assessments should reflect their purpose, which is to provide a strategic assessment of relative landscape and visual sensitivity to certain defined forms of development. Where studies are updated and the name is changed to 'sensitivity assessment' it may be necessary to update references to the amended version where relevant. Sensitivity assessments are technical studies and as such should be used to inform the preparation of Development Plans and their policies*." Further, on page 9, the document states:

"*A finding of 'high' sensitivity does not necessarily mean that there is no ability to accommodate development and 'low' sensitivity does not necessarily mean that there is definitely potential for development."*

9.2.5 The Eastern group and T14 of the Western group of the Proposed Development would be located within the *Ken* unit of the *Southern Uplands with Forest* LCT (19a). T13 of the Western group is located within the *Carsphairn* unit of the *Southern Uplands* LCT (19), as identified in the DGWLCS. The remaining three turbines of the Western group of the Proposed Development (T11, T12 and T15) would be located within the *Blackcraig Hill* unit of the *Southern Uplands* LCT (20a), as identified in the EALWCS.

9.2.6 The EALWCS and DGWLCS are strategic sensitivity studies and a number of caveats should be noted in respect of their guidance as follows:

- The EALWCS and DGWLCS are not up-to-date documents in respect of the Proposed Development, the Consented Development (nine turbines, six at 130m to blade tip and three at a maximum height of 149.9m to blade tip) is not included in the baseline, although the DGWLCS acknowledges (page 32) that wind farm development is a key feature of the *Southern Uplands with Forest LCT; Ken* Unit;
- The EALWCS and DGWLCS do not replace the need for site and project specific landscape and visual impact assessments for individual wind energy developments, which provide detailed and specific assessment of the likely landscape, visual and cumulative effects; and
- The EALWCS and DGWLCS are broad and generalised assessments, and the judgements on sensitivity represent an average across whole LCTs, within which considerable variation can occur. For example, the landscape sensitivity assessment for the Southern Uplands with Forests LCT includes four separate landscape character units (Carsphairn, Ken, Eskdalemuir and West Langholm). Not all of the identified constraints and opportunities apply to all of these areas and the DGWLCS advises "caution" in its interpretation.

[1] NatureScot, Landscape Sensitivity Assessment Guidance, April 2022

9.2.7 The DGWLCS, dated 2020, revises and updates the previous studies, dated 2017 and 2011, in response to changes in the cumulative baseline of other existing and consented wind energy development. The Consented Development is not included as part of this revised baseline.

9.2.8 Importantly, the DGWLCS notes, in the executive summary, that it is a non-statutory, strategic assessment and the judgements on sensitivity represent an average across broad character types and areas, although considerable variation can occur. In contrast, this assessment is specific to the layout and its location.

Southern Uplands with Forest: Ken

9.2.9 The DGWLCS, executive summary (page 5) advises that the "*greatest scope for additional development in parts of the Southern Uplands with Forest*" and in particular, the Southern Uplands with Forests LCT is identified as the least sensitive to very large typologies (wind turbines 150m+ to blade tip) within Dumfries and Galloway.

9.2.10 The DGWLCS judges the sensitivity of the *Southern Uplands with Forest* LCT to very large typologies (wind turbines 150m+ to blade tip) to be of '**High-Medium**' sensitivity with a '**Medium-Low**' landscape value overall.

9.2.11 Table 3 on page 17 of the DGWLCS describes 'High-Medium' sensitivity as an area where "A number of key landscape characteristics are vulnerable to change. Development would undermine some important defining aspects of landscape character and/or visual amenity and/or may result in significant cumulative effects with other wind farm developments. A limited amount of development may be able to be accommodated in very small parts of some landscape character types/areas however." Areas of 'Medium - Low' sensitivity are noted as LCTs having some sensitivities but with opportunities to accommodate wind farm development in most locations. Page 16 of the DGWLCS further notes that the sensitivity ratings excludes landscape values because designated landscapes and other values are not evenly spread across landscape character units and are identified separately in the document.

9.2.12 The Proposed Development (turbines up to 200m blade tip height) would be within the DGWLCS category for 'very large typologies' (wind turbines 150m+ to blade tip)

9.2.13 Key constraints and cumulative issues identified in the DGWLCS in respect of the *Southern Uplands with Forest* LCT*: Ken* unit and their relevance to the Proposed Development are as follows:

- "*The arc of hills which includes Benbrack, Cairn and Blackcraig which form a key focus at the head of the Upper Glen (10) of the Dalwhat Water within the Ken unit. The presence of the SUW and the landmark sculptures of Striding Arches add to the sensitivities of this area*";

  The Proposed Development would not be widely visible from the Dalwhat Water, with the wind turbines being located well beyond the summit areas of Benbrack, Cairn and Blackcraig at this location. The Southern Upland Way (SUW) is located along the south and eastern boundary of the Development Site and there will therefore be some views from this route and from some of the 'Striding Arches' sculptures. However, the design and visual composition of the Proposed Development from each of these locations and the route of the SUW ensures a reasonably balanced turbine composition. The effects on the Upper Glen landscape character unit, SUW and the landmark sculptures of the Striding Arches are included within this assessment.

- "*The rim of open-topped rugged higher hills extending from Loch Fell (688m) north-west of the Esdalemuir unit, visually prominent from the Corbetts of White Coombe and Hart Fell in the Moffat Hills.*" These hills would be unaffected by the Proposed Development due to lack of visibility.
- "*The proximity of the dramatic sculptural hill of Cairnsmore of Carsphairn to parts of the Ken and Carsphairn units*." The effects on the Cairnsmore of Carsphairn are included within this assessment.
- *"The open hills lying on the eastern edge of the West Langholm unit which are important in providing a backdrop to Eskdale and are covered by an RSA."* These open hills on the eastern edge of the West Langholm unit would be unaffected by the Proposed Development due to no visibility.
- "*Occasional areas of more complex landform and deeply incised valleys, some of these masked by extensive forest. The Logan Water Valley, the upper water of Ken Valley and Lorg Glen and dramatic open hills at the head of the Ken unit are of increased sensitivity*"; The Lorg Glen and associated receptors are included within this assessment. The Proposed Development avoids steeply sloping land, which is a practical requirement for wind farm construction, and this also limits visibility in relation to steep sloping valley sides and complex landform.
- "*Potential for cumulative effects to arise with additional wind farm development sited within the Ken, Carsphairn and West Langholm landscape units*." An assessment of cumulative effects is included within this assessment.

9.2.14 The DGWLCS also notes the following opportunities for very large wind farm development which are afforded by the *Southern Uplands with Forest* LCT:

- "*The expansive scale of this character type and its predominantly simple, gently rolling landform*";
- "*The sparsely settled nature of this character type and its distance from more populated lowland areas*";
- "*Extensive commercially managed forestry which covers the majority of the character type which precludes a strong sense of wildness.*" Although the Development Site is not forested, it is characterised by surrounding 'commercially managed' forestry and wind farm development.

9.2.15 Further, the presence of other existing and consented wind farm development in an area is often seen as a factor that can potentially mitigate the effects of new development, as well as a potential constraint in some circumstances. It may also be noted that the *Southern Uplands with Forest: Ken* unit is not listed (DGWLCS, page 42) as an area where capacity has been exceeded, or is very close to being reached.

9.2.16 The DGWLCS (page 349) provides the following conclusions in relation to very large typologies (wind turbines 150m+ to blade tip) within the *Southern Uplands with Forest* LCT: *Ken* unit:

"There is some scope for the Very Large typology (turbines 150m+) to be accommodated in this character type but only in the Eskdalemuir unit which is undeveloped, very extensive in scale and distant from more settled areas. Cumulative effects with other operational and consented wind farms and effects on adjacent glens and landmark hills are a key constraint to this typology in the Carsphairn, Ken and West Langholm units within this character type."

Southern Uplands: Carsphairn

9.2.17 Only one turbine (T13) of the Proposed Development would be located on the northeastern edge of this LCT which transitions to the *Southern Uplands: Blackcraig Hill* unit of the EALWCS and both LCTs display very similar characteristics.

9.2.18 The DGWLCS judges the sensitivity of the *Southern Uplands* LCT to very large typologies (wind turbines 150m+ to blade tip) to be of '**High**' sensitivity. The guidance advises that there is no scope for development over 150m+ to blade tip "*..without incurring significant impacts on a number of key characteristics"*.

9.2.19 Table 3 on page 17 of the DGWLCS describes 'High' sensitivity as an area where " *The majority or all of the key landscape characteristics are vulnerable to change. Development would conflict with key aspects of landscape character and visual amenity with widespread and significant adverse impacts likely to arise...*"

9.2.20 The Proposed Development (turbines up to 200m blade tip height) would be within the DGWLCS category for 'very large typologies' (wind turbines 150m+ to blade tip).

9.2.21 Key constraints and cumulative issues identified in the DGWLCS in respect of the *Southern Uplands* LCT*: Rugged Southern Upland areas* (incorporating Carsphairn) and their relevance to the Proposed Development are as follows:

- *"An often dramatic landform where high and shapely peaks, steep scarp slopes, crags and deeply incised valleys are interspersed with smoother rolling upland plateaux.";*

  One turbine of the Proposed Development would be located on the northern boundary of the *Southern Uplands* LCT*: Carsphairn* unit with all other turbines located in adjacent LCTs. This location and the association with the adjoining *East Ayrshire Southern Uplands* LCT and *Southern Uplands with Forest* LCT, reduces the effect of the Proposed Development on the geological and landscape features associated with the *Southern Uplands* LCT*: Carsphairn* unit. The Proposed Development avoids steeply sloping land, which is a practical requirement for wind farm construction and this also limits visibility in relation to steep sloping valley sides and complex landform. The effects on the above three LCTs are included within this assessment.

- "*The backdrop and distinctive skyline provided by these uplands to adjoining settled areas such as the upland glens of Moffat and Langholm, plus the broader dales of Nithsdale, the Glenkens and Annandale which have increased visibility.*" The areas immediately surrounding the Proposed Development are very sparsely settled, although there would be some visibility from New Cumnock to the north which is included in the assessment.

- "*Areas of extensive heather moorland that notably occur within the Lowther, Langholm and North and East Moffat Hills*." The Proposed Development would not be located within these areas.

- *"Extensive forestry within adjacent upland areas in Dumfries and Galloway which increases the value of these open, less modified hills and increases the sense of naturalness experienced."* The effects on the adjoining *Rugged Uplands with Forest* LCT is included within this assessment.

- "*The important contribution that these sculptural and open uplands make to wider scenic quality, particularly forming dramatic backdrops to well-settled dales, as recognised in the RSA designations that cover the majority of these uplands."* The special qualities of surrounding locally designated areas (LLA and RSA) are included within this assessment.

- "*Recreational use of these uplands which include a number of 'Corbett' hills and other celebrated features such as the Devil's Beef Tub in upper Annandale and the setting for the Grey Mare's Tail waterfall, and which increase visual sensitivity*." The effects on recreational users of Cairnsmore of Carsphairn is included within this assessment.
- "*The Talla-Hart Wild Land Area which covers part of the Moffat Hills*." The Talla-Hart Wild Land Area (WLA) is located, at its closest point, approximately 42km northeast of the Proposed Development. The assessment of effects on WLAs has been scoped out of the LVIA as set out in the scoping report.

9.2.22 The DGWLCS also notes the following cumulative issues for wind farm development within the *Southern Uplands* LCT*: Rugged Southern Upland areas*:

- "*The operational Windy Standard wind farm and its consented extension extend into the Carsphairn unit in the Southern Uplands with Forest (19a)… Other wind farms are/will also be visible from the landmark hill of Cairnsmore of Carsphairn within this character area including Whiteside, Afton and Hare Hill. Any additional wind farm development in this and the adjacent Southern Uplands with Forest (19a) could have significant cumulative effects on this landmark hill*.";

9.2.23 An assessment of the cumulative effects on the *Southern Uplands LCT: Carsphairn* unit is undertaken as part of this assessment. The presence of other existing and consented wind farm development in an area is often seen as a factor that can potentially mitigate the effects of new development, as well as a potential constraint in some circumstances.

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9.2.24 Three turbines of the Western group of the Proposed Development (T11, T12 and T15) would be located within the *Blackcraig Hill* unit of the *Southern Uplands* LCT (20a), as identified in the EALWCS.

9.2.25 The EALWCS judges the sensitivity of the *Southern Uplands* LCT as **High** for the Very Large typologies (turbines >130m). The guidance on page 130 advises that there is no scope for additional new development.

9.2.26 *Annex D* of the EALWCS uses viewpoints to assess the potential effects of repowering specific existing wind farms and as such it is not relevant to the Proposed Development. The closest viewpoints considered include Loch Doon and the A713, Dalmellington in respect of potential effects of repowering Dersalloch or South Kyle with very large turbines. The EALWCS concludes that Loch Doon, the Doon Valley and the Girvan valley would be more sensitive to increases in height. Comparative ZTV analysis was also used in the EALWCS which concluded that *"the extent of increased visibility … is not dramatic in most cases".* It is worth noting that the Proposed Development would not be visible from the shores and western edge of Loch Doon.

9.2.27 Key constraints and cumulative issues identified in the EALWCS in respect of the *Southern Uplands* LCT*: Blackcraig Hill* unit and their relevance to the Proposed Development are as follows:

- *"The higher well-defined hills of Hare Hill and the distinctly rugged Blackcraig Hill and Craigbraneoch Rig on the eastern edge of Glen Afton which form landmark features seen from roads and settlement within the glen and from the well settled Upland Basin (15)."*

  There would be limited visibility of the Proposed Development from within Glen Afton and this is included in the assessment. Visibility from the well settled Upland Basin would be even more limited due to the surrounding topography with Blackcraig Hill and Craigbraneoch Rig remaining as landmark features.

- *"Complex interlocking ridges and deeply cut narrow valleys of the lower western hills of this character type where it may be difficult to achieve an integrated layout of turbines and to minimise cut and fill of access road construction."*

  The Proposed Development avoids steeply sloping land, which is a practical requirement for wind farm construction and this also limits visibility in relation to steep sloping valley sides and complex landform.

- *"Cumulative effects with the operational and consented wind farms of Hare Hill, Afton and South Kyle seen from the Upland Basin (15) which may limit scope for additional new wind farms because of differences in turbine size and layout given variations in landform west of Glen Afton."* An assessment of cumulative effects is included within this assessment.

- *"The scenic backdrop these predominantly open and rugged uplands provide to the Upland Basin (15), seen in views from settlement and roads including the A76."* Visibility from settlement and roads including the A76 would be limited due to the surrounding topography with the scenic backdrop largely unaffected by the Proposed Development.

9.2.28 The EALWCS also notes the following opportunities for very large wind farm development which are afforded by the *Southern Uplands* LCT:

- " *There may be limited potential for very small extensions to operational wind farms on areas with a less complex landform where the exacerbation of existing adverse landscape and visual effects on Glen Afton and the Upland Basin (15) could be avoided*."

9.3 Consultation

9.3.1 As part of the scoping exercise, a consultation exercise was undertaken to inform the design of the Proposed Development and to seek agreement on potential significant environmental effects that result from the Proposed Development as well as the scope of any assessment work required as part of this EIA.

9.3.2 Consultation relevant to the LVIA assessment was undertaken with DGC, EAC and NS. EAC and NS commented on aspects of methodology, sources of information, viewpoint selection, scope of assessment and cumulative development. No response was provided by DGC in relation to the LVIA.

Table 9.1 Summary of Landscape Related Consultation

Date Received	Consultation Response(s)	How and where is this addressed?
NatureScot (NS)		
26 July 2021	Content with the proposed scope and work undertaken with respect to landscape. No additional comments.	Noted.
East Ayrshire Council (EAC)		
15 September 2021	Content with LVIA Study Area	Noted
	Advise that the cumulative situation should also be informed by up to date data from East Ayrshire and neighbouring authorities in the study area.	The cumulative assessment in the LVIA has taken into account all up to date information on cumulative wind farms up to July 2022
	The Applicant should give consideration to other tall structures such as electricity pylons and the southwest Scotland transmission line	These structures have been considered as part of the baseline conditions
	An assessment of impacts on the qualities of the East Ayrshire Sensitive Landscape Area should be reported.	Addressed and included in the LVIA
	Content with the 3km study area for the RVAA	Noted
	An additional viewpoint from the Afton valley close to the Scottish Water Filter Station is requested	This has been included as viewpoint 17
	An additional night-time viewpoint is requested from Lochside Hotel	This has been included as viewpoint N13

9.4 Assessment Methodology and Significance

9.4.1 The assessment methodology is set out in **Appendix 9A** which includes a glossary of terms and abbreviations used in this Chapter. The methodology for the LVIA and CLVIA has been undertaken in accordance with best practice guidance which is listed in the references at the end of this Chapter, they include, but are not limited to, the following:

- *Guidelines for Landscape and Visual Impact Assessment*, 3rd Edition, Landscape Institute and IEMA (May 2013), hereafter referred to as GLVIA 3;
- *Siting and Designing Windfarms in the Landscape*, Version 3a, SNH (August 2017);
- *Guidance: Assessing the Cumulative Landscape and Visual Impact of Onshore Wind Energy Developments*, NatureScot (March 2021);
- *Visual Representation of Wind Farms* Version 2.2, SNH (February 2017); and
- *Guidance: General pre-application and scoping advice for onshore wind farms*, SNH (September 2020).

Determining the Significance of Effects

9.4.2 In accordance with the EIA Regulations, it is important to determine whether the predicted effects, resulting from the Proposed Development, are likely to be significant. Significant landscape, visual and cumulative effects are highlighted in **bold** in the text and in most cases, relate to effects that result in a '**Major**' or a **'Major / Moderate'** effect as indicated in **Table 9.2**. In some circumstances, Moderate levels of effect also have the potential, subject to the assessor's opinion, to be considered as significant and these exceptions are also highlighted in bold and explained as part of the assessment where they occur.

9.4.3 A distinction has also been made between there being a variable 'range' of effects on a receptor, which has been expressed as '*Moderate to Negligible'* for example.

Table 9.2 Evaluation of Landscape and Visual Effects

Magnitude of Change	Landscapes and Visual Sensitivity			
	High	Medium	Low	Very Low
High	**Major**	**Major / Moderate**	Moderate	
High - Medium	**Major**	**Major / Moderate**	Moderate	
Medium	**Major / Moderate**	Moderate	Minor	
Medium - Low	**Major / Moderate**	Moderate	Minor	Not used
Low	Moderate	Minor	Negligible	
Low – Very Low	Moderate	Negligible	Negligible	
Very Low	Minor	Negligible	Negligible	
Zero	None / No View			

Viewpoint Selection

9.4.4 Viewpoint selection has been based on the same 23No. viewpoints identified for the Consented Development.

9.4.5 A total of 16 (1-16) out of the original 23 viewpoints are included in the assessment as set out in the table below. The remaining 7 viewpoints (17-23) have been scoped out of the assessment as set out in the scoping report and agreed by EAC and NS. No response was provided by DGC in relation to the LVIA.

9.4.6 A new viewpoint (17) at the Afton Filter Station has been included at the request of EAC.

9.4.7 The viewpoint locations are illustrated in **Figures 9.2** and **9.3**, and shown as photographs, wirelines and photomontages as agreed through consultation. The visualisations illustrated the proposed turbines and where visible the proposed access tracks and associated infrastructure within 10km.

9.4.8 Viewpoint analysis has also been used for the night-time assessment which included four of the day-time viewpoint locations. The Night-time Assessment is reported in **Appendix 9D**.

Table 9.3 Assessment Viewpoints

Viewpoint	Distance to nearest turbine (m)	Receptor
1. The Striding Arches - Colt Hill	1118	Walkers
2. Southern Upland Way, north of Lorg	837	Walkers
3. Lorg Bridge	1084	Walkers
4. Approach to Lorg (Lorg Trail)	1486	Walkers, road users
5. The Striding Arches - Benbrack	1948	Walkers
6. Minor Road from Smittons Bridge to Lorg Bridge	2407	Road Users, walkers
7. Blackcraig Hill	3965	Walkers, Uplands and Moorlands LLA
8. The Striding Arches – Bail Hill	4816	Walkers
9. Cairnsmore of Carsphairn	5197	Walkers
10. B729 East of Carsphairn	7651	Road Users
11. Cairnkinna Hill	10450	Walkers, Thornhill Uplands RSA
12. B7000	12774	Road Users
13. Lochside Hotel	13004	Visitors
14. Guffock Hill	14930	Walkers
15. Keir Hills	17460	Walkers, Thornhill Uplands RSA
16. Corserine	19700	Walkers, Galloway Hills RSA

Viewpoint	Distance to nearest turbine (m)	Receptor
17. Afton Filter Station	3953	Walkers, Uplands and Moorlands LLA

Cumulative Wind Energy Development

9.4.9 Drawing from SNH (NS) guidance[2], the cumulative baseline of all operational and consented wind energy development and other wind energy development applications, above 50m to blade tip height, within the 45km Study Area has been included in this assessment.

9.4.10 Micro-generation wind energy developments, below 50m in blade tip height have been excluded from the assessment as it is unlikely that they would make a significant cumulative contribution. In accordance with the SNH guidance projects at scoping stage have not been included, however, those within 10km are illustrated on the wirelines.

9.4.11 In total, 108 other wind energy developments are included in the assessment as listed in **Table 9.4** and illustrated in **Figure 9.12**. As of 1 October 2022, this includes 51 existing wind farms, 34 consented developments and 23 applications in the Study Area.

9.4.12 The most relevant wind energy developments to the CLVIA include those sites within 10km and in particular the existing cluster of Whiteside Hill, Sanquhar, Hare Hill and Sandy Knowe, the cluster of Afton, Windy Standard and Windy Standard Extension, Windy Rig and South Kyle, Wether Hill, and the consented Sanquhar Six, Cornharrow, Pencloe, Windy Standard Phase III, Enoch Hill and Benbrack developments. Application sites at Euchanhead, Sanquhar II and Shepherd's Rig are also relevant.

9.4.13 The cumulative assessment has considered the cumulative landscape and visual effects of the Proposed Development in addition to and in combination with the range of other wind energy development in terms of size and scale.

Table 9.4 Wind Energy Development Included in the CLVIA

Reference	Name	Distance (from Proposed Development) (m)	Number of turbines	Height to blade tip (m)	Status (as of June 2022)
E01	Afton	912	25	100/120	Existing
E02	Windy Standard	1,419	36	52	Existing
E03	Windy Rig	1,521	12	125	Existing
E04	Windy Standard Extension	3,132	30	120	Existing
E05	Whiteside Hill	4,374	10	121.2	Existing
E06	Wether Hill	4,907	14	91	Existing
E07	Hare Hill Extension	5,588	35	70/75/81/86/91	Existing
E08	Sanquhar	6,150	9	130	Existing
E09	South Kyle	6,263	50	149.5	Existing

[2] Scottish Natural Heritage, March 2012, Guidance: Assessing the Cumulative Impacts of Onshore Wind Energy Developments.

Reference	Name	Distance (from Proposed Development) (m)	Number of turbines	Height to blade tip (m)	Status (as of June 2022)
E10	Hare Hill	6,693	20	63.5	Existing
E11	Sandy Knowe	8,352	24	125	Existing
E12	High Park Farm	9,199	1	75	Existing
E13	Twentyshilling Hill	9,921	9	125	Existing
E14	Sunnyside	13,882	2	62	Existing
E15	Blackcraig	14,785	23	110	Existing
E16	Dersalloch	20,765	23	125	Existing
E17	Kennoxhead (Under Construction)	23,098	19	180	Existing
E18	Dalswinton	26,899	15	125	Existing
E19	Andershaw	28,098	11	140	Existing
E20	Middle Muir	28,229	15	136/149.9	Existing
E21	Galawhistle	29,429	22	110.2/121.2	Existing
E22	Harestanes	30,417	68	125	Existing
E23	Bankend Rig	30,467	11	76	Existing
E24	Hagshaw Hill Extension	30,569	20	80	Existing
E25	Clyde	30,911	152	125	Existing
E26	Nutberry	32,390	6	125	Existing
E27	Dungavel	33,043	13	100/120	Existing
E28	Douglas West	33,070	13	149.9	Existing
E29	Minnygap	33,531	10	125	Existing
E30	Kype Muir Extension	33,792	15	156 / 176 / 200 / 220	Existing
E31	Hadyard Hill	33,878	52	110	Existing
E32	Kype Muir	35,900	26	132	Existing
E33	Auchrobert	36,147	12	132	Existing
E34	Clyde Extension	38,140	54	125/145	Existing
E35	Calder Water	38,409	13	144.5	Existing
E36	Chapelton Farm	39,422	3	67	Existing
E37	Whitelee Extension 2	39,642	39	140	Existing
E38	West Browncastle	39,777	12	126.5	Existing
E39	Plascow	39,779	3	74	Existing
E40	Whitelee	40,132	144	110	Existing

Reference	Name	Distance (from Proposed Development) (m)	Number of turbines	Height to blade tip (m)	Status (as of June 2022)
E41	Whitelee Extension 1	40,524	36	135	Existing
E42	Ladehead Farm	40,536	3	74	Existing
E43	Mark Hill	40,592	28	110	Existing
E44	Sneddon Law (Under Construction)	40,947	15	130	Existing
E45	Tralorg	41,607	8	100	Existing
E46	Assel Valley	42,271	10	110	Existing
E47	Myres Hill	44,623	2	91/95/100	Existing
E48	GlaxoSmithKline (Irvine) T3-4	44,941	2	110	Existing
E49	Draffanmarshill Farm	45,090	2	119	Existing
E50	Kilgallioch	45,765	96	146.5	Existing
E51	Lochhead Cluster	46,051	5	100 / 99.5	Existing
C01	Sanquhar Six	3,929	6	130	Consented
C02	Cornharrow	4,068	8	149.9	Consented
C03	Pencloe	4,471	19	149.9	Consented
C04	Windy Standard Phase III	4,999	20	125/177.5	Consented
C05	Enoch Hill	8,317	16	149.9	Consented
C06	Troston Loch	8,587	14	149.9	Consented
C07	Benbrack	9,467	18	132/135/149.9	Consented
C08	Margree	10,572	9	200	Consented
C09	Glenshimmeroch	10,728	10	149.9	Consented
C10	North Kyle	13,585	54	149.9	Consented
C11	Lethans	13,744	22	176 / 200 / 220	Consented
C12	Glenmuckloch	13,861	8	149.9	Consented
C13	Fell	14,808	9	180/200	Consented
C14	Knockman Hill	15,150	5	81	Consented
C15	Over Hill	15,366	10	149.9	Consented
C16	Torrs Hill	16,085	2	100	Consented
C17	Penbreck	19,823	9	125/145	Consented
C18	Polquhairn	20,553	9	100	Consented
C19	Kennoxhead Extension	22,620	8	180	Consented

Reference	Name	Distance (from Proposed Development) (m)	Number of turbines	Height to blade tip (m)	Status (as of June 2022)
C20	Mochrum Fell	23,335	8	116.5/126.5	Consented
C21	Knockshinnoch	23,679	2	126.5	Consented
C22	Hagshaw Hill Repowering	30,238	14	200	Consented
C23	Crookedstane	30,263	4	126.5	Consented
C24	Lion Hill	30,519	4	126.5	Consented
C25	Bankend Rig II	30,973	3	126.5	Consented
C26	Cumberhead	31,012	14	149.9 / 180	Consented
C27	Cumberhead West	31,334	21	200	Consented
C28	Douglas West Extension	32,086	13	200	Consented
C29	Dalquhandy	33,374	15	131 / 149.9	Consented
C30	Kirk Hill	37,226	8	115.5	Consented
C31	Broken Cross (2T)	38,503	2	55.7	Consented
C32	Broken Cross (10T)	38,920	10	149.9	Consented
C33	Whitelaw Brae	42,173	14	136.5	Consented
C34	Glenkerie Extension	46,666	6	100	Consented
A01	Euchanhead	567	21	230	Application
A02	Sanquhar II	1,513	44	200 / 149	Application
A03	Shepherd's Rig	5,666	19	149.9/125	Application
A04	Greenburn	14,425	16	149.9	Application
A05	Fell Variation	14,808	9	180/200	Application
A06	Over Hill Variation	15,366	10	180	Application
A07	Garcrogo	19,004	9	200	Application
A08	Rigmuir	19,621	3	149.9	Application
A09	Polquhairn Variation	20,553	9	100 / 110 / 119 / 125 / 145	Application
A10	Penbreck Variation	20,717	8	200 / 220	Application
A11	Mochrum Fell Variation	23,355	7	149.9	Application
A12	Carrick	25,139	13	200	Application
A13	Knockcronal	25,539	9	180 / 200	Application
A14	Daer	28,798	17	180	Application
A15	Hare Craig	29,443	8	149.9/200/230	Application
A16	Bankend Rig II Variation	30,627	3	250	Application

Reference	Name	Distance (from Proposed Development) (m)	Number of turbines	Height to blade tip (m)	Status (as of June 2022)
A17	Craiginmoddie	30,740	14	200	Application
A18	Mill Rig	31,829	6	250 / 209	Application
A19	Harestanes South Extension	32,121	8	200	Application
A20	Clauchrie	32,709	18	200	Application
A21	Low Drumclog	37,998	3	180	Application
A22	Grayside	39,682	21	200	Application
A23	Scoop Hill	43,781	75	180 / 200 / 225 / 250	Application

Zone of Theoretical Visibility (ZTV) and Viewpoint Analysis

9.4.14 The Zone of Theoretical Visibility (ZTV) and viewpoint analysis is used to further define the scope of the assessment process. In particular, a significance threshold indicating the distance from the Proposed Development, within which significant effects may be likely, has been identified. This has been used to focus the baseline information and detailed reporting of the assessment in this chapter.

ZTV and Cumulative ZTV Analysis

9.4.15 The ZTV analysis is used to assist the design and further define the scope of the assessment process. The ZTVs have been calculated using ReSoft © WindFarm computer software to produce an area of potential visibility of any part of the proposed turbines, calculated to turbine blade-tip and hub-height, or selected infrastructure. The ZTV does not however take account of built development and vegetation, which can significantly reduce the area and extent of actual visibility in the field, and as such provides the outer limits of the visual assessment Study Area. As a result, there may be roads, tracks and footpaths in the wider setting which, although shown as falling within the ZTV, have restricted viewing opportunities since they are heavily screened or filtered by banks, walls and vegetation. The ZTVs therefore provide a starting point in the assessment process and accordingly tend towards giving a 'worst-case' or over-estimated scenario of the potential visibility of the turbines.

9.4.16 A number of ZTV maps have been provided as follows:

- **Figure 9.2**: illustrates the ZTV calculated to blade tip at 1:360,000 scale across the 45km Study Area and provides an overview of the theoretical extent of visibility with viewpoint locations;
- **Figure 9.3**: illustrates the ZTV calculated to hub height at 1:360,000 scale across the 45km Study Area and provides an overview of the theoretical extent of visibility with viewpoint locations;
- **Figure 9.4**: illustrates the central section of the blade tip ZTV, shown in more detail at 1:90,000 scale, showing the area within 10km of the Proposed Development with viewpoint locations;
- **Figure 9.5**: (A0 fold-out) illustrates the ZTV calculated to blade tip at 1:120,000 scale across the 45km Study Area and includes viewpoint locations;

- **Figure 9.6**: (A0 fold-out) illustrates the central 20km area of the ZTV calculated to blade tip at 1:50,000 scale across the Study Area and includes viewpoint locations;
- **Figures 9.13-14**: illustrates the comparative ZTV calculated to blade tip and hub height at 1:360,000 scale across the 45km Study Area and provides an overview of the theoretical extent of visibility of the Consented Development and Proposed Development.

9.4.17 Further cumulative ZTV maps are also illustrated in **Figures 9.15-18**, indicating the extent of theoretical cumulative visibility in relation to the Proposed Development, and other existing and consented wind farms, and wind farm applications within the 45km Study Area. The cumulative developments have been grouped according to their planning status or geographical location. All of the cumulative ZTVs assume bare ground and are calculated to blade tip height, indicating the maximum theoretical visibility of other wind farms within the ZTV footprint of the Proposed Development. The cumulative ZTVs do not therefore illustrate the complete ZTV for other cumulative wind energy development, which is likely to be visible from other locations where the Proposed Development is not visible.

ZTV Analysis: Proposed Development

9.4.18 The ZTV pattern for the Proposed Development reflects the underlying landform within the 45km Study Area and the percentages of theoretical visibility cover are summarised as follows:

- Total ZTV (to blade tip) coverage accounts for 26.06% of the Study Area; and
- Total ZTV (to hub height) coverage accounts for 20.39% of the Study Area.

9.4.19 These percentages would be lower in reality as they do not take account of the screening effects of vegetation such as forestry (including Carsphairn Forest), buildings and other localised screening elements such as manmade landform.

9.4.20 Within 1km of the Proposed Development, theoretical visibility is relatively continuous with fragmentary areas where there is no theoretical visibility on the back slopes of hills such as Black Hill.

9.4.21 Within 1-5km, theoretical visibility becomes increasingly fragmented due to the screening effects of hills and ridgelines. ZTV coverage is focused to the southwest and northeast along the Water of Ken, with more limited areas of theoretical visibility to the northwest along the Afton Valley. Much of this theoretical visibility is within the Southern Uplands and Southern Uplands with Forest landscape character types. There is also ZTV coverage within the Narrow Wooded Valley landscape character type, although in reality this would be limited by forestry.

9.4.22 Within 5-10km ZTV coverage becomes increasingly fragmented and is mainly present on elevated summits, with some theoretical visibility along the west facing slopes of the Afton Valley, Shinnel Water and the east-facing slopes of Dalwhat Water. The main area of theoretical visibility lies to the southwest along the Water of Ken.

9.4.23 Within 10-20km fragmented theoretical visibility is present mainly to the northwest within the Upland Basin landscape character type and includes some large areas of active open-cast mining, on elevated ground to the west of the Doon Valley and along elevated summits to the southwest and northeast of the Proposed Development. There is very limited, fragmented theoretical visibility to the east and north of the Proposed Development.

9.4.24 Beyond 20km there is little or no theoretical visibility in the southwest and northeast. There is fragmented theoretical visibility to the north and northwest around the settlements of Auchinleck, Mauchline, Tarbolton and Mossblown although in reality visibility from these areas would tend to be restricted by higher levels of intervening vegetation and built form. More fragmented areas of theoretical visibility are present to the west of Thornhill and to the south of St John's Town of Dalry. There is very limited, fragmented theoretical visibility on elevated ground within Carrick Forest to the west of the Proposed Development and within Dalmacallan and Black Mark forestry to the southeast of the Proposed Development.

Viewpoint and Cumulative Viewpoint Analysis

9.4.25 The viewpoint analysis is used to assist the design and further define the scope of the assessment process. In particular, the outer distance from the Proposed Development, where significant effects may be likely has been identified. This has been used to focus the baseline information and detailed reporting of this assessment.

9.4.26 The viewpoint analysis has been conducted from 17No. viewpoint locations as illustrated in **Figures 9.22 – 9.38** and is reported in **Appendix 9B**. Four of these viewpoints were identified for the night-time assessment and the views from these locations are illustrated in **Figures 9D.8-11** and assessed in separate appendix (**Appendix 9D**).

9.4.27 Cumulative wind farm developments that would be visible within the 45km Study Area have been illustrated in the wirelines.

Potential for Significant Effects: Proposed Development

9.4.28 The viewpoint analysis indicates that significant visual effects are likely to affect limited locations within approximately 8.3km distance from the Proposed Development (subject to a clear view of the proposed turbines, landform and vegetation screening), as indicated by Viewpoints 1, 2, 3, 4, 5, 6, 7, 8, 9 and 17. The effects on all ten viewpoints would also be cumulative and further cumulative analysis is provided below.

Potential for Significant Cumulative Effects

9.4.29 Viewpoints 1, 2, 4, 5, 6, 7, 8, 9 and 17 include cumulative visibility of other existing and consented wind farm development and the Proposed Development would have a significant and cumulative effect on these viewpoints. The Proposed Development would also have a significant and cumulative effect on Viewpoint 3 in combination and in addition to other application wind farm developments.

9.4.30 Other than Viewpoints 1-9 and 17, there are no further viewpoints where the Proposed Development is assessed as a significant contributor to cumulative visual effects with other existing, consented and application wind farms. Any other significant cumulative visual effects result from existing wind farms such as Twentyshilling Hill, Sanquhar, Sunnyside, Kennoxhead, Cornharrow, Enoch Hill, Pencloe, Sandy Knowe, Glenmuckloch, Lethans, Penbreck, Sanquhar II, Euchanhead and Shepherds Rig. Significant cumulative effects where this occurs include Viewpoints 10, 11, 12, 13 and 14. These viewpoints would not be significantly affected by the Proposed Development.

9.4.31 In some instances, the visibility of wind farm development in the same or different sector of the view serves to slightly reduce the additional cumulative effect of the Proposed Development in comparison to the assessment on a 'solus' or primary basis.

9.4.32 Importantly these levels of effect are indicative of a visual effect on a particular viewpoint location, and they should not be assumed to translate into visual effects on the overall

visual experience, as each of the viewpoints have been specifically located where the sensitivity of the receptor and / or the views of the Proposed Development would be greatest. In this sense they are not always typical or representative.

Night-time Assessment of Aviation Warning Lights

9.4.33 A night-time assessment of the effects of the aviation warning lights is provided in **Appendix 9D** and supported by **Figures 9D.1-11**.

9.4.34 A Lighting Strategy to mitigate the effects of the aviation warning lights has been prepared by aviation specialists Wind Power Aviation Consultants Ltd. (WPAC) and is illustrated in **Figure 9D.1**. The Lighting Strategy entails a reduced number of lit turbines (reduced from 15 to 9) with no mid-tower lights. The assessment takes account of the likelihood that the visibility of the 2000 / 200cd lights would be reduced in intensity due to the surrounding topography and the vertical angle between the light source and the viewer being less than 0° (**Figures 9D.3a/b**). The assessment also accounts for the intervening distance between the viewpoint and the aviation warning light. In each case the visualisations have assumed the light source is a maximum of 2000cd (occurring during periods of poor visibility, anywhere within <5km from the lit turbine locations) reduced in intensity subject to the above mitigating factors. Meteorological observations suggest that the conditions requiring 2000cd lights are likely to occur for 2% of the time.

9.4.35 Conversely, meteorological observations also suggest that the reduced intensity is likely to occur for 98% of the time and so represents a more 'typical' or 'realistic' scenario. The assessment however has also taken account of this (light intensity emitted from a 200cd light source), which would occur during periods when visibility is >5km from the lit turbines.

Sunlight and Weather Conditions

9.4.36 All of the viewpoint analysis and assessment have assumed fair weather and clear visibility.

Interpretation of Viewpoint Analysis Summary Tables

9.4.37 The information set out in **Table 9.5** provides a summary of the viewpoint analysis of the effects of the Proposed Development on an independent or ‘standalone’ basis. This part of the assessment helps to define the contribution the Proposed Development would make to any subsequent cumulative assessments (in addition to or in combination with other wind farms). It is also relevant to the latter half of the operational period for the Proposed Development, when the consented periods of operation for other existing wind farms would expire and they would be decommissioned, assuming no extensions to the operating periods or re-powering schemes are granted.

9.4.38 The information set out in **Table 9.6** provides a summary of the cumulative viewpoint analysis and sets out the effects of Proposed Development ‘in addition’ to and ‘in combination’ with other existing, consented and application wind energy developments in accordance with the methodology in **Appendix 9A**.

9.4.39 The summary tables list the names of the viewpoints and include the following information:

- Viewpoint Analysis:
  - Distance: Distance of the viewpoint location from the nearest proposed turbine within the Proposed Development;

- Sensitivity: The sensitivity of the viewer at the viewpoint location is recorded (ranging from High, Medium, Low, and Very Low) in accordance with the methodology in **Appendix 9A**;
- Magnitude: The magnitude of change, taking account of the Proposed Development only, is recorded (ranging from High, High – Medium, Medium, Medium – Low, Low, Low – Very Low, Very Low, and Zero) in accordance with the methodology; and
- Level of Effect: The level of visual effect for the Proposed Development only, is recorded and takes account of the sensitivity and magnitude in accordance with the methodology.

- Cumulative Viewpoint Analysis:
- Scenario 1: Existing + Consented + Proposed Development
  - Cumulative Magnitude: The magnitude of change, taking account of other existing and consented / under construction wind farms that may be visible (ranging from High, High – Medium, Medium, Medium – Low, Low, Low – Very Low, Very Low, and Zero) in accordance with the methodology;
  - Additional Level of Effect: The additional effect of adding the Proposed Development to the baseline of existing and consented wind farms is provided; and
  - Combined Level of Effect: The combined level of effect of the Proposed Development and the baseline of existing and consented wind farms is provided.
- Scenario 2: Existing + Consented + Application + proposed development
  - Cumulative Magnitude: The magnitude of change, taking account of other application wind farms that may be visible (ranging from High, High – Medium, Medium, Medium – Low, Low, Low – Very Low, Very Low, and Zero) in accordance with the methodology;
  - Additional Level of Effect: The additional effect of adding the Proposed Development to the baseline of existing and consented wind farms and other wind farm applications is provided; and
  - Combined Level of Effect: The combined level of effect of the Proposed Development and the existing and consented wind farms, and other wind farm applications is provided.

Table 9.5 Summary of Viewpoint Analysis

Viewpoint No. and Title	Sensitivity	Viewpoint Analysis: Proposed Development: Eastern Group			Viewpoint Analysis: Proposed Development: Western Group			Viewpoint Analysis: Proposed Development: Overall	
		Distance to nearest turbine (m)	Magnitude	Level of Effect:	Distance to nearest turbine (m)	Magnitude	Level of Effect:	Magnitude	Level of Effect:
1. The Striding Arches - Colt Hill	High	1,118	High	**Major**	5,892	Medium	**Major / Moderate**	High	**Major**
2. Southern Upland Way, north of Lorg	High	837	High	**Major**	4,074	Low-Very Low	Moderate to Minor	High	**Major**
3. Lorg Bridge	High	1,084	Medium	**Major / Moderate**	2,461	Zero	No View	Medium	**Major / Moderate**
4. Approach to Lorg	High	1,486	High-Medium	**Major**	2,677	Zero	No View	High-Medium	**Major**
5. The Striding Arches - Benbrack	High	1,948	High-Medium	**Major**	5,642	Medium	**Major / Moderate**	High-Medium	**Major**
6. Minor Road from Smittons Bridge to Lorg Bridge	High to Medium	2,407	Very Low	Minor	3,622	Medium	**Major / Moderate**	Medium	**Major / Moderate**
7. Blackcraig Hill	High	6,515	Medium-Low	**Major / Moderate to Moderate**	3,965	Medium	**Major / Moderate**	Medium	**Major / Moderate**
8. The Striding Arches - Bail Hill	High	4,816	Medium	**Major / Moderate**	9,555	Low	Moderate	Medium	**Major / Moderate**

Viewpoint No. and Title	Sensitivity	Viewpoint Analysis: Proposed Development: Eastern Group			Viewpoint Analysis: Proposed Development: Western Group			Viewpoint Analysis: Proposed Development: Overall	
		Distance to nearest turbine (m)	Magnitude	Level of Effect:	Distance to nearest turbine (m)	Magnitude	Level of Effect:	Magnitude	Level of Effect:
9. Cairnsmore of Carsphairn	High	8,389	Medium-Low	**Major / Moderate to Moderate**	5,197	Medium	**Major / Moderate**	Medium	**Major / Moderate**
10. B729 East of Carsphairn	Medium	7,651	Low-Very Low	Negligible	9,557	Low-Very Low	Negligible	Low-Very Low	Negligible
11. Cairnkinna Hill	High	10,450	Low	Moderate	14,264	Low	Moderate	Low	Moderate
12. B7000	Medium	12,774	Low	Minor	13,156	Low	Minor	Low	Minor
13. Lochside Hotel	High	15,927	Zero	No View	13,004	Low	Moderate	Low	Moderate
14. Guffock Hill	High	14,930	Low	Moderate	15,824	Low	Moderate	Low	Moderate
15. Keir Hills	High	17,461	Very Low	Minor	22,289	Very Low	Minor	Very Low	Minor
16. Corserine	High	21,842	Very Low	Minor	19,700	Very Low	Minor	Very Low	Minor
17. Afton Filter Station	High	7,359	Zero	No View	3,953	Medium	**Major / Moderate**	Medium	**Major / Moderate**

Note: Significant effects are indicated in bold text.

Table 9.6 Summary of Cumulative Viewpoint Analysis

Viewpoint No. and Title	Distance to nearest turbine (m)	Viewpoint Analysis: Proposed Development			Cumulative Viewpoint Analysis: Proposed Development (PD) and other wind farms					
		Sensitivity	Magnitude	Level of Effect	Magnitude (Existing and Consented)	Additional Level of Effect	Scenario 1: Combined Level of Effect	Magnitude (Applications)	Additional Level of Effect	Scenario 2: Combined Level of Effect
1. The Striding Arches - Colt Hill	1,118	High	High	**Major**	Medium	**Major**	**Major** (PD, Cornharrow)	High	**Major**	**Major** (PD, Cornharrow, Euchanhead, Sanquhar II)
2. Southern Upland Way, north of Lorg	837	High	High	**Major**	Medium-Low	**Major**	**Major** (PD, Whiteside Hill)	High	**Major**	**Major** (PD, Whiteside Hill, Euchanhead, Sanquhar II)
3. Lorg Bridge	1,084	High	Medium	**Major / Moderate**	N/A	No cumulative effect		High	**Major / Moderate**	**Major** (PD, Euchanhead)
4. Approach to Lorg	1,486	High	High-Medium	**Major**	Very Low	**Major**	**Major** (PD)	High-Medium	**Major**	**Major** (PD, Euchanhead)
5. The Striding Arches - Benbrack	1,948	High	High-Medium	**Major**	Medium	**Major**	**Major** (PD, Wether Hill, Cornharrow)	High-Medium	**Major**	**Major** (PD, Wether Hill, Cornharrow, Sanquhar II, Euchanhead, Shepherds Rig)
6. Minor road from Smittons Bridge to Lorg Bridge	2,407	High to Medium	Medium	**Major / Moderate**	Very Low	**Major / Moderate**	**Major / Moderate** (PD)	Medium	**Major / Moderate**	**Major / Moderate** (PD, Euchanhead)

Viewpoint No. and Title	Distance to nearest turbine (m)	Viewpoint Analysis: Proposed Development			Cumulative Viewpoint Analysis: Proposed Development (PD) and other wind farms					
		Sensitivity	Magnitude	Level of Effect	Magnitude (Existing and Consented)	Additional Level of Effect	Scenario 1: Combined Level of Effect	Magnitude (Applications)	Additional Level of Effect	Scenario 2: Combined Level of Effect
7. Blackcraig Hill	3,965	High	Medium	**Major / Moderate**	High-Medium	**Major / Moderate**	**Major** (PD, Afton, Windy Standard Extension, Hare Hill Extension, Sanquhar, Hare Hill, Whiteside Hill, Pencloe, South Kyle, Windy Rig, Enoch Hill, Sanquhar Six)	High	Moderate	**Major** (PD, Afton, Windy Standard Extension, Hare Hill Extension, Sanquhar, Hare Hill, Whiteside Hill, Pencloe, South Kyle, Windy Rig, Enoch Hill, Sanquhar Six, Euchanhead, Sanquhar II)
8. The Striding Arches - Bail Hill	4,816	High	Medium	**Major / Moderate**	Medium	**Major / Moderate**	**Major / Moderate** (PD, Wether Hill)	High-Medium	**Major / Moderate to Moderate**	**Major / Moderate** (PD, Wether Hill, Sanquhar II, Euchanhead)
9. Cairnsmore of Carsphairn	5,197	High	Medium	**Major / Moderate**	High-Medium	**Major / Moderate**	**Major** (PD, Windy Standard Extension, Windy Rig, Benbrack, South Kyle)	Medium	**Major / Moderate**	**Major** (PD, Windy Standard Extension, Windy Rig, Benbrack, South Kyle, Shpherds Rig, Sanquhar II, Euchanhead)

Viewpoint No. and Title	Distance to nearest turbine (m)	Viewpoint Analysis: Proposed Development			Cumulative Viewpoint Analysis: Proposed Development (PD) and other wind farms					
		Sensitivity	Magnitude	Level of Effect	Magnitude (Existing and Consented)	Additional Level of Effect	Scenario 1: Combined Level of Effect	Magnitude (Applications)	Additional Level of Effect	Scenario 2: Combined Level of Effect
10. B729 East of Carsphairn	7,651	Medium	Low-Very Low	Negligible	Medium	Negligible	Moderate (**Major / Moderate** – Cornharrow, if forestry is felled)	Medium	Negligible	**Major / Moderate** (Shepherd's Rig) (and Cornharrow if forestry is felled)
11. Cairnkinna Hill	10,450	High	Low	Moderate	High	Moderate	**Major** (Twentyshilling Hill)	High-Medium	Minor	**Major** (Twentyshilling Hill, Sanquhar II, Euchanhead)
12. B7000	12,774	Medium	Low	Minor	Very Low	Minor	Minor	Medium	Minor	**Moderate** (Shepherds Rig)
13. Lochside Hotel	13,004	High	Low	Moderate	Medium	Moderate	**Major / Moderate** (Pencloe, Enoch Hill)	Medium	Minor	**Major / Moderate** (Pencloe, Enoch Hill, Greenburn, Sanquhar II)
14. Guffock Hill	14,930	High	Low	Moderate	High-Medium	Moderate to Minor	**Major** (Sandy Knowe, Sanquhar, Sunnyside, Kennoxhead, Glenmuckloch, Lethans, Penbreck)	Medium	Minor	**Major** (Sandy Knowe, Sanquhar, Sunnyside, Kennoxhead, Glenmuckloch, Lethans, Penbreck, Sanquhar II, Euchanhead, Penbreck Variation)

Viewpoint No. and Title	Distance to nearest turbine (m)	Viewpoint Analysis: Proposed Development			Cumulative Viewpoint Analysis: Proposed Development (PD) and other wind farms					
		Sensitivity	Magnitude	Level of Effect	Magnitude (Existing and Consented)	Additional Level of Effect	Scenario 1: Combined Level of Effect	Magnitude (Applications)	Additional Level of Effect	Scenario 2: Combined Level of Effect
15. Keir Hills	17,460	High	Very Low	Minor	Low	Minor	Moderate (Dalswinton)	Low-Very Low	Minor	Moderate (Dalswinton)
16. Corserine	19,700	High	Very Low	Minor	Very Low	Minor	Minor	Low	Minor	Moderate to Minor (Shepherds Rig)
17. Afton Filter Station	3,953	High	Medium	**Major / Moderate**	High to High-Medium	Moderate	**Major** (PD, Afton)	N/A	No cumulative effect	

Note: Significant effects are indicated in bold text.

9.5 Baseline of Landscape Receptors

9.5.1 Information on the existing landscape resource or baseline conditions included in this assessment has been collected from local development plans, OS maps, and relevant literature, as well as information gathered from field surveys. This baseline information is set out as an inventory of the existing landscape resource and focuses on those landscape receptors with most potential to be significantly affected.

9.5.2 The baseline inventory includes the following landscape receptors:

- Landscape Character;
- Landscape Planning Designations; and
- Wild Land Areas.

9.5.3 The ZTV and viewpoint analysis indicate that significant visual effects are likely to be limited to locations within approximately 8.3km from the Proposed Development (subject to a clear view of the proposed turbines, landform and vegetation screening). Taking a precautionary approach, the assessment has been focused on those landscape receptors within 10km of the Proposed Development in order to assess the likely significant landscape effects as well as reflecting the wider context and pattern of landscape character in this area. At a further distance and within the 45km Study Area, only those areas of landscape receptors which are designated at a national or international level and overlapped by the ZTV for the Proposed Development, have been included in the assessment unless scoped out during consultation. The landscape receptors included in this assessment include landscape character and landscape designations.

9.5.4 Site survey and viewpoint analysis also indicates that landscape effects, likely to result from other activities and infrastructure associated with the Proposed Development during its construction and decommissioning would be largely limited to the host LCTs.

Landscape Character

9.5.5 The landscape character within 10km is classified for wind farm development within the EALWCS and DGWLCS. Both landscape reports divide the landscape into broad Landscape Character Types (LCT) and / or more localised and area specific Landscape Character Areas (LCA) or units. Drawing from these assessments, **Figure 9.8** illustrates the landscape character of the central 10km of the Study Area at a detailed scale. Within the wider 10-45km there are no areas of landscape character designated at a national or international level that would otherwise be included in the assessment. Landscape Planning Designations within the 45km Study Area are illustrated in **Figure 9.9**.

Landscape Character of the Development Site: Southern Uplands with Forestry and Southern Uplands LCT

9.5.6 The Eastern group (T1 to T10) and T14 of the Western group are located within the *Southern Uplands with Forest LCT: Ken unit* in Dumfries and Galloway. T13 is located within the *Southern Uplands LCT: Carsphairn unit* in Dumfries and Galloway. The Western group (with the exception to T13 and T14) is located within the East Ayrshire *Southern Uplands LCT: Blackcraig Hill unit,* all subsequently referred to as the 'host' landscape.

9.5.7 The Development Site is located within an extensive area of the Southern Uplands and Southern Uplands with Forest and bounded to the east, north, south and south-west by extensive coniferous forestry and Carsphairn Forest further to the west. The *Southern*

Uplands with Forestry and Southern Uplands generally are noted in both the EALWCS and the DGWLCS to be amongst those landscape character types, generally most able to accommodate wind energy development.

9.5.8 These LCTs are already characterised by wind farm development. In particular, the existing Windy Standard and Extension, Afton, Windy Rig, Whiteside Hill, Wether Hill, Sanquhar, Hare Hill and Extension, South Kyle and Sandy Knowe wind farms. This area would be further characterised by wind farm development with the construction of the consented Sanquhar Six, Cornharrow, Pencloe, Windy Standard Phase III and Enoch Hill wind farms.

Landscape Character of the Surrounding Area

9.5.9 Beyond the host landscape, the Proposed Development would not have a direct effect on any other LCTs. Rather the landscape effects would be indirect and relate to views and visual or perceptual characteristics which are noted to be a key feature of the surrounding landscape character.

9.5.10 The 12 LCTs of the central 10km Study Area are illustrated in **Figure 9.8** as described in the EAWLCS and DGWLCS. Each of these along with their particular landscape units or LCAs are listed in **Table 9.7**. Only the following eight LCTs are included in the assessment:

- DGC 4 Narrow Wooded River Valleys: Ken unit;
- DGC 10 Upland Glens:
  - Castlefairn and Dalwhat unit;
  - Shinnell unit;
- DGC 19 Southern Uplands:
  - Carsphain unit (host landscape – T13);
  - Nithsdale unit;
- DGC 19a Southern Uplands with Forest:
  - Ken unit (host landscape – T1 to T10 and T14);
  - Carsphairn unit;
- EAC 14 Upland Glen: Glen Afton unit;
- EAC 15 Upland Basin: New Cumnock unit;
- EAC 20a Southern Uplands: Blackcraig Hill (host landscape – T11, T12 and T15); and
- EAC 20c Southern Uplands with Forestry: Enoch Hill.

9.5.11 The remaining four LCTs have very limited to no visibility of the Proposed Development and are already heavily influenced by wind farm development and have therefore been excluded from this assessment on the basis that the potential effects on these LCTs are likely to be not significant.

Table 9.7 Landscape Character within 10km

Landscape Character Type (LCT)	Landscape Character Area / Unit	Included in Assessment
Dumfries and Galloway		
4 Narrow Wooded River Valleys	Ken	√
9 Upper Dales	Upper Glenkens	X
9 Upper Dales	Upper Nithsdale	X
10 Upland Glens	Castlefairn and Dalwhat	√
10 Upland Glens	Shinnell	√
10 Upland Glens	Scar	X
18 Foothills	West of Moniaive	X
18 Foothills	North of Moniaive	X
18a Foothills with Forest	Stroan	X
19 Southern Uplands	Carsphairn	√
19 Southern Uplands	Nithsdale	√
19a Southern Uplands with Forest (host LCT)	Ken	√
19a Southern Uplands with Forest	Carsphairn	√
East Ayrshire		
10 Upper River Valley	River Nith	X
14 Upland Glen	Glen Afton	√
15 Upland Basin	New Cumnock	√
20a Southern Uplands (host LCT)	Blackcraig Hill	√
20a Southern Uplands	Benty Cowan Hill	X
20c Southern Uplands with Forestry	Enoch Hill	√

Emerging Baseline Pattern of Wind Farm Development

9.5.12 Wind Farm Development is now a landscape characteristic of many areas of Scotland including Dumfries and Galloway, and East Ayrshire. Wind farms are referenced in SNH's most recent 2019 Landscape Character Assessment and are noted as a feature of the host LCT in the EALWCS and DGWLCS.

9.5.13 There are numerous wind farm developments within 10km, namely the existing Afton, Windy Standard and Extension, Windy Rig and South Kyle wind farms seen as one group in the northwest. The consented Pencloe, Enoch Hill, Windy Standard Phase III and Benbrack supplement this group. A further group to the north / northeast include the

existing Hare Hill and Extension, High Park, Sanquhar, Whiteside Hill and Sandy Knowe and the consented Sanquhar Six wind farms. A smaller group of wind farms to the south include the existing Wether Hill and consented Cornharrow, Troston Loch and Margree wind farms. The current pattern of development within the 45km study area is illustrated in **Figure 9.9** and is also shown at a local level in **Figure 9.8** with existing and consented wind farm development in this area largely focused on the *Southern Uplands and Southern Uplands with Forest* LCT. Much of the established development avoids larger areas of remote landscapes, although some development is located within local landscape designations.

Landscape Designations

9.5.14 Landscape Designations within the 45km Study Area are illustrated in **Figure 9.9**.

9.5.15 Three turbines of the Western group of the Proposed Development (T11, T12 and T15) are situated within the southern edge of the locally designated Afton Sensitive Local Landscape Area) (LLA).

National Landscape Designations

9.5.16 There are no National Parks within the 45km Study Area.

9.5.17 There are three National Scenic Areas within the 45km Study Area, as follows:

- Nith Estuary;
- Fleet Valley; and
- East Stewartry Coast.

9.5.18 The ZTV illustrates very limited to no visibility of the Proposed Development from the NSAs which are located over 38km to the south. They are therefore excluded from the assessment on the basis that effects would be not significant.

9.5.19 Gardens and Designed Landscapes (GDLs) are considered under visual receptors as visitor attractions.

9.5.20 The Galloway Forest Dark Sky Park has been included as part of the night-time assessment in **Appendix 9D.**

Local Landscape Designations

9.5.21 The following local landscape designations are located within 10km of the Proposed Development and included in the assessment:

- East Ayrshire Local Landscape Area (LLA) – Uplands and Moorlands LLA (three turbines of the Western group of the Proposed Development located within) (previously named Afton Sensitive Landscape Character Area (SLCA);
- Galloway Hills Regional Scenic Area (RSA); and
- Thornhill Uplands RSA.

9.5.22 It is to be noted that LLAs in East Ayrshire have been renamed from SLCAs as part of the *East Ayrshire Local Landscape Area Boundary Review*, June 2021. This review provided an evidence base to inform landscape protection and supported the formulation and implementation of a policy framework within East Ayrshire's emerging Local Development Plan 2 (LDP2), which is programmed for adoption in Spring 2023. As such its recommendations have not been adopted at the time of writing this assessment. However,

a summary of the recommendations in relation to the Uplands and Moorlands LLA are included below and illustrated in **Figure 9.9**.

9.5.23 Most notably, the 2021 Review recommends the removal of an area of the Afton Valley LLA (re-named from 'SLCA') *"…to the west of the Upland Glen, Ayrshire LCT, which would form the new boundary".* Although this is due to "*The significant number of windfarms that are operational, under construction and consented along with the associated access tracks, overhead lines (OHLs), supporting infrastructure (e.g., substations, compounds) and on-going forestry operations,* [which] *have significantly diminished the sense of wildness and remoteness…"*, it is noted that wind farm development is still present within the remaining LLA boundary which includes the southern and eastern turbines of Afton Wind Farm and Hare Hill Wind Farm and its Extension. This reinforces the advice by NatureScot in their *Siting and Designing Wind Farms in the Landscape*, 2017 guidance. The presence of these wind farms is also acknowledged within the LLA Review document (Page 32) which states that "*LLA 2 contains some features of large-scale development i.e., wind farms but remains largely open and undeveloped...*".

9.5.24 Although the EAC Background Paper: Sensitive Landscape Areas (March 2015) is still available, the special qualities outlined in EAC's Background Paper (formerly outlined in Table 5 of the paper) have now been superseded by the 2021 Review. Therefore, only the special qualities listed in the 2021 Review are included in this assessment.

Wild Land Areas

9.5.25 Merrick Wild Land Area (WLA) is the closest WLA but is located, at its closest point, approximately 21.5km southwest of the Proposed Development. The assessment of effects on the WLA has been scoped out of the LVIA as set out in the scoping report.

9.6 Baseline of Visual Receptors

9.6.1 The visual assessment draws upon the ZTV, site visits and viewpoint analysis and assesses the potential visual effects on views and visual amenity likely to be experienced by receptors (people) within the landscape as follows:

- Views from residential properties and settlements;
- Views experienced whilst travelling through the landscape (road / rail users, walkers, horse riders and cyclists for example); and
- Views from tourist and recreational destinations.

9.6.2 The ZTV and viewpoint analysis indicate that significant visual effects are likely to be limited to locations within approximately 8.3km from the Proposed Development (subject to a clear view of the proposed turbines, landform and vegetation screening). Taking a precautionary approach, the visual assessment has been focused on those visual receptors within 10km of the Proposed Development in order to assess the likely significant visual effects. Within the wider 45km study area, the assessment has included receptors of national importance such as Scotland's Great Trails and Sustrans Cycle Routes.

Visual Receptors: Settlements and Residential Properties

9.6.3 The assessment of visual effects likely to be experienced from settlements includes consideration of residential areas, the public realm, and public open spaces within the

settlement boundaries that would be frequented by people. Settlements included in the assessment are those defined in the DGC and EAC LDPs.

9.6.4 There are no settlements within 10km of the Proposed Development.

9.6.5 Other settlements beyond 10km including Carsphairn, New Cumnock, Moniaive and Kirkconnel are all outwith the ZTV and would have No View of the Proposed Development.

9.6.6 A Residential Visual Amenity Assessment (RVAA) has been undertaken to assess the effects on residential visual amenity likely to arise as a result of the Proposed Development. Residential properties within 3km of the Proposed Development that are overlapped by the blade tip ZTV and shown on the Ordnance Survey 1:25,000 scale map have been considered in the assessment. The RVAA is reported in **Appendix 9C** and is illustrated in **Figures 9.21a-u**.

Visual Receptors: Transport Routes

9.6.7 Transport routes within 10km of the Proposed Development that are overlapped by the ZTV are listed as follows and are included in the assessment:

- B729 between Craigdarroch and east of Knowehead;
- Minor road from Smittons Bridge to Lorg Bridge (Class III road - C35s);
- Minor road from northwest of Penpont to Polskeoch (Unclassified road - U405N);
- Minor road from west of Moniaive to Benbuie (Unclassified road - U394N).
- Minor road from west of Brown Knowe to Appin Lodge (Unclassified road – U400N); and
- Glen Afton Road.

9.6.8 Within the wider 45km study area the A713 Galloway National Tourist Route partly overlaps by the ZTV and is included in the assessment.

9.6.9 There are no operational railway lines within 10km of the Proposed Development. Within the wider study area, there are three railway lines, namely the Glasgow to Stranraer line via Ayr, the Glasgow to Carlisle line via Lanark and Lockerbie and the Glasgow to Carlisle line via Kilmarnock and Dumfries. The Glasgow to Stranraer railway line via Ayr and the Glasgow to Carlisle line via Lanark and Lockerbie are outwith the ZTV. The remaining railway route (Glasgow to Carlisle line via Kilmarnock and Dumfries) has been included in the assessment.

Visual Receptors: Recreational Routes

9.6.10 The visual assessment has considered the potential visual effects likely to be experienced by people (walkers / cyclists / horse riders / and others) on recreational routes within the Study Area. The recreational routes within the LVIA Study Area are illustrated in **Figures 9.10-11**. The recreational routes include Core Paths, Heritage Paths, Scottish Hill Tracks and recorded Rights of Way which have been assessed within 10km of the Proposed Development and Sustrans Cycle routes and national level long distance routes such as Scotland's Great Trails, which are assessed within the wider 45km Study Area.

9.6.11 There are no known promoted horse-riding routes within 10km of the Proposed Development.

The Core Path Network within 10km

9.6.12 Core Path Plans were created in response to a requirement of the Land Reform (Scotland) Act 2003 to provide a statutory right of non-motorised access to most land and inland water. They aim to establish and designate a reasonable network of paths and waterways, with individual paths chosen because they meet at least one objective from a range of purposes, including linking communities, providing access to places of interest, and for recreation.

9.6.13 Core Paths (sourced from the DGC and EAC Core Paths Plans) within 10km (as illustrated in Figure 9.11) that are overlapped by the blade tip ZTV are listed as follows and included in the assessment:

- DGC Core Path No. 504 Southern Upland Way (overlaps with the Southern Upland Way and Scottish Hill Track 83);
- DGC Core Path No. 51 Benbuie to Troston Hill;
- DGC Core Path No. 188 Corlae;
- DGC Core Path No. 215 Lorg Trail which extends north into DGC Core Path No. 443 and overlaps with Heritage Path 1 and part of Claimed Pedestrian Right of Way DS15;
- DGC Core Path No. 446 Benbrack;
- DGC Core Path No. 52 Cairnhead to Blackmark Hill;
- DGC Core Path No. 216 Manquhill Hill; and
- EAC Core Path No. C10: Coalfield Cycle Route.

Scottish Hill Tracks and Heritage Paths within 10km

9.6.14 Scottish Hill Tracks within 10km included in the assessment are listed as follows:

- Scottish Hill Track 83: St John's Town of Dalry to Sanquhar (overlaps with the Southern Upland Way and DGC Core Path No. 504); and
- Scottish Hill Track 84: New Cumnock to St John's Town of Dalry by Glen Afton (overlaps with EAC Core Path No. C10 and Heritage Path 1).

9.6.15 Heritage Paths within 10km included in the assessment are listed as follows:

- Heritage Path 1: Old Road from New Cumnock to Dalquhairn (overlaps with Scottish Hill Track 84); and
- Heritage Path 2: Sanquhar to Stroanpatrick Path (overlaps with the Southern Upland Way and DGC Core Path Nos. 215 and 443).

Recorded Rights of Way (up to 5km – information provided by Scotways and DGC)

9.6.16 Recorded Rights of Way within 5km included in the assessment are listed as follows:

- DS14 – Claimed Pedestrian Right of Way;
- DS13 – Claimed Pedestrian Right of Way;
- DS15 – Claimed Pedestrian Right of Way (partly overlapping with the Lorg Trail DGC Core Path 215, Heritage Path 1, and Scottish Hill Track 83); and

- DN159 – Recorded as 'other pedestrian route' (overlapping with the SUW, DGC Core Path 504, and Heritage Path 83).

National Recreational Routes within 45km

9.6.17 National and other long-distance recreational routes within 45km of the Proposed Development that are overlapped by the blade tip ZTV are included in the assessment and listed as follows:

- Southern Upland Way (Scotland's Great Trails);
- Robert the Bruce Trail; and
- Burns Heritage Trail.

9.6.18 The remaining routes including River Ayr Way, Ayrshire Coastal Path, and all Sustrans Cycle Routes have very limited to no visibility of the Proposed Development over 25km distance and therefore excluded from the assessment on the basis that effects on these routes would not be significant.

Visual Receptors: Tourist Attractions and Recreational Receptors

9.6.19 There are no tourist attractions within 10km of the Proposed Development as identified by Historic Environment Scotland, The National Trust of Scotland and Visit Scotland.

9.6.20 There are a number of recreational receptor locations within the blade tip ZTV and within 10km, with potential visibility of the Proposed Development. These include the hill walking summits of:

- Cairnsmore of Carsphairn 797m Above Ordnance Datum [AOD] (Corbett);
- Blackcraig Hill 700m AOD (Graham); and
- Windy Standard 698m AOD (Graham).

Sculptures: Striding Arches

9.6.21 There are a series of sculptures known as the 'Striding Arches' created by the artist Andy Goldsworthy, which are situated on some of the hill summits within the Study Area. Although these art works can be visited, the local Dumfries and Galloway promotion website for the Striding Arches recommends that visitors take a map and a compass as way marked footpath access is not provided to all of the arch locations.

9.6.22 The Striding Arches are located at the following locations and hill summits:

- Benbrack;
- Colt Hill;
- Bail Hill; and
- Cairnhead, in the Dalwhat Valley.

9.6.23 This latter sculpture location is outwith the ZTV and has been excluded from the assessment.

9.6.24 Within the wider 10-45km Study Area, recreational and tourist destinations at a national or regional level, which are overlapped by the ZTV are included in the assessment as follows:

- Galloway Forest Park;
- Loch Doon;
- Craigengillan GDL;
- Dumfries House GDL;
- Sorn Castle Golf Club, Catrine; and
- Auchincruive GDL.

Predicted Future Baseline

9.6.25 The lifespan of the Proposed Development would cover a period of approximately 37 years (including construction, operation and decommissioning) and the assessment takes account of this dimension by considering the duration of the likely landscape, visual and cumulative effects. The approximate time periods associated with the Proposed Development, and whether they are long-term or short-term are listed as follows:

- Construction: up to 24 months (short-term);
- Operation: up to 35 years (long-term and reversible, with some elements such as access tracks remaining as permanent development); and
- Decommissioning: up to 6 months (short-term).

9.6.26 The assessment also recognises that some elements of the Proposed Development such as borrow pits and access tracks will be permanent and remain beyond the construction and decommissioning period, although subject to mitigation in respect of the borrow pits, whilst access tracks may re-vegetate over time if left un-used. The operation period of up to 35 years, although 'long-term' is assessed as though it were permanent, whilst noting that the effects of the proposed turbines would be reversible once decommissioned.

9.6.27 During this period, the predicted future baseline of landscape and visual receptors is unlikely to change significantly beyond that described in the current baseline, subject however to the maintenance of the existing environment including forestry management and the potential for new applications and consents.

9.6.28 Land management, and consequently landscape character, is however, dependent on continued favourable development management and economic conditions, which is not a matter for this assessment. It is however likely that mitigation and adaptation in response to changing climate and biodiversity pressures will continue to have an influence on this area in the form of increased renewable energy and other environmental changes which are likely to alter the landscape baseline as follows:

- Change resulting from an increased reliance on renewable energy, including wind farm development; and
- Change to current levels of forestry and woodland.

9.6.29 Change to the future baseline of other wind energy development, that can be reasonably predicted, within 10km of the Proposed Development is set out in **Table 9.8**. It may be noted that three of the four wind farms within 10km of the Proposed Development, which are most relevant to the CLVIA, would approximately cease operation by the middle of the operational period for the Proposed Development (according to their consented periods of operation).

Table 9.8 Operational Timescales of Existing and Consented Wind Energy Development within 10km

Wind Energy Development	Indicative period of 37 years (the construction, operation and decommissioning of the Proposed Development)							
Proposed Development	**Year of Commissioning / construction completed**	**2023-2027**	**2028-2032**	**2033-2037**	**2038-2042**	**2043-2047**	**2048-2052**	**2053-2057**
		0-5	**6-10**	**11-15**	**16-20**	**21-25**	**26-30**	**31-35**
Existing Wind Farms within 10km								
E01. Afton	2018	Operating for 25 years						
E02. Windy Standard	1996		Operating for 30 years (Live application for life extension)					
E03. Windy Rig	2021	Operating for 25 years						
E04. Windy Standard Extension	2017	Operating for 25 years						
E05. Whiteside Hill	2017	Operating for 25 years						
E06. Wether Hill	2007	Operating for 25 years						
E07. Hare Hill Extension	2016	Operating for 25 years						
E08. Sanquhar	2018	Operating for 25 years						
E09. South Kyle	2022	Operating for 25 years						
E10. Hare Hill	1999 / 2022	Operating for 25 years. Extension granted to align with operating period for Hare Hill Extension.						
E11. Sandy Knowe	2022	Operating for 28 years						
E12. High Park Farm	2014	Operating for 26 years (extended from original 20 years)						
E13. Twentyshilling Hill	2022	Operating for 25 years						

Wind Energy Development	**Indicative period of 37 years (the construction, operation and decommissioning of the Proposed Development)**	
Consented Wind Farms within 10km		
C01. Sanquhar Six	2016	Consented to operate for 25 years
C02. Cornharrow	2022	Consented to operate for 35 years
C03. Pencloe	2018	Consented to operate for 27 years
C04. Windy Standard Phase III	2021	Consented to operate for 35 years
C05. Enoch Hill	2019	Consented to operate for 30 years
C06. Torston Loch	2020	Consented to operate for 30 years
C07. Benbrack	2019	Consented to operate for 30 years

9.7 Mitigation Inherent in the Proposed Development

9.1.12 The design evolution for the Proposed Development is provided in **Chapter 4** and a project description including the associated infrastructure is detailed in **Chapter 3**.

9.1.13 As noted previously, the approximate time periods associated with the Proposed Development and accounted for in the assessment include 35 years of operation with additional periods of up to 24 months for construction and 6 months for decommissioning.

9.1.14 Landscape related aspects of the design and mitigation are described in this section. The layout of the Proposed Development and its various infrastructure components are shown in **Figure 3.1**.

Landscape Design Statement

9.7.1 The inherent nature of wind turbines as tall, modern structures means that the form of the wind farm as a whole is important. The appearance of the wind farm as an object or composition in the landscape has been a key factor in generating the layout. In this respect the design evolution has taken account of the following guidance:

- SNH *Guidance on Siting and Designing Windfarms*, Version 3a, 2017, which aims to achieve a simple, rational and cohesive design that, to a reasonable degree, avoids overlapping turbines and gaps within the visual composition; and
- Landscape constraints, opportunities and guidance for wind farm development within the Southern Uplands with Forest and Southern Uplands LCTs, described by the DGWLCS and the Southern Uplands LCT, described by the EALWCS, the relevant policies of the DGC and EAC LDPs and Supplementary Guidance.

9.7.2 The Proposed Development has been designed to balance technical and project requirements with a need to safeguard the environment and satisfactorily accommodate the Proposed Development within its landscape setting. The design evolution has aimed to reduce landscape, visual and cumulative effects and to respect the landscape characteristics identified in the in the DGWLCS and EALWCS.

9.7.3 The design and appearance of the new Lorg Bridge water crossing would be agreed with DGC prior to construction to ensure that the local landscape character of the Lorg Glen (Narrow Wooded River Valley LCT) is preserved. This measure should be implemented via a planning condition.

Landscape Design Objectives

9.7.4 Drawing from the advice of the DGWLCS and EALWCS, design objectives of the Consented Development and site survey, the following design objectives have been incorporated into the design of the Proposed Development:

- Lorg Wind Farm Design Objectives:
  - Achieve a simple, rational, and cohesive design from the majority of the viewpoints (in particular those along the Water of Ken valley, Polskeoch and Glen Afton), minimising stacking / overlapping turbines, gaps and outlying turbines;
  - Turbine locations should avoid the immediate 'front' facing hill slopes of the Narrow Wooded Valley (4) and Upland Glen (14). The hill tops which are set back from the valley and the visually less sensitive interior hills would be preferable in order to maintain a sense of separation between the lower lying areas and the more elevated Southern Uplands / Southern Uplands with Forest which are most capable of accommodating wind farm development. As a consequence, a turbine 'exclusion area' was applied to the interior part of the Development Site, ensuring that turbines would not be positioned on the 'front' valley facing hill slopes and hill summits where turbines would otherwise appear to 'overlook' the valley. This constraint also had the benefit of minimising potential visual effects on the views from the closest receptors, including residential properties located within the Water of Ken valley;
  - Limit visual effects on views from the Cairnsmore of Carsphairn and Blackcraig Hill summits, the Southern Upland Way (SUW) and the Striding Arches; and
  - Within the lower areas of the Development Site, maintain the 'valley' landscape character by siting ground based infrastructure in the least visible locations when viewed from the valley floor, walkers on the SUW and sensitive residential receptors.

- Cumulative Design Objectives:
  - The Proposed Development seeks a turbine height of up to 200m which compares with the 'apparent' turbine height shown in the wireframes for other existing and in particular, consented nearby schemes such as Wind Standard Phase III (up to 177.5m) and Cornharrow (180m) and application schemes at Euchanhead (230m) and Sanquhar II (up to 200m); and
  - Limit cumulative landscape and visual effects, including sequential cumulative effects from the SUW and Glen Afton.

9.7.5 Drawing on the constraints of the DGWLCS and EALWCS previously noted, and the SNH guidance (*Siting and Designing Windfarms in the Landscape)* as part of the design process, the design of the Proposed Development has had regard to that guidance as follows:

- Achieves two simple and cohesive turbine groups, with turbines 'pushed back'; away from the front facing hill slopes of the valley landscape surrounding the Water of Ken and Glen Afton to ensure that turbines do not dominate the narrow valley landscape;
- The Proposed Development (Western and Eastern groups) would appear as a clearly recognisable scheme that 'fits' with the simplicity of the local landscape character, such that the aesthetics and visual composition of the turbines (appearing as a simple and reasonably balanced composition) can be appreciated in their own right where visible;
- Ensures that the scale of the Proposed Development is proportionate to the expansive scale of the underlying landscape and perceptually in terms of being viewed from the Narrow Wooded Valley and Glen Afton LCTs.
- Responds to the existing and consented windfarms located within the Southern Uplands with Forest and Southern Uplands LCTs;
- Ensures that associated infrastructure (access roads, tracks and buildings) are designed so as to limit their visibility, whilst maintaining the appearance of a simple landscape setting; and
- Limits, and where possible mitigates, significant adverse landscape and visual effects through the design process.

9.7.6 The design of the Proposed Development has taken account of possible cumulative scenarios as part of the turbine composition from a number of the assessment viewpoints, ensuring as far as possible visual compatibility in terms of turbine layout and scale. Cumulatively, the SNH guidance (*Siting and Design Wind Farms in the Landscape*, Version 3a) provides wind farm design guidance under a number of topics, each of which is considered, where relevant, as follows.

Relating to Landscape Character

9.7.7 SNH notes that, "*if windfarms already exist within a particular character type, further windfarm development should be limited to the same or similar types within the neighbouring area*". A key aim of the design has been to have regard that the relationship of the Proposed Development to the underlying landscape character is similar to other existing and consented wind farms.

Relationship between wind farms

9.7.8 The design of the Proposed Development has been mindful of the existing and consented development as well as other applications close to the Development Site, ensuring that the turbine composition of the Proposed Development would appear visually compatible with these wind farms.

Complementing landform

9.7.9 Through the design process the proposed turbine locations have been 'pushed back' away from the more sensitive Narrow Wooded Valley and Glen Afton LCTs, within an extensive and large scale landscape with an open and simple landscape pattern. As noted above, the Proposed Development would not adversely affect the general visibility and prominence of hills such Cairnsmore of Carsphairn, and Blackcraig Hill.

Focal point, pattern and scale

9.7.10 The main 'focal points' are the Cairnsmore of Carsphairn and other 'landmark hills' such as Blackcraig Hill and the views towards these features from the surrounding landscape would not be adversely affected by the Proposed Development.

Settlements

9.7.11 The SNH guidance advises that care should be taken to ensure that multiple wind farms do not dominate the landscape setting of settlements. There is no settlement within the host landscape or within 10km of the Proposed Development, so this is not a design concern in this case.

Inherent Mitigation

Construction Mitigation

9.7.12 The development of the wind farm would draw upon the guidance set out in SNH guidance '*Good Practice during Wind farm Construction*'[3] . The key measures that would be implemented as part of the post-consent Construction Method Statement (CMS) and the supporting Construction Environmental Management Plan (CEMP), in order to avoid or reduce potential construction effects, include:

- The selective and sensitive location of temporary storage areas for materials, plant, and security fencing;
- Using designated routes around the Site for construction vehicles and operation of construction plant such as cranes. Avoiding the creation of any wheel ruts and subsequent clear up of these;
- Implementation and monitoring of site management procedures, such as regular litter sweeps of the immediate environs to ensure the removal of all litter arising from the construction activities; and
- Removal, reinstatement, and clear up of the construction compounds and any related construction arisings.

New Site Access and Internal Access Tracks

9.7.13 A total of approximately 18.1km of new wind farm access tracks would be constructed, with approximately 4.8km being located in East Ayrshire and approximately 13.3km being located in Dumfries and Galloway. Temporary passing places would also be provided every 500m (as required). The tracks would feature local widening on corners and would be surfaced with coarse aggregate (see **Figure 3.5** for typical track cross sections).

9.7.14 Sections of the wind farm access tracks would be most visible from viewpoints 1-7 and 9 within 10km and are illustrated in **Figure 9.22 – 9.28 and 9.30**. From other viewpoints, due to intervening landform and vegetation, they would not be visible. These low levels of visibility of the Site infrastructure confirm minimal landscape and visual effects on the surrounding receptors.

9.7.15 On completion of the Development Site construction, the Development Site entrance and access tracks would be cleared of any construction signage and left in a tidy and co-

[3] Good Practice during Windfarm Construction, A joint publication by Scottish Renewables, Scottish Natural Heritage, Scottish Environment Protection Agency, and the Forestry Commission Scotland; Version 1, October 2010.

ordinated condition with verges restored and field boundary fencing neatly tied into new gates / access details.

Temporary Construction Compound

9.7.16 During the construction period, two temporary construction compounds (50m x 50m) including concrete batching plant (100m x 50m) would be required as shown on **Figure 3.7**. The locations have been selected partly because it has low landscape sensitivity and would be limited in visibility from surrounding receptors due to intervening forestry and landform. The construction compound associated with the Eastern group of the Proposed Development would be most visible from the C35s minor road near Lorg Bridge.

9.7.17 The areas would be prepared by stripping soil, laying down a geotextile material and then a working surface of stone. The stripped soil would be stored adjacent to the compound for subsequent use in reinstatement works at the end of the construction period. The site compound and laydown area would be fully re-instated with stored turfs or excavated soil and / or re-seeded to match the local contours and the existing vegetation.

Borrow Pits

9.7.18 Up to two borrow pit locations have been identified, as described in **Chapter 3** and shown as borrow pit search areas in **Figure 3.1**. It is anticipated that further detail regarding the location and specifications of any on-site borrow pits will be provided post-consent, following completion of detailed ground investigation and technical studies. The borrow pit search area locations have a low landscape sensitivity and limited visibility from the surrounding area.

9.7.19 Upon completion, the borrow pit would be restored and a detailed reinstatement programme developed, drawing upon the advice of a landscape architect and implemented in agreement with DGC, EAC, SEPA and NS. This will ensure that proposed reinstatement materials and techniques are suitable and may identify appropriate environmental enhancement opportunities. It is anticipated that steep faces would be backfilled and/ or re-profiled to match the surrounding topography, and disturbed surfaces would be covered with soil and re-seeded / re-turfed or left as exposed rock outcrops.

9.7.20 During the construction phases, the assessed levels of effect will tend to increase from zero, at the start of construction and progressively increase to a maximum level of effect, equal to that occurring during operation, upon completion of the construction period. The construction effects, although temporary, are likely to involve greater movement of machinery and visibility of contrasting construction activity, background noise and associated lighting. The nature of these effects would be temporary, indirect, and negative. Some construction activities may be remote from the Development Site (access works) and / or temporary (temporary construction compound) and subject to restoration on completion of the construction period.

Wind Turbines and Transformers

9.7.21 The proposed turbines would have a maximum turbine height of up to 200m to blade tip (based on a hub height of 119m and a rotor diameter of 162m). The turbines would be three bladed variable speed, pitch regulated wind turbines with the rotor and nacelle mounted on a cylindrical tower as described in **Chapter 3**.

9.7.22 The viewpoint analysis indicates that the turbines would frequently be viewed against the sky. For these reasons it is proposed that the standard turbine colour of pale grey would be most appropriate. The turbines would be uniform in colour (no company logos or advertising), with a semi-matt finish to reduce their contrast with the background sky and

landscape and minimise their reflectivity. This measure would ensure a reasonable degree of parity between the proposed turbines and other existing, nearby turbines.

9.7.23 The proposed turbines would all rotate in the same direction and at a slow and predictable speed of approximately 6 to 18 revolutions per minute according to wind speed.

9.7.24 Once the wind turbines are erected, the area of hardstanding required for cranes would be re-turfed and / or covered in previously excavated topsoil material and left to revegetate or re-seeded according to the CMP / CEMP. A small area, approximately 10m by 10m, within the hardstanding would be retained for turning of operational vehicles.

9.7.25 Subject to turbine selection, the transformers would be housed internally within the turbine towers, which reduces clutter and creates a simpler site image.

9.7.26 In the event that external transformers are required these would be located in small kiosks (approximately 4m x 4m x 3m) which would each be colour-coordinated with the substation building to have a low contrast with the surrounding landscape and best match the existing uplands colours.

Turbine Lighting

9.7.27 The requirements for turbine lighting are dictated by the Civil Aviation Authority (CAA) and Ministry of Defence (MOD) to ensure aviation safety in accordance with Article 222 of the Air Navigation Order 2016.

9.7.28 It is a requirement of the CAA that all turbines of 150m or greater in height to blade tip should be lit at the highest point on the nacelle or hub, and on three sides of the tower at half the hub height. A lighting strategy has been developed for the Proposed Development and is summarised in **Chapter 17: Aviation**. An assessment of the night-time effects of turbine lighting is provided in **Appendix 9D**.

Substation / Switchgear Housing Building

9.7.29 The main substation (Substation A) and control building would have very low visibility from the surrounding areas due to the surrounding landform and further screening provided by forestry. It is likely that only walkers on a small section of the Southern Upland Way near Colt Hill (Viewpoint 1) would see the Substation A and control building. There would be an additional control building/Substation B located in the eastern part of the Development Site. The substations are illustrated in **Figures 3.3 and 3.4** and would be a single storey structures with car parking. There colour would be selected to have a low contrast with the surrounding uplands and would be enclosed by a 2.4m high perimeter fence with a low visibility style and colour.

Electrical Cables and Grid Connection

9.7.30 All on-site electrical cables linking the turbines, substation and route to grid connection would be underground and buried within a trench alongside the internal access tracks.

9.7.31 The grid connection point would be determined by the local Distribution Network Operator (SPEN) and would be subject to a separate application.

Permanent Anemometry Masts

9.7.32 Two ‘permanent’ free standing anemometry masts, up to 100m high would be sited as shown on **Figure 3.1**. The design of this structure would be of a steel lattice type (an example of a steel lattice type design is shown in **Figure 3.8**), which would have an

adjacent crane pad of a similar type to the turbines with dimensions 20m x 20m, and which would be left in situ for the operational period. The met masts would be most visible from elevated viewpoints as illustrated on the visualisations within 10km.

Operational Mitigation

9.7.33 The operation of the Proposed Development would cover a period of 35 years and include site management to ensure the adequate maintenance of site facilities and landscape features, such as access tracks, field boundaries, gates, and signage.

9.7.34 The assessed levels of effects are likely to be at their greatest during the period of operation. However, the appearance of the Site would also recover a 'calmer' visual character with negligible levels of maintenance activity visible on the Site.

Decommissioning

9.7.35 The Proposed Development would be decommissioned at the end of its operational period which is expected to take approximately 6 months. All visible, above ground structures (turbines, met masts and substation) would be removed upon decommissioning, thereby rendering the vast majority of the landscape and visual effects as reversible. The Site entrance and internal access tracks would remain as permanent features and would gradually re-vegetate in accordance with the level of use and or maintenance by the landowner.

9.7.36 The assessed levels of effect during decommissioning would tend to decrease from operational levels to non-significant levels or Zero as the Proposed Development is dismantled. As with the construction period, although temporary, these works are likely to involve movement of machinery and visibility of contrasting construction activity, background noise and associated lighting.

9.8 Residual Landscape Effects

9.8.1 Landscape Effects are defined by the Landscape Institute in GLVIA 3, paragraphs 5.1 and 5.2 as follows.

"An assessment of landscape effects deals with the effects of change and development on landscape as a resource. The concern ... is with how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character. ... The area of landscape that should be covered in assessing landscape effects should include the site itself and the full extent of the wider landscape around it which the proposed Development may influence in a significant manner."

9.8.2 These effects are assessed by considering the landscape sensitivity (value and susceptibility) against the magnitude of change. The assessment takes account of the cumulative landscape effects, 'in addition' to, and 'in combination' with, other existing and consented wind energy development and current wind farm applications, as set out in **Table 9.4**; and the periods of remaining operation of existing and consented wind energy development as set out in **Table 9.8**. The type of effect may also be described as temporary or permanent, direct or indirect, cumulative, and positive, neutral, or negative.

9.8.3 The residual landscape effects assessed here are those effects remaining after all of the embedded design mitigation and enhancement measures have been taken into account.

Effects on Landscape Character: Southern Uplands with Forest (Dumfries and Galloway)

9.8.4 The landscape character within 10km is illustrated in **Figure 9.8**.

9.8.5 The 'host' landscape for the Proposed Development (Eastern group and T14 of Western Group) is an extensive area of *Southern Uplands with Forest* LCT within the north-eastern part of Dumfries and Galloway. The area of landscape within which the Proposed Development is located is locally identified as the *Southern Uplands with Forest LCT: Ken* unit - a large predominantly upland area of grassland, moorland and forestry intercut by valleys.

9.8.6 This landscape is bounded to the west and northeast by the open, un-forested and expansive *Southern Uplands LCT* (assessed separately). These LCTs extend the expansive upland nature of the host LCT and form an extensive upland landscape. To the south and southeast, the *Southern Uplands with Forest LCT: Ken* unit is bordered by foothills and valleys. The *Narrow Wooded Valley* LCT penetrates into the *Southern Uplands with Forest LCT: Ken* unit, following the Water of Ken along the Lorg Glen to the southwest of the LCT.

9.8.7 The landscape character of the *Southern Uplands with Forest LCT* is described within the DGWLCS as follows:

"The Southern Uplands with Forest (19a) generally comprises an expansive, gently undulating upland plateau of smoothly rounded hills which extends into neighbouring Scottish Borders in the Craik Forest area and into East Ayrshire north of the Carsphairn unit. Occasional more well-defined hills occur close to the Moffat, Dalwhat and Upper Water of Ken Glens, mostly on the outer edges of this character type. These are more prominent in views from surrounding roads and settlement than the very sparsely settled interior of these uplands. The Ken unit is more intercut by valleys and features a number of smaller scale local landscapes and dramatic corries at the heads of glens. Extensive coniferous forest cover masks landform and there is often little open ground with this largely confined to grass moorland within valleys and on the higher hill tops and ridges. An exception to this is the Ken unit which has a greater proportion of open ground to forest cover. Wind farm development is a key feature within the West Langholm, Carsphairn and Ken units of this landscape character type."

9.8.8 The Development Site is bounded to the east by coniferous forestry. The partial 'containment' of the Development Site area by landform and topography has contributed to the limited ZTV coverage of the area as illustrated in **Figure 9.2**.

Landscape Sensitivity of the Development Site and the Southern Uplands with Forest LCT

9.8.9 The landscape assessment has been undertaken in accordance with GLVIA 3 and the methodology and glossary set out in **Appendix 9A**. The glossary defines the terms landscape sensitivity and capacity as follows:

- *"Landscape Sensitivity: The sensitivity of the landscape to a particular development considers the susceptibility of the landscape and its value; and*
- *Landscape Capacity: The ability of a landscape to accommodate different amounts of change or development of a specific type. Capacity reflects the landscape's sensitivity to the type of change, and the value attached to the landscape, and is therefore dependent on judgements about the desirability of retaining landscape characteristics and the acceptability of their loss."*

9.8.10 It should be noted that this is slightly different to the definition of landscape sensitivity and capacity used in the DGWLCS, which is a strategic study, applied to the *Southern Uplands with Forest* as a whole. In short, the DGWLCS is a non-statutory, strategic assessment and the judgements on sensitivity represent an average across whole LCTs, within which considerable variation can occur. For example, the landscape sensitivity assessment for the Southern Uplands with Forests (19a) LCT includes 4 separate landscape character units (Carsphairn, Ken, Eskdalemuir and West Langholm) and the DGWLCS advises "*caution*" in its interpretation, noting that "*Strategic guidance within the DGWLCS does not replace the need for individual landscape and visual impact assessments and/or Environmental Assessments for individual wind energy developments."*

9.8.11 In comparison, the LVIA is a specific assessment of the effects of this Proposed Development upon the Development Site and the *Southern Uplands with Forest LCT: Ken* unit. This assessment includes reference to all of the Landscape Sensitivity Criteria considered as part of the DGWLCS as well as the revised cumulative baseline and the landscape quality and value, in order to assess the landscape susceptibility, value and subsequent sensitivity to the Proposed Development in accordance with GLVIA 3 (paragraph 5.39).

Landscape Susceptibility

9.1.15 Landscape susceptibility according to GLVIA 3 means "*the ability of the landscape to accommodate the development without undue consequences for maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies*". Common indicators of landscape susceptibility[4] to wind farm development are considered in **Table 9.9**, drawing from the broad scale advice from the DGWLCS.

9.1.16 As a result, an assessment of Medium to Low susceptibility is applied to the *Southern Uplands with Forests LCT Ken* unit and the Development Site.

Table 9.9 DGWLCS 2020 - Landscape Sensitivity Comparison

Topics (extracted from DGWLCS)	**DGWLCS Assessment (150m+)** (extracted from DGWLCS)	**Considerations for landscape susceptibility / value in relation to the Development Site**
Southern Uplands with Forests LCT: *Ken* unit		
Scale and openness *The Southern Uplands with Forests generally forms an expansive undulating upland plateau generally between 350-500m high although a few individual peaks exceed this height. The … Ken unit[s] abut[s] similar large scale upland areas (some of these extending into neighbouring authorities) increasing the extensiveness of the landscape. Smaller hills occur on the western and southern edges of this landscape. Scale is*	*Very tall turbines, and particularly those closer to 200m tall, would dominate the height of the smaller hills found on the outer edges of this landscape and also the hills which abut valleys where effects on scale would be appreciated from roads and settlement. The interior upland plateau of more extensive units of the Southern Uplands with Forests would be less sensitive.* *DGWLCS Sensitivity rating: Medium*	The Proposed Development is located within a large scale central upland area, part of the 'extensive plateau' with reduced sensitivity to wind farm development. Susceptibility to change from the introduction of large scale elements in the landscape is considered to be *Medium-Low.*

[4] Scottish Natural Heritage, A Guide to Commissioning a Landscape Capacity Study, 2015.

Topics (extracted from DGWLCS)	**DGWLCS Assessment (150m+)** (extracted from DGWLCS)	**Considerations for landscape susceptibility / value in relation to the Development Site**
significantly reduced within the narrow valleys which cut deeply into these uplands with the Ken Unit being intercut by a number of smaller valleys		
Land cover and landmark features *Extensive commercial forestry covers much of this landscape and this generally has a poor relationship with landform. There is more open ground on hill tops and within steep-sided valleys in the Ken unit. Rides, forest roads, compartment and ownership boundaries create a stark angular pattern highlighted by the strong contrast between pale grass moorland and dark conifers. Felling coupes and new planting add transitional textural contrasts across this landscape. There are few landmark features apart from the well-defined hills described above with Stroanfreggan and Round Craigs notable exceptions on the west of the Ken unit Some small areas of hill pasture fringe the lower hill slopes and a few higher hill tops are open.*	*The uniformity of extensive forest cover reduces sensitivity to wind farm development. Large scale development could introduce further pattern and confusion to this landscape although it could also present opportunities to utilise existing roads and ameliorate the poor design of forestry. Open hill tops would be highly sensitive to this typology due to their rarity and the contrast they provide to densely forested areas.* *DGWLCS Sensitivity rating: Medium-Low*	The Proposed Development is located in a moorland area that is not forested, but its character is still influenced by plantation forestry and surrounded by forestry to the north, east and south / southwest. In this respect the site area is not a, small 'open hill top' that emerges directly from the forestry. The proposed turbines relate well to the open moorland setting, a common feature in the wider landscape. Susceptibility to change is considered to be *Low*.
Settlement and archaeology *There is little settlement within this character type but there is a range of archaeological sites often sited on the outer fringes of these uplands at the transition with valleys, including hillforts and settlements with extended views.*	*There is some scope for this typology to be accommodated in the core of the more extensive Carsphairn, Ken and Eskdalemuir units while minimising effects on the scale and setting of settlements and archaeological sites.* *DGWLCS Sensitivity rating: Medium*	The Proposed Development is located in an area with little settlement. Susceptibility to change is generally considered to be *Low*.
Landscape context *These uplands tend to be set back from more sensitive small-scale valleys and glens although some hills on the edge of the Southern Uplands with Forests*	*While development sited in the more sensitive outer hills would dominate the scale of adjacent settled valleys and glens, there is some scope for this typology to be sited within the interior of*	The Proposed Development is located towards the centre of the Ken unit but would be visible from a small number of areas within surrounding valleys. The Proposed Development is not visible from

Topics (extracted from DGWLCS)	**DGWLCS Assessment (150m+)** (extracted from DGWLCS)	**Considerations for landscape susceptibility / value in relation to the Development Site**
are visible from the adjoining … Narrow Wooded River Valleys (4) of the Ken and Eskdale where they form a backdrop and contrast to these sparsely settled farmed valleys. The dramatic sculptural hill of Cairnsmore of Carsphairn within the Southern Uplands (19) lies between the Ken and Carsphairn units. Loch Doon, a popular location for recreation, is located in East Ayrshire but close to the Ken and Carsphairn units.	*the extensive Eskdalemuir unit (and which does not accommodate wind farm development) to avoid impacting on the wider landscape context. This typology would impact on the setting and key views of Cairnsmore of Carsphairn and Loch Doon if sited in parts of the Ken and Carsphairn units.* *DGWLCS Sensitivity rating: High-Medium*	Loch Doon and is remote from Cairnsmore of Carsphairn and would not adversely affect its setting. Susceptibility to change is generally considered to be *Medium-Low*.
Perceptual qualities *While the interior of these landscapes can feel remote due to the distance from settlement and public roads, the presence of extensive commercially managed forestry and wind farms in some units precludes a strong sense of naturalness.*	*This typology would be likely to have no significant adverse effect on perceptual qualities.* *DGWLCS Sensitivity rating: Low*	Susceptibility to change is considered to be *Low*.
Views and visibility *This character type is very sparsely settled and there are few public roads although there is a network of core paths, promoted heritage trails and the SUW is aligned through the Ken unit. Views from within this character type are generally restricted by extensive forestry. In terms of views to this character type, these gently undulating upland plateaux are set back from sparsely settled upland valleys and glens with views generally restricted. There are sensitivities associated with the arc of hills Benbrack, Alhang, Cairn and Blackcraig within the Ken unit which form a key focus at the head of the upper Dalwhat, Ken and Kello Water valleys.* *The SUW is aligned along the ridge of these hills as are the landmark sculptures of Striding Arches. The Ken and Carsphairn units are visible from*	*There is scope for this typology to be located within the interior of the extensive Eskdalemuir unit of this character type without widespread significant visual impact occurring due to the sparse population, absence of roads and limited visibility from more settled areas. The hills bordering glens or valleys are highly sensitive however. This typology would be visible from elevated views on popular hill summits including Cairnsmore of Carsphairn and the Rhinns of Kells if located in the Ken and Carsphairn units as well as sensitive local landscapes and recreational receptors in the Ken unit. Turbines towards 200m high could also have a significant impact on views from Loch Doon if sited in parts of these units. Turbines sited in the*	The Proposed Development would be visible from surrounding features including the summit of Cairnsmore of Carsphairn, SUW and the Striding Arches on Benbrack. Colt and Bail hills. Susceptibility to change at this broad level is considered to be *Medium*.

Topics (extracted from DGWLCS)	**DGWLCS Assessment (150m+)** (extracted from DGWLCS)	**Considerations for landscape susceptibility / value in relation to the Development Site**
the summit and ridges of Cairnsmore of Carsphairn and Rhinns of Kells ….	*Eskdalemuir unit could potentially be screened from the Moffat Hills by the ridge extending from Loch Fell on the northeast boundary of the unit and if located on lower ground. Visual sensitivity of the West Langholm unit is increased due to its relatively limited extent and proximity to settlement, roads and footpaths.* *DGWLCS Sensitivity rating: High-Medium*	
Landscape values *This character type is largely free of landscape designations. The Galloway Hills RSA extends slightly over the western boundary of the Ken and Carsphairn units. Technical Paper 6 notes that these areas have been included in the RSA as they form part of the visual envelope of the Glenkens and the wider setting to the main Rhinns of Kells ridge. The 'dramatic sculptural forms of Cairnsmore of Carsphairn and associated peaks as they relate to Glenkens and its main attractive tributary valleys plus areas forming part of the setting to the Merrick, Loch Doon and the Glenkens' are also noted in the RSA description. ….*	*There is some scope to locate wind farm development in the eastern part of the Ken unit to avoid significant intrusion on the Glenkens, and impacts on the setting of Cairnsmore of Carsphairn, the main Rhinns of Kells ridge, the Merrick and Loch Doon and therefore minimise effects on the special qualities of the Galloway Hills RSA. Operational and consented wind energy development already influences these areas. Turbines sited on the open hills to the East of the West Langholm unit would have a significant effect on the key qualities of the Langholm Hills RSA This would be exacerbated by potential design incompatibility with the operational Carlesgill wind turbines, located on sensitive ridgelines within this designated area. Sensitivity is increased in the Ken unit in respect of recreational value.* *DGWLCS Sensitivity rating: Medium-Low*	A small part of the Proposed Development is located within the Uplands and Moorlands LLA in East Ayrshire, however, the site is undesignated within Dumfries and Galloway. It is noted that the SUW is located close to the Proposed Development, indicating increased sensitivity in this area. However, the Development Site is undesignated which is a factor in reducing its sensitivity. The overall value of the site is considered to be *Medium.*

Landscape Value

9.8.12 The DGWLCS advises that the landscape value of the *Southern Uplands with Forests LCT,* is Medium to Low due to the lack of a designation, as indicated in **Table 9.9**, concluding that '*Sensitivity is increased in the Ken unit in respect of recreational value'*. It

is noted that the SUW is located close to the proposed turbine locations, indicating higher (Medium) sensitivity in this area.

9.8.13 As a result, an assessment of Medium value is applied to the Development Site.

Overall Sensitivity

9.8.14 The overall sensitivity to change considering all of the factors within the DGWLCS and the assessment of Medium to Low susceptibility and Medium value is considered to be *Medium*.

Southern Uplands with Forest: Magnitude and Level of Effect During Construction

9.8.15 The construction phase would result in localised direct landscape effects on the Development Site and its component landscape elements. None of these are highly sensitive (moorland of Low sensitivity) and although the construction works would affect localised areas, ranging from Zero to High magnitude of change, towards the completion of the Proposed Development, the likely effects on the fabric and constituent elements of the landscape would range from Moderate to Negligible and Not Significant.

9.8.16 In terms of the likely effects on landscape character, the magnitude of change would range from Zero to High during the construction phase; primarily as a result of the proposed turbines. Overall, the landscape effects on the *Southern Uplands with Forest: Ken unit* would range from None, increasing to **Major / Moderate** and Significant upon completion, due to the height and scale of the proposed turbines. The geographical extent of the significant effects would be limited to areas within the Development Site itself extending out to approximately 2-3km across a wider area of the *Southern Uplands with Forest: Ken unit*, subject to the screening effects of intervening forestry and landform. Because of the localised nature of this effect and the intervening forestry, the wider *Southern Uplands with Forest: Ken unit* would not be significantly affected overall.

9.8.17 The duration of these effects would be short-term according to the construction period but leading on to long-term (reversible) effects for those components of the development that would be retained through the operational period of up to 35 years (turbines, anemometer mast and on-site access tracks). The on-site access tracks would remain in the landscape as permanent development.

9.8.18 The nature of these effects would be temporary or long-term (reversible), (permanent for the on-site access tracks) direct, and negative, due largely to the nature of construction activity across the Development Site during this period.

Southern Uplands with Forest: Magnitude and Level of Effect: During Operation

9.8.19 During operation, the completed wind farm would gain a more 'settled' appearance when compared to the same area during the construction period, although Significant landscape effects would continue throughout the operational period.

9.8.20 The proposed turbines would be contained to the east and south by coniferous forestry, with further forestry to the north, beyond the Polskeoch Burn. Beyond the immediate area of the proposed turbines, the ZTV pattern is fragmented as a result of the steeply undulating topography to the south and east beyond Coranhae Hill, Cairn Hill, Black Hill, Colt Hill, and High Countam; and to the west by Altry Hill and the steeply sloping valley sides of the Water of Ken Valley. The magnitude of change within this localised area (within 2-3km of the proposed turbines, subject to the screening effects of forestry) would be High leading to a **Major / Moderate** and Significant effect on a relatively small and geographically contained area.

9.8.21 This level of effect, and geographical extent, is not unusual for large-scale wind farm development, and it may be noted that the landscape sensitivity of this area is Medium.

9.8.22 The duration of these effects would be long-term (through the operational period of 35 years) and reversible as a result of the decommissioning (with the exception of on-site access tracks). The nature of these effects would also be direct, cumulative and negative.

9.8.23 Considering the *Southern Uplands with Forest LCT* as a whole, the effects would be Not Significant in overall terms due the large scale of this landscape unit and presence of other existing wind farm developments. The existing wind farms, notably Whiteside Hill, Sanquhar, Wether Hill, and Windy Standard and Extension, Windy Rig, Afton and South Kyle have altered the existing landscape character such that the Proposed Development would appear as part of the wider landscape of forestry and wind farms.

Southern Uplands with Forest: Cumulative Landscape Effects on Existing + Consented Sites

9.8.24 There are three existing and two consented wind farms within or partially within the *Southern Uplands with Forest LCT: Ken* unit and several others located close by that have a notable characterising influence on this unit as follows:

- Existing Wind Farms:
  - Wether Hill Wind Farm: 14 turbines located within the *Southern Uplands with Forest LCT: Ken Unit*;
  - Whiteside Hill Wind Farm: 10 turbines located in the *Southern Uplands LCT*;
  - Afton Wind Farm: 27 turbines spanning both the *Southern Uplands LCT* and *Upland Glen LCT*;
  - Sanquhar Wind Farm: nine turbines, three of which are located within the *Southern Uplands with Forest LCT; Ken Unit*, the remainder of which are located within the *Southern Uplands LCT*;
  - Windy Standard Wind Farm: 36 turbines, 26 of which are located within the *Southern Uplands with Forest LCT*;
  - Windy Standard Extension Wind Farm: 30 turbines, 22 of which are located within the *Southern Uplands with Forest LCT*;
  - Hare Hill Wind Farm: 20 turbines, three of which are located within the *Southern Uplands with Forest LCT; Ken Unit*, the remainder of which are within the *East Ayrshire Southern Uplands LCT*;
  - Windy Rig Wind Farm: 12 turbines located in the *Southern Uplands LCT*;
  - Twentyshilling Hill Wind Farm: nine turbines located within the *Southern Uplands LCT;*
  - South Kyle Wind Farm: 50 turbines located within the *Southern Uplands with Forest LCT*; and
  - Sandy Knowe Wind Farm: 24 turbines, nine of which are located within the *Southern Uplands with Forest LCT; Ken Unit*, the remainder of which are within the *Upper Dale LCT*.
- Consented Wind Farms:

- Sanquhar Six Wind Farm: six turbines, all of which are located within the *Southern Uplands with Forest; Ken Unit*;
- Cornharrow: Eight turbines located within the *Southern Uplands with Forest LCT: Ken Unit*;
- Pencloe Wind Farm: 19 turbines located within the *Southern Uplands with Forest LCT*;
- Windy Standard Phase III Wind Farm: 20 turbines located within the *Southern Uplands with Forest LCT*;
- Benbrack Wind Farm: 18 turbines located within the *Southern Uplands with Forest LCT*; and
- Enoch Hill: 16 turbines, six of which are located within the *Southern Uplands with Forest* LCT; Ken Unit, the remainder of which are within the *Southern Uplands LCT*.

9.8.25 Collectively, the existing wind farms form two dispersed groups of wind farm development towards the south, centre and north of this LCT and contribute to a 'landscape with wind farms' as described by SNH as:

"*The wind farms are seen as a key characteristic of the landscape, but not of sufficient dominance to be a defining characteristic of the area*".

9.8.26 The cumulative magnitude of change to the landscape character caused by the additional effect of the Proposed Development would be reduced to Medium, resulting in a **Moderate** and Significant effect. The nature of these effects would be cumulative, long-term (reversible), direct and negative, given the characterising influence of existing and consented development on this area.

9.8.27 The combined cumulative effect of the existing and consented schemes and the Proposed Development on the *Southern Uplands with Forest LCT: Ken* unit would be **Major / Moderate** and Significant as a result of all of the large-scale wind farm development in this area, extending to within approximately 2km of the existing and consented wind farms and overlapping with the landscape effects of the proposed turbines. With the exception of Sandy Knowe, Cornharrow, Benbrack, Windy Standard Phase III and Troston Loch, all other existing and consented wind farms within 10km would be decommissioned ~10-25 years from the start of the operating period of the Proposed Development, reducing this cumulative effect, although significant effects would remain as a result of the other wind farms. The nature of these effects would be cumulative, long-term (reversible), direct and negative.

9.8.28 Taking account of the existing and consented wind farms and the Proposed Development, the landscape effect on the total area of this LCT would be Not Significant overall and the addition of the Proposed Development would not result in wind farm development becoming the dominant characteristic of the landscape.

Southern Uplands with Forest: Cumulative Landscape Effects on Existing + Consented Sites + Applications

9.8.29 There are three application wind farms within the *Southern Uplands with Forest: Ken* unit including Shepherd's Rig, Euchanhead and Sanquhar II.

9.8.30 These applications could have a further characterising influence on the *Southern Uplands with Forest: Ken* LCT within 2-3km of each development.

9.8.31 The additional magnitude of change would be reduced to Medium (due to the presence of existing, consented and application wind farms), resulting in a **Moderate** and Not

Significant effect. The nature of these effects would be cumulative, long-term (reversible), direct and negative, given the characterising influence of existing and consented wind farm development on this area.

9.8.32 The combined cumulative effect of the existing, consented and application schemes and the Proposed Development on the *Southern Uplands with Forest LCT: Ken* unit would be **Major / Moderate** and Significant as a result of all of the large-scale wind farm development in this area, which would be dispersed across this LCT, extending to within approximately 2-3km of turbine locations. With the exception of Sandy Knowe, Cornharrow, Benbrack, Windy Standard Phase III and Torston Loch, all other existing and consented wind farms within 10km would be decommissioned ~10-25 years from the start of the operating period of the Proposed Development, reducing this cumulative effect, although significant effects would remain as a result of the other wind farms. The nature of these effects would be cumulative, long-term (reversible), direct and negative.

9.8.33 The probability of these effects occurring would range from certain (in terms of existing development) to likely (in terms of consented development) to uncertain (in respect of wind farm development at application stage).

Southern Uplands with Forest: Magnitude and Level of Effect During Decommissioning

9.8.34 During decommissioning the Development Site would return to a 'construction site' for a temporary period and the level of effect would be variable over the site and according to the phase of activity. In overall terms the magnitude would reduce from operational levels to Low to Very Low with the removal of the turbines and associated above ground infrastructure (excepting on-site access tracks). The residual landscape effect would be **Minor to Negligible** and Not Significant. All other wind farm operations would have ceased under the existing consents and the residual cumulative effects post decommissioning would be **Minor to Negligible**. The nature of these effects would be permanent, direct, and neutral when compared to the pre-existing landscape of the local area.

Effects of Reduced Intensity Aviation Warning Lights

9.8.35 The full assessment is provided in **Appendix 9D**.

Effects on Landscape Character: Southern Uplands (Dumfries and Galloway)

9.8.36 The 'host' landscape for one turbine (T13) of the Western Group of the Proposed Development is an area of *Southern Uplands LCT* within the northern part of Dumfries and Galloway. The area of landscape within which T13 of the Proposed Development is located is locally identified as the *Southern Uplands LCT: Carsphairn* unit - a predominantly upland area of grassland and moorland intercut by valleys.

9.8.37 The landscape character of the *Southern Uplands LCT* is described within the DGWLCS as follows:

'These uplands have a generally consistent and homogenous character within Dumfries and Galloway, forming high hills with an often dramatic sculptural landform.'

Landscape Susceptibility

9.8.38 The DGWLCS does not consider the sensitivity of the *Southern Uplands LCT: Carsphairn* unit in relation to the Very Large (150m+) turbine typology, (although a '*High'* level of

sensitivity is indicated for this typology within other *Southern Upland* units (*Nithsdale and NW Lowthers*)). A '*High'* level of sensitivity is indicated for the Large (80-150m) typology. Therefore **Table 9.10** considers factors included in the sensitivity rating of the unit to the Large turbine typology to gauge key indicators of susceptibility.

9.8.39 As a result, an assessment of High- Medium susceptibility is applied to the *Southern Uplands LCT:* Carsphairn unit and the Development Site.

Table 9.10 DGWLCS 2020 - Landscape Sensitivity Comparison

Topics (extracted from DGWLCS)	**DGWLCS Assessment (80-150m** (extracted from DGWLCS)	**Considerations for landscape susceptibility / value in relation to the Development Site**
Southern Uplands LCT: *Carsphairn* unit		
Scale and openness *These uplands generally range between 400 and 500m height. The Moffat and Lowther Hills within Dumfriesshire are distinctly higher with peaks between 500 and 700m and include some 'Corbetts' over 800m in the Moffat and Lowther Hills. These uplands have an open character although a reduced scale in narrow valleys.*	*Tall turbines could relate to this generally open and large scale landscape without dominating the height of hills. Expansiveness is reduced however within the narrow valleys which frequently cut into these hills and where the more pronounced peaks provide enclosure.* *DGWLCS Sensitivity rating: Medium*	T13 of the Proposed Development is located within an upland area at the northern edge of the area where it relates to upland ridgelines in the surrounding area. Susceptibility to change from the introduction of large scale elements in the landscape is considered to be *Medium.*
Landform *These hills are generally smooth with rounded summits although distinctive craggy and shapely peaks and deeply folded slopes, corries and dramatically incised valleys also occur, for example Cairnsmore of Carsphairn and some of the Moffat Hills. The isolated conical Queensberry Hill and Beneraid hill form distinctive landmarks seen from Annandale/Nithsdale and at the head of Glen App respectively. Dramatically steep slopes occur where the Langholm and Moffat Hills abut the trough-like Upland Glens (10) producing notable features such as the deep scoop of the Devil's Beef Tub or where the high Lowther Hills form a dramatic rugged backdrop to Nithsdale.*	*Turbines would detract from the irregular landform and landmark status of distinctive rugged peaks and key landform features if located close to or on them. They would diminish the drama of sheer slopes abutting deeply incised glens and dales especially if located close to these 'scarp' edges or seen above them on the skyline. It would be difficult to attain a cohesive layout for larger developments (+30 turbines) in areas where convoluted ridges and relatively defined tops are feature. There are very few less complex areas of landform present where this typology would not impact on nearby distinctive landform features or landmark hills.* *DGWLCS Sensitivity rating: High*	T13 of the Proposed Development is located on a ridgeline at the northern edge of the LCT. Although it is located above the Holm Burn valley, it relates to the adjoining upland landscape features to the north and ridgelines (with wind farm development) to the west. The proposed turbines relate well to the open moorland setting, a common feature in the wider landscape. Susceptibility to change is considered to be *High-Medium*.
Land cover and landmark features *Land cover is simple, largely comprising grass moorland giving a bare smooth*	*There is an absence of pattern which would theoretically be less sensitive to wind farm development although the*	T13 of the Proposed Development is not located in an area of heather moorland. Although surrounding landscape features include forestry,

Topics (extracted from DGWLCS)	**DGWLCS Assessment (80-150m** (extracted from DGWLCS)	**Considerations for landscape susceptibility / value in relation to the Development Site**
appearance where the landform is apparent. Heather moorland is notable in the Moffat, Lowther and Langholm Hills. There is little woodland or commercial forestry apart from native trees and shrubs within narrow valleys.	*openness of these uplands contrasts with the surrounding densely forested Southern Uplands with Forest (19a) and Foothills with Forest (18a) and turbines would compromise this quality. Large developments could adversely affect the integrity of heather moorland where this is a notable feature. DGWLCS Sensitivity rating: Medium*	there is little pattern to the forested areas. Susceptibility to change is generally considered to be *Medium-Low*.
Settlement and Archaeology *While most of this character type is unsettled, the small settlement of Wanlockhead lies within the Lowther Hills. There are a range of archaeological features, historic routes and industrial heritage sites in the Lowthers,*	*There is some scope for this typology to be accommodated without conflicts of scale and impacts on the setting of settlements although these uplands are not extensive in area and lie close to settlement in adjacent glens and the setting of archaeological sites is sensitive* *DGWLCS Sensitivity rating: High-Medium*	T13 of the Proposed Development is located in an area with little settlement. Susceptibility to change is generally considered to be *Low*.
Landscape context *These uplands provide a distinctive backdrop to adjoining settled areas such as the upland glens of Moffat and Langholm and the broad dales of Nithsdale, the Glenkens and Annandale where they contribute to the rich scenic diversity of the wider landscape. The Lowther Hills form part of the wider setting to designed landscapes such as Drumlanrig in Nithsdale while Beneraird forms a distinctive backdrop to Glen App and Plateau Moorlands (17). These open uplands are important in the wider Dumfries and Galloway context where extensive forestry covers much of the upland area and can reduce scenic interest.*	*This typology could dominate adjacent settled landscapes and diminish the role of these areas of the Southern Uplands in providing a simple but dramatic backdrop to settled landscapes, thus adversely affecting wider landscape composition and scenic qualities.* *DGWLCS Sensitivity rating: High*	T13 of the Proposed Development is located on the northern boundary of the Carsphairn unit adjacent to existing wind farm development and would be visible from a small number of areas within surrounding valleys. Susceptibility to change is generally considered to be *High-Medium*.
Perceptual qualities *Evidence of past mining activity, reservoirs and radar installations reduces the sense of naturalness in parts of the*	*The Southern Uplands occurring within Dumfries and Galloway are relatively small in extent and this typology could impact on much of the area thus*	T13 of the Proposed Development (one turbine) is located on the northern boundary in an area influenced by Afton Reservoir and surrounding wind farm

Topics (extracted from DGWLCS)	**DGWLCS Assessment (80-150m** (extracted from DGWLCS)	**Considerations for landscape susceptibility / value in relation to the Development Site**
Lowther Hills. Elsewhere, a general absence of built development within the majority of this upland area gives a strong sense of naturalness. A degree of seclusion can also be experienced in parts of these uplands although roads prevent a true sense of remoteness. Extensive forestry within adjacent upland areas within Dumfries and Galloway increases the value of these open, less modified hills.	*significantly diminishing the sense of naturalness and remoteness experienced. Wind farm development would introduce man made elements into landscapes which are notable for their relative lack of modification given the presence of extensive forestry in surrounding uplands.* *DGWLCS Sensitivity rating: High-Medium*	development. Susceptibility to change is considered to be *Medium*.
Views and visibility *These uplands form a backdrop seen from the settled Nithsdale, upper Annandale and upland glens where the hills are distinctive and definable as individual named peaks. Roads such as the A701, A702 and A708 also provide views of dramatic features such as the Devil's Beef Tub and the scarp of the Lowthers. Footpaths provide access and views from these uplands with the area around Grey Mare's Tail and the Corbett of White Coomb being notably popular with walkers.*	*This typology would be likely to impact on key views to these uplands from adjacent settled valleys where skylines are characteristically open and uncluttered by built development. Turbines sited within the Southern Uplands Type within Dumfries and Galloway would be likely to dominate views from settlement and roads due to the limited geographic extent of this type. Development could have a significant impact on views from popularly accessed hills.* *DGWLCS Sensitivity rating: High*	The Western group of the Proposed Development would be most visible as a distant feature from settled areas and roads to the north including New Cumnock and the A76 as well as the summit of Cairnsmore of Carsphairn. Susceptibility to change at this broad level is considered to be *High-Medium*.
Landscape values *RSA designations cover the majority of the Lowther Hills, all of the Moffat, Tarras and Carsphairn units and part of the Nithsdale and West and North Langholm units. Technical Paper 6 describes the Langholm Hills RSA Southern Uplands as "smooth rounded multi-ridged peaks...covered with extensive areas of unenclosed heather moorland". The Southern Uplands within the Moffat Hills RSA are noted as being. "..dramatic, sculptural examples of this landscape type in this otherwise extensively forested part of the uplands". The Lowther Hills fall within the*	*The majority of these uplands are covered by an RSA designation. The RSA citations note the important role of these uplands in providing dramatic sculptural landform and contrast with adjacent valleys which contributes to the scenic quality of the wider landscape. The value of these open and less modified uplands is also noted in relation to the presence of extensive forested uplands. This typology would be likely to adversely affect the scenic value of these uplands and reduce their contrast with the surrounding extensively forested uplands of character types 18a and 19a. This typology would*	The Proposed Development (three turbines of the Western group – T11, T12 and T15) is located on the boundary of the Uplands and Moorlands LLA in East Ayrshire. T13 is located close to the edge of the LLA. The overall value of the site is considered to be *High-Medium.*

Topics (extracted from DGWLCS)	**DGWLCS Assessment (80-150m** (extracted from DGWLCS)	**Considerations for landscape susceptibility / value in relation to the Development Site**
Thornhill Uplands RSA and are described as displaying 'particularly strong sculptural relief and concentrations of heather moorland... scenically juxtaposed with deep, steep-sided valleys'. The relationship of the ..."dramatic sculptural forms of Cairnsmore of Carsphairn and associated peaks"... with the Glenkens are noted within the citation for the Galloway Hills RSA. Part of the North Moffat Hills falls within the Talla-Hart Wild Land Area.	*significantly compromise the qualities of wildness if sited within or close-by the Hart-Talla Wild Land Area.* *DGWLCS Sensitivity rating: High to High-medium*	

Landscape Value

9.8.40 The DGWLCS advises that the landscape value of the *Southern Uplands LCT: Carsphairn* unit, is High to High-medium due to the RSA designation assigned to some of the upland areas. Although not covered by the Galloway Hills RSA, T13 is located on the boundary of the locally designated Uplands and Moorlands LLA in East Ayrshire indicating a High-Medium sensitivity in this area.

9.8.41 As a result, an assessment of High-Medium value is applied to this part of the Development Site.

Overall Sensitivity

9.8.42 The overall sensitivity to change considering all of the factors within the DGWLCS and the assessment of High-Medium susceptibility and High-Medium value is considered to be *High-Medium.*

Southern Uplands LCT: Carsphairn unit: Magnitude and Level of Effect During Construction

9.8.43 The construction phase would result in localised direct landscape effects on the Development Site and its component landscape elements. None of these are highly sensitive (moorland of Low sensitivity) and although the construction works would affect localised areas, ranging from Zero to High magnitude of change, towards the completion of the Proposed Development, the likely effects on the fabric and constituent elements of the landscape would range from Moderate to Negligible and Not Significant.

9.8.44 In terms of the likely effects on landscape character, the magnitude of change would range from Zero to High during the construction phase; primarily as a result of the proposed turbines. Overall, the landscape effects on the *Southern Uplands LCT: Carsphairn* unit would range from None, increasing to **Major** and Significant upon completion, due to the height and scale of the proposed turbines. The geographical extent of the significant effects would be limited to areas within the Development Site itself extending out to approximately 1-1.5km up to the existing Windy Standard and Extension, and Windy Rig wind farms located within this LCT. Because of the localised nature of this

effect and the screening effects of intervening landform in places, the wider *Southern Uplands LCT: Carsphairn* unit would not be significantly affected overall.

9.8.45 The duration of these effects would be short-term according to the construction period but leading on to long-term (reversible) effects for those components of the development that would be retained through the operational period of up to 35 years. The on-site access tracks would remain in the landscape as permanent development.

9.8.46 The nature of these effects would be temporary or long-term (reversible), (permanent for the on-site access tracks) direct, and negative, due largely to the nature of construction activity across the Development Site during this period.

Southern Uplands LCT: Carsphairn unit: Magnitude and Level of Effect: During Operation

9.8.47 During operation, the completed wind farm would gain a more 'settled' appearance when compared to the same area during the construction period, although Significant landscape effects would continue throughout the operational period.

9.8.48 The ZTV coverage of this area is fragmented, present primarily on the north-eastern slopes of hills such as Cairnsmore of Carsphairn, Moorbrock, Beninner, Craigengillan and Knockwhirn. **Viewpoint 9** (**Figure 9.30**) illustrates the view from the summit of Cairnsmore of Carsphairn. This viewpoint is not typical of the wider LCT which is characterised by an undulating landscape at a lower elevation than this location.

9.8.49 Upper parts of some turbines would be visible from lower areas within the LCT, subject to the screening effect of forestry. From most elevated areas of the LCT, the Western group of the Proposed Development would be visible in views northwest. The Eastern group of the Proposed Development, where visible, would be beyond the intervening *Narrow Wooded Valley LCT: Ken* unit over 3km distance. There would be a High magnitude of change within 1-1.5km of the turbines from the Western group resulting in a **Major** and Significant effect reducing with distance - although it is noted that this area of the *Southern Uplands LCT: Carsphairn* unit is already characterised by wind farm development.

9.8.50 The duration of these effects would be long-term (through the operational period of 35 years) and reversible as a result of the decommissioning (with the exception of on-site access tracks). The nature of these effects would also be direct, cumulative and negative.

9.8.51 Considering the *Southern Uplands LCT* as a whole, the effects would be Not Significant in overall terms due the large scale of this landscape unit and presence of other existing wind farm developments. The existing wind farms, notably Windy Standard and Extension, Windy Rig, Afton and South Kyle have altered the existing landscape character such that the Proposed Development would appear as part of the wider landscape of wind farms.

Southern Uplands LCT: Carsphairn unit: Cumulative Landscape Effects on Existing + Consented Sites

9.8.52 The existing Windy Rig Wind Farm is located in the northern part of the LCT, and Windy Standard and Windy Standard Extension wind farms are partially situated within the northern edge of this LCT.

9.8.53 The cumulative magnitude of change to the landscape character caused by the additional effect of the Proposed Development would be reduced to Medium, resulting in a **Major / Moderate to Moderate** and Significant effect. The nature of these effects would be cumulative, long-term (reversible), direct and negative, given the characterising influence of existing development on this area.

9.8.54 The combined cumulative effect of the existing and consented schemes and the Proposed Development on the *Southern Uplands LCT: Carsphairn* unit would be **Major** and Significant as a result of all of the large-scale wind farm development in this area, extending up to approximately 2km of the existing and consented wind farms (Windy Rig, Windy Standard and Extension, Windy Standard Phase III, Afton and South Kyle) and overlapping with the landscape effects of the Proposed Development. With the exception of Windy Standard Phase III, all other existing and consented wind farms identified above would be decommissioned ~10-25 years from the start of the operating period of the Proposed Development, reducing this cumulative effect, although significant effects would remain as a result of the Proposed Development and Windy Standard Phase III. The nature of these effects would be cumulative, long-term (reversible), direct and negative.

9.8.55 Taking account of the existing and consented wind farms and the Proposed Development, the landscape effect on the total area of this LCT would be Not Significant overall and the addition of the Proposed Development would not result in wind farm development becoming the dominant characteristic of the landscape.

Southern Uplands LCT: Carsphairn unit: Cumulative Landscape Effects on Existing + Consented Sites + Applications

9.8.56 There are no other application wind farms within this landscape unit, although the Shepherd's Rig application is located close to the LCT (High to Medium magnitude within approximately 2km).

9.8.57 The additional magnitude of change would remain Medium, resulting in a **Major / Moderate to Moderate** and Significant effect. The nature of these effects would be cumulative, long-term (reversible), direct and negative, given the characterising influence of existing and consented wind farm development on this area.

9.8.58 The combined cumulative effect of the existing, consented and application schemes and the Proposed Development on the *Southern Uplands LCT: Carsphairn* unit would be **Major** and Significant as a result of all of the large-scale wind farm development in this area, in particular Windy Standard and Extension, Windy Rig, Afton, Windy Standard Phase III, South Kyle and Shepherds Rig) which would be dispersed across this LCT, extending to within approximately 2km of turbine locations. With the exception of Windy Standard Phase III, all other existing and consented wind farms identified above would be decommissioned ~10-25 years from the start of the operating period of the Proposed Development, reducing this cumulative effect, although significant effects would remain as a result of the Proposed Development and Windy Standard Phase III. The nature of these effects would be cumulative, long-term (reversible), direct and negative.

9.8.59 The probability of these effects occurring would range from certain (in terms of existing development) to likely (in terms of consented development) to uncertain (in respect of wind farm development at application stage).

Southern Uplands LCT: Carsphairn unit: Magnitude and Level of Effect During Decommissioning

9.8.60 During decommissioning the Development Site would return to a 'construction site' for a temporary period and the level of effect would be variable over the site and according to the phase of activity. In overall terms the magnitude would reduce from operational levels to Very Low with the removal of the turbines and associated above ground infrastructure (excepting on-site access tracks). The residual landscape effect would be **Minor to Negligible** and Not Significant. All other wind farm operations would have ceased under the existing consents and the residual cumulative effects post decommissioning would be

Minor to Negligible. The nature of these effects would be permanent, direct, and neutral when compared to the pre-existing landscape of the local area.

Effects of Reduced Intensity Aviation Warning Lights

9.8.61 The full assessment is provided in **Appendix 9D**.

Effects on Landscape Character: Southern Uplands (East Ayrshire)

9.8.62 The 'host' landscape for three turbines of the Western Group (T11, T12 and T15 and associated infrastructure) of the Proposed Development (three turbines of the Western Group – T11, T12 and T15) is an extensive area of *Southern Uplands* LCT within the south-eastern part of East Ayrshire. The area of landscape within which the Proposed Development is located is locally identified as the *Southern Uplands LCT: Blackcraig Hill* unit - a large predominantly upland area of grassland and moorland intercut by valleys.

9.8.63 The landscape character of the *Southern Uplands LCT* is described within the EALWCS as follows:

"This landscape comprises a small part of the Southern Uplands character type which extends into neighbouring Dumfries and Galloway. Within East Ayrshire, the Southern Uplands form steep-sided, rugged open hills strongly containing the Upland Glen (14) of Glen Afton and providing a scenic backdrop to the low-lying Upland Basin (15). Higher and particularly well-defined hills on the eastern edge of Glen Afton form landmark features and include the distinctly rugged Blackcraig Hill and Craigbraneoch Rig. The hills to the west of Glen Afton are generally lower but still prominent because of their complex landform. Land cover is simple, dominated by grass moorland although this accentuates the ruggedness of the landform. This landscape is not settled although it is highly visible from settlement and roads within the Upland Basin (15) to the north. Operational wind farm development is a key feature in the eastern part of this landscape character type with wind farms extending eastwards into Dumfries and Galloway into similar uplands bordering upper Nithsdale."

Landscape Susceptibility

9.8.64 Common indicators of landscape susceptibility[5] to wind farm development are considered in **Table 9.11**, drawing from the broad scale advice from the EALWCS.

9.8.65 As a result, an assessment of High-Medium to Medium susceptibility is applied to the *Southern Uplands LCT: Blackcraig Hill* unit and the Development Site.

[5] Scottish Natural Heritage, A Guide to Commissioning a Landscape Capacity Study, 2015.

Table 9.11 EALWCS 2018 - Landscape Sensitivity Comparison

Topics (extracted from EALWCS)	**EALWCS Assessment (130m+)** (extracted from EALWCS)	**Considerations for landscape susceptibility / value in relation to the Development Site**
Southern Uplands LCT: *Blackcraig Hill* unit		
Landscape context *This area of the Southern Uplands comprises higher, more defined 'landmark' hills lying east of Glen Afton and lower hills with complex interlocking ridges lying to the west of this glen. These uplands form a scenic backdrop of higher, rugged and predominantly open hills to the settled Upland Basin (15), contrasting with other lower and simpler upland areas surrounding this basin. Operational and consented wind farm development located in this LCT and the adjacent LCT 20c influences character. In particular, the operational Afton wind farm has a significant effect on the character of Glen Afton seen from both within the glen and from the Upland Basin (15). This landscape forms a relatively narrow band of hills but comprises part of a more extensive upland area where it borders the Southern Uplands and Southern Uplands with Forestry character types lying in East Ayrshire and Dumfries and Galloway.*	*Turbines of this size sited on higher and more defined hills, such as Blackcraig Hill, would be particularly prominent and detract from their landmark qualities. Although the hills west of Glen Afton are lower they still provide a scenic backdrop to the Upland Basin (15) because of their complexity and ruggedness. Additional wind farm development, and especially turbines of this size, located on these uplands would be located relatively close to the Upland Basin (15) and would have a dominant effect on this landscape. Effects on Glen Afton could also be exacerbated by additional wind farm development visible on containing skylines from within the glen.* *EALWCS Sensitivity rating: High*	T11, T12 and T15 of the Proposed Development would be located in an upland area of increased sensitivity. The turbines would not be located in the hills west of Afton Glen, but would be partially visible (between 1 and 7 turbines) from locations within the Upland Basin. The turbines would also not be sited on the higher, more defined hills as defined by the EALWCS. It is noted that the turbines would be set back from the southern edge of Glen Afton and visibility would be limited along the glen. Susceptibility to change from the introduction of the proposed turbines is considered to be *High-Medium*.
Scale *The hills of the Southern Uplands range between 360-700m in height in this area. These uplands are not settled and are open with very few scale references.*	*The large scale of this open and unsettled landscape reduces sensitivity to this typology although the outer edges and lower western hills of this LCT would be sensitive to turbines of this size as they would dominate the perceived relief of these hills seen from the Upland Basin (15).* *EALWCS Sensitivity rating: High-Medium*	T11, T12 and T15 of the Proposed Development would be located in an unsettled area to the south of the LCT at over 9km from the Upland Basin. Susceptibility to change is generally considered to be *Medium*.
Landform *Steep-sided hills contain Glen Afton. These hills are higher on*	*The presence of well-defined and sometimes distinctly rugged 'landmark' hills increases*	T11, T12 and T15 of the Proposed Development would be located to the south of the LCT and to the

Topics (extracted from EALWCS)	**EALWCS Assessment (130m+)** (extracted from EALWCS)	**Considerations for landscape susceptibility / value in relation to the Development Site**
the eastern side of Glen Afton and include Hare Hill and the distinctly rugged Blackcraig Hill. The north-eastern slopes of the band of hills lying east of Afton Glen are generally gentler. Although these hills are generally lower to the west they are often complex, forming a series of interlocking ridges deeply cut by water courses.	*sensitivity to this typology. It would be difficult to attain an integrated turbine layout in the lower, but often complex narrow ridges found to the west of Afton Glen and the construction of access roads on steep and variable slopes may also result in significant impacts.* *EALWCS Sensitivity rating: High-Medium*	south of Afton Glen. In this respect the influence of the proposed turbines on the steep sided hills to the east and west of Glen Afton would be reduced. It is noted that there would be some influence on Glen Afton where there may be glimpsed views along the valley through vegetation. Susceptibility to change is considered to be *Medium*.
Landscape Pattern *These uplands have a simple land-cover of grass moorland with occasional patchy heather.*	*There is an absence of pattern which would theoretically be less sensitive to wind farm development although the predominant openness of these uplands contrasts with the nearby densely forested Southern Uplands with Forest (20c) and Foothills with Forestry and Opencast Mining (17a) and additional development would compromise this quality.* *EALWCS Sensitivity rating: Medium*	T11, T12 and T15 of the Proposed Development is located in a moorland area that is not forested, although areas of forestry are visible in surrounding LCTs. The proposed turbines relate well to the open moorland setting, a common feature in the wider landscape. Susceptibility to change is considered to be *Medium-Low*.
Built Environment *An unsettled landscape with no public roads but accommodating operational wind farm development and access tracks.*	*Sensitivity is reduced due to the absence of settlement. The presence of existing wind farm development also reduces sensitivity although cumulative effects are a key constraint and are considered separately in this assessment.* *EALWCS Sensitivity rating: Low*	T11, T12 and T15 of the Proposed Development would be located in an unsettled area, adjacent to existing wind farm development. Susceptibility to change is considered to be *Low*.
Perceptual qualities *The presence of operational wind farm development in these uplands and within close proximity in Dumfries and Galloway, together with nearby extensive commercial forestry inhibits a strong sense of wildness although the openness of these uplands has some natural qualities.*	*While operational and consented wind farm development in and close-by this LCT reduces the sense of wildness, additional wind farm development would diminish the sense of naturalness associated with remaining open areas and their contrast with nearby densely forested and developed uplands.* *EALWCS Sensitivity rating: Medium*	T11, T12 and T15 of the Proposed Development would be located in an upland adjacent to the existing Afton Wind Farm development. Susceptibility to change is considered to be *Medium*.

Topics (extracted from EALWCS)	**EALWCS Assessment (130m+)** (extracted from EALWCS)	**Considerations for landscape susceptibility / value in relation to the Development Site**
Visual Amenity *These uplands are unsettled although they are widely visible from roads and settlement within the Upland Basin (15) and the Upland River Valley (10) of the Nith Valley. The steep-sided hills which immediately contain Afton Glen are particularly visible from settlement and the minor public road which is aligned through this Upland Glen (14). There are walking routes to Blackcraig Hill from Afton Reservoir and close views over these uplands from this hill and from the Corbett of Cairnsmore of Carsphairn.*	*Turbines sited on the higher well-defined hills would be visually prominent from the Upland Basin (15). The Upland Glen (14) of Afton Glen is already significantly influenced by wind farm development. Turbines set back into the interior of the Southern Uplands within East Ayrshire and Dumfries and Galloway would be less intrusive in views from this glen. These hills provide a highly visible southern backdrop to the settled low-lying Upland Basin (15) and are noticeably higher (and currently more scenic) than the lower profile of the Foothills and Plateau Moorland lying to the east and west of LCT 15. Turbines of this size sited on landmark hills and steep slopes/edge hills which contain Upper Nithsdale and the Upland Basin (15) would be highly visible from settlement and roads. Although the presence of operational and consented wind farms seen from LCT 15 reduces sensitivity to some degree, cumulative effects with these developments are a key sensitivity and are considered separately in this assessment.* *EALWCS Sensitivity rating: High*	T11, T12 and T15 of the Proposed Development would be located to the south of the LCT and to the south of Afton Glen. In this respect the influence of the proposed turbines on the visual amenity of the Upland Basin (15), The Upland Glen (14) Glen Afton would be reduced. It is noted that there would be some influence on walking routes to Blackcraig Hill from Afton Reservoir. Susceptibility to change is considered to be *High-Medium*.
Cumulative effects *Views from the Upland Basin (15) are most likely to be affected by cumulative effects between wind farm developments sited in this LCT 20a, the consented South Kyle wind farm sited in LCT 20c and any potential wind farms located in other nearby uplands. In views from LCT 15, the operational Hare Hill wind farm is prominently sited on a well-defined steep-sided hill. The operational Afton wind farm is also prominent, being sited*	*Cumulative effects already occur on views from the Upland Basin (15) where the operational Afton and Hare Hill wind farms are seen together due to the differences in turbine size and siting. Existing cumulative effects could be significantly exacerbated where new turbines were noticeably larger than those in operational schemes and/or where turbine layouts were more irregular due to the increased complexity of landform in the remaining undeveloped western*	The Western group of the Proposed Development would be visible in views from the Upland Basin (15) at a minimum distance of 9km where the west group would be visible alongside the existing Afton Wind Farm and several other existing and consented wind farm developments (as illustrated in Viewpoint 13). Susceptibility to change is considered to be *Medium-Low*.

Topics (extracted from EALWCS)	EALWCS Assessment (130m+) (extracted from EALWCS)	Considerations for landscape susceptibility / value in relation to the Development Site
close to the edge of the cleft cut by the Afton Glen. The consented South Kyle wind farm would additionally be visible behind the immediate skyline of LCT20a in these views (forming an extended band of very widely spaced turbines).	*part of this LCT. Potential development in other upland areas surrounding LCT 15 could also lead to cumulative effects if containing skylines were substantially occupied by turbines.* *EALWCS Sensitivity rating: High*	

Landscape Value

9.8.66 This LCT is locally designated as Uplands and Moorlands LLA indicating a High-Medium value which is applied to this part of the Development Site.

Overall Sensitivity

9.8.67 The overall sensitivity to change considering all of the factors within the EALWCS and the assessment of High-Medium susceptibility and High-Medium value is considered to be *High-Medium*.

Southern Uplands: Magnitude and Level of Effect During Construction

9.8.68 The construction phase would result in localised direct landscape effects on the Development Site and its component landscape elements. None of these are highly sensitive (Moorland of Low sensitivity) and although the construction works would affect localised areas, ranging from Zero to High magnitude of change, towards the completion of the Proposed Development, the likely effects on the fabric and constituent elements of the landscape would range from Moderate to Negligible and Not Significant.

9.8.69 In terms of the likely effects on landscape character, the magnitude of change would range from Zero to High during the construction phase; primarily as a result of the proposed turbines. Overall, the landscape effects on the *Southern Uplands: Blackcraig Hill unit* would range from None, increasing to **Major to Major / Moderate** and Significant upon completion, due to the height and scale of the proposed turbines. The geographical extent of the significant effects would be limited to areas within the Development Site itself extending out to approximately 2-3km, subject to the screening effects of intervening forestry and landform. Because of the localised nature of this effect and the intervening forestry, the wider *Southern Uplands: Blackcraig Hill unit* would not be significantly affected overall.

9.8.70 The duration of these effects would be short-term according to the construction period but leading on to long-term (reversible) effects for those components of the development that would be retained through the operational period of up to 35 years (turbines, anemometer mast and on-site access tracks). The on-site access tracks would remain in the landscape as permanent development.

9.8.71 The nature of these effects would be temporary or long-term (reversible), (permanent for the on-site access tracks) direct, and negative, due largely to the nature of construction activity across the Development Site during this period.

Southern Uplands: Magnitude and Level of Effect: During Operation

9.8.72 During operation, the completed wind farm would gain a more 'settled' appearance when compared to the same area during the construction period, although Significant landscape effects would continue throughout the operational period.

9.8.73 Beyond the immediate area of the proposed turbines, the ZTV pattern is fragmented as a result of the steeply undulating topography (and some plantation forestry) beyond Cannock Hill, Millaneoch Hill, Coranhae Hill, Blacklorg Hill, Keoch Rig and Mid Hill of Glenhead and the steeply sloping valley sides of the Water of Ken Valley. The magnitude of change within this localised area (within 2-3km of the proposed turbines, subject to the screening effects of forestry) would be High leading to a **Major to Major / Moderate** and Significant effect on a relatively small and geographically contained area.

9.8.74 This level of effect, and geographical extent, is not unusual for large-scale wind farm development.

9.8.75 The duration of these effects would be long-term (through the operational period of 35 years) and reversible as a result of the decommissioning (with the exception of on-site access tracks). The nature of these effects would also be direct, cumulative and negative.

9.8.76 Considering the *Southern Uplands LCT* as a whole, the effects would be Not Significant in overall terms due the large scale of this landscape unit and presence of other existing wind farm developments. The existing wind farms, notably Afton, Windy Standard and Extension, Hare Hill and Extension, South Kyle and Windy Rig have altered the existing landscape character such that the Proposed Development would appear as part of the wider landscape of wind farms and forestry.

Southern Uplands: Cumulative Landscape Effects on Existing + Consented Sites

9.8.77 The existing Hare Hill and Hare Hill Extension, High Park Farm and a small number of Afton turbines are located within this LCT (High magnitude within approximately 2km of these turbines). Other wind farms including Pencloe, Sanquhar Six, Sanquhar, Windy Standard and Extension, Windy Rig and the majority of Afton are located very close to the south / southwest of the LCT (High to Medium magnitude within approximately 2km).

9.8.78 The Proposed Development would be seen as being closely associated with the existing pattern of wind farm development within the *Southern Uplands* and *Southern Uplands with Forest LCTs*. As a result, the cumulative magnitude of change to the landscape character caused by the additional effect of the Proposed Development would be reduced to Medium, resulting in a **Major / Moderate to Moderate** and Significant effect. The nature of these effects would be cumulative, long-term (reversible), direct and negative, given the characterising influence of existing and consented development on this area.

9.8.79 The combined cumulative effect of the existing and consented schemes and the Proposed Development on the *Southern Uplands LCT: Blackcraig* unit would be **Major to Major / Moderate** and Significant as a result of all of the large-scale wind farm development in this area, extending to within approximately 2km of the existing and consented wind farms and overlapping with the landscape effects of the proposed turbines. All other nearby existing and consented wind farms would be decommissioned ~10-25 years from the start of the operating period of the Proposed Development, reducing this cumulative effect. The nature of these effects would be cumulative, long-term (reversible), direct and negative.

9.8.80 Taking account of the existing and consented wind farms and the Proposed Development, the landscape effect on the total area of this LCT would be Not Significant overall and the addition of the Proposed Development would not result in wind farm development becoming the dominant characteristic of the landscape.

Southern Uplands: Cumulative Landscape Effects on Existing + Consented + Applications

9.8.81 A number of turbines of Sanquhar II would be located within this LCT (High magnitude within approximately 2-3km of these turbines). Euchanhead and the majority of Sanquhar II are located very close to the east of the LCT (High to Medium magnitude within approximately 2-3km).

9.8.82 The additional magnitude of change would be reduced to Medium (due to the presence of existing, consented and application wind farms), resulting in a **Major / Moderate to Moderate** and Significant effect. The nature of these effects would be cumulative, long-term (reversible), direct and negative to neutral, given the characterising influence of existing and consented wind farm development on this area.

9.8.83 The combined cumulative effect of the existing, consented and application schemes and the Proposed Development on the *Southern Uplands with Forest LCT: Ken* unit would be **Major to Major / Moderate** and Significant as a result of all of the large-scale wind farm development in this area, which would be dispersed across this LCT, extending to within approximately 2-3km of turbine locations. All other nearby existing and consented wind farms would be decommissioned ~10-25 years from the start of the operating period of the Proposed Development, reducing this cumulative effect. The nature of these effects would be cumulative, long-term (reversible), direct and negative.

9.8.84 The probability of these effects occurring would range from certain (in terms of existing development) to likely (in terms of consented development) to uncertain (in respect of wind farm development at application stage).

Southern Uplands: Magnitude and Level of Effect During Decommissioning

9.8.85 During decommissioning the Development Site would return to a 'construction site' for a temporary period and the level of effect would be variable over the site and according to the phase of activity. In overall terms the magnitude would reduce from operational levels to Low to Very Low with the removal of the turbines and associated above ground infrastructure (excepting on-site access tracks). The residual landscape effect would be **Minor to Negligible** and Not Significant. All other wind farm operations would have ceased under the existing consents and the residual cumulative effects post decommissioning would be **Minor to Negligible**. The nature of these effects would be permanent, direct, and neutral when compared to the pre-existing landscape of the local area.

Effects of Reduced Intensity Aviation Warning Lights

9.8.86 The full assessment is provided in **Appendix 9D**.

Indirect Effects on the Surrounding Landscape Character

9.8.87 Apart from the three host LCTs, seven other LCTs within 10km are assessed in detail in **Table 9.12**, as follows:

- DGC 4 Narrow Wooded River Valleys: Ken unit;
- DGC 10 Upland Glens:
  - Castlefairn and Dalwhat unit;
  - Shinnell unit;
- DGC 19 Southern Uplands:

- Nithsdale unit;
- DGC 19a Southern Uplands with Forest: Carsphairn unit;
- EAC 14 Upland Glen: Glen Afton unit;
- EAC 15 Upland Basin: New Cumnock unit; and
- EAC 20c Southern Uplands with Forestry: Enoch Hill unit.

9.8.88 None of these landscapes would be directly affected by the proposed turbines from the Proposed Development, as they would not be located within them, and there would be no change to their physical characteristics. Instead, potential effects on these landscapes would be limited to indirect effects on the visual or key perceptual characteristics, resulting from views of wind turbines. The proposed access track for the Proposed Development would however have a direct effect on a small part of the EAC Upland Glen: Afton and DGC Narrow Wooded Valley: Ken LCTs.

9.8.89 In summary, there would be a significant landscape effect on small parts of the following LCTs:

- DGC 4 *Narrow Wooded River Valley: Ken* (between 2-3km between Lorg Bridge and south of Corlae as a result of the Eastern and Western groups of the Proposed Development);
- DGC 19 *Southern Uplands: Nithsdale* (between 2-3km, as a result of the Eastern group of the Proposed Development); and
- EAC 14 *Upland Glen: Glen Afton* (between 2-3km up to Afton Reservoir as a result of the Western group of the Proposed Development).

9.8.90 The remainder of the LCTs would not be significantly affected by the Proposed Development.

Table 9.12 Indirect Effects on the Surrounding Landscape Character within 10km

Landscape Character	Assessment
Landscape Character within Dumfries and Galloway	
4 Narrow Wooded River Valleys LCT: Ken	The *Narrow Wooded River Valleys: Ken* unit forms a narrow valley, surrounded by the steep slopes of surrounding rounded hills, also known as the 'Lorg Glen' or the upper Water of Ken valley. Viewpoints 3, 4 and 6 are located within this LCT. The DGWLCS considered the sensitivity to very large wind farm development *within it* to be High. The susceptibility to change from the introduction of the Proposed Development is High due to the intimate nature of the valley in places (in particular, at the northern end) and the potential effects on smaller scale features of the valley. The LCT is not located in a designated area, indicating a lower value, however, it is assessed as having a higher value in the DGWLCS due to the local recreational routes that run through it. The overall sensitivity is therefore considered to be *High*. Assessment: Proposed Development

Landscape Character	Assessment
	None of the proposed turbines would be located within this LCT. The Eastern group would be located at approximately 0.8km distance and the Western group would be located to the northwest at approximately 2.3km distance, although a very short section of the access track including a bridge or water crossing, would be situated on the northern edge of the LCT (See **Figure 3.11** showing a typical bridge). Theoretical visibility of the turbines would vary from none to visibility of up to 1-7 turbines on eastern facing slopes and the valley floor further to the north of the LCT, and between 7-15 turbines to the south of the LCT. Due to the length, topography and forested nature of the valley, potential effects from the Proposed Development would vary as the distance, screening and perceived scale of the turbines in the landscape changes. Site visits in combination with wireline analysis along the valley indicate that the effect on the LCT would increase towards the northern part of the LCT, subject to any intervening localised screening and as illustrated in Viewpoints 3, 4 and 6 and residential viewpoints 1, 3, 4, 5 and 7. The southernmost part of this LCT is well wooded and forested as the LCT title '*Narrow Wooded River Valley'* would imply and ranges between approximately 3.5-10km distance from the Proposed Development. Views from this area are illustrated in residential viewpoints 9, 9a and 11. Due to the screening effects of landform, vegetation, and the intervening distance the magnitude of change on the landscape character within this part of the LCT would be Low to Very Low, resulting in a **Moderate to None** level of effect which would be Not Significant. The northern end of the LCT, in the vicinity of Viewpoint 3, 4 and 6 is partly unforested and either the Eastern or Western groups would be visible from these locations within 2-3km (between Lorg Bridge and south of Corlae) from the Proposed Development resulting in a Medium magnitude of change and **Major / Moderate** and Significant effect. The nature of these effects would be long-term (reversible), indirect and negative. Due to the overall varied visibility of the turbines from within this LCT, it is not considered that the Proposed Development would significantly alter the key characteristics of this landscape, from which views of existing and consented wind farm development are already present. The short section of access track and a single water crossing or bridge at the very northern edge of the LCT would in this case, have a direct effect on landscape character that could potentially be significant. However, access tracks and bridges are not an uncharacteristic feature of this landscape and it is considered that, subject to the design and appearance, they would quickly assimilate into this landscape setting. The river crossing would therefore be sensitively designed to ensure that its appearance was in keeping with existing water crossings along the valley. Details of the bridge design would be agreed with DGC prior to construction. The access track has been designed to follow the line of an existing track which passes across the hillside and is currently visible from the valley floor as a line or 'break' in the slope. Cuttings along the line of this widened access track would be managed to revegetate and minimise potential effects (Very Low magnitude post-construction). The landscape effects of aviation warning lights on this LCT would not be significant (see full assessment in **Appendix 9D**). <u>Cumulative Assessment: Proposed Development + Existing + Consented Sites</u> There are no existing or consented wind farms present within this LCT, however, Windy Standard, Afton, Whiteside Hill and Windy Rig would have some influence on the LCT (Low to Very Low magnitude). The additional and combined effect of the Proposed Development would be **Major / Moderate** and Significant in the northern section of the LCT reducing to **Moderate to None** and Not Significant in the remainder of the LCT. The nature of these effects would be long-term (reversible), cumulative, indirect and negative. <u>Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications</u>

Landscape Character	Assessment
	One turbine of the application Shepherd's Rig Wind Farm would be located in the southern part of the LCT. The magnitude of change arising from the introduction of these turbines would be High within approximately 2km of the turbines, reducing with increased distance. Euchanhead would be partially visible particularly in the north at 1.4km distance (High magnitude within 2km). Sanquhar II would be partially visible behind Euchanhead at 2.4km distance (Low to Zero magnitude). The additional effect of the Proposed Development would be **Major / Moderate** and Significant in the northern section of the LCT reducing to **Moderate to None** and Not Significant in the remainder of the LCT. The combined cumulative effect would be **Major** and Significant due to Shepherd's Rig, Euchanhead and the Proposed Development, with Euchanhead and the Proposed Development influencing the north of the LCT and Shepherd's Rig directly affecting the south of the LCT, to **None** and Not Significant. The nature of these effects would be long-term (reversible), cumulative, indirect and negative.
10 Upland Glens LCT: Castlefairn and Dalwhat	The Upland Glens: Castlefairn and Dalwhat unit forms a small-scale, narrow valley landscape with steep sides rising to irregular ridgelines. The DGWLCS considered the sensitivity to very large wind farm development *within* it to be High. The LCT is located within the locally designated Thornhill Uplands RSA, denoting a High-Medium value. The susceptibility to change from the introduction of the Proposed Development is Medium due to the enclosed nature of this landscape and the limited range of view beyond the steep sided glen slopes and along the glen. The sensitivity to the Proposed Development is therefore considered to be *High-Medium*. Assessment: Proposed Development None of the proposed turbines would be located within this LCT. The Eastern group would be located to the northwest at 5.2km distance with the Western group located further beyond to the northwest at approximately 9.2km distance. Theoretical visibility of the turbines would vary from none to visibility of up to 1-11 turbines at the northwestern parts of the LCT, limited to the Eastern group only. The Western group would not have any influence on the key characteristics of this LCT due to lack of visibility. Due to the topography and forested nature of the valleys, visibility of the Proposed Development would be limited by screening. Site visits in combination with wireline analysis in areas of theoretical visibility indicate that the effect on the LCT would be greatest from the steep valley sides and would reduce along the accessible valley floor where the hubs of turbines 2 and 8 would be visible alongside the blades of turbines 5 and 6 of the Eastern group. It is not considered that the Proposed Development would affect the key characteristics of this landscape. The magnitude of change would be Low to Zero and the level of effect would be **Moderate to Minor** and Not Significant to **None**. The nature of these effects would be long-term (reversible), indirect and negative. The landscape effects of aviation warning lights on this LCT would not be significant (see full assessment in **Appendix 9D**). Cumulative Assessment: Proposed Development + Existing + Consented Sites There are no existing or consented wind farms present within this LCT – although the existing Wether Hill Wind Farm is located 1.2km distance to the west of the LCT and would have limited influence on this LCT (Low to Zero magnitude). The additional effect of the Proposed Development would be **Moderate to Minor, to None** and Not Significant. The combined effect would also be **Moderate to Minor, to None** and Not Significant. The nature of these effects would be long-term (reversible), cumulative, indirect and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications One turbine of the application Euchanhead Wind Farm would be visible alongside the Proposed Development in the northern part of the LCT (Very Low to Zero magnitude).

Landscape Character	Assessment
	The additional effect of the Proposed Development would be **Moderate to Minor, to None** and Not Significant. The combined effect would also be **Moderate to Minor, to None** and Not Significant. The nature of these effects would be long-term (reversible), cumulative, indirect and negative.
10 Upland Glens LCT: Shinnell	The Upland Glens: Shinnell unit forms a small-scale, narrow valley landscape with steep sides rising to irregular ridgelines. The DGWLCS considered the sensitivity to very large wind farm development *within* it to be High. The unit is located within the locally designated Thornhill Uplands RSA, denoting a High-Medium value. The susceptibility to change from the introduction of the Proposed Development is Medium due to the enclosed nature of this landscape and the limited range of view beyond the steep sided glen slopes and along the glen. The sensitivity to the Proposed Development is therefore considered to be *High-Medium*. Assessment: Proposed Development None of the proposed turbines would be located within this LCT. The Eastern group would be located to the west at approximately 4.1km distance and the Western group would be located further beyond to the northwest at approximately 8.5km distance. Theoretical visibility of the turbines would vary from none to visibility of up to 1-3 turbines for the majority of the LCT with theoretical visibility of up to 11 turbines in isolated elevated areas, limited to the Eastern group only. The Western group would not have any influence on the key characteristics of this LCT due to lack of visibility. Site visits in combination with wireline analysis in areas of theoretical visibility indicate that screening from forest, riparian trees, shelterbelts and scrub would screen most views of the turbines from the glen. It is not considered that the Proposed Development would affect the key characteristics of this landscape. The magnitude of change would be Very Low to Zero and the level of effect would be **Minor** and Not Significant to **None**. The nature of these effects would be long-term (reversible), indirect and neutral. The landscape effects of aviation warning lights on this LCT would not be significant (see full assessment in **Appendix 9D**). Cumulative Assessment: Proposed Development + Existing + Consented Sites There are no existing or consented wind farms present or in views within this LCT. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications The application Sanquhar II Wind Farm would be located at the northwest end of the glen at approximately 0.6km distance from the edge of the LCT (High magnitude within 2km of the turbines and reducing with distance). Euchanhead application would be partially visible behind Sanquhar II at approximately 4.7km distance (Low to Zero magnitude). The additional effect of the Proposed Development would be **Minor to None** and Not Significant. The combined cumulative effect would be **Major** and Significant (due to Sanquhar II and not the Proposed Development) to **None** and Not Significant. The nature of these effects would be long-term (reversible), cumulative, indirect and negative.

Landscape Character	Assessment
19 Southern Uplands LCT: Nithsdale	The *Southern Uplands LCT: Nithsdale* unit is a large-scale landform with simple land cover beyond 2km northeast of the Proposed Development. Viewpoint 11 is located within this LCT. The DGWLCS considered the sensitivity to very large wind farm development *within it* to be High to High- Medium. The southern part of this LCT is locally designated as the Thornhill Uplands RSA, indicating a High-Medium value. Part of the SUW also passes through this LCT. The susceptibility to change from the introduction of the Proposed Development is High-Medium due to the open and un-forested nature of this landscape, although this is also a large-scale landscape with limited visual receptors and no settlement. The sensitivity to the Proposed Development is therefore considered to be *High-Medium*. Assessment: Proposed Development The Eastern group of the Proposed Development would be located to the southwest at approximately 2km distance whilst the Western group would be located further to the west at approximately 5.3km distance. The ZTV coverage of this area is fragmented and limited predominantly across elevated hill summits and west-facing hill slopes, including Black Rigg, Countam, White Knowe, Fingland Shoulder and Cairnkinna. Where visible, the lower parts of the Eastern group would be partially screened by landform and intervening forestry and would appear beyond the *Southern Uplands with Forests LCT: Ken unit* with the Western group visibile further beyond. Viewpoint 11 (**Figure 9.32**) illustrates the view from the summit of Cairnkinna Hill. It is not considered that the Proposed Development would significantly alter the key perceptual and visual characteristics of this landscape, which would remain an open and un-forested landscape, typical of the *Southern Uplands LCT*. This is due to the intervening forestry in the adjacent host LCT and the existing pattern of wind energy development at Whiteside Hill, Sanquhar and Twentyshilling Hill, which means the Proposed Development would not appear incongruous. The magnitude of change would range from Medium to Zero and the addition of the Proposed Development would lead to a **Major / Moderate to Moderate** and Significant effect in limited areas on the southwestern edge of the LCT between 2-3km (Eastern group only) to **None** and Not Significant. There would be no significant effects on the LCT as a result of the Western group. The nature of these effects would be long-term (reversible), indirect and negative. The landscape effects of aviation warning lights on this LCT would not be significant (see full assessment in **Appendix 9D**). Cumulative Assessment: Proposed Development + Existing + Consented Sites The existing Whiteside Hill and half of Sanquhar turbines, and the Twentyshilling Hill Wind Farm are located within this LCT and would lead to a High magnitude within approximately 1-2km. Other wind farms including Sanquhar Six and Sandy Knowe located close to the LCT would also influence the character of this landscape (Medium magnitude). The addition of the Proposed Development would be Low magnitude, and the effect would be **Moderate to None** and Not Significant (reduced due to the characterising influence of other wind farms located within the LCT). The combined cumulative effect would be **Major to Major / Moderate** and Significant (due to Whiteside Hill, Sanquhar, Twentyshilling Hill, Sandy Knowe, Sanquhar Six and the Proposed Development) to **None** and Not Significant. Whiteside Hill, Sanquhar, Twentyshilling Hill, Sandy Knowe, Sanquhar Six would be decommissioned ~5-15 years prior to the Proposed Development, reducing the cumulative effect. The nature of these effects would be long-term (reversible), cumulative, indirect and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications The Sanquhar II application is partially located within this LCT (High magnitude within 2-3km) and Euchanhead application would be located close to the boundary of the LCT (High-Medium magnitude). The addition of the Proposed Development would be

Landscape Character	Assessment
	Very Low magnitude, and the effect would be **Minor to None** and Not Significant (reduced due to the characterising influence of other wind farms located within the LCT). The combined cumulative effect would be **Major to Major / Moderate** and Significant (due to Whiteside Hill, Sanquhar, Twentyshilling Hill, Sandy Knowe, Sanquhar Six, Sanquhar II, and Euchanhead and not the Proposed Development) to **None** and Not Significant. The nature of these effects would be long-term (reversible), cumulative, indirect and negative.
19a Southern Uplands with Forest LCT: Carsphairn	The *Southern Uplands and Forest: Carsphairn* unit is an extensive area of forestry to the west of the Proposed Development. The DGWLCS considered the sensitivity to very large wind farm development *within it* to be High- Medium. There are no landscape designations covering the LCT and the value of the area is judged to be Medium-Low by the DGWLCS. The susceptibility to change from the introduction of the Proposed Development is judged to be Medium due to the forested nature of this landscape and its large-scale with limited visual receptors and no settlement. The sensitivity to the Proposed Development is therefore considered to be *Medium*. Assessment: Proposed Development The Eastern group of the Proposed Development would be located to the east at approximately 5.4km distance and the Western group would be located at approximately 1.6km distance at its closest point. There would be very limited views of the Eastern group from within this LCT except along the ridgeline where the existing Windy Standard Wind farm is located (Low to Zero magnitude). There would be some theoretical visibility of the Western group from areas at higher elevation such as the summits of Benbrack Hill and Lamford Hill. However, these would be seen behind the existing turbines at Windy Standard, Windy Standard Extension, and Windy Rig. The forested character of this LCT would further limit views. The Proposed Development would not significantly alter the key characteristics of this landscape due to intervening landform and forestry which limits visibility. The magnitude of change would range from Low to Zero and the addition of the Proposed Development would be **Minor to None** and Not Significant. The nature of these effects would be long-term (reversible), indirect and negative. The landscape effects of aviation warning lights on this LCT would not be significant (see full assessment in **Appendix 9D**). Cumulative Assessment: Proposed Development + Existing + Consented Sites The existing Windy Standard, Windy Standard Extension, South Kyle and the consented Windy Standard Phase III and Benbrack wind farms are partly or entirely located within this landscape (High magnitude within 1-2km of turbines) and other wind farm development (Windy Rig, Afton, Hare Hill, Hare Hill Extension and the consented Pencloe and Enoch Hill) would be visible nearby within similar landscape character (Low magnitude). The addition of the Proposed Development would be Very Low magnitude, and the effect would be **Negligible to None** and Not Significant (reduce due to the presence of other wind farms). The combined cumulative effect would be **Major / Moderate** and Significant (due to Windy Standard, Windy Standard Extension, South Kyle and the consented Windy Standard Phase III and Benbrack and not the Proposed Development) to **None** and Not Significant. The nature of these effects would be long-term (reversible), cumulative, indirect and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications There are no other application wind farms within this landscape unit. Euchanhead and Sanquhar II wind farms (Very Low to Zero magnitude) would have limited influence on this LCT. The addition of the Proposed Development would be Very Low magnitude, and the effect would be **Negligible to None** and Not Significant (reduce due to the

Landscape Character	Assessment
	presence of other wind farms). The combined cumulative effect would be **Major / Moderate** and Significant (due to Windy Standard, Windy Standard Extension, South Kyle and the consented Windy Standard Phase II and Benbrack and not the Proposed Development) to **None** and Not Significant. The nature of these effects would be long-term (reversible), cumulative, indirect and negative.
Landscape Character within East Ayrshire	
14 Upland Glen LCT: Glen Afton	The *Upland Glen: Glen Afton* unit forms a narrow glen strongly enclosed by steep sides rising to irregular and prominent ridgelines to the northwest of the Proposed Development. Viewpoint 17 is located within this LCT. The EALWCS considered the sensitivity to very large wind farm development *within it* to be High. The Afton unit is located within the locally designated Uplands and Moorlands LLA and the value of the area is judged to be High-Medium. The susceptibility to change from the introduction of the Proposed Development is judged to be High-Medium due to the small-scale of the landscape with mostly internal views and middle distance skylines. The sensitivity to the Proposed Development is therefore considered to be *High-Medium*. Assessment: Proposed Development The Eastern group of the Proposed Development would be located at approximately 4.3km distance to the southeast whilst and the Western group would be located at approximately 0.4km distance at its closest point. There would be widespread theoretical visibility of the Proposed Development within approximately 2km to 3km of the nearest turbines of the Western group at Afton Reservoir and surrounding area. Beyond this, theoretical visibility becomes fragmented and is present across parts of the steep valley slopes to either side of the glen and the valley floor near Dalhanna Farm. Visible turbines are largely restricted to those within the Western group which would generally be seen behind or adjacent to the existing Afton Wind Farm. Approximately 900m of access track would located within the southern end of the unit which would connect into the access track for the existing Afton Wind Farm. The magnitude of change would range from Medium (between 2-3km up to Afton Reservoir) to Zero and the level of effect would be **Major/ Moderate to Moderate** and Significant (between 2-3km up to Afton Reservoir due to the Western group only) to **None** and Not Significant. The nature of these effects would be long-term (reversible), indirect and negative. The landscape effects of aviation warning lights on this LCT would not be significant (see full assessment in **Appendix 9D**). Cumulative Assessment: Proposed Development + Existing + Consented Sites The existing Afton Wind Farm is partly located within this LCT (High to Zero magnitude) and the consented Pencloe Wind Farm would be located near to the western boundary of the LCT, set back from the valley sides (Medium to Low magnitude). The addition of the Proposed Development would be of Low to Zero magnitude (reduced due to Afton) and the effect would be **Moderate to None** and Not Significant. The combined cumulative effect would be **Major** and Significant (due to Afton and the Proposed Development) to **None** and Not Significant. Afton would be decommissioned ~10 years prior to the Proposed Development, thereby reducing the cumulative effect. The nature of these effects would be long-term (reversible), cumulative, indirect and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications There are no other wind farm applications within this LCT. Sanquhar II application would be located close to the eastern boundary and would be visible on the skyline in views east from the LCT (High-Medium to Zero magnitude). The addition of the Proposed Development would be of Low-Very Low to Zero magnitude (reduced due to Afton and Sanquhar II) and the effect would be **Moderate to None** and Not Significant.

Landscape Character	Assessment
	The combined cumulative effect would be **Major** and Significant (due to Afton, Sanquhar II and the Proposed Development) to **None** and Not Significant. Afton would be decommissioned ~10 years prior to the Proposed Development, thereby reducing the cumulative effect. The nature of these effects would be long-term (reversible), cumulative, indirect and negative.
15 Upland Basin LCT: New Cumnock	The *Upland Basin: New Cumnock unit* forms a low-lying, small-scale landscape located to the northwest of the Proposed Development which is strongly contained by surrounding upland character types. Viewpoint 13 is located within this LCT. The EALWCS considered the sensitivity to very large wind farm development *within it* to be High. The LCT is not within a designated landscape area with the exception of the eastern edge of the LCT at New Cumnock which is located within the locally designated Uplands and Moorlands LLA. The value of the area is judged to be Medium (increasing to High-medium near New Cumnock). The susceptibility to change from the introduction of the Proposed Development is judged to be High-Medium due to the open nature of the landscape with the Southern Uplands forming the backdrop and skyline. The sensitivity to the Proposed Development is therefore considered to be *High-Medium*. Assessment: Proposed Development The Eastern group of the Proposed Development would be located to the at approximately 12.2km distance and the Western group would be located at approximately 8.9km distance at its closest point. There would be widespread theoretical visibility of the Proposed Development across the LCT of between 1-7 turbines. Although there would be no theoretical visibility indicated at New Cumnock or to the south of the LCT. Visible turbines are largely restricted to those within the Western group which would generally be seen behind or adjacent to the existing Afton Wind Farm. It is not considered that the addition of the Proposed Development would significantly alter the key perceptual characteristics of the overall landscape. The magnitude of change would be Very Low to Zero across the majority of the LCT and the effect would be **Minor to Negligible, to None** and Not Significant. The nature of these effects would be long-term (reversible), indirect and neutral. The landscape effects of aviation warning lights on this LCT would not be significant (see full assessment in **Appendix 9D**). Cumulative Assessment: Proposed Development + Existing + Consented Sites The consented North Kyle Wind Farm would be partially located within this LCT (High magnitude within 2km reducing with distance) and the existing single turbine at High Park Farm would be located just outside the LCT (Low to Zero magnitude). The additional effect of the Proposed Development would be **Negligible to None** and Not Significant (reduced due to the presence of other wind farms). The combined cumulative effect would be **Major** and Significant (due to North Kyle and not the Proposed Development) to **None** and Not Significant. The nature of these effects would be long-term (reversible), cumulative, indirect and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications Greenburn application would be located close to the western boundary of the LCT (High to Zero magnitude). The additional effect of the Proposed Development would be **Negligible to None** and Not Significant (reduced due to the presence of other wind farms). The combined cumulative effect would be **Major** and Significant (due to North Kyle, Greenburn and not the Proposed Development) to **None** and Not Significant. The nature of these effects would be long-term (reversible), cumulative, indirect and negative.
20c Southern Uplands with	The *Southern Uplands and Forestry: Enoch Hill* unit forms predominantly rounded open hills largely covered by areas of coniferous forestry. The EALWCS considered

Landscape Character	Assessment
Forestry LCT: Enoch Hill.	the sensitivity to very large wind farm development within it to be High. The eastern part of this LCT is located within the locally designated Uplands and Moorlands LLA and the value of the area is judged to be High-Medium. The susceptibility to change from the introduction of the Proposed Development is judged to be Medium due to the large scale of the landscape and the largely forested nature of the landscape. The sensitivity to the Proposed Development is therefore considered to be *High-Medium*. Assessment: Proposed Development The Eastern group of the Proposed Development would be located to the southeast at approximately 5.9km distance and the Western group would be located at approximately 2km distance at its closest point. The ZTV coverage of this area is very limited, restricted largely to potential views of the Western group which would be seen predominantly through large areas of coniferous forestry. It is not considered that the Proposed Development would affect the key characteristics of this landscape. The magnitude of change would be range from Low-Very Low to Zero and the level of effect would be **Moderate to Negligible, to None** and Not Significant. The nature of these effects would be long-term (reversible), indirect, and negative. The landscape effects of aviation warning lights on this LCT would not be significant (see full assessment in **Appendix 9D**). Cumulative Assessment: Proposed Development + Existing + Consented Sites The existing South Kyle and Afton, and consented Pencloe and Enoch Hill wind farms are partly or entirely located within this LCA (High to Zero magnitude). The consented Benbrack Wind Farm would be located near to the southern boundary, and North Kyle, Over Hill and Polquharn would be located near to the northern boundary of the LCT and subject to screening from forestry (Low to Zero magnitude). The additional effect of the Proposed Development would be **Minor to Negligible, to None** and Not Significant (reduced due to the presence of other wind farms). The combined cumulative effect would be **Major** and Significant (due to South Kyle, Afton, Pencloe and Enoch Hill and not the Proposed Development). The nature of these effects would be long-term (reversible), cumulative, indirect and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications There are no other wind farm applications within this LCT. Sanquhar II application would be located close to the eastern boundary of the LCT and Over Hill Variation would be located near the northern boundary (both Very Low to Zero magnitude). The additional effect of the Proposed Development would be **Minor to Negligible, to None** and Not Significant (reduced due to the presence of other wind farms). The combined cumulative effect would be **Major** and Significant (due to South Kyle, Afton, Pencloe and Enoch Hill and not the Proposed Development). The nature of these effects would be long-term (reversible), cumulative, indirect and negative.

Landscape Designations

9.8.91 The following local landscape designations are located within 10km of the Proposed Development and included in the assessment in **Table 9.13**:

- East Ayrshire – Uplands and Moorlands LLA; and
- Dumfries and Galloway - Galloway Hills RSA and Thornhill Uplands RSA.

9.8.92 Information relating to the DGC RSAs in terms of its boundary, landscape character, special quality and integrity is set out in the *DGC Local Development Plan 2, Technical Paper; Regional Scenic Areas,* January 2018. Information relating to the EAC LLAs are set out in the *East Ayrshire Local Landscape Area Boundary Review*, 2015.

9.8.93 With regard to the special qualities and value of the locally designated landscapes, NatureScot[6] note that landscapes may be locally valued for many reasons and advise that:

"A wind farm will not necessarily be incompatible with valued qualities of a landscape, this will depend on the nature of the development and the nature of the landscape qualities."

"The key test applied in relation to NSAs, but often employed for other valued landscapes too, is whether impacts would affect the integrity of a valued landscape."

9.8.94 Within *their Spatial Planning for On-Shore Wind Turbines Guidance*, page 20, NatureScot also advise that 'landscape accommodation' may be an appropriate approach for wind farms sites in Spatial Planning Group 2 and 3 areas:

"Within local landscape designations and Wild land Areas, the degree of landscape protection will be less than for National Scenic Areas. In these areas, an appropriate objective may be to accommodate wind farms, rather than seek landscape protection."

9.8.95 And:

"The aim of landscape accommodation is to retain the overall character of the landscape, yet accepting that development may be allowed which will have an impact on the landscape at the local scale. Development fits within the landscape and does not change its character to a significant extent."

9.8.96 The Landscape Institute (GLVIA 3, paragraphs 5.46-47) further advises as follows:

"An internationally, nationally or locally valued landscape does not automatically or by definition have high susceptibility to all types of change."

"It is possible for an internationally, nationally or locally important landscape to have relatively low susceptibility to change resulting from the particular type of development in question, by virtue of both the characteristics of the landscape and the nature of the proposal."

"The particular type of change or development proposed may not compromise the specific basis for the value attached to the landscape."

9.8.97 In summary, there would be no significant effects on the special qualities or integrity of any of the local landscape designations as a result of the Proposed Development.

Uplands and Moorlands LLA (previously named Afton SLCA)

9.8.98 Three turbines of the Western Group of the Proposed Development (T11, T12 and T15) would be located within the locally designated Uplands and Moorlands LLA. The LLA area covers the entire Afton valley as well as the Muirkirk Uplands area to the north of the A76. Viewpoints 7 (Blackcraig Hill) and 17 (Afton Filter Station) are located within the LLA.

9.8.99 The Western group and southern tip of the LLA is noted from site surveys to overlook both the surrounding *Southern Uplands / Southern Uplands with Forest* LCTs to the north and south as well as the Water of Ken valley (*Narrow Wooded River Valley* LCT) with sporadic settlement to the south and the Glen Afton (*Upland Glen* LCT) to the north, where the engineered Afton Reservoir is a notable man-made feature. The surrounding uplands include a mix of agricultural, forestry, mining, and wind farm development, appearing as a 'working rural landscape'.

9.8.100 Originally the designation was based on a sensitivity assessment of landscape character, undertaken as part of the Ayrshire Joint Structure Plan in 1999 and 'whole' landscape

[6] *Siting and Designing Wind Farms in the Landscape*, Guidance, Version 3a, Aug 2017

character areas were included. That assessment jointly assessed the *Southern Uplands* and *Southern Uplands with Forestry* as of inherently Medium / High and Low / Medium sensitivity respectively, in terms of their landscape resource; scenic quality; unspoilt character; sense of place; and conservation interest.

9.8.101 Table 1 of the EAC Background Paper, 2015, describes the "*Characteristics and Sensitivities of the Landscape Character Areas included within the Sensitive Landscape Area*" describing the key characteristics and why the area is sensitive. The document notes the increased presence of wind farm development and re-confirms the local landscape designation.

9.8.102 The document defines the key qualities of the *Southern Uplands* LCT and the *Southern Uplands with Forestry* LCT (in East Ayrshire) which warranted their inclusion within the former SLCA as follows:

- the "*well defined, steep-sided hills on the eastern edge of Glen Afton, Blackcraig and Craigbraneoch*" are "*important landmark features*" which provide "*spectacular views*" and which include the area of Southern Uplands to the east of Glen Afton as an important area for recreation and hillwalking.
- "*the steep sided, rugged open hills of the Southern Uplands form a dramatic backdrop to the adjacent low-lying upland basin, and form an important part of East Ayrshire's southern skyline*".
- The eastern edge of the Southern Uplands with Forestry however is included to provide "*an important buffer between Glen Afton and the non-forested section of the Southern Uplands, and helps provide a logical boundary to the Sensitive Landscape Area*"

9.8.103 Table 1 of the EAC *Local Landscape Area Boundary Review* (2021) review outlines the "*Characteristics and Sensitivities of the Landscape Character Types included within the Local Landscape Area*" describing the key characteristics and why the area is sensitive. The document notes the presence of wind farm development within the *Southern Uplands with Forestry* LCT.

9.8.104 The document defines the key qualities of the *Southern Uplands* LCT and the *Upland Glen* LCT (in East Ayrshire) which warranted their inclusion within the LLA as follows:

"*Bold, upland, rugged, open hills form a dramatic backdrop and contrast to the adjacent low-lying upland basin and form an important part of East Ayrshire's southern skyline…An extensive, remote and largely untamed landscape creating landmark features when seen from adjacent hills and roads. Views are long distant and panoramic*" with "*most parts of the uplands only accessible on foot*".

"*Glen Afton is the only Upland Glen LCT within East Ayrshire, making it an important landscape feature for the area. The narrowness of the glen creates a small-scale, intimate landscape, with a relatively remote and tranquil character…The high ridgelines and well defined hills on the edges of the glens are visually prominent and the rugged upland landscape has a high scenic value, attractive to walkers*."

Landscape Sensitivity

9.8.105 As a local landscape designation, not of the highest or national level, the value of the Uplands and Moorlands LLA is assessed as High to Medium. The susceptibility of this landscape to change is considered to range from High to Medium in reference to the range of LCTs that are located within the LLA boundary and previously assessed. Taking account of these factors, the overall sensitivity of the Uplands and Moorlands LLA is assessed as *High* to *High-Medium*.

Primary Assessment of the Proposed Development

9.8.106 ZTV coverage within the LLA remains almost constant within 2km of the Proposed Development and thereafter becomes fragmented where there is no theoretical visibility beyond Cannock Hill, Blacklorg Hill, Blackcraig Hill, and Craigbraneoch Hill. Theoretical visibility becomes increasingly more fragmented and is largely absent between New Cumnock and Black Hill (431m AOD) becoming present on the south-facing slopes of the East Ayrshire Plateau Moorland LCT as the landform rises to Wardlaw Hill (497m) and Cairn Table (517m).

9.8.107 An assessment of the special qualities, drawn from EAC's *Local Landscape Area Boundary Review* (2015), using the 'Evaluation of Criteria' of the LLA (Table 4) and the 'Characteristics of the Landscape Character Types within the Local Landscape Area' (Table 1) have been used to provide an assessment of the LLA and the effects of the Proposed Development on its special qualities and integrity in accordance with GLVIA3 (page 84). This assessment is set out in **Table 9.13** and paragraphs 9.8.108-112 below.

Table 9.13 Effects on the special qualities of the Uplands and Moorlands LLA

Special Qualities (Headings and level of rating extracted from Table 5, EAC's Local Landscape Area Boundary Review, 2021)	**Sensitivities / Key Characteristics of the LCTs within the LLA** (Extracted from Table 1 EAC's Local Landscape Area Boundary Review, 2021)	**Assessment EAC LLA2: Uplands and Moorlands** (East Ayrshire Southern Uplands/ Upland Glen: (Alhang Hill / Alwhat Hill, the Development Site))
<u>Identity and sense of place:</u> **Considered to be 'Medium': 'The landscape contains some features which are distinctive of East Ayrshire or which make a strong positive contribution to identity and sense of place.'**	**Southern Uplands – East Ayrshire** Bold, upland, rugged, open hills form a dramatic backdrop and contrast to the adjacent low-lying upland basin and form an important part of East Ayrshire's southern skyline. An extensive, remote and largely untamed landscape creating landmark features when seen from adjacent hills and roads. Views are long distant and panoramic. **Upland Glen** Glen Afton is the only Upland Glen LCT within East Ayrshire, making it an important landscape feature for the area. The narrowness of the glen creates a small-scale, intimate landscape, with a relatively remote and tranquil character. The high ridgelines and well-defined hills on the edges of the glens are visually prominent and the rugged upland landscape has a high scenic value, attractive to walkers.	**Southern Uplands – East Ayrshire** The Proposed Development would have ***no effect*** on the physical aspects and would appear as a 'clean' and well-designed scheme on the southern skyline. The Proposed Development would have a ***Minor*** effect on the overall backdrop of hills, avoiding the main foci along Afton Glen and the landmark hill at Blackcraig. **Upland Glen** The Proposed Development would be located beyond the southern end of the glen and would be mostly screened along the majority of Glen Afton by the steep sides, narrow form and vegetation with no effect on the intimate landscape features or the high ridgelines either side of the glen. Alwhat Hill is visible from elevated areas of Afton Reservoir and dam at the end of the glen. The effects from the introduction of the Proposed Development would be

Special Qualities (Headings and level of rating extracted from Table 5, EAC's Local Landscape Area Boundary Review, 2021)	**Sensitivities / Key Characteristics of the LCTs within the LLA** (Extracted from Table 1 EAC's Local Landscape Area Boundary Review, 2021)	**Assessment EAC LLA2: Uplands and Moorlands** (East Ayrshire Southern Uplands/ Upland Glen: (Alhang Hill / Alwhat Hill, the Development Site))
		limited to this area of the Afton Glen and would result in a locally **Major to Major / Moderate** effect within 2-3km of the proposed turbines (Western group) and a **Minor to None** effect elsewhere along the glen.
Rarity: **Considered to be 'Medium': 'Some landscape features which are rare or unique within East Ayrshire.'**	-	The landscape is not 'rare' and the Proposed Development would have ***no effect*** on this attribute, which is not representative of special quality.
Intactness and condition: **Considered to be 'Low': The landscape has experienced past decline in quality and is potentially subject to further decline and/or the landscape is not in a good state of repair, with many elements which have been less well maintained.**	-	The Proposed Development would have ***no effect*** on this attribute, which is not representative of special quality.
Wildness: **Considered to be 'Medium': 'The landscape has some degree of wildness.'**	**Southern Uplands – East Ayrshire** Absence of modern settlement. Expansive, remote and largely untamed landscape. Most parts of the uplands are only accessible on foot. **Upland Glen** Small scale landscape with some areas of remote and wild character.	The Proposed Development would be located in part of the LLA influenced by development (including wind farms, reservoir, scattered settlement to north along Afton Glen and south along the Water of Ken Valley) and would have ***no effect*** on this attribute.
Scenic qualities: **Considered to be 'High':** **'Pleasing combination of features, visual contrasts and / or dramatic elements. Visual, sensory, perceptual and experiential qualities which contribute to the setting of an adjacent area of**	**Southern Uplands – East Ayrshire** The combination of natural features and the contrast with the lower moorlands gives an impression of uplands which are more extensive, remote and higher than is actually the case.	The Proposed Development would be located in part of the LLA influenced by development (including wind farms, reservoir, scattered settlement to north along Afton Glen and south along the Water of Ken Valley) and would have a ***minor to no effect*** on this attribute.

Special Qualities (Headings and level of rating extracted from Table 5, EAC's Local Landscape Area Boundary Review, 2021)	**Sensitivities / Key Characteristics of the LCTs within the LLA** (Extracted from Table 1 EAC's Local Landscape Area Boundary Review, 2021)	**Assessment EAC LLA2: Uplands and Moorlands** (East Ayrshire Southern Uplands/ Upland Glen: (Alhang Hill / Alwhat Hill, the Development Site))
high landscape quality (AHLQ).	Long distance and panoramic views. **Upland Glen** Distinctive profile comprising steep, often craggy valley slopes and a rounded valley floor. Complex and prominent ridgelines along tops of steep valley sides. Views contained by the steep valley sides.	
<u>Enjoyment:</u> **Considered to be 'Medium': 'The landscape has some importance as a greenspace or recreation area. Some provision of access routes, key viewpoints and facilities, potentially less well-used.'**	-	The Proposed Development would have a ***minor to no effect*** on this attribute, which is not representative of special quality.
<u>Cultural qualities:</u> **Considered to be 'Low': 'The landscape has fewer literary, historical or artistic associations; these may be little-known or of principally local interest.'**	-	The Proposed Development would have ***no effect*** on this attribute, which is not representative of special quality.
<u>Naturalness and natural Heritage assets:</u> **Considered to be 'High': 'Natural heritage features are a key aspect of the character of this landscape.'**	**Southern Uplands – East Ayrshire** Steep, smooth slopes rising to rounded summits. Series of distinctive valleys cut into the uplands created by glacial erosion with U-shaped cross sections, precipitous side slopes, hanging valleys, waterfalls, crags and screes. Scarce, semi-natural woodland limited to a few sheltered glens, gullies and clefts. Occasional forested areas and shelterbelts on lower slopes leaving the domed peaks exposed. **Upland Glen**	The Proposed Development would have ***no effect*** on the physical aspects of the landscape such as smooth slopes, distinctive valleys, and broadleaf woodlands. There would be a locally **Major to Major / Moderate** effect on the natural features of Alwhat Hill and Alhang Hill within 2-3km of the proposed turbines (Western group) and a **Minor to None** effect elsewhere.

Special Qualities (Headings and level of rating extracted from Table 5, EAC's Local Landscape Area Boundary Review, 2021)	**Sensitivities / Key Characteristics of the LCTs within the LLA** (Extracted from Table 1 EAC's Local Landscape Area Boundary Review, 2021)	**Assessment EAC LLA2: Uplands and Moorlands** (East Ayrshire Southern Uplands/ Upland Glen: (Alhang Hill / Alwhat Hill, the Development Site))
	Distinctive profile comprising steep, often craggy valley slopes and a rounded valley floor, containing a comparatively small 'misfit' river. Complex and prominent ridgelines along tops of steep valley sides. Pasture on the valley floors and lower valley slopes giving way rapidly to rough grassland and heather moorland on higher ground. Broadleaf woodland is scarce, but small to medium scale coniferous forests are found on the valley slopes.	
Settlement setting: **Considered to be 'Medium: 'The landscape performs some function in providing the setting of settlement(s) and/or makes some contribution to settlement identity.'**	Bold, upland, rugged, open hills form a dramatic backdrop and contrast to the adjacent low-lying upland basin and form an important part of East Ayrshire's southern skyline.	The Proposed Development would appear as a 'clean' and well-designed scheme on the southern skyline. The Proposed Development would have a ***Minor*** effect on the overall backdrop of hills, avoiding the main foci along Afton Glen and the landmark hill at Blackcraig.
Views: **Considered to be 'High: 'The landscape is important in views from recognised key viewpoints, settlements or transport routes and/or includes key landmarks.'**	Bold, upland, rugged, open hills form a dramatic backdrop and contrast to the adjacent low-lying upland basin and form an important part of East Ayrshire's southern skyline.	The Proposed Development would appear as a 'clean' and well-designed scheme on the southern skyline from the adjacent low-lying upland basin. The Proposed Development would have a ***Minor*** effect on the overall backdrop of hills, avoiding the main foci along Afton Glen and the landmark hill at Blackcraig.

9.8.108 Much of the sensitivity of the LLA, within which only three turbines of the Western group of the Proposed Development are located, is determined by potential effects on the Glen Afton valley and the backdrop of hills of East Ayrshire's southern skyline. ZTV analysis and site visits have determined that the Proposed Development would have little to no effect on the majority of the Glen Afton valley landscape due to the lack of visibility of the proposed turbines. There would, however be visibility from the elevated dam and Afton Reservoir at the southern tip of the valley. Whilst there would be some views from the summits of landmark hills (Blackcraig Hill), the adjacent and surrounding hills to the east (Craigbraneoch Hill, Blackcraig Hill, Cannoch Hill and Blacklorg Hill) provide much

screening of the proposed turbines in views from the floor of Afton Glen and there are no particular opportunities to view the Proposed Development against these landmark features and so the qualities of these, which are described as, "*well defined, steep-sided hills*" would not be affected.

9.8.109 Similarly, whilst limited sequential views of the Proposed Development may be available to the south and east of the summits of Blackcraig Hill, Hare Hill and Corsencon Hill, there would be no visibility to the north and northeast of these summits within the wider area of this part of the *Southern Uplands* LCT. It is not considered that the extent of available views would affect the overall experience of walking in the landscape.

9.8.110 Although there would be a significant effect on part of the landscape character within the Uplands and Moorlands LLA (as noted in the *Upland Glen: Glen Afton* assessment in **Table 9.12** above), the Development Site area and adjacent landscape is not noted in the document as part of the special qualities of the LLA. The *East Ayrshire Local Landscape Area Boundary Review* notes in feedback that in the location of the '*hills above / around Afton Reservoir*', '*Windfarms have altered the character of the landscape'* (Table 2). The Proposed Development would be located within this altered landscape setting and would not introduce new or unfamiliar elements into the views.

9.8.111 It is therefore not considered that the special qualities of the Uplands and Moorlands LLA, its integrity or the reasons for its designation would be significantly affected. There would be little or no visibility from within much of the Glen Afton valley, which forms the focus of the LLA in this area, and a minor effect on the backdrop of hills to the south of East Ayrshire. That part of the Development Site within the LLA is not well representative of the special qualities and attributes expected for LLA designation. The overall magnitude of change would range from Low to Zero and the level of effect would be **Moderate to None** and Not Significant. The nature of these effects would be indirect, long-term (reversible), and negative.

9.8.112 The landscape effects of aviation warning lights on the LLA would not be significant (see full assessment in **Appendix 9D**).

Cumulative Assessment: Proposed Development + Existing + Consented Sites

9.8.113 There are a number of wind farms within the Uplands and Moorlands LLA and some on the boundary to the south, east and northeast. These include Hare Hill, Hare Hill Extension, Afton, Enoch Hill, Pencloe and High Park Farm within the LLA and Windy Standard, Windy Standard Extension, North Kyle and Sanquhar and Nutberry to the south, east and northeast as well as Windy Rig to the south, South Kyle to the west and Sandy Knowe, Lethans, Glenmuckloch, Penbreck and Kennoxhead to the east. The magnitude of change due to the existing and consented wind farms within and close to the LLA would range from Medium to Negligible.

9.8.114 The additional effect of the Proposed Development would remain **Moderate to None** and Not Significant. The combined cumulative effect would be **Major / Moderate** and Significant (due to Afton, Hare Hill and Extension, Pencloe and not the Proposed Development) to **None** and Not Significant. The nature of these effects would be long-term (reversible), cumulative, and negative.

Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications

9.8.115 Sanquhar II application is located within the LLA (Medium magnitude). Shepherd's Rig is also located close to the LLA (Low magnitude) as are Polquhairn Variation, Daer, Hare Craig and Craigenmoddie (all Low magnitude). The additional effect of the Proposed

Development would remain **Moderate to None** and Not Significant. The combined cumulative effect would be **Major / Moderate** and Significant (due to Afton, Hare Hill and Extension, Pencloe, Sanquhar II and not the Proposed Development) to **None** and Not Significant. The nature of these effects would be long-term (reversible), cumulative, and negative.

Table 9.14 Indirect Effects of the Proposed Development on Local Landscape Designations within Dumfries and Galloway

Local Landscape Designation	Landscape Assessment
Galloway Hills RSA	The Galloway Hills RSA covers a very large area of Dumfries and Galloway, from the A714 in the west, on the western edge of the Galloway Forest Park, to Wigtown Bay in the south, the A713 in the east and Cairnsmore of Carsphairn and Loch Doon in the north. Viewpoint 9 (Cairnsmore of Carsphairn) is located within the RSA at a distance of over ~5km from the nearest turbine. In the wider study area Viewpoint 16 (Coreserine) is located within the RSA at a distance of over 19km from the nearest turbine. As a local landscape designation, not of the highest or national level, the value of the Galloway Hills RSA is assessed as High to Medium. The susceptibility of this landscape to change is considered to range from High to Medium in reference to the range of LCTs that are located within the RSA boundary and previously assessed. Other factors such as key scenic views tend to be focused towards or within the RSA and away from the Proposed Development. Perceptual qualities of wildness and naturalness as well as recreational value are also focused towards the core area of the RSA, with the exception of the Cairnsmore of Carsphairn in the east. Taking account of these factors, the overall sensitivity of the Galloway Hills RSA is assessed as *High to Medium*. Assessment: Proposed Development There would be no direct landscape effects arising from the Proposed Development. The Eastern group of the Proposed Development would be located approximately 4.5km distance to the northeast and the Western group at approximately 2.3km distance from the RSA boundary at its closest point. The ZTV coverage of this area is fragmented and largely focused on mountain summits and east and northeast facing slopes as illustrated in the assessment of Viewpoint 9 where the magnitude of change on the view is assessed as Medium-Low. The majority of the wider RSA lies outwith the ZTV, is some distance from the Proposed Development and would not be affected. Therefore, overall, it is not considered that the Proposed Development would significantly affect the special qualities of the RSA either in whole or in part. The overall magnitude of change would range from Low to Very Low, to Zero and the level of effect would be **Moderate to Negligible, to None** and Not Significant. The nature of these effects would be indirect, long-term (reversible), and negative. The effects of aviation warning lights on the RSA would not be significant (see full assessment in **Appendix 9D**). Cumulative Assessment: Proposed Development + Existing + Consented Sites There are no existing wind farms within the RSA although the existing Windy Rig and South Kyle wind farms, and the consented Benbrack wind farms are located on the northern edge of the RSA resulting in significant effects within 1-2 km of these turbines. The consented Torrs Hill Wind Farm is located within the RSA. The magnitude of change due to the existing and consented wind farms within and close to the Galloway Hills RSA would be High to Medium.

Local Landscape Designation	Landscape Assessment
	The additional effect of the Proposed Development would remain **Moderate to None** and Not Significant. The combined cumulative effect would be **Major to Major / Moderate** and Significant (due to Windy Rig, South Kyle, Benbrack and Torrs Hill and not the Proposed Development). The nature of these effects would be long-term (reversible), cumulative, and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications Shepherd's Rig would be partially located within the boundary of the RSA. The magnitude of change would be High to Medium resulting in a significant effect within 1-2km of the turbines. The additional effect of the Proposed Development would remain **Moderate to None** and Not Significant. The combined cumulative effect would be **Major to Major / Moderate** and Significant (due to Windy Rig, South Kyle, Benbrack, Torrs Hill and Shepherd's Rig and not the Proposed Development). The nature of these effects would be long-term (reversible), cumulative, and negative.
Thornhill Uplands RSA	The Thornhill Uplands RSA extends across the northern sections of the Upland Glens of Castlefairn and Dalwhat, Shinnel and Scar valleys as well as the northern parts of the Dalmacallan and Keir Foothills and the north-western section of the Nithsdale area of the Southern Uplands. Viewpoint 11 (Cairnkinna Hill) is located within the RSA. As a local landscape designation, not of the highest or national level, the value of the RSA is assessed as High to Medium. The susceptibility of the special qualities of the RSA are considered to range from High to Medium with many of these qualities related to the open, large scale, upland landscape characteristics that are indicative of reduced sensitivity to wind farm development. The main focus of the RSA and its special quality is Drumlanrig Castle Garden and Designed Landscape and that is outwith the ZTV and would not be affected. Overall, the RSA has been assessed as of *High to Medium* sensitivity to the Proposed Development. Assessment: Proposed Development There would be no direct landscape effects arising from the Proposed Development. The Eastern group of the Proposed Development would be located approximately 4.6km distance to the northeast with the Western group located at approximately 8.7km distance from the RSA boundary at its closest point. The ZTV coverage of this area is fragmented with areas of theoretical visibility on elevated hill summits towards the west of the RSA such as Cairnkinna Hill, Peat Hill, Welltrees Hill, Keb Hill and Countam Hill. Viewpoint 11 (**Figure 9.32**) illustrates the views from the summit of Cairnkinna Hill. Elsewhere theoretical visibility would occur on the rising landform and foothills to the east and northeast of the River Nith valley. The magnitude of change affecting the special qualities of the RSA would range from Low (on the elevated and peripheral areas) to Zero (in more central and core areas of the RSA). Hence, there would be no effect on the Drumlanrig Castle Garden and Designed Landscape. The effect on the special qualities and integrity of the Thornhill Uplands RSA would be **Moderate to None** and Not Significant, affecting the elevated and western areas of the RSA. The nature of these effects would be long-term (reversible), indirect, and negative. The effects of aviation warning lights on the RSA would not be significant (see full assessment in **Appendix 9D**). Cumulative Assessment: Proposed Development + Existing + Consented Sites The existing Wether Hill and consented Twentyshilling Hill wind farms are located just beyond the western and northern edges of the RSA (High to Medium magnitude). The additional effect of the Proposed Development would remain **Moderate to None** and Not Significant. The combined cumulative effect would be **Major to Major / Moderate** and Significant (due to Wether Hill and Twentyshilling

Local Landscape Designation	Landscape Assessment
	Hill, and not the Proposed Development). The nature of these effects would be long-term (reversible), cumulative, indirect, and negative. Cumulative Assessment: Proposed Development + Existing + Consented + Applications Euchanhead would be partially located within the RSA to the west near Blackcraig Hill, and Daer would be partially located within the RSA to the east near the Lowther Hills (all High to Medium magnitude). The additional effect of the Proposed Development would reduce to **Minor to None** and Not Significant (reduced due to the presence of other wind farms). The combined cumulative effect would be **Major to Major / Moderate** and Significant (due to Wether Hill, Twentyshilling Hill, Euchanhead and Daer, and not the Proposed Development). The nature of these effects would be long-term (reversible), cumulative, indirect, and negative.

9.9 Residual Visual Effects

9.9.1 Visual effects are assessed by considering the sensitivity of the receptor (people in the landscape) and the magnitude of change that would affect the view or overall visual amenity. They are defined by the Landscape Institute in GLVIA 3, paragraphs 6.2 as follows:

"An assessment of visual effects deals with the effects of change and development on the views available to people and their visual amenity. The concern here is with assessing how the surroundings of individuals or groups of people may be specifically affected by changes in the content and character of views as a result of the change or loss of existing elements of the landscape and/or introduction of new elements."

9.9.2 The type of effect may also be described as temporary or permanent, direct or indirect, cumulative and positive, neutral, or negative. The assessment methodology is set out in **Appendix 9A**.

9.9.3 The residual visual effects assessed here are those effects remaining after all of the embedded design mitigation and enhancement measures have been taken into account.

9.9.4 The visual assessment has been set out as follows:

- Overview of Visual Effects during Construction, Operation and Decommissioning;
- Visual Effects on Views from Settlements and Residential Properties;
- Visual Effects on Views from Transport Routes;
- Visual Effects on Views from Recreational Routes; and
- Visual Effects on Views from Recreational and Tourist Destinations.

9.9.5 Visualisations of the Proposed Development are provided from 17No. viewpoint locations and illustrated in **Figures 9.21** to **9.39**. Each of the viewpoints are assessed in a separate appendix (**Appendix 9B**).

9.9.6 The viewpoint analysis indicates that significant visual effects are likely to affect limited locations within approximately 8.3km distance from the Proposed Development (subject to a clear view of the proposed turbines, landform and vegetation screening), as indicated by

Viewpoints 1, 2, 3, 4, 5, 6, 7, 8, 9 and 17. Taking a precautionary approach, and drawing from best practice guidance, the visual assessment has been focused on receptors within 10km of the Proposed Development in order to assess the likely significant visual effects. Within the wider 45km study area, the assessment has included receptors of national importance such as Scotland's Great Trails and Sustrans Cycle Routes.

Overview of Visual Effects during Construction and Decommissioning

9.9.7 The majority of the significant visual effects would be experienced as a result of the proposed turbines, during the operational period and this forms the main focus of the assessment. However, the visual effects associated with the construction and decommissioning phases of the Proposed Development and the infrastructure components also have the potential to be significant. The layout of the Proposed Development is shown in **Figure 3.3**. Visualisations of the proposed internal Development Site access tracks, anemometer mast, and substation building have been modelled and illustrated in viewpoints 1 to 10 and 17 where visible, within approximately 10km of the Proposed Development. In general terms, visual effects associated with the construction phase would increase from Zero at the start of construction, and progressively increase, until they are at the same levels as that predicated for the operational effects once the turbines are constructed. The construction effects, although temporary, are likely to involve greater movement of machinery and visibility of contrasting construction activity, background noise and associated lighting. The nature of these effects would be temporary, direct, and negative. Some construction activities may be remote from the Site (access works) and / or temporary (temporary construction compounds) and subject to restoration on completion of the construction period.

9.9.8 The assessed levels of effect are likely to be at their greatest during the period of operation, due to the visibility of the proposed turbines. However, the appearance of the Proposed Development would also recover a ‘calmer’ overall visual character with negligible levels of maintenance activity visible on Site. The main visual assessment although focused on the proposed turbines, also refers to and assesses the associated infrastructure, where visible.

9.9.9 During decommissioning the wind farm would return to a construction site for a temporary period and the level of visual effect would gradually reduce with the removal of the turbines, the substation building, met masts and eventually any temporary construction compounds, required during the decommissioning. Therefore, the visual effects likely to be experienced during the decommissioning period would be largely reversed and would not be significant on completion of the decommissioning. As with the construction period, although temporary, these works are likely to involve greater movement of machinery and visibility of contrasting construction activity, background noise and associated lighting. The internal tracks and Site access would remain as a permanent feature for use by the landowner but would ‘grass over’ subject to the level of use. In overall terms the level of visual effect would reduce to non-significant levels (Minor) and the nature of these effects would be permanent, direct, and neutral when compared to the pre-existing baseline landscape of the local area.

Visual Effects on Views from Settlements and Residential Properties

9.9.10 As described in the baseline section, there are no settlements within 10km of the Proposed Development. The nearest settlements are over 10km away at Carsphairn, New Cumnock, Moniaive and Kirkconnel which are all outwith the ZTV.

9.9.11 A Residential Visual Amenity Assessment (RVAA) has been undertaken to assess the effects on residential visual amenity likely to arise as a result of the Proposed

Development. Residential properties within 2-5km of the Proposed Development that are overlapped by the blade tip ZTV and shown on the Ordnance Survey 1:25,000 scale map have been considered in the assessment. The RVAA is reported in **Appendix 9C** and is illustrated in **Figures 9.21a-u**.

9.9.12 The sensitivity of each of these receptors (people) at settlements and residential properties has been assessed as *High*.

Residential Visual Amenity Assessment

9.9.13 The RVAA is reported in **Appendix 9C**.

9.9.14 In summary, none of the residential properties included in the RVAA would be unacceptably affected by the Proposed Development in terms of their residential visual amenity. This is due largely to the intervening distance, partial screening and use / orientation of the property, such that the living standards would not be affected, and the property would not be adversely affected by 'visual dominance' to the extent that it would become an unattractive place to live when judged objectively and in the public interest, on an individual basis or cumulatively.

9.9.15 Seven of the residential properties within 5km (Polskeoch, Nether Holm of Dalquhairn, Craigythorn Croft, Corlae Byre 1 and 2, Dalgonar, Polcheskie Brae and Strahanna Farm) would experience a significant visual effect due to the Proposed Development. Polskoech is the only property within 2km of the Proposed Development whilst the remaining six properties are between 2-5km distance from the Proposed Development. The remaining five properties within 5km would not be significantly affected, although residents and visitors accessing Upper Holm of Dalquhairn would experience significant views of the Proposed Development from the long access track to the property.

9.9.16 The effect of aviation warning lights on the Proposed Development, although theoretically visible from these properties, would however not result in a significant effect due to the lighting mitigation which would reduce the intensity and luminance of the lights during operation. However, there would be one significant combined cumulative effect on the views from Polskeoch as a result of the application Sanquhar II and Euchanhead wind farms and the Proposed Development. This significant cumulative effect applies only to the scenario of the proposed aviation warning lights operating at maximum intensity in conditions of restricted (poor) visibility of <5km (less than 2% of the time).

9.9.17 The experience of a significant view of the Proposed Development is not the same as an unacceptable effect or indicative of a failure in terms of maintaining residential amenity.

Visual Effects on Views from Transport Routes

9.9.18 This section of the assessment considers the visual effects on views from the transport routes within 10km of the Proposed Development. Those routes which are overlapped by the ZTV and included in the assessment are listed as follows:

- B729 between Craigdarroch and east of Knowehead;
- Minor road from Smittons Bridge to Lorg Bridge (Class III road - C35s);
- Minor road from northwest of Penpont to Polskeoch (Unclassified road - U405N);
- Minor road from west of Moniaive to Benbuie (Unclassified road - U394N).
- Minor road from west of Brown Knowe to Appin Lodge (Unclassified road – U400Nn);
- Glen Afton Road;

- A713 Galloway National Tourist Route; and
- Glasgow to Carlisle railway line via Kilmarnock and Dumfries.

9.9.19 The views from these routes would be experienced transiently by road users (mainly drivers and any passengers, and where appropriate cyclists or walkers). All would experience the wind farm as part of the changing sequence of views experienced from the road. Each of these routes were driven or travelled in both directions in order to assess the potential effects and each assessment has been visited on-site with the use of sequential wirelines, ZTV maps and True View Visuals 3D augmented reality software. The assessment has also taken account of other wind farms visible from these routes.

9.9.20 The visual effects on views from the B729 is set out in **Table 9.15**, the C35s: Minor road from Smittons Bridge to Lorg Bridge is set out in **Table 9.16** and the effects on the other routes is set out in **Table 9.17**.

9.9.21 In summary, there would be significant visual effects from two transport routes, as follows:

- Approximately 3.5-4km of the northern section of the Class III C35s road, intermittently between Polcheskie Brae and Lorg Bridge;
- Approximately 0.3km section of the minor, Unclassified Road (U405N) between Dalnagor and Polskeoch (this would increase to approximately 1.5km if the coniferous forestry were felled).

9.9.22 There would be no significant visual effect on the views from the remaining transport routes as a result of the Proposed Development. However, it is recognised that some of these routes overlap with recreational walking routes within the Afton Glen and Ken Water valley and the visual effects on some views experienced by walkers along parts of these routes would be significant, as assessed in **Tables 9.18-19**.

B729 between Craigdarroch and east of Knowehead

9.9.23 The B729 is the only 'B' class road within 10km and much of the 13km route is outwith the ZTV except for the section between Knowehead and Smittons Bridge (routed through forestry) and again at Blackmark. At its closest point, the route passes to the south of the Proposed Development at approximately 7.4km distance north of Blackmark. The route is illustrated in **Figure 9.19a** and the viewpoints along the route are illustrated in **Figures 9.19b-e.** Viewpoint 10 is also located along this route (**Figure 9.31**).

9.9.24 The route is not a designated tourist route and although it passes through the Thornhill Uplands RSA, this is outside the ZTV and there are no areas designated for their scenic value in the area assessed between Knowehead and Blackmark. The value of the route is therefore assessed as Medium. Most of the road users would experience the landscape transiently whilst using the road (Medium susceptibility). To conclude, the sensitivity of this route is assessed as *Medium*.

9.9.25 The route is assessed sequentially in **Table 9.15** below.

Table 9.15 Visual Effects on Views from the B729

Viewpoint / Location	Description of Effects
1. South of Cornharrow (Figure 9.19b)	Located at a passing place as the road turns northwest near Blackmark and views open up beyond Carroch Hill, the ZTV indicates that up to 11 turbines would be theoretically visible. In reality, this section of the route is partially screened by forestry and woodland trees. Where visible (subject to forestry screening / felling),

Viewpoint / Location	Description of Effects
	the upper parts of the turbines (hubs and blades) would be seen on the horizon in the direction of travel at approximately 7.8-9.8km distance. The magnitude of change where visible would be *Low-Very Low*.
2. LVIA Viewpoint 10 (Figure 9.19b)	Located at the entrance to Cornharrow Woodland, the ZTV indicates that up to 11 turbines would be theoretically visible. In reality, this section of the route is partially screened by forestry and woodland trees. Where visible (subject to forestry screening / felling), the upper parts of the turbines (hubs and blades) would be seen on the horizon in the direction of travel at approximately 7.6-9.5km distance. The magnitude of change where visible would be Low-Very Low.
3. North of Access Track to Cornharrow (Figure 9.19c)	Located at an informal layby before theoretical visibility disappears, the ZTV indicates that up to seven turbines would be theoretically visible. In reality the turbines would be partially screened by distant forestry and woodland trees. Where visible (subject to forestry screening / felling), the upper parts of the turbines (hubs and blades) would be seen on the horizon in the direction of travel at approximately 7.5-9.3km distance. The magnitude of change where visible would be *Very Low*.
	There is very fragmented theoretical visibility of up to three turbines indicated for approximately 2.5km between viewpoints 3 and 4. The magnitude of change where visible would be *Very Low to Zero.*
4. East of Smittons Bridge (Figure 9.19c)	Located at a passing place as the road turns west towards Smittons Bridge, this illustrates the oblique view towards the proposed turbines where ZTV indicates visibility of up to three turbines. In reality, the turbines would be mostly screened by local, middle-distance landform. Where visible the upper parts of the turbines (hubs and blades) would be seen on the horizon in the direction of travel at approximately 8.5-9.2km distance. The magnitude of change where visible would be *Very Low*.
5. Smittons Bridge (Figure 9.19d)	This viewpoint is located at the bridge and views north / northeast along the Water of Ken at an oblique angle to the road. The ZTV indicates theoretical visibility of 12-15 turbines, however, they would be partially screened by intervening forestry and trees. Where visible the upper parts of the turbines (hubs and blades) would be seen on the horizon in the direction of travel at approximately 8.5-9.2km distance. The magnitude of change where visible would be *Low-Very Low*.
6. Southeast of Marscalloch Hill (Figure 9.19d)	14 turbines (nine hubs and five blades) would be theoretically visible above the horizon in the direction of travel (eastbound). All the turbines would be largely screened by plantation forestry and other vegetation in the foreground and middle distance. The magnitude of change where visible would be *Very Low*.
7. East of Knowehead (Figure 9.19e)	All 15 turbines (mostly hubs) would be theoretically visible above the horizon in the direction of travel (eastbound), however they would be largely screened by coniferous forestry and roadside trees in the foreground and middle distance. The magnitude of change would be *Zero* (increasing to *Low-Very Low* if forestry felled).
8. Near Knowehead (Figure 9.19e)	10 turbines would be theoretically visible above the horizon in the direction of travel (eastbound). All the turbines would be largely screened by coniferous forestry and other vegetation in the foreground and middle distance. The magnitude of change where visible would be *Zero* (increasing to *Low-Very Low* if forestry felled).

9.9.26 In summary, there would be no significant effects along the sections of the B729 with theoretical visibility. The greatest level of effect would be experienced by road users as they pass south of Cornharrow at Blackmark where the turbines would be visible on the distant skyline in the direction of travel, and briefly around Smittons Bridge before the turbines become screened by roadside vegetation and forestry. The magnitude of change

would range from Low-Very Low to Zero and the level of visual effect would be **Negligible to No View** and Not Significant. The nature of these effects would be long term (reversible), indirect and negative.

9.9.27 Aviation warning lights would be visible as reported in **Appendix 9D**, however, the visual effects of these lights would not be significant.

Cumulative Assessment: Proposed Development + Existing + Consented Sites

9.9.28 The existing Windy Rig would be visible to the northwest alongside Windy Standard and Afton at Blackmark (Low - Very Low to Zero magnitude) but would be screened by forestry west of Smittons Bridge. Wether Hill would be mostly screened by coniferous forestry and/or landform along the route (Very Low to Zero magnitude). The consented Cornharrow Wind Farm would be visible above intervening forestry and roadside trees from viewpoints 1-3 where it would be most visible for eastbound road users at approximately 2.4km distance (Medium to High-Medium if forestry felled). Troston Loch and Glenshimmeroch wind farms would also be visible from Smittons Bridge to eastbound traffic as blades and hubs in the skyline (both Low to Zero magnitude). The additional effect of the Proposed Development would remain **Negligible to No View** and Not Significant. The combined effect would be **Moderate** and Not Significant (due to Cornharrow) (increasing to **Major / Moderate** and Significant if forestry felled, also due to Corharrow). The nature of these effects would be long term (reversible), indirect, cumulative, and negative.

Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications

9.9.29 Shepherd's Rig would be visible for much of the route at distances of between approximately 3.5km near Blackmark, and 0.7km at Smittons Bridge and would be visible in the direction of travel (High – Medium / High to Zero magnitude). Euchanhead and Sanquhar II would be mostly screened by intervening landform and vegetation for much of the route (Very Low to Zero magnitude) at over 8.5km. The additional effect of the Proposed Development would remain **Negligible to No View** and Not Significant. The combined effect would be **Major / Moderate** and Significant (due to Shepherd's Rig) (and Cornharrow, if forestry felled). The nature of these effects would be long term (reversible), indirect, cumulative, and negative.

C35s (Class III) Minor Road from Smittons Bridge to Lorg Bridge

9.9.30 The C35s is a minor road which follows the Water of Ken valley from Smittons Bridge at the junction with the B729 in the south, to the head of the glen at Lorg Bridge. The route passes to the west and southwest of the Proposed Development at approximately 1.3km distance at its closest point at Lorg Bridge.

9.9.31 The route is not a designated tourist route, however there are a number of local recreational routes that overlap with the northern section of the road. The value of the route is therefore assessed as High-Medium. Most of the road users would experience the landscape transiently whilst driving, cycling or walking (High to Medium susceptibility). To conclude, the sensitivity of this route is assessed as *High to Medium*. A number of viewpoints (3, 4 and 6) are located along this route (**Figures 9.24, 9.25 and 9.27**) including residential property locations (**Figure 9.21**).

9.9.32 The route is assessed sequentially in **Table 9.16** below, following the route northeast from Smittons Bridge to Lorg Bridge where it terminates. The route is approximately 11.5km in length.

Table 9.16 Visual Effects on Views from the C35s (Class III) minor road from Smittons Bridge to Lorg Bridge

Viewpoint / Location	Description of Effects
Between B729 / Smittons Bridge to Strathanna	Travelling north from the junction with the B729 at Smittons Bridge to Strathanna, the ZTV indicates that up to 1-7 turbines would be theoretically visible for approximately 1.3km, before the road turns northeast between Auchrae and Craigengillan Hill. From this point to Strathanna (approximately 2.3km), theoretical visibility of up to 15 turbines is indicated, reducing to up to 11 at Strathanna. In reality, this section of the route is largely screened by forestry and woodland trees – although some of this has been felled and replanted in recent years. Where visible (subject to forestry screening / felling), the upper parts of the turbines (hubs and blades with some upper towers) would be seen on the horizon in the direction of travel at approximately 8.5-4.7km distance. The magnitude of change where visible would be *Low*.
Strathanna (Figure 9.21u)	The viewpoint illustrates that all of the Eastern group (five hubs and five blades) and one blade tip of the Western group would be theoretically visible from this location, however, they would be screened by roadside trees (filtered views in the winter). Parts of the turbines would be visible from sections of the road, just north of Strathanna with open views towards the Proposed Development (Eastern group), although only 1-3 turbines would be partly visible. The magnitude of change where visible would be *Low* (*Medium-Low* in winter views).
Auchrae (Figure 9.21s)	The viewpoint illustrates that up to 10 turbines would be theoretically visible from this location at Auchrae. The Eastern group, comprising seven of the proposed turbines (two hubs, five blades) would be theoretically visible to the northeast but would screened by intervening farm buildings and vegetation. The Western group comprising three turbines (two hubs and one blade tip) would be theoretically visible to the north on the skyline of the view but would be screened by intervening buildings and vegetation. The magnitude of change where visible would be *Very Low.*
Polcheskie Brae (Figure 9.21t)	Between Auchrae and Corlae, the ZTV indicates theoretical visibility of between 8-15 turbines for approximately 0.5km where the landform opens out beyond Polcheskie Crags. From the road adjacent to the Polcheskie Brae, up to 13 turbines would be theoretically visible. The Eastern group, comprising nine of the proposed turbines (four hubs, three blades and two blade tips) would be theoretically visible to the northeast but would partially screened by intervening vegetation such that two hubs would be visible. The Western group comprising four turbines (two hubs and two blade tips) would be visible to the north on the skyline of the view with towers partially screened by intervening landform and turbines partially screened by vegetation. The magnitude of change where visible would be *Low*. As the road progresses north towards Corlae the Eastern group would continue to be partially screened by landform and forestry and the Western group would remain visible, with the fifth turbine becoming visible beyond landform. The magnitude of change where visible would be *Medium-Low*.
Corlae (Figure 9.21l-q)	The ZTV indicates a reduction in theoretical visibility as the route progresses north through Corlae from 15 turbines to up to 8-11 turbines. Some of the turbines would be screened by buildings and garden trees as well as forestry, but where visible, up to 12 turbines would be theoretically visible. The Eastern group, comprising seven of the proposed turbines (two hubs, four blades and a blade tip) would be theoretically visible to the northeast but would largely screened by intervening vegetation and forestry. The Western group (five hubs) would be visible to the north on the skyline of the view with towers partially screened by intervening landform and turbines partially screened by vegetation. However, they would be largely

Viewpoint / Location	Description of Effects
	screened by intervening forestry / trees and / or buildings. The magnitude of change where visible would be *Medium-Low*.
Between Corlae and Holm of Dalquhairn Bridge (Figure 9.21j-k, Figure 9.27a-i)	Along this part of the route theoretical visibility of the proposed turbines reduces in places from 8-11 turbines to 4-7 turbines. However, proximity to the turbines increases such that at Craigythorn Croft (**Figure 9.21j-k**) and LVIA Viewpoint 6 (**Figure 9.27**), up to ten turbines would be theoretically visible with the nearest turbine a minimum of 2.4km distance. The Eastern group, up to 5 of the proposed turbines would be theoretically visible but would be mostly screened by intervening coniferous forestry such that potentially blades or tips would be visible. The Western group (five hubs) would be visible to the north on the skyline of the view with towers partially screened by intervening landform affecting approximately 24° of the horizontal FoV. The magnitude of change where visible would be *Medium*.
North of Holm of Dalquhairn Bridge (Figure 9.25a-e)	Up to nine turbines (three hubs, four blades and two tips) would be theoretically visible above the horizon as the route reaches the car park and picnic area beyond Holm of Dalquhairn Bridge. The turbines would be visible at an oblique angle to the road if travelling along the route and beyond coniferous trees at the car park and picnic area. The magnitude of change where visible would be *High-Medium*.
Lorg Bridge (Figure 9.24a-g)	Up to three turbines (two hubs, one blade) would be visible above Altry Hill. A small part of the access track would be visible crossing the Water of Ken and as a line on the hillside in the middle distance which joins an existing track. This is the end of the public road and drivers in vehicles would stop or turn in a layby at the bridge from where there would be views of three turbine blades as illustrated. The magnitude of change where visible would be *Medium.*

9.9.33 In summary, the experience of significant visual effects would be limited to a ~3.5-4km section at the northern end of the route intermittently between Polcheskie Brae and Lorg Bridge. Within this section of the route, the magnitude of change would be between Medium – Low and High - Medium and the level of visual effect would be **Major** to **Major / Moderate** and Significant for up to ~3.5km distance. Elsewhere along the C35s route between Smittons Bridge and Polcheskie Brae, the Proposed Development would be largely screened from view or partly visible due to the screening effects of landform, vegetation (mature roadside vegetation and forestry), and / or buildings. The views from these sections of the route would not be significantly affected by the Proposed Development with the majority of visual effects ranging between **Moderate** and **No View** and Not Significant (with potentially significant winter views from Strathanna at around 4.7km distance). The nature of these effects would be long term (reversible), indirect and negative.

9.9.34 Aviation warning lights would be visible as reported in **Appendix 9D**, however, the visual effects of these lights would not be significant.

Cumulative Assessment: Proposed Development + Existing + Consented Sites

9.9.35 Parts of the existing Windy Standard Wind Farm would be theoretically visible for approximately 1.3km between Corlae and Holm of Dalquhairn Bridge (Very Low to Zero magnitude). Parts of the existing Whiteside Hill Wind Farm would be visible between Holm of Dalquhairn Bridge and Lorg Bridge (Very Low to Zero magnitude). The additional effect of the Proposed Development would remain **Major** to **Major / Moderate** and Significant (between Polcheskie Brae and Lorg Bridge) to **Moderate to No View** and Not Significant from elsewhere along the route. The combined effect would also be unaffected by other wind farms, remaining **Major** to **Major / Moderate** and Significant (due to the

Proposed Development) to **Moderate to No View** and Not Significant. The nature of these effects would be long term (reversible), indirect, cumulative, and negative.

Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications

9.9.36 Shepherds Rig application would be located within approximately 450m from the route between Smittons Bridge and Strathanna and would be theoretically visible along the majority of the route particularly in views for southbound road users (High to Zero magnitude). Euchanhead (Medium to Zero magnitude) alongside Sanquhar II (Low to Zero magnitude) would be visible along the route for northbound road users where they would be visible in combination with the Proposed Development. The additional effect of the Proposed Development would remain **Major** to **Major / Moderate** and Significant (between Polcheskie Brae and Lorg Bridge) to **Moderate to No View** and Not Significant from elsewhere along the route. The combined effect would increase to **Major** and Significant (due to the Shepherds Rig, Euchanhead and the Proposed Development) to **Moderate to No View** and Not Significant. The nature of these effects would be long term (reversible), indirect, cumulative, and negative.

Table 9.17 Visual Effects on Views from other Transport Routes within 10km

Transport Route	Assessment
U405N (Unclassified Road) between Polskoech and east of Polgown in the Scuar Water valley	The U405N unclassified road follows the Scaur Water and Polskeoch Burn from Polskeoch to a point approximately 2km east of Polgown. The SUW follows the section of the route between Polskoech and Polgown which is assessed in **Table 9.19** as part of the nationally designated recreational route. Apart from the SUW which overlaps the route between Polskoech and Polgown, the remainder of the route is not designated, however, part of the route, just beyond 6km is located within the Thornhill Uplands RSA. The value of the route is therefore assessed as High to Medium. Most of the road users would experience the landscape transiently whilst driving, cycling or walking (High to Medium susceptibility). To conclude, the sensitivity of this route is assessed as *High to Medium*. Viewpoint 2 is located along this route (**Figure 9.23**). <u>Assessment: Proposed Development</u> ZTV coverage indicates that theoretical visibility would first occur approximately 500m east of Polgown where up to 1-11 turbines would be theoretically visible and continue with up to 11 turbines visible until Polskeoch burn where theoretical visibility would increase to 12-15 turbines. Although there is screening from the steep sided landform and roadside vegetation, particularly to the west of Dalnagor where the route passes through forestry, there are some open views along the valley for approximately 2.2km between Polgowan and Dalnagor where the hubs and blades of the Eastern group would be visible on the skyline of the route (Low magnitude). As the route enters the forestry west of Dalnagor, views are mostly screened by roadside trees (for approximately 1.1km) (High-Medium magnitude if forestry felled) and visibility opens up for the last 300m of the route where there would be views of the Eastern group of turbines at approximately 1.2km-1.5km distance (High magnitude). The magnitude of change along the open section of the route would be Low to Zero resulting in a **Moderate to No View** and Not Significant effect. There would, however, be a Significant effect along the forested section of the route, west of Dalnagor if the trees were felled and for the last 300m of the route where views open out where the magnitude of change would be between High and High-Medium and the level of effect would be **Major** and Significant (Eastern group only). The nature of these effects would be long-term (reversible) indirect and negative.

Transport Route	Assessment
	Aviation warning lights would be visible as reported in **Appendix 9D,** however, the visual effects of these lights would not be significant. Cumulative Assessment: Proposed Development + Existing + Consented Sites The existing Whiteside Hill Wind Farm (Medium to Zero magnitude) would be theoretically visible to the north and northeast at between approximately 1-4km distance. The additional effect of the Proposed Development would be **Moderate to No View** and Not Significant (**Major** and Significant for 300m and subject to forest felling). The combined effect would be **Major** and Significant (due to Whiteside Hill and the Proposed Development) to **No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications Euchanhead would be located at either side and within 850m of the route at Polskeoch and Sanquhar II would also be located at either side of the route between Polgowan and Polskeoch within 450m of the route (both High to Zero magnitude). There would be some theoretical visibility of Shepherds Rig from Polskeoch but these would be screened by forestry (Zero magnitude). The additional effect of the Proposed Development would be **Moderate to No View** and Not Significant (**Major** and Significant for 300m and subject to forest felling). The combined effect would be **Major** and Significant (due to Whiteside Hill, Euchanhead, Sanquhar II, and the Proposed Development) to **No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and negative.
U394N (Unclassified Road) From south of Corriedow to Benbuie in the Dalwhat Water valley	The U394 unclassified road is routed along the Dalwhat Water valley from south of Corriedow to Benbuie after which it continues as a Core Path which is assessed in **Table 9.18**. Part of this route passes through the Thornhill RSA indicating a High to Medium value. Most of the road users would experience the landscape transiently whilst driving, cycling or walking (High to Medium susceptibility). To conclude, the sensitivity of this route is assessed as *High to Medium*. Assessment: Proposed Development There would be theoretical visibility of up to 1-3 turbines for the majority of the route between Benbuie and south of Corriedow, with a short (2km) section where 4-7 turbines would be theoretically visible at Corriedow. Beyond this the route is outwith the ZTV. Only the Eastern group would be theoretically visible from this route. In reality, up to two hubs and a blade would be visible along this section of the route with blade tips mostly screened by intervening forestry. The magnitude of change would range from Low to Zero and the level of effect would be **Moderate to No View** and Not Significant. The effect would not be significant due to the limited extent of visibility of the Proposed Development as a result of intervening landform and vegetation / forestry. The nature of these effects would be long-term (reversible), indirect and negative. Aviation warning lights would be visible as reported in **Appendix 9D,** however, the visual effects of these lights would not be significant. Cumulative Assessment: Proposed Development + Existing + Consented Sites The existing Wether Hill Wind Farm (Very Low to Zero magnitude) would be theoretically visible to the north and northwest at between approximately 1.5-2.5km distances. A blade tip of the consented Cornharrow Wind farm would be theoretically visible to the northwest (Very Low to Zero magnitude). The additional effect of the

Transport Route	Assessment
	Proposed Development would be **Moderate to No View** and Not Significant. The combined effect would also be **Moderate to No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications The Euchanhead Wind Farm application (Low to Zero magnitude) would be partially visible adjacent to the Proposed Development. The additional effect of the Proposed Development would be **Moderate to No View** and Not Significant. The combined effect would also be **Moderate to No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and negative.
U400N (Unclassified Road) Minor road from west of Brown Knowe to Appin Lodge	This route follows the Shinnell Water valley from Tynron to Appin Lodge after which it continues as a Core Path (51) through forestry. The route is located within the Thornhill RSA indicating a High to Medium value. Most of the road users would experience the landscape transiently whilst driving, cycling or walking (High to Medium susceptibility). To conclude, the sensitivity of this route is assessed as *High to Medium*. Assessment: Proposed Development There would be theoretical visibility of up to 1-3 turbines between Brown Knowe and Old Auchenbrack equating to approximately 3.8km of the route (Eastern group only). Views from the route between Brown Knowe and northwest of Craigencoon are heavily filtered by roadside trees and there would be no view of the proposed turbines. Between northwest of Craigencoon and Old Auchenbrack, the views open slightly and there would be intermittent theoretical visibility of a blade and two blade tips. The magnitude of change would range from Very Low to Zero and the level of effect would be **Minor to No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect and neutral. Aviation warning lights would be visible as reported in **Appendix 9D,** however, the visual effects of these lights would not be significant. Cumulative Assessment: Proposed Development + Existing + Consented Sites There are no existing or consented wind farms visible from this route between Brown Knowe and Old Auchenbrack. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications The Euchanhead and Sanquhar II wind farm applications would be partially visible along the valley at between 5km and 7km (both Low to Zero magnitude). The additional effect of the Proposed Development would be **Minor to No View** and Not Significant. The combined effect would be **Moderate to No View** and Not Significant (due to Euchanhead and Sanquhar II). The nature of these effects would be long-term (reversible), indirect, cumulative and negative.
Glen Afton Road	This route follows the Afton Water along Glen Afton from New Cumnock to the Afton Reservoir water treatment works after which it continues as a Heritage Path to the Water of Ken valley. The route is located within the Uplands and Moorlands LLA indicating a High to Medium value. Most of the road users would experience the landscape transiently whilst driving, cycling or walking (High to Medium susceptibility). To conclude, the sensitivity of this route is assessed as *High to Medium*. It is to be noted that Viewpoint 17 is located an elevated location on a Core

Transport Route	Assessment
	Path above Glen Afton Road and the Afton Filter Station and is therefore not representative of views from the road itself. Assessment: Proposed Development There would be theoretical visibility of 1-7 turbines for approximately 2.1km between Laight Farm and Ashmark, and theoretical visibility of 1-3 turbines for approximately 1.8km as the route passes Bolt Craig (Western group only). In reality views from the route between Laight Farm and Ashmark are heavily filtered by roadside trees and at best there would be glimpsed views of turbines blades and tips in winter views (Very Low magnitude). Similarly, as the route passes Bolt Craig, views from the route would be filtered by roadside vegetation of the proposed turbines. After Craigdorroch, the road continues as an access track to Afton Filter Station with parking in a wooded area to the south of the filter station. There would be theoretical visibility of up to 4 turbines from this section of the route. In reality, views from this section of the route are heavily filtered by coniferous trees such that there would only be glimpsed views of turbines along this section of the route (Very Low magnitude). The magnitude of change would range from Very Low to Zero and the level of effect would be **Minor to No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect and neutral. Aviation warning lights would be visible as reported in **Appendix 9D,** however, the visual effects of these lights would not be significant. Cumulative Assessment: Proposed Development + Existing + Consented Sites The existing Afton Wind Farm (Medium magnitude) is intermittently visible on the skyline along the route with the nearest turbine located approximately 0.9km as the road approaches the filter station - although views are intermittent at the location heavily filtered by surrounding vegetation. The existing Hare Hill would be theoretically from limited sections of the route in filtered views (Very Low to Zero magnitude). The consented Pencloe Wind Farm would be theoretically visible to the north of Afton Wind Farm and from the northern section of the route where mostly hubs and blades would be visible in filtered views at a minimum distance of approximately 1.5km (Medium - Low to Zero magnitude). The additional effect of the Proposed Development would be **Minor to No View** and Not Significant. The combined effect would be **Major / Moderate** and Significant (due to Afton and Pencloe, and not the Proposed Development) to **No View** and Not Significant The nature of these effects would be long-term (reversible), indirect, cumulative and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications The Sanquhar II Wind Farm application would be intermittently visible along the route partially screened by intervening landform and roadside vegetation. At its closest point, near Afton Filter Station, the nearest turbine would be approximately 750m from the road and visible in gaps or above the intervening vegetation (High – Medium to Zero magnitude). The Euchanhead Wind Farm application (Very Low to Zero magnitude) would be partially visible along the route, mostly screened by intervening landform and intervening vegetation. The additional effect of the Proposed Development would be **Minor to No View** and Not Significant. The combined effect would be **Major** and Significant (due to Afton, Pencloe and Sanquhar II and not the Proposed Development) to **No View** and Not Significant The nature of these effects would be long-term (reversible), indirect, cumulative and negative.

Transport Route	Assessment
A713 Galloway National Tourist Route	Within the 45km study area, the A713 Galloway National Tourist Route passes between Ayr and Castle Douglas following a low -lying route alongside several waterbodies and lochs including Loch Doon and Earlston Loch. The majority of the route passes through locally designated landscapes including Doon Valley LLA and the Galloway Hills RSA. The value of this route, as a national tourist route, is considered to be High. Most of the road users would experience the landscape transiently whilst driving, cycling or walking (High to Medium susceptibility). To conclude, the sensitivity of this route is assessed as *High*. <u>Assessment: Proposed Development</u> At its closest point (Carsphairn), the Proposed Development would be approximately 10.4km distance from the nearest turbine. Theoretical visibility is indicated between Carsphairn and St John's Town of Dalry (approximately 11km). Much of this section of the route is screened by roadside trees and intervening forestry apart from a ~1.2km section between Carnavel and Bardennoch and a ~1.6km section at Stroangassel where there would be intermittent open views towards the Proposed Development which would be visible at an oblique angle and visible on the skyline filtered by middle distance trees or distant forestry and at distances between 10.8km and 15km. More distant glimpsed and filtered views would occur further south in open areas and in gaps in roadside vegetation. The magnitude of change would range from Very Low to Zero and the level of effect would be **Minor to No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect and neutral. Aviation warning lights would be visible as reported in **Appendix 9D,** however, the visual effects of these lights would not be significant. <u>Cumulative Assessment: Proposed Development + Existing + Consented Sites</u> The blades and tips of the existing Wether Hill, Windy Rig, Windy Standard and Afton wind farms are mostly screened by intervening vegetation (Very Low to Zero magnitude). The consented Troston Loch, Margree and Glenshimmeroch are also theoretically cumulatively visible as blades and hubs between Carnavel and Bardennoch filtered by intermittent roadside vegetation (all Very Low to Zero magnitude). The additional effect of the Proposed Development would be **Minor to No View** and Not Significant. The combined effect would remain **Minor to No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and neutral. <u>Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications</u> The Shepherds Rig Wind farm application would be cumulatively visible mostly as hubs and blades at approximately 3.9km distance at its closest point (between Carnaval and Bardennoch) (Low to Zero magnitude). Sanquhar II and Euchanhead applications would be theoretically visible mostly as hubs and blades, at over 13km distance in the same view as the Proposed Development (both Very Low to Zero magnitude) mostly screened by intervening landform and intervening vegetation. The additional effect of the Proposed Development would be **Minor to No View** and Not Significant. The combined effect would be **Moderate to No View** and Not Significant (due to Shepherds Rig). The nature of these effects would be long-term (reversible), indirect, cumulative and negative.
Glasgow to Carlisle railway line via	The Glasgow to Carlisle railway line passes to the north and east of the Proposed Development across the East Ayrshire Lowlands LCT and roughly following the Nith Valley as it nears the Proposed Development. The route passes through locally

Transport Route	Assessment
Kilmarnock and Dumfries	designated landscapes including Uplands and Moorlands LLA and the Galloway Hills RSA indicating a High to Medium value. Most of the passengers would experience the landscape transiently whilst travelling with views depending on orientation of seating within the carriage (High to Medium susceptibility). To conclude, the sensitivity of this route is assessed as *High to Medium*. Assessment: Proposed Development At its closest point the route passes at approximately 12km distance between New Cumnock and Kirkconnel. ZTV coverage is patchy along the route showing greatest theoretical visibility of between 4-7 turbines to the northwest of New Cumnock where patches of visibility are indicated as far as Kilmarnock. In reality much of this section would be screened or filtered by intervening vegetation, rail line cuttings and built form, with the greatest potential visibility as the line nears New Cumnock and there would be glimpsed or intermittent views of up to five turbines from the Western group on the skyline to the south. Theoretical visibility of 1-3 turbines is indicated at Sanquhar and Thornhill with greater visibility indicated as the line passes to the south of Thornhill. In reality much of this section of the route would be screened by intervening vegetation, rail line cuttings and built form and the distant proposed blades or blade tips would not be perceptible in many of the more open views. The magnitude of change would range from Very Low, to Zero and the level of effect would be **Minor to No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect and neutral. Aviation warning lights would be visible as reported in **Appendix 9D,** however, the visual effects of these lights would not be significant. Cumulative Assessment: Proposed Development + Existing + Consented Sites As the line approaches New Cumnock from the northwest, there would be cumulative visibility of the Proposed Development with the existing Hare Hill, High Park Farm (both Low magnitude) and Sandy Knowe (Very Low to Zero magnitude) to the southeast, Afton, Windy Standard and Extension (all Low to Zero magnitude), Windy Rig (Very Low to Zero magnitude) and South Kyle (Medium-Low to Zero magnitude) would be simultaneously visible to the south and southwest at distances of between approximately 4km – 14km. The consented Pencloe (Medium to Zero magnitude), Windy Standard Phase II (Very Low to Zero magnitude) and Enoch Hill (Medium to Zero magnitude) would be visible simultaneously with the Proposed Development at between 7.7km and 8.8km. North Kyle and Overhill would be partially visible to the west (both Very Low to Zero magnitude). To the east of New Cumnock, in areas where there would be no visibility of the Proposed Development, the line would pass close to Sandy Knowe and Sanquhar wind farms and the consented Glenmuckloch wind farms (all High to Medium, to Zero magnitude). Other existing and consented wind farms may be sequentially visible at greater distances within the study area resulting in sequential views along the line with a Very Low to Zero magnitude of change. The additional effect of the Proposed Development would be **Minor to No View** and Not Significant. The combined effect would be **Major to Major / Moderate,** and Significant (due to Sandy Knowe, Sanquhar, Glenmuckloch and South Kyle and not the Proposed Development) to **No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications As the line approaches New Cumnock from the northwest, there would be cumulative visibility of the Proposed Development with Sanquhar II and Euchanhead (Very Low to Zero magnitude). Greenburn (Medium to Zero magnitude) and Overhill Variation

Transport Route	Assessment
	would be partially visible (Very Low to Zero magnitude). Other application wind farms may be sequentially visible at greater distances within the study area resulting in sequential views along the line with a Very Low to Zero magnitude of change. The additional effect of the Proposed Development would be **Minor to No View** and Not Significant. The combined effect would be **Major to Major / Moderate,** and Significant (due to Sandy Knowe, Sanquhar, Glenmuckloch, South Kyle and Greenburn) to **No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and negative.

Visual Effects on Views from Recreational Routes

9.9.37 The visual assessment has considered the potential visual effects likely to be experienced by people (walkers / cyclists / horse riders / joggers / others) on recreational routes within the Study Area. It has been split into local routes on the Core Path Network (rights of way and core paths) within 10km, sourced from DGC and EAC, and recorded Scottish Hill Tracks and Heritage Paths, promoted by ScotWays. National or regional long-distance routes and Sustrans cycle routes have also been assessed within 45km. The assessment is set out in **Tables 9.18-9.20**, and the routes are illustrated in **Figures 9.10-11**.

9.9.38 Each of these routes were walked and / or visited and walked in sections according to the ZTV coverage and the assessment has been assisted on site with the use of sequential wirelines and True View Visuals 3D augmented reality software.

9.9.39 All of the routes have been assessed as of *High* sensitivity on account of their High or High to Medium value as recreational routes, some routed through locally designated landscapes and the High susceptibility of the people using these routes, mostly walkers and cyclists, whose attention would be focused on the landscape around them.

9.9.40 In summary, there would be significant effects on the views from parts of the following nine local recreational routes:

- DGC Core Path No. 51 Benbuie to Troston Hill;
- DGC Core Path No. 188: Corlae;
- DGC Core Path No. 215 (Lorg Trail) / Heritage Path 2: Sanquhar to Stroanpatrick / Core Path No. 443 (Bank Hill to Graystone Hill)/ Right of Way DS15;
- DGC Core Path No. 446: Benbrack;
- EAC Core Path No. C10: Coalfield Cycle Route;
- Heritage Path 1: Old Road from New Cumnock to Dalquhairn / Scottish Hill Track 84: New Cumnock to St John's Town of Dalry; and
- Rights of Way: DS14, DS13 and DS15.

9.9.41 Significant effects would also be experienced by users of the Southern Upland Way (also overlapped with DGC Core Path No. 504: Southern Upland Way, Scottish Hill Track 83: St John's Town of Dalry to Sanquhar and Other Pedestrian Route': DN159) in three areas (up to around 6.5-7km of the 151km route within the 45km study area) as follows:

- Area to the north / northeast, between Dalgonar and Wether Hill via Polskoech at the low watershed between the Polskoech Burn and the Water of Ken valley, as the SUW approaches from the north / northeast, through forestry, revealing partial views of the Eastern group;

- Area closest to the Proposed Development, between Wether Hill and Cairn Hill, as the SUW approaches and skirts the east and southern boundary of the Eastern group Site with open views of the proposed turbines; and
- Area to the south, between Cairn Hill and Benbrack, as the SUW approaches the Eastern group from the south near one of the Striding Arches sculptures, revealing full and partial views of the Proposed Development (Eastern and Western groups).

9.9.42 None of the remaining recreational routes would be significantly affected by the Proposed Development.

Table 9.18 Visual Effects on Views from Local Recreational Routes within 10km

Receptor	Description of Effects
DGC Core Path No. 504: Southern Upland Way	This route forms part of the SUW and is assessed within the visual effects of the SUW section in **Table 9.19**.
DGC Core Path No. 51 Benbuie to Troston Hill	The DGC Core Path No. 51 starts at Benbuie in Dalwhat Water valley, then continues past Cairnhead and through the pass between Black Hill and Colt Hill to Troston Hill. It then descends to Appin Lodge via Shinnell Water valley. The route is approximately 7.7km in length and is located at approximately 500m distance from the nearest turbine of the (Turbine 8 of the Eastern group) at its closest point. Assessment: Proposed Development The ZTV analysis indicates partial visibility of 1-3 turbines along much of the route with increased visibility of between 12-15 turbines indicated as the route passes to the west and north of Colt Hill. There would be no theoretical visibility indicated in sections near Shinnelhead, south of Blach Hill and at Cairnhead. However, the route passes through forestry in areas where between 1-3 turbines are theoretically visible and views of the Proposed Development would be screened by existing vegetation in combination with steeply sloping landform (Zero magnitude). The route also passes through recently felled forestry to the west and north of Colt Hill and whilst there would be some open views of the Proposed Development as replanted forestry matures, areas of existing forestry and path-side trees remain. From this section of the route the turbines are also partially screened by rising landform such that the several of the Eastern group turbines would appear at hub height or as blades with the bases and lower towers of most of the turbines screened (High-Medium magnitude – reducing over time as replanted forestry matures), The magnitude of change would range from High to Zero and the effect would be **Major** and Significant, reducing to **No View** and Not Significant for the forested part of the route. The nature of these effects would be long-term (reversible), indirect and negative. Aviation warning lights would be visible as reported in **Appendix 9D,** however, the visual effects of these lights would not be significant. Cumulative Assessment: Proposed Development + Existing + Consented Sites There would be theoretical views of several existing and consented wind farms along the route, many of these would be intermittently screened by forestry and landform as the route progresses. The main existing wind farms in the same view as the Proposed Development as the route passes to the west of Colt Hill include: Afton, Windy Rig, South Kyle, Windy Standard and Extension, Wether Hill, Whiteside Hill and Sanquhar (all Very Low to Zero magnitude). Consented wind farms in the same view include Sanquhar Six, Pencloe, Windy Standard Phase III, Cornharrow and Enoch Hill (varying from Low to Very Low, to Zero magnitude).

Receptor	Description of Effects
	The additional effect of the Proposed Development would remain **Major** and Significant, reducing to **No View** and Not Significant. The combined effect would also remain **Major** and Significant (due to the Proposed Development), reducing to **No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and negative. <u>Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications</u> The route would pass through the application Eucanhead Wind Farm which would be visible at either side of the route on the section to the west and north of Colt Hill (High magnitude). Sanquhar II would also be in close proximity to the route and visible between Shinnelhead and Colt Hill (High-Medium magnitude). The additional effect of the Proposed Development would remain **Major** and Significant, reducing to **No View** and Not Significant. The combined effect would also remain **Major** and Significant (due to Euchanhead, Sanquhar II and the Proposed Development). The nature of these effects would be long-term (reversible), indirect, cumulative and negative.
DGC Core Path No. 188: Corlae	Core Path No. 188 connects between the SUW, south of Cairn Hill and the C35s minor road at Holm of Dalquhairn Bridge. The route is approximately 3km in length and is located approximately 0.6km distance from the Proposed Development at its closest point. Although theoretically routed through forestry, there has been recent felling and replanting around Craigythorn and Shiel Burn opening up views to the Water of Ken valley from the route (subject to replanted forestry maturing). <u>Assessment: Proposed Development</u> ZTV coverage indicates theoretical visibility of between 8-11 turbines from the majority of the route with visibility of up to 12-15 turbines from the western edge of the route near the C35s minor road. However, most views of both the Western and Eastern groups of the Proposed Development would be limited due to screening by intervening forestry, subject to forestry management plans, and landform. The magnitude of change would range from Low to Zero and the effect would be **Moderate** and Not Significant (**Moderate** and Significant for approximately 100m as the route reaches the SUW due to open views of T2), reducing to **Minor to No View** and Not Significant for the forested part of the route and as forestry matures. The nature of these effects would be long-term (reversible), indirect and negative. Aviation warning lights would be visible as reported in **Appendix 9D,** however, the visual effects of these lights would not be significant. <u>Cumulative Assessment: Proposed Development + Existing + Consented Sites</u> The existing Windy Standard and Extension, and Afton, and Windy Rig wind farms (all Low to Zero magnitude) would be visible at approximately 5.5-6km distance to the west / northwest, subject to forestry screening. The consented Torrs Hill Wind Farm may also be visible to the south, although its contribution would not be significant (Very Low to Zero magnitude). The additional and combined effect would be **Moderate** and Not Significant (**Moderate** and Significant for approximately 100m as the route reaches the SUW due to open views of T2), reducing to **Minor to No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and negative. <u>Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications</u>

Receptor	Description of Effects
	There would be theoretical views of the Sanquhar II and Euchanhead wind farms (Low to Zero magnitude) and Shepherd's Rig (Low to Zero magnitude) application wind farms, subject to forestry screening. The additional and combined effect would be **Moderate** and Not Significant (**Moderate** and Significant for approximately 100m as the route reaches the SUW due to open views of T2), reducing to **Minor to No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and negative.
DGC Core Path No. 215 (Lorg Trail) / Heritage Path 2: Sanquhar to Stroanpatrick / Core Path No. 443 (Bank Hill to Graystone Hill)/ Right of Way DS15	Core Path No. 215 (Lorg Trail) is mainly routed along part of the Water of Ken valley and overlaps with Heritage Path 2: Sanquhar to Stroanpatrick, Core Path No. 443 and Right of Way DS15. Core Path No. 215 starts at the Holm of Dalquhairn Bridge and follows the route of the C35s minor road to Lorg Bridge. It then continues northeast between Lorg Hill and Altry Hill to the junction with the SUW, with the last 2.5km following a forestry track in a northwest direction, traversing the slopes of Lorg Hill. Core Path No. 443 starts on the eastern slopes of Lorg Hill as a continuation of the Core Path No. 215. It is routed along forestry tracks traversing the hill slopes and continues north along the Euchan Water valley. The route is approximately 11km in length within 10km and approximately 0.65km distance from the Proposed Development (Eastern group - T10) at its closest point. Views from this route are illustrated by Viewpoints 3 (**Figure 9.24**) and 4 (**Figure 9.25**). <u>Assessment: Proposed Development</u> ZTV coverage indicates theoretical visibility of up to 1-3 turbines from the southern section of the route between Holm of Dalquhairn Bridge to a point just before the SUW. Visibility from this 1.3km section of route is illustrated by viewpoints 3 and 4 and assessed in **Appendix 9B** (High-Medium magnitude) largely limited to views of the Eastern group only. ZTV coverage indicates theoretical visibility of up to 1-11 turbines as the route turns to the northwest at Lorg Hill until Black Shoulder for approximately 4km, with up to 15 turbines indicated for a short (~350m) section as the route climbs Polskeoch Rig. This section of the route coincides with an area of forestry and most of the available views would be screened by forestry, subject to forestry management including periodic felling and re-planting. Excluding the forestry, the magnitude of change from this section would range from High-Medium to Zero. Beyond Black Shoulder, intermittent visibility of 1-3 turbines is indicated. This would also be in an area of forestry. Excluding the forestry, the magnitude of change from this section would range from Very Low to Zero. The magnitude of change along the route/s within 10km would range from High-Medium to Zero and the effect would range from **Major** and Significant, reducing to **Minor to No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect and negative. Aviation warning lights would be visible as reported in **Appendix 9D,** however, the visual effects of these lights would not be significant. <u>Cumulative Assessment: Proposed Development + Existing + Consented Sites</u> A number of wind farms would be theoretically visible including the existing Whiteside Hill, Wether Hill and Sanuqhar (all Low to Zero magnitude). The consented Sanquhar Six would be visible in close proximity from the northern section of the route (Medium to Zero magnitude). Windy Rig and the consented Knockman Hill wind farms may also be theoretically visible, although their contribution would not be significant (both Very Low to Zero magnitude). The additional effect of the Proposed Development would remain **Major** and Significant, reducing to **Minor to No View** and Not Significant. The combined effect would be **Major** and Significant (due to the Proposed Development and Sanquhar Six),

Receptor	Description of Effects
	reducing to **Minor to No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications There would be theoretical views of the Euchanhead and Sanquhar II application wind farms which would be visible on both sides of the route with some turbines between ~50m – 500m for approximately 6km of the route (High magnitude). Shepherd's Rig application wind farm would be visible to the south, subject to forestry screening (Low to Zero magnitude). The additional effect of the Proposed Development would remain **Major** and Significant, reducing to **Minor to No View** and Not Significant. The combined effect would be **Major** and Significant (due to the Proposed Development, Sanquhar Six, Euchanhead and Sanquhar II). The nature of these effects would be long-term (reversible), indirect, cumulative and negative.
DGC Core Path No. 446: Benbrack	The DGC Core Path No. 446 starts at around Little Dibbin Hill (479m AOD) and continues northwest to the summit of Benbrack (681m AOD). Viewpoint 5 (**Figure 9.26**) illustrate views from the summit of Benbrack. The route is approximately 1.5km in length and the nearest turbine (Eastern group - T2) would be approximately 2km distance from the route at its closest point. Assessment: Proposed Development ZTV coverage indicates theoretical visibility of up to 1-7 turbines along the route. Wireline analysis indicates that one hub and up to 4 blade tips would be theoretically visible along the route with full visibility of the Eastern and Western groups only visible at the summit of Benbrack (Viewpoint 5). The magnitude of change along the route would range from Low to Very Low (and High-Medium towards the summit of Benbrack) and the effect would be **Moderate to No View** and Not Significant for the majority of the route due to limited visibility, (increasing to **Major** and Significant at the summit of Benbrack). The nature of these effects would be long-term (reversible), indirect and negative. Aviation warning lights would be visible as reported in **Appendix 9D,** where the visual effects of these lights would be significant from the summit of Benbrack reducing to not significant from the remainder of the route. Cumulative Assessment: Proposed Development + Existing + Consented Sites Many existing and consented wind farms would be visible from this route and the main ones include Windy Rig, Windy Standard / Extension and Afton to the northwest, Whiteside Hill and Sanquhar at between 6km and 10km distance (all Low to Zero magnitude). Wether Hill would be visible to the south at 3km distance (Medium-Low magnitude). Cornharrow at 2km distance (Medium to Zero magnitude) and Glenshimmeroch, Troston Loch, Margree, Fell and Sanquhar Six (all Low to Zero magnitude). The additional effect of the Proposed Development would remain **Moderate to No View** and Not Significant for the majority of the route, (increasing to **Major** and Significant at the summit of Benbrack). The combined effect would be **Major** and Significant (due to Wether Hill, Cornharrow and the Proposed Development – around the summit of Benbrack) reducing to **Moderate to No View** and Not Significant. Wether Hill would be decommissioned ~25 years prior to the operational period of the Proposed Development reducing this cumulative effect. The nature of these effects would be long-term (reversible), indirect, cumulative and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications

Receptor	Description of Effects
	The main applications visible from this route include Sanquhar II and Euchanhead, spanning from east to north at 2.5km-4.7km distance (both High–Medium magnitude) and Shepherd's Rig (Medium-Low magnitude). The additional effect of the Proposed Development would remain **Moderate to No View** and Not Significant for the majority of the route, (increasing to **Major** and Significant at the summit of Benbrack). The combined effect would be **Major** and Significant (due to Wether Hill, Cornharrow, Sanquhar II, Euchanhead, Sanquhar II, Shepherds Rig and the Proposed Development – around the summit of Benbrack) reducing to **Moderate to No View** and Not Significant. Wether Hill would be decommissioned ~25 years prior to the operational period of the Proposed Development reducing this cumulative effect. The nature of these effects would be long-term (reversible), indirect, cumulative and negative.
DGC Core Path No. 52: Cairnhead	The DGC Core Path No. 52 starts at Cairnhead and continues southwest along Dubbin Lane through forestry to connect to DGC Core Path No. 216. The route is approximately 2km in length and is located at approximately 2.6km distance from the nearest turbine (Eastern group - Turbine 8) at its closest point. Assessment: Proposed Development ZTV coverage indicates theoretical visibility of up to 1-3 turbines for a short (approximately 300m) section of the route between Cairnhead and Dalwhat Water. Wireline analysis indicates that as the route progresses from Cairnhead, there would be theoretical visibility of two blade tips increasing to a hub and a blade tip from the Eastern group at ~2.7km distance as the route reaches Dalwhat Water. There would be some screening from forestry and foreground trees along this section of the route such that the blade tip is likely to be screened and only a blade visible at Dalwhat Water. There is no further theoretical visibility indicated along the route. The magnitude of change along the route would range from Very Low to Zero and the effect is judged to be **Minor** to **No View** and Not Significant for the majority of the route due to limited visibility. The nature of these effects would be long-term (reversible), indirect and neutral. Aviation warning lights would not be visible from this route due to screening from intervening landform. Cumulative Assessment: Proposed Development + Existing + Consented Sites The consented Cornharrow Wind Farm would be visible in a different part of the view at Dalwhat Water, and to the south at ~0.7km distance as the route nears Eldrick Hill - subject to forestry screening (High-Medium to Zero magnitude). The additional effect of the Proposed Development would remain **Minor** to **No View** Not Significant. The combined effect would be **Major** and Significant (due to Cornharrow and not the Proposed Development). The nature of these effects would be long-term (reversible), indirect, cumulative and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications No other application wind farms would be visible from this route.
DGC Core Path No. 216 Manquhill Hill	The DGC Core Path No. 216 starts on the SUW south of Manquhill Hill and splits with one branch continuing north to re-join the SUW near Craigencarse and a further branch continuing northeast along forestry tracks to Core Path No. 52 south of Little Dibbin Hill. The route is approximately 5.5km in length and is located at approximately 3.3km distance from the nearest turbine (Eastern group - Turbine 2) at its closest point.

Receptor	Description of Effects
	Assessment: Proposed Development ZTV coverage indicates theoretical visibility of up to 1-7 turbines for approximately 1km section of the route between Manquhill and Craigencarse, with up to 11 turbines theoretically visible as the route reaches the SUW near Craigencarse. Wireline analysis indicates that as the route progresses from Manquhill, there would be theoretical visibility of two blade tips from the Western group increasing to two hubs and two blades as the route nears Craigencarse and additional visibility of five hubs from the Eastern group as the route re-joins the SUW to the north of Craigencarse. There would be some screening from forestry along this section of the route (subject to felling and forestry management) such that there would be very limited visibility along most of this section of the route. There would be no further theoretical visibility indicated along the route. The magnitude of change along the route would range from Very Low to Zero and the effect would be **Minor** to **No View** and Not Significant for the majority of the route due to limited visibility. The nature of these effects would be long-term (reversible), indirect and neutral. Aviation warning lights would be visible as reported in **Appendix 9D,** however, the visual effects of these lights would not be significant. Cumulative Assessment: Proposed Development + Existing + Consented Sites There are several existing and consented wind farms theoretically visible along the route including the existing Wether Hill, and consented Cornharrow wind farms which would both be visible in open areas of the route across the Ken valley at approximately 2.2km and 0.6km distance respectively (at their closest points) (both High to Zero magnitude). Other existing wind farms would be visible as the route re-joins the SUW north of Craigencarse including Windy Standard Extension, but these are likely to be screened by intervening forestry (subject to forestry management) (Very Low to Zero magnitude). The additional effect of the Proposed Development would remain **Minor** to **No View** Not Significant. The combined effect would be **Major** and Significant (due to Cornharrow and Wether Hill and not the Proposed Development). The nature of these effects would be long-term (reversible), indirect, cumulative and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications Euchanhead and Sanquhar II would be theoretically visible from north of Craigencarse but would mostly be screened by forestry (subject to forestry management) (both Very Low to Zero magnitude). The additional effect of the Proposed Development would remain **Minor** to **No View** Not Significant. The combined effect would be **Major** and Significant (due to Cornharrow and Wether Hill and not the Proposed Development). The nature of these effects would be long-term (reversible), indirect, cumulative and negative.
EAC Core Path No. C10: Coalfield Cycle Route	This route follows minor roads and tracks between Cumnock and the EA boundary west of Afton Reservoir. Within 10km, it follows the Afton Glen Road between New Cumnock and Craigdarroch, where it leaves the main road and follows the Afton Wind Farm access track along the western valley side and continues along the track to the southwest before switching south towards the Water of Deugh at the base of Jedburgh Knees. Viewpoint 17 (**Figure 9.38**) is located along this route as it departs the main road and passes Glen Afton Water Works. The route is approximately 24.3km in length in total and is located at approximately 2.5km distance from the nearest turbine (Western group – T12) at its closest point near Afton Reservoir. Assessment: Proposed Development

Receptor	Description of Effects
	ZTV coverage indicates theoretical visibility of between 1-7 turbines along several parts of the route. Views along the section of the route following the Glen Afton Road are described in **Table 9.17** (Very Low to Zero magnitude of change). Apart from a short section where the route departs the road, there is continuous ZTV coverage along the remainder of the route as it gains altitude and views across the wider landscape. Viewpoint 17 illustrates the views from part of this section of the route and illustrates screening from forestry as the route passes the water works. Wireline analysis indicates that as the route progresses south and southwest for approximately 1.7km, there would be increased visibility of the Western group which would be partially screened by landform, but visible as up to 5 hubs and 4 upper towers as the route turns southwest near Afton Reservoir. Visibility of the proposed turbines would decrease as the route enters forestry and heads south towards the Water of Deugh due to a combination of intervening landform and forest. The magnitude of change along the route would range from Medium to Zero and the effect is judged to be **Major / Moderate** and Significant for approximately 1.7km near Afton Reservoir, reducing to **Minor to No View** and Not Significant for the majority of the route north of Craigdarroch. The nature of these effects would be long-term (reversible), indirect and negative. Aviation warning lights would be visible as reported in **Appendix 9D,** however, the visual effects of these lights would not be significant. <u>Cumulative Assessment: Proposed Development + Existing + Consented Sites</u> The route passes through the existing Afton Wind Farm as it passes between Craigdarroch and its termination at Water of Deugh (High magnitude). Windy Standard is also visible from this section of the route and is located at approximately 0.5km from the end of the route at the Water of Deugh, although partially screened by forestry at this point (High-Medium to Zero magnitude). Several other existing wind farms would be visible at greater distance, the main ones Windy Standard Extension, South Kyle, and Hare Hill (all Low to Zero magnitude). Consented wind farms include Pencloe visible in filtered views at approximately 1.5km distance (Low to Zero magnitude), Windy Standard Phase III, and Enoch Hill (both Very Low to Zero magnitude). The additional effect of the Proposed Development would be reduced to **Moderate** and Significant (due to the presence of other wind farms) to **No View** and Not Significant. The combined effect would be **Major** and Significant (due to Afton, Windy Standard and the Proposed Development). Afton and Windy Standard would be decommissioned ~10-30 years prior to the operational period of the Proposed Development reducing this cumulative effect. The nature of these effects would be long-term (reversible), indirect, cumulative and negative. <u>Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications</u> Sanquhar II would be intermittently visible along the route partially screened by intervening landform and vegetation. At its closest point, near Afton Filter Station, the nearest turbine would be approximately 0.8km from the route and visible in gaps or above the intervening vegetation (High – Medium to Zero magnitude). Euchanhead (Medium to Low, to Zero magnitude) would be partially visible along the route, mostly screened by intervening landform and intervening vegetation, but visible in elevated parts to the south of the route. The additional effect of the Proposed Development would be reduced to **Moderate** and Not Significant (due to the presence of other wind farms) to **No View** and Not Significant. The combined effect would be **Major** and Significant (due to Afton, Windy Standard, Sanquhar II, Euchanhead and the Proposed Development). Afton and Windy Standard would be decommissioned ~10-30 years prior to the operational period of the Proposed

Receptor	Description of Effects
	Development reducing this cumulative effect. The nature of these effects would be long-term (reversible), indirect, cumulative and negative.
Heritage Path 2: Sanquhar to Stroanpatrick	This route forms part of the SUW, Core Path 215 and C35s minor road, and is assessed within the visual effects of these routes above.
Scottish Hill Track 83: St John's Town of Dalry to Sanquhar	This route forms part of the SUW and is assessed within the visual effects of the SUW section in **Table 9.19**.
Heritage Path 1: Old Road from New Cumnock to Dalquhairn / Scottish Hill Track 84: New Cumnock to St John's Town of Dalry	The Heritage Path 1: Old Road from New Cumnock to Dalquhairn overlaps with Scottish Hill Track 84 which continues further south along the Water of Ken valley, overlapping with part of Heritage Path 2: Sanquhar to Stroanpatrick. Within 10km, the routes are approximately 15km in length and pass the base of Turbine 13 (Western group) at their closest point. Assessment: Proposed Development The northern part of the route overlaps with Core Path No. C10 until it reaches the northern edge of Afton Reservoir (Very Low to Zero magnitude of change increasing to High as the route leaves the Afton Glen Road and ascends further along the Afton Wind Farm access track towards the Reservoir). As it reaches the Reservoir, the route splits and follows a forest track to the south and west of the reservoir and from there continues south and southeast, roughly following the Holm Burn to the C35s minor road in the Water of Ken valley. ZTV coverage indicates continual theoretical visibility along the remaining part of the route with between 1-7 turbines theoretically visible increasing to 8-15 for 2km as the route passes Nether Holm of Dalquhairn and nears the C35s road. As the route passes through forestry at the reservoir, views would be screened by surrounding forestry. Wireline analysis indicates that in open areas as the route leaves the forestry and heads south and southwest, it would pass close to the base of T13 at Alhang Hill, before descending steeply to follow the Holm Burn valley. Visibility would reduce in this section of the route due to screening by landform, increasing as the route follows the valley southeast as the Eastern group become visible. At Nether Holm of Dalquhairn both groups would be theoretically visible, but views would be filtered by surrounding vegetation as illustrated in **Figures 9.21c-d.** The magnitude of change along the route would range from High to Zero and the effect is judged to be **Major** and Significant for approximately 2km between Afton Reservoir and Alhang Hill, reducing to **Minor to No View** and Not Significant elsewhere. The nature of these effects would be long-term (reversible), indirect and negative. Aviation warning lights would be visible as reported in **Appendix 9D,** however, the visual effects of these lights would not be significant. Cumulative Assessment: Proposed Development + Existing + Consented Sites There would be theoretical visibility of the existing Afton, Windy Standard and Windy Rig wind farms (all High to Zero magnitude) between 0.2-1.1km distance. Other wind farms visible from the routes include Pencloe (Medium to Zero magnitude), Torrs Hill, Cornharrow, Whiteside Hill, Wether Hill, Sanquhar, and Knockman Hill (all Low to Zero magnitude). The additional effect of the Proposed Development would remain **Major** and Significant, reducing to **Minor to No View** and Not Significant. The combined effect would be **Major** and Significant (due to the Proposed Development, Afton, Windy Standard and Windy Rig), reducing to **Minor to No View** and Not Significant. Afton, Windy Standard and Windy Rig would be

Receptor	Description of Effects
	decommissioned ~10-30 years prior to the end of the operation of the Proposed Development, reducing this cumulative effect. The nature of these effects would be long-term (reversible), indirect, cumulative and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications Sanquhar II Wind Farm would be intermittently visible along the route partially screened by intervening landform and vegetation. At its closest point, near Afton Filter Station, the nearest turbine would be approximately 0.8km from the route and visible in gaps or above the intervening vegetation (High – Medium to Zero magnitude). Euchanhead Wind Farm (Medium to Low, to Zero magnitude) would be partially visible along the route, mostly screened by intervening landform and vegetation, but visible in elevated parts near Afton Reservoir. The additional effect of the Proposed Development would be reduced to **Major / Moderate** (due to the presence of other wind farms) to **No View** Not Significant. The combined effect would be **Major** and Significant (due to Afton, Windy Standard, Windy Rig, Sanquhar II, Euchanhead and the Proposed Development). Afton, Windy Standard and Windy Rig would be decommissioned ~10-30 years prior to the end of the operation of the Proposed Development, reducing this cumulative effect. The nature of these effects would be long-term (reversible), indirect, cumulative and negative.
Right of Way: DS14	Right of Way DS14 connects the Water of Ken valley at the C35s minor road with the summit of Alwhat, via steep, southeast facing slopes of Ewe Hill. The route is approximately 2.9km in length and would be approximately 0.3km distance from the nearest turbine (Turbine 12 – Western group) at its closest point as it reaches the summit of Alwhat Hill. Assessment: Proposed Development Both the Western and Eastern groups would be theoretically visible from the southeast facing slopes of Ewe Hill, affecting the majority of the route at between 0.2km (Western group) and 1.1km (Eastern group) distance. There would be a short part of the route where visibility would reduce to three West group turbines. The magnitude of change along this route would range from High to Medium and the effect would be **Major** and Significant**.** The nature of these effects would be long-term (reversible), indirect and negative. Aviation warning lights would be visible as reported in **Appendix 9D,** where the visual effects of these lights would be significant from the summits of Ewe Hill and Alwhat reducing to not significant from the remainder of the route. Cumulative Assessment: Proposed Development + Existing + Consented Sites There would be panoramic views of several existing and consented wind farms from the top of Alwhat Hill. The main ones include Windy Standard and Extension (Medium to Zero magnitude) at approximately 2.8km distance. Afton (High to Zero magnitude) would also be theoretically visible at approximately 1.5km distance. Windy Rig would be theoretically visible at approximately 3.5km distance (Medium to Zero magnitude). The additional effect of the Proposed Development would be **Major** and Significant. The combined effect would be **Major** and Significant (due to the Proposed Development, Afton, Windy Standard and Extension, and Windy Rig). Afton, Windy Standard and Windy Rig would be decommissioned ~10-30 years prior to the end of the operation of the Proposed Development, reducing this cumulative effect. The nature of these effects would be long-term (reversible), indirect, cumulative and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications

Receptor	Description of Effects
	Sanquhar II and Euchanhead would be visible along the route partially screened by intervening landform and vegetation at approximately 0.8km distance and occupying approximately 90 degrees of the horizontal view at Alwhat Hill (High magnitude). There would be theoretical visibility of, Scoop Hill, Daer and Shepherd's Rig (all Low to Zero magnitude) from sections of the route. The additional effect of the Proposed Development would be **Major** and Significant. The combined effect would be **Major** and Significant (due to the Proposed Development, Afton, Windy Standard and Extension, Windy Rig, Sanquhar II and Euchanhead. Afton, Windy Standard and Windy Rig would be decommissioned ~10-30 years prior to the end of the operation of the Proposed Development, reducing this cumulative effect. The nature of these effects would be long-term (reversible), indirect, cumulative and negative.
Right of Way: DS13	Right of Way DS13 connects the Water of Ken valley at the C35s minor road, north of Corlae, with Alhang Hill on the East Ayrshire boundary. The route crosses the flat river basin, across the Water of Ken valley to connect with a track at Upper Holm of Dalquhairn. From this property, it heads northwest up the slopes of Mid Rig and roughly follows a contour on the southwest facing slope of Mid Rig to a point west of the summit of Alhang Hill. Beyond this point it crosses into East Ayrshire and continues to Afton Reservoir. The route is approximately 3.3km in length and would and pass the base of Turbine 13 (Western group) at its closest point (Alhang Hill). <u>Assessment: Proposed Development</u> The Proposed Development would be theoretically visible from the majority of the of the route with the greatest theoretical visibility of both the Eastern and Western groups (12-15 turbines) indicated on the southeast facing slopes and summits of Mid Rig and in the Water of Ken valley. The greatest visibility would affect approximately 0.5km of the route near the summit of Mid Rig, a further 0.3km near the summit of Alhang as it passes near to the base of Turbine 13, and for 1.1km as it crosses the Water of Ken valley (High magnitude). Elsewhere the turbines would be partially screened by landform and vegetation as illustrated in **Figures 9.21c-d** at Nether Holm of Dalquairn (Medium – Low magnitude). The magnitude of change along this route would be High and the effect would be **Major to Major / Moderate** and Significant**.** The nature of these effects would be long-term (reversible), indirect and negative. Aviation warning lights would be visible as reported in **Appendix 9D,** where the visual effects of these lights would be significant from the summit of Alhang reducing to not significant from the remainder of the route. <u>Cumulative Assessment: Proposed Development + Existing + Consented Sites</u> There would be theoretical visibility of the existing Windy Standard and Extension (Medium to Zero magnitude) at approximately 2km distance. The existing Afton Wind Farm (High to Zero magnitude) would also be theoretically visible at approximately 1km distance. Windy Rig would be theoretically visible at approximately 1.5km distance (High to Zero magnitude). There are several other existing and consented wind farms theoretically visible at greater distance from the summit at Alhang including South Kyle, Cornharrow and Pencloe (all Low to Zero magnitude). The additional effect of the Proposed Development would be **Major to Major / Moderate** and Significant. The combined effect would be **Major** and Significant (due to the Proposed Development, Afton, Windy Standard and Extension, and Windy Rig). Afton, Windy Standard and Windy Rig would be decommissioned ~10-30 years prior to the end of the operation of the Proposed

Receptor	Description of Effects
	Development, reducing this cumulative effect. The nature of these effects would be long-term (reversible), indirect, cumulative and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications There would be theoretical visibility of some Sanquhar II and Euchanhead turbines at over 1.8km (both High-Medium magnitude). Shepherd's Rig (Low to Zero magnitude) would also be visible from sections of the route. The additional effect of the Proposed Development would be **Major to Major / Moderate** and Significant. The combined effect would be **Major** and Significant (due to the Proposed Development, Afton, Windy Standard and Extension, Windy Rig, Sanquhar II and Euchanhead). Afton, Windy Standard and Windy Rig would be decommissioned ~10-30 years prior to the end of the operation of the Proposed Development, reducing this cumulative effect. The nature of these effects would be long-term (reversible), indirect, cumulative and negative.
Right of Way: DS15	Right of Way DS15 is routed along the Water of Ken valley and part of this route overlaps with Core Path No. 215 and Heritage Path 1, assessed previously. A section of this route not assessed previously is routed to the south, between Dalquhairn and Glenhead Rig, to the western valley side of the Water of Ken valley. This section of the route is approximately 2.3km in length and would be approximately 2.6km from the Western group (Turbine 11) and 2.3km from the Eastern group (Turbine 1) at its nearest point. Assessment: Proposed Development All of this section of the route is within the ZTV, indicating that between 8-15 turbines from the Eastern and Western groups would be theoretical visible. Wireline analysis indicates that the bases and towers of some of the turbines would be screened by landform along this section of the route. The magnitude of change would be Medium and the effect would be **Major / Moderate** and Significant. The nature of these effects would be long-term (reversible), indirect and negative. Aviation warning lights would be visible as reported in **Appendix 9D,** however, the visual effects of these lights would not be significant. Cumulative Assessment: Proposed Development + Existing + Consented Sites The existing Windy Rig, Windy Standard and its Extension, Whiteside Hill and Wether Hill, and the consented Cornharrow wind farms would be most noticeable from this section of the route (all Low to Zero magnitude). The additional effect of the Proposed Development would remain **Major / Moderate** and Significant. The combined effect would also remain **Major / Moderate** and Significant (due to the Proposed Development). The nature of these effects would be long-term (reversible), indirect, cumulative and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications The applications at Sanquhar II, Euchanhead, and Shepherd's Rig would be most noticeable (all Medium to Zero magnitude). The additional effect of the Proposed Development would remain **Major / Moderate** and Significant. The combined effect would be **Major / Moderate** and Significant (due to the Proposed Development, Sanquhar II, Euchanhead and Shepherd's Rig). The nature of these effects would be long-term (reversible), indirect, cumulative and negative.

Receptor	Description of Effects
Other Pedestrian Route': DN159	This route forms part of the SUW and is assessed within the visual effects of the SUW section in **Table 9.19.**

Visual Effects on the Southern Upland Way

9.9.43 The Southern Upland Way (SUW) is one of Scotland's Great Trails and is a long-distance walking route between Portpatrick on the southwest coast of Scotland to Cockburnspath on the east coast. The route is 341km in length and is located approximately 0.2km distance at its closest point to the Proposed Development.

9.9.44 The route is assessed sequentially within the 45km study area from northeast to southwest in **Table 9.19** below and is illustrated in **Figures 9.20a-j.** This section of the route is approximately 151km in length.

Table 9.19 Visual Effects on Views from the Southern Upland Way

Viewpoint / Location	Description of Effects
East of Moffat to Whing **Viewpoints 1-4 (Figure 9.20b-c)**	There would be almost ***no view*** of the Proposed Development within the 45km study area between east of Moffat and Hod's Hill (Viewpoint 1) where there would be theoretical visibility of 11 turbines in clear conditions at approximately 32.5km distance (Very Low magnitude). There would be no view for a further 12km until the route reaches Comb Head and climbs towards Lowther Hill (Viewpoint 2) and Whiteside Hill. There would be theoretical visibility of all 15 turbines for approximately 4km along this elevated ridgeline at a distance of over 23km distance (Very Low magnitude), before the route descends to Wamlockhead and follows the Wanlock Water valley. Visibility occurs again as the route climbs Glengaber Hill (Viewpoint 3) where mostly hubs would be visible at over 20km distance (Very Low magnitude). Visibility of hubs and blades again occurs for approximately 5km as the route descends towards Sanquhar (Viewpoint 4) with visibility screened by landform at Loch Burn and by the built environment and vegetation at Sanquhar (Very Low magnitude). Between Sanquhar and Whing, there would be no theoretical visibility of the Proposed Development. The magnitude of change would range from Very Low to Zero and the effect would be **Minor to No View** and Not Significant.
Whing Head, Cloud Hill and Polgown **Viewpoint 5 (Figure 9.20c)**	The SUW follows the upper slopes and shoulders of a series of hills between Whing Head and Polgown, from where the hubs of the Eastern group and blades of the Western group would be theoretically visible between 4.4-8km (Eastern group) and 7.2-10.6km (Western group) distance from the Proposed Development. There would be some partial landform screening, increasing on approach to Polgown and the Western group would be screened. The magnitude of change would be Low to Zero and the effect would be **Moderate to No View** and Not Significant. The effect would be not significant due to the intervening distance, partial screening of the lower parts of the turbines as a result of intervening landform and the wide views.
Polgown to Dalgonar **Viewpoint 6 (Figure 9.20d)**	The SUW between Polgown and Dalgonar follows the lower contours of the Rough Shoulder near the confluence of Polskeoch Burn and the upper part of the Scar Water valley. ZTV coverage and wireline analysis indicate that up to 4-10 turbines from the Eastern group would be theoretically visible between 2.4-4.4km distance from the Proposed Development, however, the turbines would be partially screened by landform and forestry such that only hubs and blades would be visible above Wether Hill (Low to Very Low magnitude) until the route reaches Dalgonar where there would be views beyond Wether Hill of hubs and three towers, as illustrated in

Viewpoint / Location	Description of Effects
	Viewpoint 6 (Medium magnitude). The magnitude of change would be Low to Zero (Medium for 0.3km at Dalgonar) and the effect would be **Moderate** and Not Significant (**Major / Moderate** and Significant for 0.3km at Dalgonar – Eastern group only).
Dalgonar to Polskeoch **Viewpoint 7 (Figure 9.20d)**	The SUW between Dalgonar and Polskeoch follows the Polskeoch Burn. Viewpoints 6 and 7 are representative of the views from this section of route at Dalgonar and Polskoech. ZTV coverage and wireline analysis indicate that up to 4-10 turbines from the Eastern group would be theoretically visible for most of this section between 1.2-2.4km distance from the Proposed Development, with theoretical visibility of two turbines from the Western group at Polskeoch at 3.7km distance. There would be some partial landform and forestry screening at Dalgonar, as illustrated in Viewpoint 6. Travelling southwest from Dalgonar, the route rises slightly through a forested area and then descends towards Polskeoch where the Eastern group would be visible at almost full height as illustrated in Viewpoint 7. The Western group would be theoretically visible as a partial blade and blade tip but would be screened by intervening vegetation. The magnitude of change would range from High to Zero and the effect would be **Major** and Significant (Eastern group only) to **No View** and Not Significant (as the route travels through a forested area (subject to forest felling management)).
Polskeoch to Wether Hill **Viewpoint 8 (Figure 9.20e)**	The SUW between Polskeoch and Wether Hill crosses the low watershed between the Scar Water and the Water of Ken valleys, passing Polskeoch Bothy. Viewpoints 7 and 8 are representative of the views from this section of the route. ZTV coverage and wireline analysis indicate that up to 10 turbines from the Eastern group would be theoretically visible for most of this section between 0.8-1.2km distance from the Proposed Development, with theoretical visibility of up to three turbines from the Western group theoretically visible at 3.7-4.1km distance. There would be some partial landform and vegetation (including forestry) screening as illustrated in the viewpoints. The magnitude of change would be High and the effect would **Major** and Significant.
Wether Hill to Cairn Hill **(Figure 9.20e)**	The SUW passes through an area of forestry between Wether Hill, Allan's cairn and High Countam where the views would be largely screened by forestry, subject to felling plans. From High Countam to Blackhill the SUW is routed along the outside of the forestry boundary, on the eastern edge of the Site along with the Eastern group and then continues west to the summit of Cairn Hill. The Proposed Development would be largely screened where the route passes through forestry, however, elsewhere between High Countam and Cairn Hill, the Eastern group would be visible in open views to the west, between 0.2-1km distance and the Western group would be visible beyond at between 4.4-5.4km distance. The magnitude of change would be High (where visible) and the effect would be **Major** and Significant.
Cairn Hill to Benbrack **Viewpoint 9 (Figure 9.20e)**	The SUW between Cairn Hill to Benbrack is north / south and crosses the low saddle between Cairn Hill to Benbrack where turbine visibility would reduce (up to two hubs and three blades of the Eastern group theoretically visible, and up to 5 of the Western group visible, affecting 0.5km distance of the route) due to the screening effects of Cairn Hill. All of the proposed turbines would, however, be visible from the summit of Benbrack and an associated lower hilltop or shoulder to the north of Benbrack, as illustrated in Viewpoint 9 and LVIA viewpoint 5. Turbine visibility would affect approximately 2km distance of the SUW in total, between 0.25-2km distance (Eastern group) and 4.5-5.7km distance from the Western group. The magnitude of change would be High to High-Medium and the effect would be Major to **Major / Moderate** and Significant.

Viewpoint / Location	Description of Effects
Benbrack to Manquhill Hill **Viewpoint 10 (Figure 9.20f)**	The SUW between Benbrack to Manquhill Hill is largely routed through forestry. Continuing south from Benbrack ZTV and wireline analysis indicate theoretical visibility of the Western group (1-3 turbines) for approximately 1.2km of the route (with a short section of no visibility) due to the screening effects of Benbrack and then increased visibility of up to all 15 turbines as the route climbs Manquhill. The Eastern group would be visible at between 2.5-4.7km distance and the Western group at between 5.9-6.7km distance. From the summit of Manquhill Hill as illustrated in the viewpoint where most turbines would be visible, however, the Eastern group would be partially screened by landform and forestry. The magnitude of change would be Low to Zero and the effect would be **Moderate to No View** Not Significant. The effect would be not significant due to the intervening distance, partial screening of the lower parts of the turbines as a result of intervening landform and the wide views.
Manquhill Hill to Culmark Hill **Viewpoints 10 and 11 (Figure 9.20f/g)**	The SUW between Manquhill Hill and Stellhead is largely routed through undulating landform. ZTV and wireline analysis indicates patchy visibility in this section of the route with partial visibility of the Eastern group receding behind Manquhill summit and the Western group theoretically visible for up to 1km as the route descends Manquhill. Theoretical visibility returns at Stellhead where hubs of the Western group would be theoretically visible and a blade of the Eastern group for approximately 0.6km of the route. There would be a further short (0.6km) section of theoretical visibility where partial blades and blade tips from both groups would be theoretically visible at Stroanfreggan Craig before the route crosses the low-lying Stroanfreggan Burn watershed and then climbs towards Culmark Hill. From Culmark Hill there would be visibility of both the Eastern and Western groups with some screening from intervening landform such that mostly hubs and blades would be visible. Along this section of the route the proposed turbines (where visible) would be seen at distances of between 4.7 and 9.8km (Eastern group) and 5.9-11.2km (Western group) distance. The magnitude of change would be Low to Zero and the effect would be **Moderate to No View** and Not Significant. The effect would be not significant due to the intervening distance, partial screening of the lower parts of the turbines as a result of intervening landform and the wide views.
Culmark Hill to West of Knowe **Viewpoints 11-16 (Figures 9.20g-i)**	The SUW continues towards the Glenkens and then turns east through Glentrool Forest, exiting the 45km study area to the west of Knowe. ZTV coverage along this section of the route is patchy, occurring at short sections as the route traverses elevated sections as illustrated in viewpoints 11-16. Some of the views would be partially screened by intervening forestry and vegetation, but in general, where visible, both the Eastern and Western groups would be visible as separate groups on the skyline at distances of between 15-20km, mostly as hubs and blades. The magnitude of change would be Very Low to Zero and the effect would be **Minor to No View** and Not Significant.

9.9.45 In summary, the experience of significant visual effects would comprise three areas within 2-2.5km distance from the Proposed Development as the SUW travels around the north, east and south of the Development Site, as follows:

- Area to the north / northeast, between Dalgonar and Wether Hill via Polskoech at the low watershed between the Polskoech Burn and the Water of Ken valley, as the SUW approaches from the north / northeast, through forestry, revealing partial views of the Eastern group;
- Area closest to the Proposed Development, between Wether Hill and Cairn Hill, as the SUW approaches and skirts the east and southern boundary of the Eastern group Site with open views of the proposed turbines; and

- Area to the south, between Cairn Hill and Benbrack, as the SUW approaches the Eastern group from the south near one of the Striding Arches sculptures, revealing full and partial views of the Proposed Development (Eastern and Western groups).

9.9.46 In total, if the screening effects of forestry are discounted to provide an absolute worst case, the views from up to approximately 10km of the route could be significantly affected. In reality, the process of forestry management would involve re-planting, felling and long periods of tree growth during which, the incidence of significantly affected views would reduce by approximately 3-3.5km during periods of forestry cover.

9.9.47 The magnitude of change on the SUW would range from High to Zero and the level of effect would be **Major** and Significant (affecting approximately 6.5-7km of the route allowing for forestry screening) to **No View** and Not Significant. These significant effects equate to 10% of the entire 151km route within the 45km study area. The nature of these effects would be long-term (reversible), indirect, and negative.

9.9.48 Aviation warning lights would be visible as reported in **Appendix 9D**, where the visual effects of these lights would be significant as the route passes the summits of Black Hill and Benbrack reducing to not significant from the remainder of the route.

Cumulative Assessment: Proposed Development + Existing + Consented Sites

9.9.49 The existing Windy Standard and Extension, Afton, Windy Rig, Twentyshilling Hill and Hare Hill (all Low to Zero magnitude), Whiteside Hill (High to Zero magnitude) wind farms would often be visible along elevated sections of the SUW within 10km. With the exception of Wether Hill (Medium to Zero magnitude), and the consented Cornharrow wind farms (High-Medium to Zero), all wind farm development is located to the west of the SUW. The consented Troston Loch Wind Farm (Low to Zero magnitude) would be visible to the south from the SUW by Benbrack. The additional effect of the Proposed Development would remain **Major** and Significant to **No View** and Not Significant. The combined effect would be **Major** and Significant (due to the Proposed Development, Whiteside Hill, Wether Hill and Cornharrow) to No View and Not Significant. Wether Hill and Whiteside Hill would be decommissioned ~15-25 years prior to the end of the operation of the Proposed Development, reducing this cumulative effect, although significant effects would remain as a result of Cornharrow and the Proposed Development. The nature of these effects would be long-term (reversible), indirect, cumulative and negative.

Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications

9.9.50 Between Dalgonar and Cairn Hill the SUW would pass through Euchanhead and Sanquhar II wind farms which would be visible in open areas at various locations at close proximity (both High to Zero magnitude). Shepherd's Rig Wind Farm would be visible to the west beyond the Water of Ken valley (Medium to Zero magnitude). The additional effect of the Proposed Development would remain **Major** and Significant to **No View** and Not Significant. The combined effect would be **Major** and Significant (due to the Proposed Development, Whiteside Hill, Wether Hill, Cornharrow, Sanquhar II, Euchanhead and Shepherd's Rig) to No View and Not Significant. Wether Hill and Whiteside Hill would be decommissioned ~15-25 years prior to the end of the operation of the Proposed Development, reducing this cumulative effect, although significant effects would remain as a result of Cornharrow and the Proposed Development. The nature of these effects would be long-term (reversible), indirect, cumulative and negative.

Table 9.20 Visual Effects on Views from Other National Recreational Routes within 45km

Receptor	Description of Effects
Robert the Bruce Trail	Robert the Bruce Trail is a set of four trails centring on Dumfries and commemorating Robert the Bruce and the Wars of Independence. Sections of all four trails enter the 45km study area, with the eastern and the central trails passing closest to the Proposed Development at approximately 13km and 21.5km at their closest points, respectively. Assessment: Proposed Development The majority of the route is outwith the ZTV with theoretical visibility indicated at Sanquhar, south of Thornhill, Dumfries, Castle Douglas and New Galloway. Wireline analysis indicates that there would be theoretical visibility of partial blades and blade tips from these locations and site visits indicate that these views would be mostly screened by intervening buildings and vegetation. The magnitude of change would be at most Very Low to Zero and the effect would be **Minor to No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect and neutral. Aviation warning lights would be visible as reported in **Appendix 9D,** however, the visual effects of these lights would not be significant. Cumulative Assessment: Proposed Development + Existing + Consented Sites The eastern and central routes will pass close to the existing Clyde / Extension Wind Farm (Low to Zero magnitude), Dalswinton (Low to Zero magnitude) and Blackcraig (Very Low to Zero magnitude) wind farms and the consented Mochrum Fell Wind Farm (Low-Very Low to Zero magnitude). The additional effect of the Proposed Development would remain **Minor to No View** and Not Significant. The combined effect would be **Moderate to No View** and Not Significant (due to other cumulative wind farms identified above). The nature of these effects would be long-term (reversible), indirect, cumulative and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications The eastern and central routes will pass close to the application Daer, Scoop Hill and Garcrogo wind farms (all Low to Very Low to zero magnitude). The additional effect of the Proposed Development would remain **Minor to No View** and Not Significant. The combined effect would be **Moderate to No View** and Not Significant (due to other cumulative wind farms identified above). The nature of these effects would be long-term (reversible), indirect, cumulative and negative.
Burns Heritage Trail	The Burns Heritage Trail is a circular driving route which passes through Tarbolton, Sanquhar to Dumfries (following the A76), southwest to Kirkcudbright then north towards Ayr and out to Kilmarnock. It is approximately 327km long in total. The route passes within approximately 11km of the proposed turbines at its nearest point as it passes through New Cumnock. Assessment: Proposed Development The majority of the route is outwith the ZTV with theoretical visibility indicated at Maybole, Ayr, between Kilmarnock and New Cumnock, and sporadic visibility indicated at Sanquhar, Thornhill and Dumfries and between Castle Douglas and Carsphairn. Wireline analysis indicates that there would be theoretical visibility of partial blades and blade tips from the majority of these locations, with greater

Receptor	Description of Effects
	theoretical visibility of hubs as the route approaches New Cumnock, and at Bardennoch, south of Carsphairn. Site visits indicate that these views would be mostly screened by intervening buildings and vegetation. The magnitude of change would be at most Very Low to Zero and the effect would be **Minor to No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect and neutral. Aviation warning lights would be visible as reported in **Appendix 9D,** however, the visual effects of these lights would not be significant. <u>Cumulative Assessment: Proposed Development + Existing + Consented Sites</u> The eastern section of the route passes along the A76 and will pass closest to wind farm development as it approaches New Cumnock from the northwest. In this section of the route, there would be cumulative visibility of the Proposed Development with several existing wind farms including: Hare Hill, High Park Farm (both Low to Zero magnitude), Afton, Windy Standard and Extension (all Low to Zero magnitude), Windy Rig (Very Low to Zero magnitude) and South Kyle (Medium-Low to Zero magnitude) in intermittent, oblique views to the south and southwest at distances of between approximately 4km – 14km. The consented Pencloe and Enoch Hill (both Medium to Zero magnitude), Windy Standard Phase II (Very Low to Zero magnitude) would also be visible simultaneously with the Proposed Development at between 7.7km and 8.8km. To the east of New Cumnock, in areas where there would be no visibility of the Proposed Development, the route would pass close to Sandy Knowe Wind farm- filtered by roadside and middle-distance vegetation (Medium to Zero magnitude) and Sanquhar Wind Farm behind (Very Low to Zero magnitude) as well as the consented Glenmuckloch to the north (Medium to Zero magnitude). The southern part of the route follows the A75 between Dumfries and Newton Stewart and there would be very limited sequential wind farm visibility in distant views (Very Low to Zero magnitude). The western section of the route follows the A714 and A77 and joins the A76 at Kiklmarnock. This section of the route will pass near to several wind farms including, Hadyard Hill, Tralorg, and Assel Valley. Most of these would be set back from the route in surrounding hills and would be partially visible in glimpsed views through roadside vegetation and/or between landforms (Low to Zero magnitude). The additional effect of the Proposed Development would remain **Minor to No View** and Not Significant. The combined effect would be **Minor to No View** and Not Significant for the majority of the route (and **Moderate** and Significant as it passes Pencloe, Enoch Hill, Sandy Knowe and Glenmuckloch wind farms). The nature of these effects would be long-term (reversible), indirect, cumulative and negative. <u>Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications</u> The eastern section of the route would pass closest to application wind farms as it approaches New Cumnock from the northwest, where there would be visibility of Sanquhar II and Euchanhead (both Very Low to Zero magnitude). Greenburn (Medium-Low to Zero magnitude) and Overhill Variation (Very Low to Zero magnitude) would also be partially visible in intermittent, oblique views. Along the southern part of the route between Dumfries and Newton Stewart there would be very limited sequential wind farm visibility with potential glimpsed views of distant wind farms at Garcrogo and Mochrum Fell Variation (Very Low to Zero magnitude). The western section of the route follows the A714 and A77 and joins the A76 at Kiklmarnock. There would be distant, partial views of the application Clauchrie, Polquhairn and Knockshinnoch wind farms (both Very Low to Zero magnitude). The additional effect of the Proposed Development would remain **Minor to No View** and Not Significant. The combined effect would be **Minor to No View** and Not

Receptor	Description of Effects
	Significant for the majority of the route (and **Major / Moderate** and Significant as it passes Pencloe, Enoch Hill, Sandy Knowe, Glenmuckloch, and Greenburn wind farms). The nature of these effects would be long-term (reversible), indirect, cumulative and negative.

Visual Effects on Views from Recreational and Tourist Destinations

9.9.51 There are no tourist attractions within 10km of the Proposed Development as identified by Historic Environment Scotland, The National Trust for Scotland and Visit Scotland.

9.9.52 There are a series of sculptures known as the 'Striding Arches' created by the artist Andy Goldsworthy, which are situated on some of the hill summits within 10km. Although these art works can be visited, the local Dumfries and Galloway promotion website for the Striding Arches[7] recommends that visitors take a map and a compass as way marked footpath access is not provided to all of the arch locations. The Striding Arches at Benbrack, Colt Hill, Bail Hill and The Byre are assessed below.

The Striding Arches Sculptures

9.9.53 The Striding Arches are a series of four red sandstone arches, designed by Andy Goldsworthy, as 'land art' sculptures, three of which are located on hill summits around the head of the Dalwhat Water valley and a further arch and an 'amphitheatre' is located at the head of the Dalwhat Water valley, near Cairnhead. Each Striding Arch stands just under four metres high, with a span of about seven metres.

Visitor Access

9.9.54 The Striding Arches website[8] advises that the route from one hill-top to another around the perimeter of the glen is approximately 10 miles (16km) long and walkers require an OS map and a compass. The intention was that over time a route would be created as people walk between the arches. In practice this is somewhat hampered by existing forestry and rough vegetation and such a route remains difficult to navigate.

9.9.55 Further, access to each of the sculptures is not widely promoted and there are few signposts, with most visitors likely to 'encounter' the sculptures from the SUW.

Setting of Sculptures and Experience

9.9.56 As pieces of sculpture, each of the three summit arches at Benbrack, Colt Hill and Bail Hill have a 'close' setting related to the immediate space around it and the hill summit on which it is located. It is within this area that the visitor experience of exploring, encountering and appreciating each of the Striding Arches is likely to be most intense.

9.9.57 The wider landscape setting of the three summit arches at Benbrack, Colt Hill and Bail Hill includes a line of sight whereby they are inter-visible with each other (subject to intervening forestry operations), with each Striding Arch appearing as small summit features within the wider Southern Uplands with Forest landscape that also contains notable wind farm development.

7 https://www.dumfries-and-galloway.co.uk/walks/striding-arches.html
8 https://www.dumfries-and-galloway.co.uk/walks/striding-arches.html

Visual Assessment

9.9.58 Each sculpture is assessed in terms of the recreational / visitor experience and setting of each sculpture and the effects of the Proposed Development on the views and visual amenity associated with them.

9.9.59 The sensitivity of visitors to the sculptures has been assessed as High due to the High susceptibility visitors, whose attention is likely to be focused on the landscape and the High-Medium value of the landscape.

Striding Arch: The Byre

9.9.60 There is a 'central' Striding Arch sculpture (The Byre) and an 'amphitheatre' near Cairnhead, at the head of the Dalwhat Water valley. ZTV and wireline analysis indicate that there would be theoretical visibility of one blade tip of the Eastern group visible. In reality this would be screened by intervening forestry and vegetation and there would be **No View** of the Proposed Development.

9.9.61 Aviation warning lights would not be visible from this location due to intervening landform.

Striding Arch at Colt Hill

9.9.62 The Striding Arch at Colt Hill is accessed by diverting from the SUW, following a signpost, along the edge of the forest up to the summit of Colt Hill. Viewpoint 1 (**Figure 9.22**) illustrates the view away from the sculpture directly towards the Eastern group of the Proposed Development at approximately 1.1km distance, and the more distant Western group beyond at approximately 5.8km distance. The visual effect viewing in this direction would be **Major** and Significant - although recently felled foreground forestry would provide some partial screening when it is replanted and matures. The turbines would be located 'down the hill' at a lower elevation and affecting a quadrant of the view where other existing and consented wind farm development is, or would be, visible in the background.

9.9.63 The setting of the Striding Arch at Colt Hill relates to the immediate summit area of Colt Hill which is sharply defined by the topography and partially contained by forestry, separating this area from the Proposed Development. In this regard it is considered that neither the setting of the Striding Arch at Colt Hill or its intervisibility with other sculptures (located to the southeast and southwest) would be significantly affected by the Proposed Development.

9.9.64 Visitors to the Striding Arch at Colt Hill have a choice to access the sculpture from the SUW or via the forested route of the DGC Core Path No. 51. Nearing the summit however, all visitors would approach the sculpture from the west, facing away from the Proposed Development, and would be focused on reaching and viewing the arch with a sense of anticipation whilst climbing towards the summit looking for the first glimpse of arch itself. The sculpture would be seen and experienced against an eastern backdrop which is unaffected by the Proposed Development, with visitors being able to walk right up to the arch and walk around it. Taking in the wider 360º views these are partly characterised by existing (and consented) wind farm development and the primary views from the hill summit are focused to the southeast along the Dalwhat Water valley and away from the Proposed Development. Although the Proposed Development would feature significantly on the views back towards it, its 'alignment' with sectors of the view already affected by wind farm development, the partial screening of some of the Eastern group turbines beyond future, matured forestry and the lower site elevation, provide sufficient mitigation to ensure that the turbines would not otherwise significantly affect these wider 360º views. Considering all of these factors, the overall magnitude of change

to the visitor's visual experience and appreciation of the sculpture would be Low and the level of effect **Moderate** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and negative.

9.9.65 Aviation warning lights would be visible as reported in **Appendix 9D**, where the visual effects of these lights would be significant at the summit of Colt Hill. It is to be noted that whilst the visual night-time effect from the Striding Arch location may be significant, the visitor's / walker's appreciation of the sculptures would be largely unaffected as the sculptures are not lit and won't be visible during periods of darkness.

Striding Arch Sculpture at Benbrack

9.9.66 The Striding Arch sculpture at Benbrack can be accessed via a short diversion from the SUW along DGC Core Path No. 446 which is signposted from the SUW, however, the signpost is for Benbrack with no mention of the Arch. Viewpoint 5 (**Figure 9.26**) illustrates the view away from the sculpture directly towards the Proposed Development at a distance of approximately 1.9km (Eastern group) and 5.6km (Western group) distance. The visual effect viewing in this direction would be **Major** and Significant although the closest (Eastern group) proposed turbines would be located 'down the hill' at a lower elevation (High-Medium magnitude of change). Both groups would affect a quadrant of the view where other existing and consented wind farm development is, or would be, visible in the background.

9.9.67 The setting of the Striding Arch at Benbrack relates to the immediate hill summit area of Benbrack which is sharply defined by the topography and intervening steep sided valleys, effectively placing the sculpture on a 'pedestal' and separating this area from the Proposed Development. In this regard it is considered that neither the setting of the Striding Arch at Benbrack or its intervisibility with other sculptures would be significantly affected by the Proposed Development.

9.9.68 Visitors to the Striding Arch at Benbrack could access the sculpture from the SUW, approaching from either the north or the south. As with the approach to Colt Hill, visitors approaching from the north would be facing away from the Proposed Development and would see and experience the arch against a southern backdrop, which includes the existing Wether Hill Wind Farm, the consented Cornharrow Wind Farm and the Cairnsmore of Carsphairn summit. Visitors would be able to walk right up to the arch from the north and walk around it, unaffected by the Proposed Development. Visitors approaching from the south would be facing towards the Proposed Development although it would be partially screened by landform on the approach to the summit. Upon reaching the summit from this direction the arch would be seen with the Proposed Development visible beyond it to the north, significantly affecting the view in that direction, but appearing consistent with the wider character of the Southern Uplands with Forestry and other wind farm development.

9.9.69 The wider 360º views are partly characterised by existing (and consented) wind farm development and the primary views from the hill summit are focused to the south along the Water of Ken valley and towards Cairnsmore of Carsphairn, away from the Proposed Development. Although the Proposed Development would feature significantly on the views back towards it, the lower site elevation and its 'alignment' with sectors of the view already affected by wind farm development provides sufficient mitigation to ensure that the turbines would not otherwise dominate or significantly affect these wider 360º views. Considering all of these factors, the overall magnitude of change to the visitor's visual experience and appreciation of the sculpture would be Low and the level of effect **Moderate** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and negative.

9.9.70 Aviation warning lights would be visible as reported in **Appendix 9D**, where the visual effects of these lights would be significant at the summit of Benbrack. It is to be noted that whilst the visual night-time effect from the Striding Arch location may be significant, the visitor's / walker's appreciation of the sculptures would be largely unaffected as the sculptures are not lit and won't be visible during periods of darkness.

Striding Arch Sculpture on Bail Hill

9.9.71 The Striding Arch sculpture on Bail Hill is difficult to access and there are currently no recorded paths leading to it. Viewpoint 8 (**Figure 9.29**) illustrates the view away from the sculpture directly towards the Proposed Development at approximately 4.8km (Eastern group) and 9.6km (Western group) distance. The visual effect viewing in this direction would be **Major / Moderate** and Significant, but the existing forestry, topography and intervening distance provide a strong 'separation' from the turbines. The turbines would appear as a simple layout, mostly visible as hubs, upper towers and blades and affecting a quadrant of the view where other existing and consented wind farm development is, or would be, visible in the background.

9.9.72 The setting of the Striding Arch on Bail Hill relates to the immediate hill summit area of Bail Hill which is sharply defined by the topography and partial containment of existing forestry and neither the setting of the Striding Arch on Bail Hill or its intervisibility with other sculptures would be significantly affected by the Proposed Development.

9.9.73 There is little evidence of visitors accessing the Striding Arch on Bail Hill, but assuming an approach via the forest rides from the Dalwhat Water Valley to the southwest, visitors would, subject to the screening effects of intervening forestry, view the Proposed Development obliquely to the northwest. As such, they would see and experience the arch against a northeast and eastern backdrop and be able to walk right up to the arch and walk around it, unaffected by the Proposed Development.

9.9.74 The wider 360º views are partly characterised by existing (and consented) wind farm development and the primary views from the hill summit are focused to the east and south towards the Nith Valley and away from the Proposed Development. Although the Proposed Development would feature significantly on the views back towards it, its 'alignment' with sectors of the view already affected by wind farm development and its greater intervening distance beyond forestry would provide sufficient mitigation to ensure that the turbines would not otherwise dominate or significantly affect these wider 360º views. Considering all of these factors, the overall magnitude of change to the visitor's visual experience and appreciation of the sculpture would be Low-Very Low and the level of effect **Moderate to Minor** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and negative.

9.9.75 Aviation warning lights would be visible as reported in **Appendix 9D**, where the visual effects of these lights would not be significant at the summit of Bail Hill.

Cumulative Assessment: Proposed Development + Existing + Consented Sites

9.9.76 Although a number of existing and consented wind farms are visible collectively from the Striding Arches, these add to the background landscape character within which the sculptures are currently experienced and within which the Proposed Development would assimilate. Whilst the addition of the Proposed Development would lead to a significant, and cumulative visual effect, experienced from three of the Striding Arches (at Colt Hill, Benbrack and Bail Hill) it is not considered that these specific visual effects would lead to a significant effect on the wider visitor experience and visual amenity at each of the three Striding Arches located within the ZTV.

9.9.77 Within the wider 360º views, there would be simultaneous and successive visibility of a number of other wind farm development, the most notable of which include the existing and consented developments at Wether Hill, Whiteside Hill, Afton, Sanquhar / Sanquhar Six, Windy Standard and Extension, Hare Hill and Extension, Windy Rig and Twentyshilling Hill (all Low magnitude), and Cornharrow (Medium magnitude) from Colt Hill and Benbrack.

9.9.78 The cumulative magnitude of change to the visitor's visual experience and appreciation of the sculptures would be Medium (from Colt Hill and Benbrack) and Low (from Bail Hill), and taking account of the Proposed Development, there would be no increase in the level of effect from Bail Hill (Moderate and Not Significant), and an increase in the level of effect from Colt Hill and Benbrack (**Major/Moderate** and Significant). The nature of these effects would be long-term (reversible), indirect, cumulative and negative.

Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications

9.9.79 Other notable wind farm applications that would be most visible include Eucanhead (High magnitude from Colt Hill, High to Medium magnitude at Benbrack and Bail Hill), Sanquhar II (High-Medium magnitude at Colt Hill and Benbrack and Medium magnitude at Bail Hill), Shepherd's Rig (Medium-Low magnitude from Benbrack, Low magnitude from Colt Hill and Very Low magnitude from Bail Hill).

9.9.80 The cumulative magnitude of change to the visitor's visual experience and appreciation of the sculptures would be High (from Colt Hill) and High-Medium (from Benbrack and Bail Hill), and taking account of the Proposed Development, there would be an increase in the level of effect (**Major** and Significant). The increase in the level of effect at is due to Euchanhead and Sanquhar II from the northwest to the northeast. Euchanhead would be to the fore of the Proposed Development from Colt Hill and both Euchanhead and Sanquhar II would be visible in conjunction with the Proposed Development from the three hills in the quadrent of the view most affected by existing and consented wind farm development. The nature of these effects would be long-term (reversible), indirect, cumulative and negative.

Table 9.21 Visual Effects on Views from Hill Summits within 10km

Receptor	Description of Effects
Windy Standard 698m AOD (Graham)	Windy Standard is a hill summit in the Southern Uplands located to the southeast of the Afton Reservoir and approximately 1.7km distance west of the Proposed Development (Western group). The summit and its immediate surrounds are occupied by the existing Windy Standard Wind Farm. <u>Assessment: Proposed Development</u> The Western group would appear beyond the existing Windy Standard Wind Farm turbines which surround the summit and would appear as an 'extension' to Windy Standard. The Eastern group would be visible behind the Western group turbines. The magnitude of change would be Medium and the level of effect would be **Major / Moderate** and Significant. The nature of these effects would be long-term (reversible), indirect, and negative. Aviation warning lights would be visible as reported in **Appendix 9D**, where the visual effects of these lights would be significant at the summit of Windy Standard. <u>Cumulative Assessment: Proposed Development + Existing + Consented Sites</u>

Receptor	Description of Effects
	There would be simultaneous views with the existing Windy Standard Wind Farm to the east (High magnitude). There would also be simultaneous views with the existing Windy Rig to the south at approximately 0.9km distance, Afton to the northeast at a distance of approximately 1.1km distance and Windy Standard Extension to the west at approximately 1.5km distance (both High to Medium magnitude). There would be simultaneous views with the existing Whiteside Hill, Twentyshilling Hill. Wether Hill, Harestanes, Minnygap, and Dalswinton although their contribution would not be significant. There would be successive views with existing Dersalloch and Hare Hill and a number of consented wind farms although their contribution would not be significant. The additional effect of the Proposed Development would be **Moderate** and Significant (reduced due to the presence of Windy Standard). The combined effect would be **Major** and Significant (due to Windy Standard, Afton, Windy Rig, Windy Standard Extension and the Proposed Development). Afton, Windy Standard and Extension and Windy Rig would be decommissioned ~10-30 years prior to the end of the operation of the Proposed Development, reducing this cumulative effect. The nature of these effects would be long-term (reversible), indirect, cumulative and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications The applications at Sanquhar II and Euchanhead (both Medium magnitude) would be visible at over 3.7km distance. Daer, and Scoop Hill (both Low magnitude) would be simultaneously visible with the Proposed Development in the distance. Other Wind farm applications would be visible simultaneously at greater distance and in other parts of the view, but their contribution would not be Significant. The additional effect of the Proposed Development would be **Moderate** and Significant (reduced due to the presence of Windy Standard). The combined effect would be **Major** and Significant (due to Windy Standard, Afton, Windy Rig, Windy Standard Extension, Sanquhar II, Euchanhead and the Proposed Development). Afton, Windy Standard and Extension and Windy Rig would be decommissioned ~10-30 years prior to the end of the operation of the Proposed Development, reducing this cumulative effect. The nature of these effects would be long-term (reversible), indirect, cumulative and negative.
Blackcraig Hill 700m AOD (Graham)	This location is assessed in detail in **Appendix 9B** (Viewpoint 7). In summary, there would be a **Major / Moderate** and Significant level of effect resulting from the introduction of the Proposed Development.
Cairnsmore of Carsphairn 797m AOD (Corbett)	This location is assessed in detail in **Appendix 9B** (Viewpoint 9). In summary, there would be a **Major / Moderate** and Significant level of effect resulting from the introduction of the Proposed Development.

Table 9.22 Visual Effects on Views from Recreational and Tourist Destinations within 10-45km

Receptor	Description of Effects
Galloway Forest Park	The Galloway Forest Park is 300 square miles of forestry and wider landscape within Dumfries and Galloway managed by Forestry Commission Scotland. It is Britain's largest forest park. The main area of the Galloway Forest Park is located at approximately 13km distance from the Proposed Development at its closest point. Viewpoint 16 is located within the park. Assessment: Proposed Development

Receptor	Description of Effects
	Theoretical visibility across the park is fragmented and limited almost solely to the hill summits including Corserine, Merrick and Shalloch on Minnoch. Viewpoint: 16 illustrates potential views of the Proposed Development from within the Forest Park. The overall magnitude of change, resulting from the addition of the Proposed Development would be Very Low to Zero due to the intervening distances and the limited visibility as indicated by the fragmented ZTV and the level of effect would be **Minor** to **No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect and neutral. <u>Cumulative Assessment: Proposed Development + Existing + Consented Sites</u> There are many existing and consented wind farms from elevated locations within the forest including: Wether Hill, South Kyle, Windy Rig, Blackcraig and Windy Standard Extension (all Very Low to Zero magnitude), and the consented Benbrack, Windy Standard Phase III, Enoch Hill, Pencloe and Glenshimmeroch (all Very Low to Zero magnitude). The additional effect of the Proposed Development would be **Minor** to **No View** and Not Significant. The combined effect would **Minor** to **No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and neutral. <u>Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications</u> There are many application wind farms visible from elevated locations and the main ones include: Sanquhar II, Euchanhead (both Very Low to Zero magnitude), Shepherds Rig (Low to Very Low magnitude). to the northwest a further cluster of wind farms would be visible including Clauchrie, Knochkronal and Carrick (all Very Low to Zero magnitude). The additional effect of the Proposed Development would be **Minor** to **No View** and Not Significant. The combined effect would **Moderate** to **No View** and Not Significant (due to Shepherds Rig. The nature of these effects would be long-term (reversible), indirect, cumulative and negative.
Loch Doon	Loch Doon is a freshwater loch in the Galloway Forest Park to the southwest of the Proposed Development. The loch was dammed in the 1930s, raising the water some 8 meters. It is a popular visitor attraction with footpaths and visitor destinations along the western parts of the loch. It is approximately 13km distance from the Proposed Development at its closest point. <u>Assessment: Proposed Development</u> The ZTV analysis indicates that views of between 1-7 proposed turbines would only be available from some parts of the western and northwest shores of the Loch. Wireline analysis indicates that partial blades and blade tips would be theoretically visible. In reality these are likely to be screened by intervening vegetation. The overall magnitude of change, resulting from the addition of the Proposed Development would be Very Low to Zero due to the intervening distances and the limited visibility as indicated and the level of effect would be **Minor** to **No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect and neutral. <u>Cumulative Assessment: Proposed Development + Existing + Consented Sites</u> There would be Significant effects due to the consented Benrack Wind Farm (Medium to Low magnitude). Other wind farms would be visible including South Kyle, Windy Standard / Ext and Windy Rig (Very Low to Zero magnitude). The additional effect of the Proposed Development would be **Minor** to **No View** and Not Significant. The combined effect would be **Major / Moderate** and Significant (due to

Receptor	Description of Effects
	Benbrack and not the Proposed Development). The nature of these effects would be long-term (reversible), indirect, cumulative and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications Euchanhead and Sanquhar II would be theoretically visible (both Very Low to Zero magnitude). The additional effect of the Proposed Development would be **Minor** to **No View** and Not Significant. The combined effect would be **Major / Moderate** and Significant (due to Benbrack and not the Proposed Development). The nature of these effects would be long-term (reversible), indirect, cumulative and negative.
Craigengillan GDL	The Craigengillan GDL is set amidst the hills of the Southern Uplands. It was first established as an estate in 1580, when it encompassed over 30,000 acres and stretched as far as Carsphairn. The estate changed hands in early 2000 and the new owner embarked on a restoration programme to encourage public access and to protect and enhance the landscape and the nature conservation interest. It is open year round for various activities. The main house is approximately 16.4km distance west of the Proposed Development. Assessment: Proposed Development ZTV coverage indicates theoretical visibility of between 1-7 turbines would be available from limited areas at Little Shalloch and Auchenroy Hill. Wireline analysis indicates that up to three hubs and two blade tips would be theoretically visible from near Little Shalloch and four blade tips would be theoretically visible from partial blades and blade tips would be theoretically visible from Auchenroy Hill. In reality these are likely to be screened or partially screened by intervening vegetation. The overall magnitude of change, resulting from the addition of the Proposed Development would be Very Low to Zero due to the intervening distances and the limited visibility as indicated and the level of effect would be **Minor** to **No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect and neutral. Cumulative Assessment: Proposed Development + Existing + Consented Sites A cluster of existing and consented wind farms would be theoretically visible to the east including South Kyle, Windy Standard / Ext. Windy Rig and Afton and the consented Benbrack (all Low to Very Low magnitude). The additional effect of the Proposed Development would **Minor** to **No View** and Not Significant. The combined effect would be **Minor** to **No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and neutral. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications There would be theoretical visibility of a number of application wind farms including Euchanhead and Sanquhar II. The magnitude of change would be Very Low to Zero. The additional effect of the Proposed Development would **Minor** to **No View** and Not Significant. The combined effect would be **Minor** to **No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and neutral.
Dumfries House GDL	Dumfries House GDL is located approximately 20.7km to the northwest of the Proposed Development. It is open year round to the public. Assessment: Proposed Development ZTV and wireline analysis indicate that views of the Western group would be theoretically available from the northeast edge of the site. The upper parts of up to

Receptor	Description of Effects
	five turbines would be potentially visible in the distance across the horizon. In reality most views of the Proposed Development would be screened by intervening blocks of dense woodland, though glimpses between the trees may be available from the elevated northern part of the estate near Auchinleck. The overall magnitude of change, resulting from the addition of the Proposed Development would be Very Low to Zero due to the intervening long distance and the limited visibility as indicated and the level of effect would be **Minor** to **No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect and neutral. Cumulative Assessment: Proposed Development + Existing + Consented Sites A cluster of existing and consented wind farms would be theoretically visible to the southeast including South Kyle, Windy Standard / Ext. Windy Rig and Afton and the consented Benbrack (all Low to Very Low magnitude). The consented North Kyle Wind Farm would also be theoretically visible to the south (Low magnitude) The additional effect of the Proposed Development would **Minor** to **No View** and Not Significant. The combined effect would be **Moderate to Minor,** to **No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications There would be theoretical visibility of a number of application wind farms including Greenburn to the south (Low to Zero magnitude) Euchanhead and Sanquhar II (both Very Low to Zero magnitude). The additional effect of the Proposed Development would **Minor** to **No View** and Not Significant. The combined effect would be **Moderate to Minor,** to **No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and negative.
Ballochmyle Golf Club, Catrine	The Ballochmyle Golf Course is located to the southeast of Mauchline at approximately 27.2km to the northwest of the Proposed Development. Assessment: Proposed Development Views towards the Proposed Development would be heavily filtered due mixed woodland planting within the course and adjoining deciduous and riparian woodland. The overall magnitude of change, resulting from the addition of the Proposed Development would be Very Low to Zero due to the intervening long distance and the limited visibility as indicated and the level of effect would be **Minor** to **No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect and neutral. Cumulative Assessment: Proposed Development + Existing + Consented Sites A cluster of existing and consented wind farms would be theoretically visible to the southeast including South Kyle, Windy Standard / Ext. Windy Rig and Afton and the consented Benbrack, Polquairn, North Kyle and Overhill (all Low to Very Low magnitude). The additional effect of the Proposed Development would **Minor** to **No View** and Not Significant. The combined effect would be **Minor** to **No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and neutral. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications There would be theoretical visibility of a number of application wind farms including Greenburn to the south, Euchanhead and Sanquhar II (all Very Low to Zero magnitude). The additional effect of the Proposed Development would **Minor** to **No View** and Not Significant. The combined effect would be **Minor** to **No View** and Not

Receptor	Description of Effects
	Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and neutral.
Auchincruive GDL	Auchincruive is a privately owned estate in South Ayrshire and the location of Scotland's Rural College. The estate grounds are open to the public. Part of the estate is densely wooded along the banks of the River Ayr. The estate is located at approximately 33km distance to the northwest of the Proposed Development. Assessment: Proposed Development ZTV coverage indicates theoretical visibility of up to five turbines from the western and eastern edges of the site and the site high point. The overall magnitude of change, resulting from the addition of the Proposed Development would be Very Low to Zero due to the intervening long distance and the limited visibility as indicated and the level of effect would be **Minor** to **No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect and neutral. Cumulative Assessment: Proposed Development + Existing + Consented Sites A cluster of existing and consented wind farms would be theoretically visible to the southeast including South Kyle, the consented Polquairn, North Kyle and Overhill, Lethans and Glenmuchloch (all Very Low magnitude). The additional effect of the Proposed Development would **Minor** to **No View** and Not Significant. The combined effect would be **Minor** to **No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and neutral. Cumulative Assessment: Proposed Development + Existing + Consented Sites + Applications There would be theoretical visibility of a number of application wind farms including Greenburn, Euchanhead and Sanquhar II (all Very Low to Zero magnitude). The additional effect of the Proposed Development would **Minor** to **No View** and Not Significant. The combined effect would be **Minor** to **No View** and Not Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and neutral.

9.10 Consideration of Optional Additional Mitigation or Compensation

9.10.1 No additional mitigation measures are proposed to further reduce the landscape and visual effects that are identified in this EIA Report. This is because all relevant and implementable measures have already been embedded into the development proposals and are assessed above in this chapter.

9.11 Summary of Residual Landscape and Visual Effects

9.11.1 A summary of the landscape and visual effects are provided in **Tables 9.23** and **9.24**.

9.11.2 The information set out in the tables lists the main receptors included in this assessment and provides a summary of the landscape and visual effects of the Proposed Development as well as the cumulative effects as follows:

- Level of Effect: Proposed Development:

- Sensitivity: The sensitivity of the receptor is recorded (ranging from high, medium, low, to negligible) in accordance with the methodology in **Appendix 9A**;
- Magnitude (Proposed Development only): The magnitude of change for the Proposed Development is recorded;
- Level of Effect (Proposed Development only): The level of effect resulting from the Proposed Development is recorded (taking account of the sensitivity and magnitude in accordance with the methodology). Those levels of effect shown in bold relate to significant effects in accordance with the relevant EIA Regulations.

- Cumulative Level of Effect (including the Proposed Development):
  - Magnitude (Existing and Consented Wind Farms): The magnitude of change, taking account of other existing and consented wind farms is recorded in accordance with the methodology;
  - Additional Level of Effect: Adding the Proposed Development to the baseline of existing and consented wind farms;
  - Scenario 1 / Cumulative Level of Effect 1: The level of effect, taking account of the other existing, consented / under construction wind farms and the Proposed Development, is recorded (taking account of the sensitivity and magnitude in accordance with the methodology). Those levels of effect shown in bold relate to significant effects in accordance with the relevant EIA Regulations and the wind farm contributing most to the cumulative effects is recorded in brackets;
  - Magnitude (Other Application Wind Farms): The magnitude of change, taking account of other wind applications is recorded in accordance with the methodology;
  - Additional Level of Effect: Adding the Proposed Development to the baseline of existing and consented wind farms and other wind farm applications;
  - Scenario 2 / Cumulative Level of Effect 2: The level of effect, taking account of the other existing, consented / under construction, application wind farms and the Proposed Development, is recorded (taking account of the sensitivity and magnitude in accordance with the methodology). Those levels of effect shown in bold relate to significant effects in accordance with the relevant EIA Regulations and the wind farm contributing most to the cumulative effects is recorded in brackets.

Table 9.23 Summary of Landscape and Cumulative Landscape Effects

Receptor	Primary Assessment: Proposed Development only			Cumulative Assessment: Proposed Development (PD) and other wind farms					
	Sensitivity	**Magnitude**	**Level of Effect:**	**Magnitude** (Existing and Consented)	**Additional Level of Effect**	**Scenario 1: Combined Level of Effect**	**Magnitude** (Applications)	**Additional Level of Effect**	**Scenario 2: Combined Level of Effect**
Landscape Effects on the host Southern Uplands with Forest LCT: Ken unit (19a) (Dumfries and Galloway)									
Southern Uplands with Forest during Construction	Medium	Increasing Zero to High	**Major / Moderate** to None	Cumulative effects would increase from None at the start of construction to the operational levels of **Major / Moderate** (due to PD + Wether Hill + Whiteside Hill + Hare Hill + Sanquhar Six + Windy Rig + Sandy Knowe + Sanquhar + Cornharrow)					
Southern Uplands with Forest during Operation	Medium	High (2-3km) to Zero	**Major / Moderate** (2-3km) to None	High to Zero	**Moderate** to None	**Major / Moderate** (PD + Wether Hill + Whiteside Hill + Hare Hill + Sanquhar Six + Windy Rig + Sandy Knowe + Sanquhar + Cornharrow) to None	High to Zero	Moderate to None	**Major / Moderate** (PD + Wether Hill + Whiteside Hill + Hare Hill + Sanquhar Six + Windy Rig + Sandy Knowe + Sanquhar + Cornharrow + Shepherd's Rig + Sanquhar II + Euchanhead) to None

Receptor	Primary Assessment: Proposed Development only			Cumulative Assessment: Proposed Development (PD) and other wind farms					
	Sensitivity	**Magnitude**	**Level of Effect:**	**Magnitude** (Existing and Consented)	**Additional Level of Effect**	**Scenario 1: Combined Level of Effect**	**Magnitude** (Applications)	**Additional Level of Effect**	**Scenario 2: Combined Level of Effect**
Southern Uplands with Forest during Decommissioning	Medium	Decreasing to Low to Very Low	Minor to Negligible	All other wind farm operation would have ceased under the existing consents and the residual cumulative effects post decommissioning would be Minor to Negligible.					
Landscape Effects on the host Southern Uplands LCT: Carsphairn unit (19) (Dumfries and Galloway)									
Southern Uplands during Construction	High-Medium	Increasing Zero to High	**Major** to None	Cumulative effects would increase from None at the start of construction to the operational levels of **Major / Moderate** (due to PD, Windy Rig, Windy Standard and Extension, Windy Standard Phase III, Afton and South Kyle)					
Southern Uplands during Operation	High-Medium	High (1-1.5km) to Zero	**Major** (1-1.5km) to None	High to Zero	**Major / Moderate to Moderate,** to None	**Major** (PD, Windy Rig, Windy Standard and Extension, Windy Standard Phase III, Afton and South Kyle) to None	High to Zero	**Major / Moderate to Moderate,** to None	**Major** (PD, Windy Rig, Windy Standard and Extension, Windy Standard Phase III, Afton, South Kyle, Shepherds Rig) to None

Receptor	Primary Assessment: Proposed Development only			Cumulative Assessment: Proposed Development (PD) and other wind farms					
	Sensitivity	**Magnitude**	**Level of Effect:**	**Magnitude** (Existing and Consented)	**Additional Level of Effect**	**Scenario 1: Combined Level of Effect**	**Magnitude** (Applications)	**Additional Level of Effect**	**Scenario 2: Combined Level of Effect**
Southern Uplands during Decommissioning	High-Medium	Decreasing to Very Low	Minor to Negligible	All other wind farm operation would have ceased under the existing consents and the residual cumulative effects post decommissioning would be Minor to Negligible.					
Landscape Effects on the host Southern Uplands LCT: Blackcraig Hill unit (20a) (East Ayrshire)									
Southern Uplands during Construction	High-Medium	Increasing Zero to High	**Major / Moderate** to None	Cumulative effects would increase from None at the start of construction to the operational levels of **Major / Moderate** (due to PD + Wether Hill + Whiteside Hill + Hare Hill + Sanquhar Six + Windy Rig + Sandy Knowe + Sanquhar+ Cornharrow),					
Southern Uplands during Operation	High-Medium	High (2-3km) to Zero	**Major / Moderate** (2-3km) to None	High to Zero	**Major / Moderate to Moderate,** to None	**Major to Major / Moderate** (PD, Hare Hill + Ext, High Park, Pencloe, Sanquhar Six + Sanquhar + Windy Standard + Ext + Afton) to None	High to Zero	**Major / Moderate to Moderate,** to None	**Major to Major / Moderate** (PD, Hare Hill + Ext, High Park, Pencloe, Sanquhar Six + Sanquhar + Windy Standard + Ext + Afton + Sanquhar II + Euchanhead) to None

Receptor	Primary Assessment: Proposed Development only			Cumulative Assessment: Proposed Development (PD) and other wind farms					
	Sensitivity	**Magnitude**	**Level of Effect:**	**Magnitude** (Existing and Consented)	**Additional Level of Effect**	**Scenario 1: Combined Level of Effect**	**Magnitude** (Applications)	**Additional Level of Effect**	**Scenario 2: Combined Level of Effect**
Southern Uplands during Decommissioning	High-Medium	Decreasing to Low to Very Low	Minor to Negligible	All other wind farm operation would have ceased under the existing consents and the residual cumulative effects post decommissioning would be Minor to Negligible.					
Indirect Landscape Effects on the surrounding Landscape Character in Dumfries and Galloway within 10km									
Narrow Wooded Valleys: Ken (4)	High	Low to Zero (Medium between Lorg Bridge and south of Corlae)	**Major / Moderate** to None (Significant between Lorg Bridge and south of Corlae)	Low to Very Low, to Zero	**Major / Moderate** to None (Significant between Lorg Bridge and south of Corlae)	**Major / Moderate** (PD) to None	High to Zero	**Major / Moderate** to None (Significant between Lorg Bridge and south of Corlae)	**Major** (PD, Shepherds Rig, Euchanhead) to None
Upland Glens: Castlefairn and Dalwhat (10)	High-Medium	Low to Zero	Moderate to Minor, to None	Low to Zero	Moderate to Minor, to None	Moderate to Minor, to None	Very Low to Zero	Moderate to Minor, to None	Moderate to Minor, to None
Upland Glens: Shinnell (10)	High-Medium	Very Low to Zero	Minor to None	Zero	No cumulative effect		High to Zero	Minor to None	**Major** (Sanquhar II) to None

Receptor	Primary Assessment: Proposed Development only			Cumulative Assessment: Proposed Development (PD) and other wind farms					
	Sensitivity	**Magnitude**	**Level of Effect:**	**Magnitude** (Existing and Consented)	**Additional Level of Effect**	**Scenario 1: Combined Level of Effect**	**Magnitude** (Applications)	**Additional Level of Effect**	**Scenario 2: Combined Level of Effect**
Southern Uplands: Nithsdale (19)	High-Medium	Medium (2-3km) to Zero	**Major / Moderate to Moderate** (2-3km) to None	High to Zero	Moderate to None	**Major to Major / Moderate** (PD + Whiteside Hill + Sanuqhar +Twentyshilling Hill + Sandy Knowe + Sanquhar Six)	High to Zero	Minor to None	**Major to Major / Moderate** (Whiteside Hill + Sanuqhar +Twentyshilling Hill + Sandy Knowe + Sanquhar Six + Sanquhar II + Euchanhead)
Southern Uplands with Forest: Carsphairn (19a)	Medium	Low to Zero	Minor to None	High to Zero	Negligible to None	**Major / Moderate** (Windy Standard + Ext + South Kyle + Windy Standard Phase III + Benbrack)	Very Low to Zero	Negligible to None	**Major / Moderate** (Windy Standard + Ext + South Kyle + Windy Standard Phase III + Benbrack)

Receptor	Primary Assessment: Proposed Development only			Cumulative Assessment: Proposed Development (PD) and other wind farms					
	Sensitivity	**Magnitude**	**Level of Effect:**	**Magnitude** (Existing and Consented)	**Additional Level of Effect**	**Scenario 1: Combined Level of Effect**	**Magnitude** (Applications)	**Additional Level of Effect**	**Scenario 2: Combined Level of Effect**
Indirect Landscape Effects on the surrounding Landscape Character in East Ayrshire within 10km									
Upland Glen LCT: Glen Afton (14)	High-Medium	Medium (2-3km at Afton Reservoir) to Zero	**Major/ Moderate to Moderate** (2-3km at Afton Reservoir) to None	High to Zero	Moderate to None	**Major** (PD + Afton) to None	High-Medium to Zero	Moderate to None	**Major** (PD + Afton + Sanquhar II) to None
Upland Basin: New Cumnock (15)	High-Medium	Very Low to Zero	Minor to Negligible, to None	High to Zero	Negligible to None	**Major** (North Kyle) to None	High to Zero	Negligible to None	**Major** (North Kyle + Greenburn) to None
Southern Uplands with Forestry: Enoch Hill (20c)	High-Medium	Low-Very Low to Zero	Moderate to Negligible, to None	High to Zero	Minor to Negligible, to None	**Major** (Afton + South Kyle + Pencloe + Enoch Hill)	Very Low to Zero	Minor to Negligible, to None	**Major** (Afton + South Kyle + Pencloe + Enoch Hill)
Landscape Effects on Landscape Designations within 10km									

Receptor	Primary Assessment: Proposed Development only			Cumulative Assessment: Proposed Development (PD) and other wind farms					
	Sensitivity	**Magnitude**	**Level of Effect:**	**Magnitude** (Existing and Consented)	**Additional Level of Effect**	**Scenario 1: Combined Level of Effect**	**Magnitude** (Applications)	**Additional Level of Effect**	**Scenario 2: Combined Level of Effect**
Uplands and Moorlands LLA (East Ayrshire)	High to High-Medium	Low to Zero	Moderate to None	Medium to Zero	Moderate to None	**Major/ Moderate** (Afton + Hare Hill + Ext + Pencloe) to None	Medium to Zero	Moderate to None	**Major/ Moderate** (PD + Afton + Hare Hill + Ext + Pencloe + Sanquhar II) to None
Galloway Hills RSA (Dumfries and Galloway)	High to Medium	Low to Very Low, to Zero	Moderate to Negligible, to None	High to Medium, to Zero	Moderate to None	**Major to Major / Moderate** (Windy Rig + South Kyle + Benbrack + Torrs Hill) to None	High to Medium, to Zero	Moderate to None	**Major to Major / Moderate (**Windy Rig + South Kyle + Benbrack + Torrs Hill + Shepherds Rig)
Thornhill Uplands RSA (Dumfries and Galloway)	High to Medium	Low to Zero	Moderate to None	High to Medium, to Zero	Moderate to None	**Major to Major / Moderate** (Wether Hill + Twentyshilling Hill) to None	High to Medium, to Zero	Minor to None	**Major to Major / Moderate** (Wether Hill + Twentyshilling Hill + Euchanhead + Daer)

Table 9.24 Summary of Visual and Cumulative Visual Effects

Receptor	Primary Assessment: Proposed Development only			Cumulative Assessment: Proposed Development (PD) and other wind farms					
	Sensitivity	**Magnitude**	**Level of Effect:**	**Magnitude** (Existing and Consented)	**Additional Level of Effect**	**Scenario 1: Combined Level of Effect**	**Magnitude** (Applications)	**Additional Level of Effect**	**Scenario 2: Combined Level of Effect**
Visual Effects on Settlements within 10km									
No settlements within 10km of the Proposed Development									
Visual Effects on Transport Routes within 10km									
B729 - between Craigdarroch and east of Knowehead	Medium	Low-Very Low to Zero	Negligible to No View	High-Medium to Zero	Negligible to No View	Moderate to No View, increasing to **Major / Moderate** (Cornharrow - subject to felling)	High to High-Medium to Zero	Negligible to No View	**Major / Moderate** (Shepherd's Rig and Cornharrow – subject to felling)
C35s (Class III Road) – From Smittons Bridge to Lorg Bridge	High to Medium	High-Medium to Zero	**Major to Major / Moderate** (3.5-4km between Polcheskie Brae and Lorg Bridge) to No View	Very Low to Zero	**Major to Major / Moderate** (3.5-4km between Polcheskie Brae and Lorg Bridge) to No View	**Major to Major / Moderate** (PD) to No View	High to Zero	**Major to Major / Moderate** (3.5-4km between Polcheskie Brae and Lorg Bridge) to No View	**Major** (PD + Euchenhead + Shepherd's Rig) to No View

Receptor	Primary Assessment: Proposed Development only			Cumulative Assessment: Proposed Development (PD) and other wind farms					
	Sensitivity	**Magnitude**	**Level of Effect:**	**Magnitude** (Existing and Consented)	**Additional Level of Effect**	**Scenario 1: Combined Level of Effect**	**Magnitude** (Applications)	**Additional Level of Effect**	**Scenario 2: Combined Level of Effect**
U405N (Unclassified Road) - From northwest of Penpont to Polgown	High to Medium	Low to Zero (High between Dalnagor and Polskeoch)	Moderate to No View (**Major** between Dalnagor and Polskeoch)	Medium to Zero	Moderate to No View (**Major** between Dalnagor and Polskeoch)	**Major** (Whiteside Hill + PD) to No View	High to Zero	Moderate to No View (**Major** between Dalnagor and Polskeoch)	**Major** (Whiteside Hill, Euchanhead, Sanquhar II, PD) to No View
U394N (Unclassified Road) - From west of Moniaive to Benbuie	High to Medium	Low to Zero	Moderate to No View	Very Low to Zero	Moderate to No View	Moderate to No View	Low to Zero	Moderate to No View	Moderate to No View
U400N (Unclassified Road) Minor road from west of Brown Knowe to Appin Lodge	High to Medium	Very Low to Zero	Minor to No View	Zero	No cumulative effect		Low to Zero	Minor to No View	Moderate to No View
Glen Afton Road	High to Medium	Very Low to Zero	Minor to No View	Medium to Zero	Minor to No View	**Major / Moderate** (Afton + Pencloe) to No View	High-Medium to Zero	Minor to No View	**Major** (Afton + Pencloe + Sanquhar II) to No View
A713 Galloway National Tourist Route	High	Very Low to Zero	Minor to No View	Very Low to Zero	Minor to No View	Minor to No View	Low	Minor to No View	Moderate to No View

Receptor	Primary Assessment: Proposed Development only			Cumulative Assessment: Proposed Development (PD) and other wind farms					
	Sensitivity	**Magnitude**	**Level of Effect:**	**Magnitude** (Existing and Consented)	**Additional Level of Effect**	**Scenario 1: Combined Level of Effect**	**Magnitude** (Applications)	**Additional Level of Effect**	**Scenario 2: Combined Level of Effect**
Glasgow to Carlisle railway line via Kilmarnock and Dumfries	High to Medium	Very Low to Zero	Minor to No View	High to Medium	Minor to No View	**Major to Major / Moderate** (Sandy Know + Sanquhar + Glenmuckloch + South Kyle) to No View	Medium to Zero	Minor to No View	**Major to Major / Moderate** (Sandy Know + Sanquhar + Glenmuckloch + South Kyle + Sanquhar II + Greenburn) to No View
Visual Effects on National Recreational Routes within 45km									
Southern Upland Way (overlaps with Scottish Hill Track 83 / DGC Core Path No. 504 / Pedestrian Route DN159/ Heritage Path 2)	High	High to Zero	**Major** (6.5-7km) to No View	High-Medium to Zero	**Major** (6.5-7km) to No View	**Major** to No View (PD + Whiteside Hill + Wether Hill + Cornharrow)	High to Zero	**Major** (6.5-7km) to No View	**Major** to No View (PD + Whiteside Hill + Wether Hill + Cornharrow + Euchanhead + Sanquhar II + Shepherd's Rig)
Robert the Bruce Trail	High	Very Low to Zero	Minor to No View	Low to Zero	Minor to No View	Moderate to No View	Low to Very Low, to Zero	Minor to No View	Moderate to No View
Burns Heritage Trail	High	Very Low to Zero	Minor to No View	Medium to Zero	Minor to No View	**Moderate** (Sandy Knowe, Pencloe, Enoch Hill,	Medium to Zero	Minor to No View	**Moderate** (Sandy Knowe, Pencloe, Enoch Hill, Glenmuckloch,

Receptor	Primary Assessment: Proposed Development only			Cumulative Assessment: Proposed Development (PD) and other wind farms					
	Sensitivity	**Magnitude**	**Level of Effect:**	**Magnitude** (Existing and Consented)	**Additional Level of Effect**	**Scenario 1: Combined Level of Effect**	**Magnitude** (Applications)	**Additional Level of Effect**	**Scenario 2: Combined Level of Effect**
						Glenmuckloch) to No View			Greenburn) to No View
Visual Effects on Local Recreational Routes within 10km									
DGC Core Path No. 51 Benbuie to Troston Hill	High	High to Zero	**Major** to No View	Low-Very Low to Zero	**Major** to No View	**Major** (PD) to No View	High to Zero	**Major** to No View	**Major** (Euchanhead + Sanquhar II + PD)
DGC Core Path No. 188: Corlae	High	Low to Zero	Moderate to No View (**Moderate** for 100m as route reaches SUW)	Low to Zero	Moderate to No View (**Moderate** for 100m as route reaches SUW)	Moderate to No View (**Moderate** - PD)	Low to Zero	Moderate to No View (**Moderate** for 100m as route reaches SUW)	Moderate to No View (**Moderate** - PD)
DGC Core Path No. 215 Lorg Trail / Part of Sanquhar to Stroanpatrick Heritage Path 1 / DGC Core Path No. 443 / Part of Recorded Right of Way: DS15	High	High-Medium to Zero	**Major** to No View	Medium to Zero	**Major** to No View	**Major** (PD + Sanquhar Six) to No View	High to Zero	**Major** to No View	**Major** (PD + Sanquhar Six + Euchanhead + Sanquhar II)

Receptor	Primary Assessment: Proposed Development only			Cumulative Assessment: Proposed Development (PD) and other wind farms					
	Sensitivity	**Magnitude**	**Level of Effect:**	**Magnitude** (Existing and Consented)	**Additional Level of Effect**	**Scenario 1: Combined Level of Effect**	**Magnitude** (Applications)	**Additional Level of Effect**	**Scenario 2: Combined Level of Effect**
DGC Core Path No. 446: Benbrack	High	Low to Very Low (High-Medium at the summit of Benbrack)	Moderate to No View (**Major** at summit of Benbrack)	Medium to Zero	Moderate to No View (**Major** at summit of Benbrack)	**Major** (PD + Wether Hill + Cornharrow) to No View	High-Medium to Zero	Moderate to No View (**Major** at summit of Benbrack)	**Major** (PD + Wether Hill + Cornharrow + Euchanhead, + Sanquhar II + Shepherds Rig) to No View
DGC Core Path No. 52: Cairnhead	High	Very Low to Zero	Minor to No View	High-Medium to Zero	Minor to No View	**Major** (Cornharrow) to No View	Zero	No cumulative effect	
DGC Core Path No. 216 Manquhill Hill	High	Very Low to Zero	Minor to No View	High to Zero	Minor to No View	**Major** (Wether Hill + Cornharrow) to No View	Very Low to Zero	Minor to No View	**Major** (Wether Hill + Cornharrow) to No View
EAC Core Path No. C10: Coalfield Cycle Route	High	Medium to Zero	**Major / Moderate** to No View	High to Zero	**Moderate** to No View	**Major** (PD + Afton + Windy Standard) to No View	High-Medium to Zero	Moderate to No View	**Major** (PD + Afton + Windy Standard + Sanquhar II + Euchanhead)
Heritage Path 1: Old Road from New Cumnock to Dalquhairn /Scottish Hill Track 84: New	High	High to Zero	**Major** to No View	High to Zero	**Major** to No View	**Major** (PD + Afton + Windy Standard + Windy Rig)	High-Medium to Zero	**Major** to No View	**Major** (PD + Afton + Windy Standard + Windy Rig + Sanquhar II + Euchanhead)

Receptor	Primary Assessment: Proposed Development only			Cumulative Assessment: Proposed Development (PD) and other wind farms					
	Sensitivity	**Magnitude**	**Level of Effect:**	**Magnitude** (Existing and Consented)	**Additional Level of Effect**	**Scenario 1: Combined Level of Effect**	**Magnitude** (Applications)	**Additional Level of Effect**	**Scenario 2: Combined Level of Effect**
Cumnock to St John's Town of Dalry									
Recorded Right of Way: DS14	High	High to Medium	**Major**	High to Zero	**Major** to No View	**Major** (PD + Afton + Windy Standard + Ext + Windy Rig)	High to Zero	**Major** to No View	**Major** (PD + Afton + Windy Standard + Ext + Windy Rig + Sanquhar II + Euchanhead)
Recorded Right of Way: DS13	High	High	**Major to Major / Moderate**	High to Zero	**Major to Major / Moderate**	**Major** (PD + Afton + Windy Standard + Ext + Windy Rig)	High-Medium to Zero	**Major to Major / Moderate**	**Major** (PD + Afton + Windy Standard + Ext + Windy Rig + Sanquhar II + Euchanhead)
Recorded Right of Way: DS15	High	Medium	**Major / Moderate**	Low to Zero	**Major / Moderate**	**Major / Moderate** (PD)	Medium to Zero	**Major / Moderate**	**Major / Moderate** (PD + Sanquhar II + Euchanhead + Shepherd's Rig)
Visual Effects on Recreational and Tourist Destinations - Visitor Experience of the Striding Arches									

Receptor	Primary Assessment: Proposed Development only			Cumulative Assessment: Proposed Development (PD) and other wind farms					
	Sensitivity	**Magnitude**	**Level of Effect:**	**Magnitude** (Existing and Consented)	**Additional Level of Effect**	**Scenario 1: Combined Level of Effect**	**Magnitude** (Applications)	**Additional Level of Effect**	**Scenario 2: Combined Level of Effect**
Colt Hill	High	Low	Moderate overall (**Major** viewing towards PD)	Medium	Moderate overall (**Major** viewing towards PD)	**Major** (Cornharrow, PD)	High	Moderate overall (**Major** viewing towards PD)	**Major** (PD + Cornharrow + Eucanhead + Sanquhar II)
Benbrack	High	Low	Moderate overall (**Major** viewing towards PD)	Medium	Moderate overall (**Major** viewing PD))	**Major** (PD, Wether Hill, Cornharrow)	High - Medium	Moderate overall (**Major** viewing towards PD)	**Major** (PD + Wether Hill + Cornharrow + Eucanhead + Sanquhar II + Shepherds Rig)
Bail Hill	High	Low-Very Low	Moderate to Minor overall (**Major / Moderate** viewing towards PD)	Medium	Moderate overall (**Major / Moderate** viewing towards PD)	**Major / Moderate** (PD, Wether Hill)	High - Medium	Moderate overall (**Major / Moderate** viewing towards PD)	**Major / Moderate** (PD, Wether Hill, Sanquhar II, Euchanhead)
Visual Effects on Recreational and Tourist Destinations - Hill Summits within 10km									
Windy Standard 698m AOD (Graham)	High	Medium	**Major / Moderate**	High	**Moderate**	**Major** (PD + Afton + Windy	Medium	**Moderate**	**Major** (PD + Afton + Windy Standard + Ext +

Receptor	Primary Assessment: Proposed Development only			Cumulative Assessment: Proposed Development (PD) and other wind farms					
	Sensitivity	**Magnitude**	**Level of Effect:**	**Magnitude** (Existing and Consented)	**Additional Level of Effect**	**Scenario 1: Combined Level of Effect**	**Magnitude** (Applications)	**Additional Level of Effect**	**Scenario 2: Combined Level of Effect**
						Standard + Ext + Windy Rig)			Windy Rig + Sanquhar II + Euchanhead)
Blackcraig Hill 700m AOD (Graham)	(See Viewpoint 7, **Appendix 9B**)								
Cairnsmore of Carsphairn 797m AOD (Corbett)	(See Viewpoint 9, **Appendix 9B**)								
Visual Effects on Recreational and Tourist Destinations within 10-45km									
Galloway Forest Park	High	Very Low to Zero	Minor to No View	Very Low to Zero	Minor to No View	Minor to No View	Low to Zero	Minor to No View	Moderate to No View
Loch Doon	High	Very Low to Zero	Minor to No View	Medium - Low	Minor to No View	**Major / Moderate** (Benbrack)	Very Low to Zero	Minor to No View	**Major / Moderate** (Benbrack)
Craigengillan GDL	High	Very Low to Zero	Minor to No View	Low to Very Low	Minor to No View	Minor to No View	Very Low to Zero	Minor to No View	Minor to No View
Dumfries House GDL	High	Very Low to Zero	Minor to No View	Low to Zero	Minor to No View	Moderate to Minor, to No View	Very Low to Zero	Minor to No View	Moderate to Minor, to No View

Receptor	Primary Assessment: Proposed Development only			Cumulative Assessment: Proposed Development (PD) and other wind farms					
	Sensitivity	**Magnitude**	**Level of Effect:**	**Magnitude** (Existing and Consented)	**Additional Level of Effect**	**Scenario 1: Combined Level of Effect**	**Magnitude** (Applications)	**Additional Level of Effect**	**Scenario 2: Combined Level of Effect**
Ballochmyle Golf Club, Catrine	High	Very Low to Zero	Minor to No View	Low to Very Low	Minor to No View	Minor to No View	Very Low to Zero	Minor to No View	Minor to No View
Auchincruive GDL	High	Very Low to Zero	Minor to No View	Low to Very Low	Minor to No View	Minor to No View	Very Low to Zero	Minor to No View	Minor to No View

9.12 Summary and Conclusions

9.12.1 The LVIA has been undertaken in accordance with GLVIA 3 by chartered landscape architects at WSP Environment and Infrastructure Solutions UK Limited. The assessment process has encompassed the construction, operation, and decommissioning phases of the Proposed Development.

9.12.2 The Proposed Development comprises up to 15 wind turbines, in two groups (described as the Eastern group of ten turbines and the Western group of five turbines) with a maximum height of 200m to blade tip and associated infrastructure. The Eastern group (T1 to T10) and T14 of the Western group are located within an undesignated area of the *Southern Uplands with Forest* landscape character (Ken Unit) in Dumfries and Galloway T13 is located within the *Southern Uplands* landscape character (Carsphairn Unit) in Dumfries and Galloway. The Western group (with the exception to T13 and T14) is located within the locally designated Uplands and Moorlands Local Landscape Area of the *Southern Uplands* landscape character in East Ayrshire.

9.12.3 The ZTV (calculated to blade tip) for the Proposed Development is limited, accounting for 26.06% of the total Study Area, reducing to 20.39% when considering hub height visibility.

Landscape Planning Policy and Guidance

9.12.4 The LVIA process has taken account of legislation and national and local planning policy in relation to wind farm development as well as the *Dumfries and Galloway Council Local Development Plan 2, Part 1 Wind Energy Development: Development Management Considerations, Appendix 'C' Dumfries and Galloway Wind Farm Landscape Capacity Study Supplementary Guidance*, February 2020 (DGWLCS) and the Dumfries and Galloway Council Local Development Plan 2 (LDP2), *Dark Skies Friendly Lighting Supplementary Guidance,* February 2020 (referred to hereafter as the 'DSFL'). The LVIA has also taken account of the *East Ayrshire Council* (EAC) *Local Development Plan, April 2017,* the *East Ayrshire Council Local Development Plan, Supplementary Guidance: Planning for Wind Energy* December 2017 and the *East Ayrshire Council Local Development Plan, Non-Statutory Planning Guidance: East Ayrshire Landscape Wind Capacity Study* (EALWCS) (June 2018).

9.12.5 The Proposed Development has taken account of the relevant broad scale constraints and opportunities contained within the DGWLCS and EALWCS.

Consultation

9.12.6 Consultation has been undertaken with DGC, EAC and NS. EAC and NS commented on aspects of methodology, sources of information, viewpoint selection, scope of assessment and cumulative development. No response was provided by DGC in relation to the LVIA.

Mitigation Inherent in the Proposed Development

9.12.7 The design of the Proposed Development has been reviewed against SNH's guidance *Siting and Designing Windfarms in the Landscape*, Version 3a, 2017, the advice contained within the DGWLCS and EALWCS, the relevant policies of the DGC and EAC LDPs and Supplementary Guidance. The design objectives of the Consented Development have also been reviewed, and those relevant have been incorporated into the design of the Proposed Development. As a result, the Proposed Development has

been designed to reduce landscape, visual and cumulative effects and to reflect the landscape characteristics of the site location and its wider area which includes LLAs and RSAs.

9.12.8 The Proposed Development has been designed to balance technical and project requirements with a need to safeguard the environment and satisfactorily accommodate the proposed development within its landscape setting.

9.12.9 All of the mitigation related to landscape, visual and cumulative effects is 'built-in' or embedded into the design of the Proposed Development with the exception of detailed reinstatement proposals for the borrow pits which would be provided as part of the construction phase of the development to integrate these features into their landscape setting. A Lighting Strategy for the aviation warning lights has been provided (approved by the CAA) and assessed in **Appendix 9D**.

Landscape and Cumulative Landscape Effects

9.12.10 Landscape Effects are concerned with how the Proposed Development would affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape, and its distinctive character.

9.12.11 There would be a localised significant effect on the host Landscape Character Types, and the addition of the Proposed Development would have a limited, although significant effect on part of the Southern Uplands with Forest: Ken unit, within up to approximately 2 – 3km of the proposed turbines, and Southern Uplands: Carsphairn unit within up to approximately 1-1.5km of the proposed turbines within Dumfries and Galloway. There would also be a localised significant effect on the host Southern Uplands: Blackcraig Hill unit, within up to approximately 2-3km of the proposed turbines within East Ayrshire. These effects would also be limited by existing / retained forestry cover and other wind farm development in this area and would not be significant in terms of the overall landscape character. A localised and significant cumulative effect is also predicted on all three host LCTs as a result of the combined effect of a number of existing, consented and other application wind farms.

9.12.12 With regards to other LCTs within the Study Area, there would be a localised and significant cumulative effect on a small part of the Narrow Wooded Valleys: Ken unit (between Lorg Bridge and south of Corlae) and Southern Uplands: Nithsdale unit (within approximately 2-3km). The majority of these LCTs would not be significantly affected by the Proposed Development.

9.12.13 All remaining LCTs within the Study Area would not be significantly affected by the proposed development.

9.12.14 Three turbines of the Western Group of the Proposed Development (T11, T12 and T15) would be located within the locally designated Uplands and Moorlands LLA. However, there would be no significant effects on the special landscape qualities or integrity of any landscape planning designations as a result of the Proposed Development.

Visual and Cumulative Visual Effects

9.12.15 Visual effects are concerned wholly with the effect of development on views, and the general visual amenity that would be experienced by people in the landscape.

9.12.16 The ZTV and viewpoint analysis indicate that significant visual effects are likely to be limited to locations within approximately 8.3km from the Proposed Development (subject to a clear view of the proposed turbines, landform and vegetation screening), as indicated

by viewpoints 1, 2, 3, 4, 5, 6, 7, 8, 9 and 17. The effects on these viewpoints would also be cumulative.

Visual Effects on Settlements and Residential Properties

9.12.17 There are no settlements within 10km of the Proposed Development and there would be no significant effects on any settlements.

9.12.18 None of the residential properties included in the RVAA would be unacceptably affected by the Proposed Development in terms of their residential visual amenity. This is due largely to the intervening distance, partial screening and use / orientation of the property, such that the living standards would not be affected, and the property would not be adversely affected by 'visual dominance' to the extent that it would become an unattractive place to live when judged objectively and in the public interest, on an individual basis or cumulatively.

9.12.19 Seven of the residential properties within 5km (Polskeoch, Nether Holm of Dalquhairn, Craigythorn Croft, Corlae Byre 1 and 2, Dalgonar, Polcheskie Brae and Strahanna Farm) would experience a significant visual effect due to the Proposed Development. Polskoech is the only property within 2km of the Proposed Development whilst the remaining six properties are between 2-5km distance from the Proposed Development. The remaining five properties within 5km would not be significantly affected, although residents and visitors accessing Upper Holm of Dalquhairn would experience significant views of the Proposed Development from the long access track to the property.

9.12.20 The effect of aviation warning lights on the Proposed Development, although theoretically visible from these properties would however not result in a significant effect due to the lighting mitigation which would reduce the intensity and luminance of the lights during operation. However, there would be one significant combined cumulative effect on the views from Polskeoch as a result of the application Sanquhar II and Euchanhead wind farms and the Proposed Development. This significant cumulative effect applies only to the scenario of the proposed aviation warning lights operating at maximum intensity in conditions of restricted (poor) visibility of <5km (less than 2% of the time). The experience of a significant view of the Proposed Development is not the same as an unacceptable effect or indicative of a failure in terms of maintaining residential amenity.

Visual Effects on Transport Routes

9.12.21 There would be localised and significant visual effects from two transport routes, as follows:

- Approximately 3.5-4km of the northern section of the Class III C35s road, intermittently between Polcheskie Brae and Lorg Bridge;
- Approximately 0.3km section of the minor, Unclassified Road (U405N) between Dalnagor and Polskeoch (this would increase to approximately 1.5km if the coniferous forestry were felled).

9.12.22 There would be no significant visual effect on the views from the remaining transport routes as a result of the Proposed Development. However, it is recognised that some of these routes overlap with recreational walking routes within the Afton Glen and Ken Water valley and the visual effects on some views experienced by walkers along parts of these routes would be significant.

Visual Effects on Recreational Routes

9.12.23 There would be localised and significant effects on the views from parts of the following nine local recreational routes:

- DGC Core Path No. 51 Benbuie to Troston Hill;
- DGC Core Path No. 188: Corlae;
- DGC Core Path No. 215 (Lorg Trail) / Heritage Path 2: Sanquhar to Stroanpatrick / Core Path No. 443 (Bank Hill to Graystone Hill)/ Right of Way DS15;
- DGC Core Path No. 446: Benbrack;
- EAC Core Path No. C10: Coalfield Cycle Route;
- Heritage Path 1: Old Road from New Cumnock to Dalquhairn / Scottish Hill Track 84: New Cumnock to St John's Town of Dalry; and
- Rights of Way: DS14, DS13 and DS15.

9.12.24 Localised and significant effects would also be experienced by users of the Southern Upland Way (also overlapped with DGC Core Path No. 504: Southern Upland Way, Scottish Hill Track 83: St John's Town of Dalry to Sanquhar and Other Pedestrian Route': DN159) in three areas (up to around 6.5-7km of the 151km route within the 45km study area) as follows:

- Area to the north / northeast, between Dalgonar and Wether Hill via Polskoech at the low watershed between the Polskoech Burn and the Water of Ken valley, as the SUW approaches from the north / northeast, through forestry, revealing partial views of the Eastern group;
- Area closest to the Proposed Development, between Wether Hill and Cairn Hill, as the SUW approaches and skirts the east and southern boundary of the Eastern group Site with open views of the proposed turbines; and
- Area to the south, between Cairn Hill and Benbrack, as the SUW approaches the Eastern group from the south near one of the Striding Arches sculptures, revealing full and partial views of the Proposed Development (Eastern and Western groups).

9.12.25 None of the remaining recreational routes would be significantly affected by the Proposed Development.

Visual Effects on Recreational and Tourist Destinations

9.12.26 There are four sculptures (the 'Striding Arches' by the artist Andy Goldsworthy) located on hill summits above, or within the Dalwhat Water valley to the southeast of the Proposed Development. One of the four sculptures would have no view and would be unaffected. Views north / north west / west from three of these sculpture locations, towards the Proposed Development, would be significantly affected. However, the wider 360° views, sculpture setting and visitor experience would not be significantly affected due to the way in which these features would be accessed and experienced and their wider landscape context.

9.12.27 The remaining recreational and tourist destinations would also not be significantly affected by the Proposed Development.

9.12.28 Significant visual and cumulative visual effects would be experienced by walkers from three hill summits within 10km including Windy Standard, Blackcraig Hill and Cairnsmore of Carsphairn.

Night-time Assessment on Aviation Warning Lights

9.12.29 There would be no significant effects on landscape character or designated landscapes. However, a significant and localised combined cumulative night-time effect has been predicted on the host landscape character type (*Southern Uplands with Forest* (DGC) and *East Ayrshire Southern Uplands* LCTs*)* due to the consented Cornharrow, application Sanquhar II and Euchanhead wind farms and the Proposed Development.

9.12.30 The night-time viewpoint assessment concludes that there would be significant night-time visual effects on a very small number of receptors including the views from two small sections of the Southern Upland Way as the route passes the summits of Benbrack and Black Hill, and small parts of three local recreational routes (DGC Core Path No. 446: Benbrack, Right of Way: DS14 and Right of Way: DS13). Significant night-time visual effects would also be experienced from the Striding Arch summits of Colt Hill and Benbrack, and the hill summits of Windy Standard and Blackcraig Hill. These significant effects only apply to the scenario of the proposed aviation warning lights operating at maximum intensity in conditions of restricted (poor) visibility of <5km (which would be less than 2% of the time). It is to be noted that whilst the visual night-time effect from two of the Striding Arches may be significant, the visitor's / walker's appreciation of the sculptures would be largely unaffected as the sculptures are not lit and won't be visible during periods of darkness. Where a small number of walkers are out the hillside at night, they would require torches and are less in number in comparison to the number of walkers accessing the hills during the daytime.

9.12.31 No significant landscape or visual effects on the remaining receptors are predicted. This conclusion applies to the scenarios of the proposed aviation warning lights operating at either a reduced intensity of 10%, which according to meteorological records is likely to occur for 98% of the time (assuming good visibility >5km in all directions from all of the lit turbine locations), or as a result of the proposed aviation warning lights operating at maximum intensity in conditions of restricted (poor) visibility of <5km (less than 2% of the time).

9.12.32 There would be limited practical access to mountain summits during the night, with campers most likely to prefer lower lying or sheltered locations within the glens and straths which are largely outwith the ZTV and would have no view of the Proposed Development. Hill walkers in the area, during the summer months, are unlikely to experience the aviation warning lights. For example, during the summer solstice the aviation warning lights would switch on at 22.36 and switch off at 04.05 in the morning. Local residents and local road users are more likely to experience the aviation warning lights during the winter months. During the winter solstice the lights would come on at 16.19 and switch off at 08.11 in the morning, but hill walkers are less likely to be on the hill summits at these times during the winter months.

9.12.33 Operation of the aviation warning lights would have no adverse effect on periods of sunrise (when the sun disk passes above the horizon and the period just after this) and sunset (the period just before the sun disk passes below the horizon) as the operation is programmed to switch off 30 mins before sunrise and switch on 30 mins after sunset, respectively.

Conclusions

9.12.34 The Proposed Development comprises up to 15 wind turbines, in two groups (described as the Eastern group of ten turbines and the Western group of five turbines) with a maximum height of 200m to blade tip and associated infrastructure. The Eastern group (T1 to T10) and T14 of the Western group are located within an undesignated area of the *Southern Uplands with Forest* landscape character (Ken Unit) in Dumfries and Galloway

T13 is located within the *Southern Uplands* landscape character (Carsphairn Unit) in Dumfries and Galloway. The Western group (with the exception to T13 and T14) is located within the locally designated Uplands and Moorlands Local Landscape Area of the *Southern Uplands* landscape character in East Ayrshire.

9.12.35 The design of the Proposed Development has been reviewed against SNH's guidance *Siting and Designing Windfarms in the Landscape*, Version 3a, 2017, the advice contained within the DGWLCS and EALWCS, the relevant policies of the DGC and EAC LDPs and Supplementary Guidance. The design objectives of the Consented Development have also been reviewed, and those relevant have been incorporated into the design of the Proposed Development. As a result, the Proposed Development has been designed to reduce landscape, visual and cumulative effects and to reflect the landscape characteristics of the site location and its wider area which includes LLAs and RSAs.

9.12.36 The Site is located in an area with potential for wind farm development (given the Consented Development), which is made more suitable by the existing landscape character, forestry and landform of the area, which act to reduce the sensitivity of the Site and limit both the visibility and numbers of people close to the Site who might otherwise view the proposed turbines.

9.12.37 Significant and localised landscape effects are restricted to an area of the Southern Uplands with Forest: Ken unit, Southern Uplands: Carsphairn and Nithsdale units, and Narrow Wooded Valley LCT: Ken unit within Dumfries and Galloway and the Southern Uplands: Blackcraig Hill unit within East Ayrshire. There would be no other significant effects on other surrounding areas of landscape character or the integrity and special quality of designated landscapes within the Study Area. Significant and localised visual effects are restricted to the views from seven residential properties, two minor roads, ten recreational routes and three hill summits. Significant night-time effects are restricted to a very small number of local receptors due to the proposed Lighting Strategy.

9.13 References

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East Ayrshire Council, June 2018, Local Development Plan, Non-Statutory Planning Guidance: East Ayrshire Landscape Wind Capacity Study.

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10. Historic Environment

10.1 Introduction

10.1.1 This chapter considers the likely significant effects on the historic environment resulting from the construction, operation and decommissioning of the Proposed Development. The 'historic environment' is referred to in accordance with the definition provided in Scottish Planning Policy 2014 (SPP)[1] and Historic Environment Policy for Scotland 2019 (HEPS)[2]. This definition includes standing buildings, earthwork monuments, industrial features, sub surface archaeological remains and artefact scatters. It also includes landscapes and their constituent features which have been shaped by human occupation, from planned features such as gardens and designed landscapes (GDL), field boundaries and plantations, to areas that have historical significance for their location such as battlefields. Tangible cultural heritage features can be described as 'heritage assets', although not all material remains of cultural heritage interest will constitute a heritage asset.

10.1.2 The assessment has considered any direct effects on heritage assets and indirect effects or change to the setting of off-site assets and the wider historic environment arising from and related to the construction, operation and the decommissioning of the Proposed Development. The chapter should be read in conjunction with the development description provided in **Chapter 3: Description of the Proposed Development** and with respect to relevant parts of the Landscape and Visual Impact Assessment (LVIA) (**Chapter 9: Landscape & Visual**).

10.2 Limitations of this assessment

10.2.1 No intrusive archaeological surveys or geophysical surveys have been undertaken, and as a result, conclusions on the potential presence of archaeological features within the Development Site have not been fully tested. However, as set out at **Section 10.5**, the potential for the presence of previously unrecorded heritage assets within the boundary of the Proposed Development is generally low, and where such heritage assets are present, these are likely to be represented by widely dispersed smaller concentrations of features, meaning that intrusive surveys would not necessarily provide a more effective characterisation of the potential presence of archaeological features within the boundary of the Proposed Development.

10.2.2 While readily available documentary sources were consulted, it is always possible that there are additional documentary sources, for example those held under obscure references, which were not identified. However, given the nature of the area of the Proposed Development, and the results of previous archaeological investigations, it is unlikely that any such unidentified sources would hold information which would alter the conclusions of this assessment.

[1] Scottish Government 2014. Scottish Planning Policy (SPP). (https://www.gov.scot/publications/scottish-planning-policy/)
[2] Historic Environment Scotland 2019. Historic Environment Policy for Scotland. (https://www.historicenvironment.scot/advice-and-support/planning-and-guidance/historic-environment-policy-for-scotland-heps/)

10.3 Relevant legislation, planning policy, technical guidance

10.3.1 Certain assets that are deemed to be of particular importance are given legal protection. The importance of heritage assets and the protection of these and their settings is recognised in legislation as well as national, regional and local planning policy.

Legislative context

10.3.2 The following legislation is relevant to the assessment of the effects on historic environment receptors:

- The *Ancient Monuments and Archaeological Areas Act 1979* (AMAAA)[3]
- *The Planning (Listed Buildings and Conservation Areas) (Scotland) 1997*[4] provides for the definition and protection of a list of buildings and areas of architectural and historical interest, including Conservation Areas. The Act sets out a requirement to have special regard to the desirability of preserving the integrity and setting of listed buildings and conservation areas in considering any proposed development.
- The *Historic Environment Scotland Act 2014*[5] sets out provisions for the establishment of Historic Environment Scotland, setting out, amongst others, its powers, and duties in respect of designated heritage assets.

Planning policy context

National policies

10.3.3 Relevant national planning policies to this chapter are the Scottish Planning Policy (2014)[1] and Historic Environment Policy for Scotland (HEPS) (2019)[2]. These are summarised in **Table 10.1**.

Local Plan policies

10.3.4 The current Development Plan for the eastern cluster of the Development Site is the Dumfries and Galloway's second Local Development Plan (DGLDP2), 2019[6]. This Plan was adopted by Dumfries and Galloway Council in September 2019 and replaces the Dumfries and Galloway Local Development Plan of 2014.

10.3.5 Within the western cluster of the Development Site, the Ayrshire Joint Structure Plan, 2007[7] and East Ayrshire Local Development Plan (EALDP), 2017[8] apply. Both LDPs and their respective Supplementary Guidance referenced in this EIA Chapter must be adhered

[3] UK Government 1979. Ancient Monuments and Archaeological Areas Act (http://www.legislation.gov.uk/ukpga/1979/46)
[4]UK Government 1997. Planning (Listed Buildings and Conservation Areas) (Scotland) Act. (https://www.legislation.gov.uk/ukpga/1997/9/contents)
[5] UK Government 2011. The Historic Environment (Scotland) Act. (https://www.legislation.gov.uk/asp/2011/3/contents/enacted)
[6] Dumfries and Galloway Council, 2019 Dumfries and Galloway Council Local Development Plan 2 (https://www.dumgal.gov.uk/article/16130/ldp2)
[7] Scottish Government, 2007 Ayrshire Joint Structure Plan (https://www.gov.scot/binaries/content/documents/govscot/publications/factsheet/2018/06/east-ayrshire-council-planning-authority-core-documents/documents/supplementary-guidance-and-supporting-documents/ayrshire-joint-structure-plan/ayrshire-joint-structure-plan/govscot%3Adocument/CD21%2BAyrshire%2BJoint%2BStructure%2BPlan.pdf)
[8] East Ayrshire Council, 2017 East Ayrshire Local Development Plan (https://www.east-ayrshire.gov.uk/PlanningAndTheEnvironment/development-plans-and-policies/adopted-local-development-plans/ldp.aspx)

to in any application for development. A second Local Development Plan for East Ayrshire (EALDP2) has concluded its consultation period and will enter examination in late 2022, to last nine months. Following examination EALDP2 will replace EALDP.

10.3.6 A summary of the relevant planning policies is given in **Table 10.1**.

Table 10.1 Planning policy issues relevant to the historic environment

Policy reference	Policy issue	Considered in Section
National planning policies		
Scottish Planning Policy (2014)	Valuing the Historic Environment Subject Policy (paragraphs 135 – 151).	10.5, 10.8, 10.9-14
Historic Environment Policy for Scotland (2019)	Policy HEP1 Policy HEP2 Policy HEP3 Policy HEP4 Policy HEP5	10.5, 10.8-14
Development plan policies		
Dumfries and Galloway Local Development Plan 2 (2019)	Policy HE1: Listed buildings Policy HE3: Archaeology Policy HE4: Archaeologically Sensitive Areas	10.8-14
Dumfries and Galloway LDP2 Supplementary Guidance	Wind Energy Development: Development Management Considerations	10.5, 10.8-14
Ayrshire Joint Structure Plan (2007)	ENV 6: Protection of The Built Heritage	10.5, 10.8-14
East Ayrshire Local Development Plan (2017)	Policy ENV1: Listed buildings Policy ENV2: Scheduled monuments and archaeological resources Policy ENV3: Conservation Areas Policy ENV4: Gardens and designed landscapes Policy ENV5: Historic battlefields	10.5, 10.8-14
East Ayrshire LDP Supplementary Guidance (2017)	Planning for Wind Energy Supplementary Guidance	10.5, 10.8-14

Technical guidance

10.3.7 In the consideration of planning applications affecting the historic environment, planning authorities are directed to the Historic Environment Policy for Scotland 2019 (HEPS[9]), Historic Environment Circular 1[10], Planning Advice Note (PAN) 2/2011[11] and the Managing

[9] Historic Environment Scotland, 2019. Historic Environment Policy for Scotland (HEPS) (https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=1bcfa7b1-28fb-4d4b-b1e6-aa2500f942e7)
[10] Historic Environment Scotland, 2019. Historic Environment Scotland Circular: Regulations and Procedures (https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=a768f3cb-eb44-4473-be7b-aa2500e4892b)
[11] Scottish Government 2011. PAN2/2011 Planning and Archaeology. (https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=a768f3cb-eb44-4473-be7b-aa2500e4892b)

Change in the Historic Environment guidance note series. The most relevant of the Managing Change series to this assessment are Managing Change in The Historic Environment: Setting (2016)[12] and Managing Change in The Historic Environment: Gardens and Designed Landscapes (2016)[13].

10.3.8 The assessment has been carried out in accordance with the principles laid down in the Chartered Institute for Archaeologists (CIfA) Standard and Guidance for Historic Environment Desk-Based Assessments (2017)[14]. Historic Environment Scotland's (HES) Environmental Impact Assessment Handbook (2018)[15] was also considered during the assessment.

10.4 Data gathering methodology

Study area

10.4.1 To establish the baseline for the assessment of direct effects on the historic environment, data was collected for both designated and non-designated heritage assets within a 1 km study area from the Development Site boundary. This study area is primarily to provide contextual information and inform the archaeological potential of the Development Site and its immediate surroundings. The study area of 1 km was agreed through scoping and consultation with the Dumfries and Galloway Council (DGC) Archaeologist, as well as the West of Scotland Archaeology Service (WoSAS) who provide archaeological advice and curate data for East Ayrshire.

10.4.2 Data was collected for designated sites within an 'extended study area' of 10 km from the Development Site boundary (hereafter referred to as the "extended 10 km study area"). At the request of WoSAS during consultation, data was also collected for non-designated heritage assets within the WoSAS HER from within a study area of 5 km from the boundary of the Development Site (hereafter referred to as the "5 km study area") in order to identify those assets of regional or potentially national importance, which had the potential to be indirectly affected by the Proposed Development. No assets at this distance were requested to be assessed by DGC.

10.4.3 A Zone of Theoretical Visibility (ZTV) for the Proposed Development was used to determine which assets had the potential to be affected by the Proposed Development. An initial ZTV was included within the scoping Report, and a final ZTV was used to confirm those assets which may be affected. Given the reduction in prominence over increased separation, heritage assets located over 5 km from the Development Site are less likely to be indirectly affected. Ultimately, only those assets that are particularly sensitive, or where the proposed turbines would intervene in specific views that make a substantial contribution to their setting are likely to be subject to significant effects.

[12]Historic Environment Scotland 2016. Managing Change in the Historic Environment: Setting. (https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=80b7c0a0-584b-4625-b1fd-a60b009c2549)
[13] Historic Environment Scotland 2016. Managing Change in the Historic Environment: Gardens and Designed Landscapes. (https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=83214207-c4e7-4f80-af87-a678009820b9)
[14] CIfA 2017. Standard and Guidance for Historic Desk-Based Assessments. (https://www.archaeologists.net/sites/default/files/CIfAS&GDBA_2.pdf)
[15] HES 2018 Environmental Impact Assessment handbook (https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=6ed33b65-9df1-4a2f-acbb-a8e800a592c0)

Data Gathering

10.4.4 A summary of the organisations that have supplied data, together with the nature of that data is as follows:

- National data covering registers of designated archaeological and historical sites and historic land-use assessment (HLA) mapping from HES;
- County-based registers of non-designated heritage records from the West of Scotland Archaeology Service (WoSAS) Historic Environment Record (WoSAS HER); the Dumfries and Galloway Historic Environment Record (DGHER);
- Aerial photographs from the National Collection of Aerial Photography (NCAP), Scotland;
- Historic mapping from the National Library of Scotland Map Library website (NLS) [16];
- Geological mapping from The British Geological Survey online (BGS)[17]; and
- Previous Historic Environment chapters covering the Development Site (2015 ES; 2017 FEI; 2019 EIAR).

10.4.5 Due to the availability of previous historic environment assessments for the Development Site which included site walkovers, and the nature of the historic landscape that may be affected, it was considered that a site walkover would provide very limited, if any, new information. As such, it was considered that a further walkover was not required for the purpose of informing the baseline at the Development Site.

10.5 Overall baseline

Current baseline

Site description and Geology

10.5.1 The Development Site is located within an area that has been classified by NatureScot as southern uplands with forest (Landscape Character Type 19a). Ranging in height between approximately 280 and 642 metres above ordnance datum (AOD), the landscape is characterised by large smooth domed or slightly conically shaped hills which are dissected by steeply sided clefts and glens [18]. Although the uplands generally lack walled enclosures, the plateau contained within the peaks of the Development Site contain a former farmstead at Lorg with associated enclosures and sheepfolds.

10.5.2 The geology of the Development Site comprises various rock formations and associated superficial deposits. To the north of the valley of the Water of Ken, the bedrock consists of the Kirkcolm Formation overlain by peat, whilst to the south, the Portpatrick Formation is overlain by Devensian tills. The solid geology across the centre of the Development Site (i.e., within the valley of the Water of Ken) contains bands of the Moffat Shale Group and the Crawford Group of chert with superficial deposits of alluvium in the form of silts, sands and gravel (BGS 1:50,000 mapping).

[16] National Library of Scotland 2022. (https://maps.nls.uk/) [accessed 14/07/2022]
[17] British Geological Survey 2020. Geology of Britain viewer (https://mapapps.bgs.ac.uk/geologyofbritain/home.html)
[18] NatureScot, Landscape Character Assessment in Scotland (https://www.nature.scot/professional-advice/landscape/landscape-character-assessment/landscape-character-assessment-scotland) [accessed 14/07/2022]

Historic Landscape Character

10.5.3 The Historic Landuse Assessment (HLA) mapping data identifies the principal land use within the study area as Moorland and Rough Grazing with localised areas of Fields and Farming. Woodland and Forestry are seen within the outer extents, bounding the Development Site in all directions other than the north-west.

10.5.4 This data provides a view of the 1 km study area as it is today but does not fully elucidate the extent of landuse from the past; these processes are considered in more detail in the site chronology subsection and in **Section 10.8**.

10.5.5 An inspection of the Development Site for the 2015 ES noted three distinct historic landscape character areas; the valley floor at Lorg and along the Water of Ken, the steep-sided sloping hills to either side of the Water of Ken, and the frequently boggy plateaus.

Designated heritage assets

10.5.6 Designated heritage assets referred to in this section are shown on **Figure 10.2** and are included in **Table 10.A.1 to 10.A.3 of Appendix 10A**.

10.5.7 There are four scheduled monuments within the extended 10 km study area, all of which are further than 5 km from the Development Site boundary. These are all features of presumed prehistoric date, the majority of which have undergone previous disturbance through robbing, quarrying or forestry ploughing. Stroanfreggan Craig HillFort (SM 1095) to the south is the exception to this, occupying the summit of Stroanfreggan Craig Hill Fort. The monument features double stone walls and is thought to have Iron Age origins, though no detailed archaeological work has been undertaken to date at this monument. The Kings Cairn (SM1046) and Craigengillan cairn (SM2238) were identified as not having settings that would be sensitive to change arising from the proposed development as a result of their distance from the site, their landscape context and screening from the underlying topography and have not been assessed further.

10.5.8 There are five listed buildings located within the 10 km extended study area. The only Category A listing within these is that of Craigdarroch House (LB 10340), with associated Category B Ice House (LB 10341) and Category C Lodge (LB 10342). The remaining two assets both comprise bridges of early-19th century date. These assets are all over 5 km from the Development Site and are outwith the ZTV.

10.5.9 Two archaeologically sensitive areas (ASA) are located within the extended study area (**Figure 10.2**). The Water of Deugh ASA, approximately 7.8 km to the west falls partly within the extended study area. The Stroanfreggan ASA, approximately 5.5 km to the south, is described as containing multi-period archaeological remains which feature in a Heritage Trail promoted by Carsphairn Heritage Group19 (DGC, 2018).

10.5.10 There are no designated Gardens and Designed Landscapes, Conservation Areas, Historic Battlefields or World Heritage Sites within the 10 km extended study area.

10.5.11 Beyond the 10 km extended study area are two inventory Gardens and Designed Landscapes (GDL) which have been included within this assessment at consultee request. These are Dumfries House GDL (GDL00149) and Craigengillan GDL (GDL00111). Drumlanrig GDL is visible on **Figure 10.2**. All three of these GDLs are within 20km of the Development Site boundary. However, as there was no consultee request in relation to Drumlanrig GDL, it has not been taken forward for assessment in this chapter. Twelve listed buildings lie within the Dumfries House inventory GDL, including the

[19] Dumfries and Galloway Council 2018. *Dumfries and Galloway Local Development Plan 2 - Technical Paper: Archaeologically Sensitive Areas (ASAs)*

Category A listed Dumfries House, Dovecot, Avenue Bridge and Temple. The Craigengillan GDL includes five listed buildings, including the Category A Craigengillan House and Category B Lodge and bridges in addition to two scheduled monuments (Stroanfreggan Bridge Cairn (SM 1043) and the Stroanfreggan Craig Hill Fort (SM 1095).

Non-designated heritage records.

10.5.12 Non-designated heritage assets referred to in this section are shown on **Figure 10.1** and are listed in **Table 10.A.4 -Table 10.A.8 of Appendix 10A.**

10.5.13 The DGHER identifies 21 recorded features within the 1 km study area (accounting for point and area data, and allowing for duplicate records between datasets), seven of which are within the Development Site.

10.5.14 WoSAS HER identifies a single HER monument record for a Drove Road (9033) within the 1 km study area which extends into the Development Site boundary. This is the same feature recorded within the Dumfries and Galloway HER as there are an additional 17 records within the wider 5 km study area, although none were identified as being of potential national importance.

10.5.15 The assets within the Development Site predominantly relate to transport and agriculture of the medieval to modern periods. A feature known as Whig's Hole (MDG 20) is said to have been used by dissenting protestant groups (also known as Covenanters or Cameronians) for clandestine worship. The formation of this hollow is however, thought to be geological. The transport features comprise former drove ways and trackways to the north (MDG 12935 and MDG 12936) and a road at Black Hill in the south of the Development Site (MDG 9425), which was originally recorded during investigations for Roman roads, but is more likely to be the remains of an improved road of medieval date (and considered to be of potential national importance). This asset is now covered by peat along its length but can be traced on aerial photographs. The remaining features consist of agricultural buildings and associated field systems at Altry and are of probable pre-improvement origin (MDG 15845 & MDG 15846).

10.5.16 Within the wider study areas, records predominately relate to historic farmsteads, transportation infrastructure and prehistoric activity with evidence of trackways (MDG12938, MDG12937), farmsteads (MDG28408, MDG28409) and a prehistoric cairn (MDG3909) all present.

10.5.17 The 2015 ES Chapter identified six further heritage assets during the Desk Based Assessment (DBA) and site walkover. These are listed in **Table 10.A.9** within **Appendix 10A**. They comprise features relating to stone scatters of uncertain date, quarrying (DBA1) and a farmstead (DBA6).

Historic mapping

10.5.18 The general area around the Development Site is shown on county mapping of Kirkcudbrightshire dating back to Pont's atlas of the later-16th century where the name of Lorgfoot and occupation are shown. However, the first map to show the Development Site in any detail is Roy's military map of 1747-55 which shows the Development Site as undulating moorland with a small settlement annotated as Lorgfoot. It seems likely that this is the same settlement as the existing farmstead at Lorg. No extensive cultivation is suggested, the closest being shown at 'Holmes', approximately 700m south-west of the Development Site boundary.

10.5.19 Little had changed within the Development Site by the time of Ainslie's map of 1797, which shows the settlement name as 'Lorg'. The presence of the farmsteads at Lorg and Altry are recorded on an estate map of 1815 (NRS RHP 14376). Subsequent pre-

Ordnance Survey mapping shows little further development within the vicinity; a road running through Lorg visible on Thomson's map of 1821, appears to be the same route as the surviving road along the Water of Ken.

10.5.20 The first edition Ordnance Survey (OS) mapping (6" – 1 mile: 1853) shows the Development Site as entirely moorland, with various sheep folds (known locally as rees) and a shepherds cairn at Coranbae Hill, suggesting that it was used as rough grazing at this time. The settlement of Lorg is by now shown in greater detail with a bridge now shown to the south-south-west. Further buildings to the south (MDG 15845 & MDG 15846), annotated as 'Altry', are shown in a ruinous state by this time. The only evidence of any industrial activity within the Development Site is seen through a series of small and localised gravel pits that follow the road from the west and terminate at the settlement of Lorg.

10.5.21 The second edition OS mapping (6" – 1 mile: 1893-1909) shows no change within the Development Site with the exception of an additional cairn (DBA 5) now annotated to the east of Altry and north of Coranbae Hill.

Aerial Photography

10.5.22 Aerial photography held by the RCAHMS ranging in date from 1971 to 1988 was inspected. The earliest aerial photography showed the Development Site has changed little from its appearance on the 1893-1909 OS mapping; the main differences being the appearance of the areas of forestry surrounding the Development Site, which in 1971 appeared to be in the very early stages of cultivation. A depression (DBA 2) was noted to the north-east of Whig's Hole which has been identified as the location of Altry Loch and therefore of natural origin.

10.5.23 Linear drainage features are clearly visible surrounding Spout Burn to the west and Polskeoch Burn to the east by 1975, at which time the area encompassing Polskeoch and Sour Snout appears very scoured, possibly a result of forestry development or natural geology being exposed.

10.5.24 The aerial photography of 1988 revealed the Development Site largely as it is today with developed forestry to the north-east and south-west and further drainage now visible surrounding the Water of Ken and its associated burns. Further small-scale irregular features (DBA 1) were also visible within the enclosed area surrounding Lorg, possibly the result of further gravel pits as seen on the first edition Ordnance Survey mapping or natural geology and vegetation.

Site chronology

Prehistoric, Romano-British, Early-medieval and Medieval periods

10.5.25 There is no specific evidence for any activity or occupation of the Development Site during these periods. A road recorded within the southern limits of the Development Site (MDG9425), is of indeterminate date but its character appears to be substantially different from common trackways, with a thin metalled surface, now obscured by a layer of peat. Antiquarian records such as the Ordnance Survey Name Book suggest that this is of Roman date, although in the absence of any evidence for its date, it seems more likely to be an improved medieval road.

10.5.26 A settlement at Lorgfoot is visible within early mapping of the area, and although the origins of the current structure are at this time unknown, the continued use of this location for small scale settlement does suggest that the location may have been occupied as far back as the pre-improvement periods or earlier.

10.5.27 In the absence of any further evidence, it is a reasonable, though untested, assumption that activity here was primarily pastoral and agricultural during these periods, and that large areas of the Development Site may not have been occupied at all.

Postmedieval and Modern periods

10.5.28 The origins of the present farmsteads are unclear. Land at Lorg was granted to David Arnot in 1614 (NRS SIG1/1/2), although it is by no means certain that this was the same 'Lorg' as shown on later mapping. The abandonment of the farmstead at Altry suggests that this area was used for grazing and reflects a post-improvement landscape probably dating from the late-18th century onwards. The clearest evidence for the use of the Development Site during these periods is demonstrated by the sheep rees scattered throughout the landscape. The exception to these agricultural activities is seen through the small gravel pits surrounding the settlement of Lorg and its associated road. However, the small scale nature and location of this activity suggests that it was undertaken to support the agricultural settlement and does not impose an industrial aspect upon the Development Site.

10.5.29 Whig's Hole (MDG 20), located near the western summit of Altry Hill, is said to have been used by Covenanters as a meeting place during the religious struggles. This oral tradition is first noted in the Old Statistical Account and is repeated largely unchanged by the New Statistical Account. Allan's Cairn (MDG 24), a memorial stone to George Allan and Margaret Gracie killed during this time, is located to the east beyond the Development Site, supporting the suggestion of Covenanter activity within the wider area. The current memorial dates from the mid-19th century and claims to be placed on an earlier cairn marking Allan and Gracie's burial place. The documented history of Allan and Gracie is sparse and frequently contradictory and, it has been argued, their story is largely mythic[20] (Jardine 2014). While the story of the Whig's Hole being used for clandestine gatherings and worship is plausible, this type of use is very difficult to substantiate and is likely to have left little archaeological trace in any case.

10.5.30 The Old and New Statistical Accounts[21] provide little further information about the Development Site specifically, but present a picture of a rural economy, dominated by upland sheep farming, with improvement of both the breeds of sheep and husbandry occurring around the beginning of the 19th century. This change reflects wider changes both in contemporary Scottish society more generally and on a local level with the establishment of coal mining in Carsphairn and Dalmellington. These changes are likely to provide the context for the abandonment of the Altry farmstead, presumably sometime after 1815.

10.5.31 Further changes to the Development Site have been limited, with commercial forestry plantation restricted to areas surrounding it. The farmstead at Lorg has been abandoned and is believed to be in occasional use for overnight stays by a shepherd rather than in permanent occupation.

Future baseline

10.5.32 No changes are anticipated in the baseline condition prior to the Proposed Development being constructed and operated. The Development Site will continue to be managed as rough grazing with planted woodland at the periphery.

[20] Jardine 2014 Jardine's Book of Martyrs: History, *Covenanters*, Scotland. https://drmarkjardine.wordpress.com/2014/04/11/the-whigs-hole-on-altry-a-conflict-in-traditions/ [accessed 20/07/2022]
[21] The Statistical Accounts of Scotland http://stat-acc-scot.edina.ac.uk/sas/sas.asp?action=public [accessed 20/07/2022]

10.6 Consultation

10.6.1 **Table 10.2** provides a summary of the issues about the Proposed Development that have been raised by consultees and the responses given.

Table 10.2 Summary of issues raised during consultation regarding the historic environment

Issue raised	Consultee(s)	Response and how considered in this chapter	Section Ref
Request to consider effects on Craigengillan GDL (raised during scoping response)	Historic Environment Scotland	Craigengillan GDL included within the assessment.	10.9-10.13
Request to consider non-inventory designed landscapes within study area (raised during scoping response)	East Ayrshire Council	Data reviewed, and no assets within requested 5km search area.	10.5
Study area request: Minimum 5km from red line boundary study area of WoSAS data to be ordered, screened for potentially nationally significant sites that could be affected indirectly by proposals	West of Scotland Archaeology Service (WoSAS), representing East Ayrshire Council	Non-designated data ordered from the WoSAS HER to 5km from red line boundary of the Development Site. No assets of potentially national significance were identified within the 5km study area within the ZTV. Non-designated records up to 1km from Development Site boundary were used to provide context for the Development Site chronology and establishing the potential for further remains. Assets out to 1km area reproduced in figures and discussed in Development Site baseline/potential direct effects,	10.5, 10.9-10.13

10.7 Scope of the assessment

Spatial scope

10.7.1 The spatial scope of the assessment of the historic environment covers the area of the Proposed Development, together with the study areas determined by ZTVs described in **Section 10.4**.

Temporal scope

10.7.2 The temporal scope of the assessment of the historic environment is consistent with the period over which the Proposed Development would be carried out and therefore covers the construction, operational and decommissioning periods.

Potential receptors

Direct Effects

10.7.3 Direct effects may arise on known and previously unrecorded heritage assets within the Development Site as a result of disturbance arising from intrusive ground works, such as the construction of turbine bases, new access tracks and other site infrastructure. Consequently, only heritage assets located within the Development Site have the potential to be directly affected by the Proposed Development. The greater part of the land within the Development Site would not be directly affected by the Proposed Development, as direct effects would be restricted to the footprint of the proposed wind farm infrastructure and related working areas during construction.

10.7.4 There are no designated heritage assets within the Development Site. There are seven features recorded in the Dumfries and Galloway HER, one feature recorded in the WoSAS HER and six further features noted during the 2015 DBA and desk-based research that has informed this assessment. The heritage assets identified within this area can be grouped into three principal types:

- **Transport and communication**: Sheil Burn/Colt Hill/Black Hill Road (MDG 9425), is a possible improved medieval road that crosses the Development Site within the southern extent. It is suggested in a survey by Newall and Lonie[22] [23] that this may have connected to a mapped Stroanpatrick Road. Possible drove roads have been identified running alongside the Lorg Burn.
  - These features can be very difficult to define or identify as material remains are frequently confined to locations such as watercourse crossings or boggy areas where the track has been metalled or otherwise reinforced, and the presence of a recorded route does not necessarily presuppose the presence of a defined road surface, hollow way or similar material remains;
  - The Sheil Hill/Black Hill Road would normally be expected to remain as discontinuous survivals of defined archaeological features and is most likely to be of regional importance (but may be of greater importance where particularly well-preserved or where associated features are present). The location of this road is

[22] Proudfoot, E. V. W., & Proudfoot, B. E., 1990. *Discovery and Excavation in Scotland. The Council for Scottish Archaeology.*
[23] Newall, F and Lonie, W. 1989. 'Dalry Parish' *Discovery and Excavation in Scotland. The Council for Scottish Archaeology*.

poorly recorded, and consequently a larger area around the presumed line of the road has been identified as of interest by the DGC Archaeologist. Within the Development Site, this area is between 85m and 100m wide. The road line appears to be visible on aerial photography as a linear hollow, which follows the southern edge of the area identified by the Dumfries and Galloway HER.

- **Possible agricultural features**: assets such as ruinous structures or 'old fences' shown on the first edition Ordnance Survey (MDG 15845-15846) appear likely to represent elements of pre-enclosure agricultural settlement and land division. This occupation was based on a network of small and isolated fermtoun[24] supported by subsistence cultivation immediately around each fermtoun and transhumant pasturage, where livestock were pastured on upland moor during the summer and brought down to lower-lying pastures during the autumn and winter.
  - Further aspects of this land use are demonstrated by trackways that cross the north of the Development Site (MDG 12935-12936). These trackways may have been in use for a substantial period, and certainly elements appear to have been resurfaced repeatedly in the modern period in places above the farmstead at Lorg. This continuing use is likely to have affected any earlier phases of surface that may be present;
  - It has been suggested (Newall and Lonie 1989[25]) that these are remains of drove roads, used for either long-distance transport of livestock to market or shorter-distance movements between summer and winter pastures;
  - Sheep grazing has remained the primary use of the Development Site within the post improvement era and results in further assets such as the current Lorg Farmstead (MDG 26134), which may have had earlier origins but remains in use through to the present day. This longevity of activity is also demonstrated by the presence of the former farmstead at Altry (MDG 15845);
  - The necessity for materials with which to build during the post-improvement period has also resulted in possible small scale quarrying or gravel pits being present within the Development Site (DBA 1);
  - These features are primarily of local importance, depending on condition and character, with well-preserved pre-Improvement farmsteads surviving within associated field systems being of greater value and less well-preserved or peripheral areas being of lesser importance.
- Features of uncertain archaeological origin or use, include Whig's Hole (MDG 20) and other features observed during research and site visits (DBA 2, 3 & 4). The importance of these features is very difficult to assess and must be treated on a case-by-case basis.
  - The Whig's Hole is potentially of entirely natural origin and with no material or documentary evidence which links it directly to its supposed use. Conversely, it may be an important survival of a feature which is characteristic of the region's involvement in a formative period in modern Scottish history. For the purposes of this assessment, it has been considered as of regional importance;
  - Altry Loch appears to have become marshland very recently, and while it may preserve material which is of interest for its potential to inform studies of the past environment of the area, its small size suggests that this potential is limited. For the

[24] *Fermtoun* – a rural settlement comprising cottages for workers on an individual farm.
[25] Newall, F and Lonie, W. 1989. 'Dalry Parish' *Discovery and Excavation in Scotland*. The Council for Scottish Archaeology.

purposes of this assessment, it has been considered as an asset of potentially local importance.

10.7.5 Although there are no known prehistoric assets within the Development Site, a number of cairns, flint scatters and enclosures are present within 1km of the boundary of the Development Site suggesting that the potential use of this area for settlement, ritual or industry during these periods cannot be discounted. Where present, such remains would be likely to be represented by small and widely dispersed concentrations of remains.

10.7.6 The intrusive elements of the Proposed Development, namely construction of the turbine foundations, crane pads, new access tracks, the temporary construction compound and control building compound would be expected to disturb any heritage assets that may be present in the directly affected areas. The potential for archaeological heritage assets to be present at specific work locations, as set out at **Table 10.3**, is generally low, with a few areas of higher potential. Archaeological investigation would be used to mitigate the loss of archaeological value that would ensue from disturbance. Expected archaeological conditions at each turbine location are set out in **Table 10.3**.

Table 10.3 Direct receptors by turbine location

Location	Archaeological Potential	Rationale
T1	Low	No identified heritage assets within 500 m of turbine.
T2	Medium	Turbine position 90 m north of area of possible buried road marked by Dumfries and Galloway HER (MDG9425).
T3	Low	Former Altry Loch identified on aerial photography 245 m north-west of turbine (DBA 2).
T4	Low	No identified heritage assets within 500 m of turbine.
T5	Low	No identified heritage assets within 500 m of turbine.
T6	Low	No identified heritage assets within 500 m of turbine.
T7	Low	No identified heritage assets within 500 m of turbine.
T8	Medium	Turbine 45 m north of area of possible buried road marked by Dumfries and Galloway HER (MDG9425), though road appears to follow the southern edge of this area on mapping, approximately 150 m from turbine.
T9	Low	No identified heritage assets within 500 m of turbine.
T10	Low	No identified heritage assets within 500 m of turbine.
T11	Low	No identified heritage assets within 500 m of turbine.
T12	Low	No identified heritage assets within 500 m of turbine.
T13	Low	No identified heritage assets within 500 m of turbine.
T14	Low	No identified heritage assets within 500 m of turbine.
T15	Low	No identified heritage assets within 500 m of turbine.

Indirect effects

10.7.7 Indirect effects during the operational phase of the Proposed Development may arise as a result of change to the settings of heritage assets. These effects can be expected to be primarily visual, although non-visual aspects of the operation of the Proposed Development may also contribute to experiential change of the heritage assets setting. These effects can include noise (assessed in **Chapter 7: Noise**), shadow flicker (assessed in **Chapter 8: Shadow Flicker**), as well as effects deriving from the movement of the turbine blades including chasing shadows. These non-visual effects tend, however, to be most important in close proximity to wind turbines. The separation of the Proposed Development from the heritage assets considered in this section consequently means that these effects would not contribute to any adverse effects.

10.7.8 Indirect effects can also arise as the result of construction or operational activity giving rise to material disturbance to heritage assets even though these assets are not directly disturbed by construction activities. Effects such as vibration, compaction and dewatering can give rise to adverse change to heritage assets located at a distance from the construction footprint. These effects have been considered through cross-reference to other technical assessments, and none have been identified.

10.7.9 An assessment has been undertaken of the potential for effects on the setting of those heritage assets identified through review of the ZTV and in consultation with Historic Environment Scotland, the DGC Archaeologist and WoSAS as discussed in **Section 10.6** and identified within **Table 10.2**. These heritage assets have been reviewed with reference to the historic landscape character of the area and the ZTV (shown on **Figure 10.1**, and **Figure 9.2**). The guidance note on setting, 'Managing Change in the Historic Environment' (HES 2016), has been used to inform settings assessment.

10.7.10 The results of the initial appraisal and scoping consultation identified the following assets to be taken forward for further assessment:

- Stroanfreggan Bridge, Cairn (SM 1043) – the proposed turbines may be visible in views from the south of the cairn in which they could appear behind the hill fort at Stroanfreggan Craig;
- Stroanfreggan Craig Hill Fort (SM 1095) – the proposed turbines could be visible in views northwards along the valley of the Water of Ken;
- Dumfries House Garden and Designed Landscape (GDL00149) - the proposed turbines could be visible in designed views within and out of the designed landscapes, affecting the composition of these views; and
- Craigengillan Designed Landscape (GDL00111) – the proposed turbines could be visible in designed views within and out of the designed landscapes, affecting the composition of these views.

10.8 Assessment methodology

10.8.1 The project-wide approach to the assessment methodology is set out in **Chapter 4: Approach to preparing the EIAR**. Whilst this will inform the approach that will be taken for the Historic Environment assessment, the way in which this methodology will be applied, and adapted as appropriate, to address the specific needs of the Historic Environment assessment for the EIA is set out in **Tables 10.4-10.6**. The levels of effect upon a heritage asset, for either direct or indirect effects resulting from the Proposed Development, largely depend upon its level of sensitivity and the potential magnitude of change. **Tables 10.4-10.6** provide details on how the historic environment assessment

establishes these qualities, which then inform the conclusion as to the level of impact upon the asset.

10.8.2 The rationale contained within **Table 10.4** is predominantly based on information provided within the SPP (Scottish Government 2014) and the associated supporting documents; HEPS and the Historic Environment Circular 1, Planning Advice Note (PAN) 2/2011. Note that the categorisation of the relative importance of those assets which are of less than national importance generally relies on professional judgement.

Table 10.4 Asset Importance

Importance	Rationale
National and International	World heritage sites are designated on the basis of 'Outstanding Universal Value' and would normally be considered of international importance. By legal definition, scheduled monuments are considered as being of national importance. As the process of scheduling is ongoing and as scheduling is a representative designation, there are further assets which are not scheduled but which may be of equivalent importance. HES describes Category A listed buildings as buildings of national or international importance, either architectural or historic; or fine, little-altered examples of some particular period, style or building type (HES website – Categories of listed building[26]). The SPP states that sites identified within the Inventory of Historic Battlefields and the Inventory of Gardens and Designed Landscapes are of national and/or international importance. Conservation areas rated by HES as of Outstanding quality (where such appraisals have been made) could be considered as being of national importance.
Regional	These include archaeological sites which do not merit scheduling but which are nevertheless of interest or which could make a substantial contribution to established regional research agendas. HES describes Category B listed buildings as buildings of regional or more than local importance; or major examples of some particular period, style or building type, which may have been altered (HES website – Categories of listed building). The principles of selection for designation of conservation areas do not explicitly include valuations of national, regional or local importance, although most examples would be of importance on a regional level. Designed landscapes that are recognised by local authorities but not included within the Inventory of Gardens and Designed Landscapes would usually be considered to be regionally important.
Local	The majority of non-designated assets would normally be considered of local importance. HES describes Category C listed buildings as buildings of local importance; lesser examples of any period, style or building type, as originally constructed or moderately altered; and simple, traditional buildings that group well with other listed buildings (HES website – Categories of listed building).

[26] Historic Environment Scotland, *What is Listing?* https://www.historicenvironment.scot/advice-and-support/listing-scheduling-and-designations/listed-buildings/what-is-listing/#categories-of-listing_tab

Table 10.5 Potential Magnitude of Change

Magnitude	Definition
High	Loss of significance of an order of magnitude that would result from total or substantial demolition/disturbance of a heritage asset or from the disassociation of an asset from its setting.
Medium	Loss of significance arising from partial disturbance or inappropriate alteration of asset which would adversely affect its importance. Change to the key characteristics of an asset's setting, which gives rise to harm to the significance of the asset, but which still allows its archaeological, architectural or historic interest to be appreciated.
Low	Minor loss to or alteration of an asset which leave its current significance largely intact. Minor and short-term changes to setting which do not affect the key characteristics and in which the historical context remains substantially intact.
Negligible	Minor alteration of an asset which does not discernibly affect its significance. Minor and short-term or reversible change to setting which do not affect the significance of the asset.

10.8.3 Effects are considered to be significant or not significant according to the matrix in **Table 10.6**. However, this matrix is used as a guide only and the assessment of the significance of an effect on a heritage asset or its setting is dependent on the exercise of professional judgement as previously noted.

Table 10.6 Matrix of Significance

	Policy Importance		
Magnitude	**International or National**	**Regional**	**Local or Lesser**
High	Significant	Significant	Not Significant
Medium	Significant	Not Significant	Not Significant
Low	Not Significant	Not Significant	Not Significant
Negligible	Not Significant	Not Significant	Not Significant

10.9 Predicted effects: Construction

Indirect effects on Designated Heritage Assets

10.9.1 As the construction period would 24 months, any temporary increase in the magnitude of adverse change in the setting of designated heritage assets in addition to that occurring during the operational phase, would be of negligible magnitude. In addition, the distance of potential receptors of indirect effects (the closest such feature, Stroanfreggan Craig Hillfort, being over 8km from the nearest turbine position) indicates specific effects to setting associated with the construction phase, aside from increasing visibility of the operational components of the Development (turbines) would be negligible. Indirect effects are therefore considered as operational effects.

Direct Effects on Known Heritage Assets

Previously Recorded Heritage Assets

10.9.2 Direct effects are anticipated on previously identified heritage assets where:

- The track linking the east and west turbine clusters passes through stone scatters (DBA 3 and DBA 4). These appear most likely to be of geological origin and to have no archaeological value, although they may reflect the presence of previously disturbed heritage assets which are of no more than local importance. Works required to construct the access road would affect a sufficient proportion of these features to give rise to a change of medium magnitude. This change on potential heritage assets of no more than local importance would not give rise to a significant adverse effect;
- The track linking the east and west turbine clusters passes along the line of the presumed drove road (MDG 12935/WoSAS 9031). The nature of the drove road in this location is uncertain. It is most likely to be represented by intermittent material remains which would be of local importance, and the Proposed Development would affect only a small proportion (approximately 100 m) of a much larger feature, which extends for approximately 750 m within the Development Site boundary before extending over 2 km further north from the Development Site, and the magnitude of change would be low. This change to part of a heritage asset of local importance would not give rise to a significant adverse effect;
- The track between the east and west turbine clusters would pass through the field system around the farmstead at Lorg (MDG26134). Some of the route of the west and east access tracks would follow the existing tracks which would require upgrading. The Proposed Development would therefore affect only a relatively small proportion of the outlying elements of the asset of local importance where either new access track needed to be built or new gaps created in existing field boundaries. This would comprise approximately 1km of new access track requiring four new openings to be made in the existing field boundaries. The magnitude of change is considered to be low, and would not give rise to a significant adverse effect;
- The east access track would pass close to the area identified by the Dumfries and Galloway HER as a former field system around the farmstead at Altry (MDG15845). This area does not have any clear above-ground survivals of the field system and it is clear that the land has been 'improved' by the insertion of modern drains. The farmstead itself, by contrast, is well-preserved and located within a flat area adjacent to the Altry Burn. While elements of the field system may survive as buried archaeological features, they would not have the same importance as the farmstead itself and would be of no more than local importance. The access track would pass close to this area for approximately 250 m, and would not affect any elements which are visible as structures or earthworks. This represents only a close proximity to this heritage asset of no more than local importance resulting in a low magnitude of change, which would not give rise to a significant adverse effect; and
- Turbines 2 and 8, as well as their access tracks, lie close (c.50m) to the possible location of a potential Roman or medieval road (MDG 9425). Any potential disturbance to a small part of a heritage asset of local importance would be of medium magnitude, which would not give rise to a significant adverse effect.

10.9.3 No significant adverse direct effects have been identified, and in all cases, any non-significant effects would be further mitigated by the adoption of a scheme of archaeological work agreed with the DGC Archaeologist and WoSAS (in respect of works within East Ayrshire) expected to be required by planning condition (**Section 10.13**).

Direct effects on Previously Unrecorded Heritage Assets

10.9.4 Previously unrecorded heritage assets are potentially present within the Development Site as scattered concentrations of archaeological material most likely relating to post medieval post-improvement use of the land. Any such remains are likely to be of predominantly local importance, and the relatively small scale of the Proposed Development within the overall Development Site means that it is unlikely that such assets would be affected. Consequently, no significant adverse effects are anticipated. Any potential effects would be mitigated by the adoption of a scheme of archaeological work agreed with the DGC Archaeologist and WoSAS (in respect of works within East Ayrshire).

Indirect Effects on Heritage Assets

Potential Peat Instability at Possible Roman Road at Black Hill (MDG 9425)

10.9.5 The potential for an indirect effect on the possible Roman road at Black Hill (MDG 9425) has been identified as a result of possible peat instability caused by destabilisation of peats during the construction of turbines 2 and 8 with associated access tracks. The potential for this effect could be effectively mitigated by the adoption of appropriate construction and water management methods which would reduce the potential of peat slide to low. Such measures would also reduce the potential extent and severity of peat instability such that any effects on the possible Roman road would be localised. It is also not clear that the whole line of this road is defined by identifiable features such as cobbled or metaled surfaces, and it is possible that any peat instability would affect less well-preserved elements of the road. Consequently, any disturbance arising from peat instability would be unlikely and of low magnitude. This change to a receptor of regional or national importance would be not significant.

10.10 Predicted Effects: Operation

Direct Effects on Heritage Assets

10.10.1 No direct effects on heritage assets are anticipated during the operational phase as no further intrusive works are planned during this phase.

Indirect effects on designated heritage assets

Stroanfreggan Bridge Cairn (SM 1043) and Stroanfreggan Craig Hill Fort (SM 1095)

Present character, importance and setting

10.10.2 To avoid duplication, the Scheduled Monuments of Stroanfreggan Bridge Cairn (SM 1043) and the Stroanfreggan Craig Hill Fort (SM 1095), both located within the Stroanfreggan ASA, are considered together in this context-setting section, although a separate assessment for each asset is presented.

10.10.3 The Stroanfreggan ASA is of itself a sensitive heritage asset, which is promoted within heritage trails as part of a community initiative (DGC 2013[27]).

[27] Dumfries and Galloway Council 2013. *Dumfries and Galloway Structure Plan - Technical Paper: Archaeologically Sensitive Areas (ASAs)*

10.10.4 Both Stroanfreggan Bridge Cairn and Stroanfreggan Craig Hill Fort are Scheduled Monuments and as such are of national importance. These assets are both Heritage Promoted Sites, supported by various organisations, and are specifically mentioned within walks suggested by the Carsphairn Heritage Group[28] and the Moniaive Action Project website (Moniaive Action Project 2009-2011) as well as being mentioned within an archaeological guide to the Southern Upland Way[29] (DGC 2003).

10.10.5 Stroanfreggan Bridge Cairn is located within a low-lying valley that continues to the west with higher ground backgrounding views in all directions. It is visually prominent in close views and is clearly visible from within the valleys of the Water of Ken and the Stroanfreggan Burn.

10.10.6 Stroanfreggan Craig Hill Fort is located upon an outcrop at the north-east edge of the plateau and has longer views out to the west and south-west. The fort's location on the summit of the outcrop makes it a visually dominant feature within the landscape when viewed from numerous other assets within the ASA, but particularly from the valley of the Water of Ken. Forestry planting to the south-east and west help to lead the views from these monuments out into the wider plateau. The Water of Ken then draws the eye through this area, extending the view to the north along the valley floor until long distance views become broken through natural landform and further forestry. The land to the east of these monuments rises quite sharply, enclosing the area in this direction.

10.10.7 The monuments are intervisible with each other and can be considered as being related in so much as they are of prehistoric origin. However it is unlikely that their original use was contemporaneous. The Stroanfreggan Bridge Cairn has been dated to the Bronze Age through the recovery of artefacts by a local shepherd in 1910, following which further investigations were carried out but with no further dating evidence. Stroanfreggan Craig Hill Fort, on the other hand has not been subject to formal excavation and its origins remain a matter of debate with the Iron Age currently thought as the most likely date. The relationship between the two is therefore as a fortuitous result of past location preference rather than any necessary functional connection during their creation.

10.10.8 The prehistoric relationship of these features and other, non-designated, heritage assets within the area, is recognised by the designation of the wider area as an ASA. It has been classified as such due to multi-period archaeological remains which demonstrate that the land here has been used from the Mesolithic period onwards (DGC 2013). It is due to this wider group of assets that these monuments can be considered as part of an overall prehistoric landscape which can still be understood.

Change to Character and Setting:

10.10.9 Stroanfreggan Bridge Cairn is located within the ZTV (shown on **Figure 10.1**) of the Proposed Development. The hubs of five turbines would be theoretically visible as very distant elements in the background of some views of the cairn from the Southern Upland Way to the south of the asset (**Figure 10.5**), although the proposed turbines would not appear juxtaposed with the asset and the separation involved combined with the partial visibility means that these turbines would not be readily apparent.

10.10.10 The proposed turbines would be more clearly visible from Stroanfreggan Craig Hill Fort, although they would still appear as very distant features and would be partially obscured by the intervening hills (**Figure 10.3**). The proposed turbines would be screened in views of the hillfort from the valley floor by forestry planation and the underlying topography,

[28] Carsphairn Heritage Group 1999. *Carsphairn Heritage Trail number 5 – Stroanfreggan Trail*
[29] Dumfries and Galloway Council 2003. *The Southern Upland Way Archaeology Guide.*

particularly in the key view along the ridgeline from the east end of Smitten's Bridge identified by HES.

10.10.11 The post-improvement landscape in which the monuments are now located would remain unchanged with the closest proposed turbine located over 8 km to the north-north-east of Stroanfreggan Craig. The prominence of the proposed turbines would vary depending on the exact viewpoint, with many proposed turbines being entirely screened by intervening forestry and landform. Where visible, the proposed turbines would appear as small additions to a horizon already broken by forestry, and furthermore, in the case of assets within the southern extent of the ASA, by electricity pylons that run parallel to the B729.

10.10.12 The natural sense of enclosure to the east (due to the land formation) and the more open views to the west and south-west would remain entirely unchanged with only a few viewpoints to the north incorporating any view of the Proposed Development.

10.10.13 The relationship between the individual assets within this area would also remain the same. Although the Cairn can be viewed with relative ease from the east side of the Fort, the views from the Cairn to the Fort are partial, obscured by the natural land formation with the modern cairn on top of the crag being the only clearly visible structure. As noted above, turbines would not be visible in these views, being screened by the underlying topography. These assets would remain ancient features within a wider landscape, the development and use of which through and since prehistory, can still be read. Their relationship to each other as part of the wider ASA would be preserved.

Significance of Effect

10.10.14 The extremely restricted and very distant visibility of the proposed turbines in views of Stroanfreggan Bridge Cairn would not affect any understanding or appreciation of the Cairn and consequently, the magnitude of change is assessed as negligible and no significant effect would arise. The integrity of the setting of this asset would therefore not be affected.

10.10.15 The distant visibility of the proposed turbines in views from Stroanfreggan Craig Hill Fort, while appearing in a sensitive area of the view from this asset, would not affect any understanding of the asset nor would it present any material change to the ability to appreciate its place in the landscape. Any adverse change would be of a low magnitude and no significant effect would arise. The integrity of the setting of this asset would therefore not be affected.

Dumfries House Inventory Garden and Designed Landscape and associated Listed Buildings

Importance of Asset and Present Setting

10.10.16 Dumfries House is an inventory GDL that contains several listed buildings and HER assets, although a number of these buildings are at a distance of beyond 10 km from the boundary of the Development Site. There are four category A listed buildings: The Temple (LB A 96); Dumfries House (LB A 14413); Lugar Water (LB A 14414); and the Dovecot (LB A 14416). Six buildings are category B listed: the Sundial (LB B 14415); an ice house (LB B 14419); the Coach Houses (LB B 14420); the Westgates Lodges and Gateway (LB B 14421); the Stockiehill Lodges and Gateway (LB B 14422); and Taringzean Castle (LB B 14423). Two category C listed buildings are also present: Lady's Bridge (LB C 14417); and Waterloo Bridge (LB C 14418).

10.10.17 The inventory description for Dumfries House GDL states that the asset is important for its outstanding value of historical and architectural interest as well as having outstanding

value for its scenic properties. It is also classed as having a high value as a Work of Art. As a result, this asset is considered to be of national importance.

10.10.18 A number of these aspects have the potential for harm through change in the setting of the designed landscape, most notably its scenic importance, as a result of the GDL's contribution to the surrounding landscape which is influenced by its size and layout.

10.10.19 Contributing factors to the architectural value of the asset (rated by HES as Outstanding) are:

- The Adam designed house; and
- Several other listed structures, particularly the Avenue Bridge and the Temple.

10.10.20 Contributing factors to the historical value of the asset (rated by HES as Outstanding) are:

- Part of the pattern of the designed landscape dates from before General Roy's map of 1750;
- There is a good collection of plans and records kept by the estate; and
- Associations with the Dalrymple family and the Marquesses of Bute.

10.10.21 The outstanding scenic value of the asset is discussed in terms of its contribution to the surrounding landscape while the high Work of Art value derives from the use of the valley in which it is located to create a setting for the structures and planting within the inventory landscape.

10.10.22 Dumfries House lies in the valley of the Lugar Water and occupies an irregular area covering approximately 535ha. The asset is bounded by a mixture of urban settlement at Auchinleck and Cumnock to the north and east, and farmland to the west and south. The wider landscape, although largely agricultural, contains elements that are the result of the 19th and 20th century coal and quarrying industries, most notably large opencast quarry pits. Forestry planting is also present sporadically throughout the wider area.

10.10.23 Historically, the designed views within the landscape have focused on an east to west alignment, initially through avenue planting depicted on Roy's map of 1750 and later through an avenue with a bowling green that runs to the east of Dumfries House (although this latter view is no longer maintained).

10.10.24 Further views are designed to look inwards toward Dumfries House from the outer edges of the estate, with the exception of the roundels which were planted to provide a view from within the park. Although some aspects of the estate can be clearly viewed from outside the estate, especially towards the east, the house and core of the designed landscape is heavily screened to the south by the natural topography and surviving woodland that makes up part of the estate.

10.10.25 To a certain extent, the designed landscape defines the setting of the associated estate buildings by creating an architectural and landscape composition in which the structures were intended to be seen and enjoyed. In this context, the policy woodland and underlying landform around Dumfries House creates a self-reflective space; focusing primarily on the views from the edges of the estate towards the centre.

Change to Character and Setting:

10.10.26 The landscape in which listed buildings are located would remain unchanged as would the designed landscape itself. The majority of the asset lies outwith the ZTV with only minimal visibility indicated from within the northern fringes of the landscape. Wireframe visualisation (**Figure 10.6**) from within the northern part of the park suggests potential visibility of five turbine hubs. Visibility of turbines from this area would be further reduced

by intervening planting within and around the inventory landscape. At the distances involved, visibility of the Proposed Development would be minimal, with visibility precluded by even relatively small and localised foreground features, such as groups of trees or structures.

10.10.27 Of the listed buildings within the inventory GDL, theoretical visibility is indicated only from the Category A Temple (LB A 96) from which views of the proposed turbines would be precluded by the intervening policy woodland. The closest proposed turbine would be located 19.6km to the south-east of the closest point in the inventory GDL with theoretical visibility and is typically over 22km from areas with any likely visibility which is not precluded by planting.

10.10.28 Visibility of the proposed turbines is likely to be restricted to glimpsed views of the proposed turbines as small and very distant additions discernible only to a viewer who actively searches for them against a horizon which is already broken by trees located much closer to the viewer.

Significance of Effect:

10.10.29 The extremely limited degree of visibility and the separation of the proposed turbines from the heritage asset would not present any change in any of the key values of the inventory GDL and would not give rise to any change in the viewer's ability to understand or appreciate the asset. It is concluded that the operation of the Proposed Development would result in negligible change in the setting of the asset which would not give rise to a significant effect.

Craigengillan Garden and Designed Landscape and associated listed buildings

Present importance and setting

10.10.30 The Craigengillan Garden and Designed Landscape is an asset of recognised National importance, and contains a number of further assets which are considered to be of equivalent importance, principally the house (LB 18793) and stables (LB 18794) which form the centre of the estate and are listed at Category A. Further assets of national, regional and local importance are contained within the designated landscape.

10.10.31 The extent of the designed landscape largely provides the setting of the associated estate buildings by creating an architectural and landscape composition in which the structures were intended to be seen and enjoyed. In this context, the policy woodland and underlying landform around Craigengillan House creates a tightly defined and controlled space; screening views of the house in the principal approach from the north until the viewer is presented with a dramatic revealed view on arrival, and creating an intimate space around the lawn to the west of the house. This estate core appears likely to result from the late 19th-century replanting of the estate, and is characteristic of the period.

10.10.32 Aspects of the designed landscape which contribute to a scenic value rated by HES as Outstanding are:

- Contribution to the villages of Bellbank and Dalmellington;
- Composition and integrity of the designed landscape;
- Contribution to the approach to Loch Doon; and
- Enrichment of local landscape which has been affected by industrial uses.

10.10.33 Contributing factors to the Work of Art value (again rated by HES as Outstanding) which relate to the setting of the asset are:

- The blending of the designed landscape into the wider landscape; and
- The picturesque qualities of the overall composition.

10.10.34 Longer views contribute towards the importance of the Craigengillan GDL. While there are no identifiable designed views towards specific distant structures or landmarks, the surrounding hills serve to place the designed landscape into a regional context and sequential views from different points along routes through the designed landscape, while fortuitously created, have been exploited to contribute to the overall effect of the designed scheme. There are few clear views into the designed landscape, reinforcing the sense of privacy and seclusion; the most important views being glimpsed views of the house and estate centre from the Loch Doon Road between Bellsbank Plantation and Gaw Glen Burn.

10.10.35 The designated designed landscape also includes a number of earlier heritage assets which pre-date the establishment of the parkland. Most important of these is the medieval settlement at Dalnean. This is noted by HES as of importance primarily for its potential to inform study of past settlement and comprises well preserved earthwork and structural remains of medieval buildings and the associated field system. The relatively small scale of the relict structures means that this asset is best appreciated in close views, and in longer views rapidly becomes difficult to discern from the surrounding landscape context.

Change to Setting

10.10.36 Turbines are likely to be visible in views from the far north-west and southern areas of the designed landscape to varying degrees. In considering the principal contributions to scenic and Work of Art value identified in the designation, it is noted that:

- The proposed turbines would not be visible in views of, or from, the designed landscape which also contribute to the villages of Bellbank and Dalmellington.
- The Proposed Development would not affect the composition of the designed landscape in that none of the elements of that landscape would be directly affected. Visibility of the turbines from key points within the designed landscape could arguably give rise to harmful effects but this has been considered further in **Section 10.10.38** and it has been concluded that this change has been assessed to be of negligible magnitude which would not give rise to a significant adverse effect.
- The Proposed Development would not affect the contribution of the designed landscape to the approach to Loch Doon; there would be no visibility of the Proposed Development from the road leading past the eastern edge of the designed landscape. Turbines would be visible only from the shore of Loch Doon to the south of the designated landscape.
- The enrichment of the local landscape, insofar as this relates to the historic environment, relates entirely to areas within the designated designed landscape and would not be affected by the Proposed Development. This effect is considered in its wider context as an issue of landscape and visual amenity in the LVIA in **Chapter 9**
- The blending of the designed landscape into the wider landscape relates, by definition, primarily to the area immediately surrounding the designated landscape, and the magnitude of any adverse change would decrease rapidly with distance from the designated asset as the landscape changes from one of deliberate design to a less artful composition.

- The picturesque qualities of the overall composition again relate primarily to the character of the asset and its immediate surroundings.
- Turbines would not be visible in views of, or from, the Category A listed buildings at the estate core.

10.10.37 Wireframe visualisations suggest that there is theoretical blade-tip visibility of five turbines from the north-west and four from the south-centre of the Craigengillan GDL (**Figures 10.7, 10.8**). This shows blades tips discernible only with reference to the indicators on the visualisation.

Significance of Effect

10.10.38 While the ZTV and wireframes visualisations indicate partial visibility of the proposed turbine array from parts of the designated designed landscape, the prevailing planting scheme and underlying topography means that visibility of turbines from areas of the designed landscape which are particularly sensitive or important are almost entirely precluded. The Proposed Development would appear in sequential views as the viewer moves around the landscape, but always as an element to the background of views and behind the enclosing higher ground to the south and east of the designed landscape. Consequently, this change is considered to be of negligible magnitude which would not give rise to a significant adverse effect.

10.11 Predicted Effects: Decommissioning

10.11.1 No adverse direct effects are anticipated during the decommissioning phase as any intrusive works would be restricted to areas, such as turbine bases and hardstandings, which have already been disturbed during the construction of the Proposed Development.

10.11.2 The decommissioning of the Proposed Development would effectively reverse any indirect effects of the scheme and would not give rise to any adverse changes. As the decommissioning process would take place over a limited time period and be characterised by a progressive reduction in visibility, any temporary increase in the magnitude of adverse effects would be negligible.

10.12 Predicted Effects: Cumulative

10.12.1 There are many operational, consented or proposed wind energy developments in the area around the Development Site. In order to consider the effects of the Proposed Development when taken in combination with other wind energy developments, the cumulative baseline established for the Landscape and Visual Impact Assessment (**Chapter 9**) has been used. Those assets where it was determined that there was no change, or that the effect of the Proposed Development would be negligible, have not been considered within the cumulative assessment.

Direct effects

10.12.2 There are expected to be no additional direct impacts within the Development Site arising through the combination of the Proposed Development with any planned, consented or operational developments. There are no proposed developments which would present a direct effect on any of the heritage assets which would be directly affected by the Proposed Development.

Indirect effects

Stroanfreggan Craig, Hill Fort

10.12.3 Stroanfreggan Craig Hill Fort has extensive views, primarily westwards in an arc from north to southeast, looking down from the crag. Views north and east are constrained by the underlying topography. Consequently, views of the existing Wether Hill Wind Farm are restricted (**Figure 10.3**). More distant turbines at Windy Standard are visible as distant background features. Visibility of the existing Afton Wind Farm, Windy Rig Wind Farm (under construction) and Windy Standard Repower scoping layout. Of more immediate prominence would be the proposed Shepherd's Rig Wind Farm, Quantans Hill Wind Farm scoping layout, which would appear in views to the west of the Stroanfreggan Craig Hill Fort on the opposite side of the Water of Ken.

10.12.4 The Proposed Development would be seen behind and to the east of the Shepherd's Rig Wind Farm which as noted above would appear prominent in views west from the asset. Any cumulative change presented by the construction of the Proposed Development turbines would be of negligible magnitude and no significant adverse cumulative effect would arise.

10.13 Mitigation and Enhancement Measures

Direct Effects

10.13.1 Potential direct effects would be effectively mitigated by an agreed programme of archaeological work to be overseen by an Archaeological or Environmental Clerk of Works (ACoW/ECoW). The details of this work would be contained within a Written Scheme of Investigation including a Post- Excavation and Research Design (PERD) to be agreed with the DGC Archaeologist and WoSAS (in respect of works within East Ayrshire), but in principle it will comprise the following elements:

- Micro-siting of access tracks to avoid/minimise direct effects;
- Monitoring of intrusive groundworks within areas of archaeological interest, including deep peat;
- Archaeological Recording: any archaeological features or deposits of archaeological or palaeoenvironmental importance which cannot be preserved in situ would be excavated to standards agreed with the DGC Archaeologist and WoSAS (in respect of works within East Ayrshire); and
- Analysis, archival, reporting and dissemination: standards for analysis and archival of archaeological and palaeoenvironmental material with subsequent reporting of results to DGC Archaeologist and WoSAS

Indirect Effects

10.13.2 Potential indirect effects are difficult to mitigate, in that techniques for mitigation which screen visibility of turbines from an asset may actually have a greater adverse effect than the effect that they are intended to mitigate. Consequently, mitigation by design which aims to reduce the visibility of the Proposed Development and maximise the separation distance through a combination of site selection and iterative design which takes the setting of heritage assets into account is of critical importance.

10.13.3 In this case, the Development Site is located over 5km from the closest designated heritage asset and in terrain where the majority of heritage assets are screened by the

underlying topography and planting. This screening has been maximised by the location of proposed turbines within the Development Site. This combination of site selection and design means that no significant adverse effects would arise.

10.14 Residual Effects

Conclusions of Significance Evaluation

10.14.1 **Table 10.7** summarises the residual effect for each potential receptor and states the residual significance.

Table 10.7 Summary of Residual Effects

Potential Receptor and Effect	Magnitude of Change	Receptor Sensitivity	Significance: Construction	Significance: Operation	Significance: decommissioning	Significance: Cumulative	Summary Rationale
Disturbance of previously recorded heritage assets within the Development Site	Low-Medium	Local-Regional	NS	NS	NS	N/A	Known features have been avoided, where possible. Any Archaeological features disturbed would be appropriately recorded where on-site micro-siting cannot be used to avoid any disturbance.
Disturbance of previously unrecorded heritage assets within the Development Site	Low	Lesser-Regional	NS	NS	NS	N/A	Features anticipated to be of lesser regional importance and sparsely distributed. These are expected to predominantly relate to peat deposits and burns within the Development Site. Effects can be mitigated by archaeological investigation.
Effect on character and setting of Stroanfreggan Cairn (SM1043)	Negligible	National	NS	NS	NS	N/A	Turbines would appear only as distant elements of the background in a small number of passing views of the asset.
Change to setting of Stroanfreggan Craig Hill Fort (SM1095)	Low	National	NS	NS	NS	NS	Asset has extensive views which contribute to its significance, although

Potential Receptor and Effect	Magnitude of Change	Receptor Sensitivity	Significance: Construction	Significance: Operation	Significance: decommissioning	Significance: Cumulative	Summary Rationale
							turbines would be visible only as distant background elements of views from the asset.
Change to character and setting of Dumfries House Garden and Designed Landscape (GDL00111)	Negligible	National	NS	NS	NS	N/A	Turbines would only appear as very distant features in a small number of glimpsed views and the only designated buildings to have potential visibility being screened by woodland.
Change to character and setting of Craigengillan Designed Landscape (GDL00149)	Negligible	National	NS	NS	NS	N/A	Turbines would only appear as very distant features in a small number of glimpsed views and the only designated buildings to have potential visibility being screened by woodland.
Key/Footnotes: **High S = Significant** **Medium NS = Not Significant** **Low** **Negligible**							

11. Ecology

11.1 Introduction

11.1.1 This chapter of the EIA Report assesses the likely significant effects[1] of the Proposed Development with respect to ecology. The chapter should be read in conjunction with the description of the Proposed Development provided in **Chapter 3: Description of the Proposed Development** and with respect to relevant parts of other chapters, including **Chapter 12: Ornithology** and **Chapter 13: Geology, Hydrology and Hydrogeology**, where common receptors have been considered and where there is an overlap or relationship between the assessment of effects. In the Ecology Chapter, receptors are referred to as ecological features, to accord with the Chartered Institute of Ecology and Environmental Management (CIEEM 2018) "Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine" [updated April 2022]. The term "ecological feature" is defined in the guidance as pertaining to habitats, species and ecosystems.

11.1.2 This chapter provides a summary of historical consultation, desktop studies, field studies and assessments undertaken at the proposed Lorg Wind Farm ranging from 2013 – 2020.

11.1.3 Further details of all the surveys undertaken to date is provided within the following Technical Appendices:

- Technical Appendix 11.A: Lorg Wind Farm Desk Study Report;
- Technical Appendix 11.B: Lorg Wind Farm Phase 1 Habitat Survey, NVC and Peatland Condition Report;
- Technical Appendix 11.C: Lorg Wind Farm Protected Mammal Report [Confidential];
- Technical Appendix 11.D: Lorg Wind Farm Bat Report; and
- Technical Appendix 11.E: Lorg Wind Farm Fish Survey Report.

11.1.4 **Technical Appendix 11.C** contains details of the location of species subject to persecution and therefore should only be made available to NatureScot.

11.2 Limitations of this assessment

11.2.1 The Ecobat analysis tool provides a variety of outputs that are useful for interpreting the importance of a site with respect to bat activity and distribution. However, it is important to note that these outputs are considered in the context of the wider data collection from third parties, and the accuracy of results requires a considerable number of records to be present. For example, a reference range (i.e. the number of nights for each species that the data is compared to) of at least 200 is recommended to be confident in the relative activity level.

11.2.2 Due to the ongoing technical issue relating to the summing of genus level species in Ecobat, there is potential for the sum of *Pipistrellus* and *Nyctalus* species contacts, and thus the relative activity level of each genus, to be underestimated. For example, during nights in which both common pipistrelle and *Pipistrellus* species were recorded, the

[1] In this Ecology chapter, the term "potentially significant effects" is used in the sections prior to the "scope of the assessment" (**Section 11.7**) being determined, as it accords with CIEEM guidance. The term "likely significant effects" is used once the scope of the assessment has been determined. The use of this term is not to be confused with Likely Significant Effects (LSEs) as used in the context of the Habitats Regulations Appraisal.

number of contacts for both will be added to the total sum *Pipistrellus*. However, on nights where common pipistrelle was recorded but *Pipistrellus* was not, the sum of common pipistrelle contacts will not be added to the overall *Pipistrellus* count, thus leading to an underestimation of total *Pipistrellus* contacts. This technical issue is currently being addressed by the Mammal Society, who are in the process of constructing an updated version of the Ecobat application.

11.2.3 No further limitations to the assessment completed for this chapter in relation to the Proposed Development were identified. As required by the relevant professional guidance (CIEEM, 2018), the precautionary principle has been adopted when undertaking the assessment to ensure that conclusions on residual effects are robust and realistic. Any assumptions made regarding effects to Important Ecological Features (IEFs) are based on current CIEEM (2018) guidance.

11.3 Relevant legislation, planning policy and technical guidance

Legislative Context

11.3.1 The legislative context of this EIA Report is set out in **Chapter 5: Planning Policy**. The following legislation has been considered in the assessment of the effects on ecological features[2]:

- Habitats Directive (Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora) as transposed into Scots Law by the Conservation (Natural Habitats &c.) Regulations 1994 (as amended in Scotland) (the "Habitats Regulations");
- Wildlife and Countryside Act 1981 (as amended in Scotland);
- The Protection of Badgers Act 1992;
- Nature Conservation (Scotland) Act 2004 (as amended);
- Water Environment and Water Services (Scotland) Act 2003 (WEWS Act);
- Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003; and
- Marine (Scotland) Act 2010.

Planning Policy Context

National Policies

11.3.2 A summary of the relevant national planning policies is given in **Table 11.1**.

Table 11.1 National Planning Policy issues relevant to ecology

Policy reference	Policy issue
Scottish Planning Policy[3] Valuing the Natural Environment Subject	The 'Valuing the Natural Environment' subject policy within the Scottish Planning Policy (SPP 2014) sets out detailed policy provisions relating to the protection and

[2] The Chartered Institute for Ecology and Environmental Management (CIEEM) refer to biodiversity receptors within technical guidance as ecological features.
[3] Scottish Planning Policy (SPP), Scottish Government 2014. (https://www.gov.scot/publications/scottish-planning-policy/)

Policy reference	Policy issue
Policy (paragraphs 193-218)	enhancement of different types of natural resources and natural heritage assets, as detailed below: • Protecting Designated Sites (paragraph 196); • Development Management Decisions (paragraphs 202-206); • Non-native Species (paragraph 206); • Protected Species (paragraph 214); and • Woodland (paragraph 216).
Protecting Designated Sites (paragraph 196)	The SPP 2014 requires designated areas and sites to be identified and appropriately protected through development plans, without the use of buffer zones (paragraph 196). Within the same paragraph the SPP 2014 states that "*the level of protection given to local designations should not be as high as that given to international or national designations*".
Development Management Decisions (paragraphs 202-206)	The SPP 2014 states that planning decisions "*should take account of potential effects on landscapes and the natural and water environment, including cumulative effects*". The SPP 2014 further states that "*planning permission should be refused where the nature or scale of proposed development would have an unacceptable impact on the natural environment*". It is noted in the same paragraph that whilst effects on statutorily protected sites will be an important consideration, designation "*does not impose an automatic prohibition on development*".
Non-native Species (paragraph 206)	The SPP 2014 states that "*where non-native species are present on site, or where planting is planned as part of a development, developers should take into account the provisions of the Wildlife and Countryside Act 1981 relating to non-native species*".
Protected species (paragraph 214)	The SPP 2014 notes that "*the presence (or potential presence) of a legally protected species is an important consideration in decisions on planning applications. If there is evidence to suggest that a protected species is present on site or may be affected by a proposed development, steps must be taken to establish their presence. The level of protection afforded by legislation must be factored into the planning and design of the development and any impacts must be fully considered prior to the determination of the application*".
Woodland (paragraph 214)	The SPP 2014 notes that the Scottish Government's Control of Woodland Removal Policy "*includes a presumption in favour of protecting woodland. Removal should only be permitted where it would achieve significant and clearly defined additional public benefits"*. The SPP 2014 also confirms that where woodland is removed in association with a proposed development, compensatory planting will generally be expected.
UK Biodiversity Action Plan (UKBAP) / UK Post-2010 Biodiversity Framework (UKBAP)	The UKBAP[4], produced in 1994 by the UK Government, was a national strategy for the conservation of biodiversity. The UKBAP was updated in July 2012 with a plan which covers the period 2011-2020. This framework is implemented individually by each of the four UK countries. Within Scotland, the UKBAP is coordinated through the Biodiversity Action Reporting System (BARS), which is an online tool which contains a list of Scottish priority habitats and species (The Scottish Biodiversity List [SBL]). All UKBAP species and habitats are listed in the SBL.
Scottish Biodiversity List (SBL)	The SBL is a list of flora, fauna and habitats considered by the Scottish Ministers to be of principal importance for biodiversity conservation and its publication was a requirement of Section 2(4) of The Nature Conservation (Scotland) Act 2004.
Ayrshire Local Biodiversity Action Plan (LBAP)	The Ayrshire LBAP is referred to for species action plans and habitat action plans relevant to the Proposed Development.
Dumfries and Galloway Local Biodiversity Action Plan	The Dumfries and Galloway LBAP is referred to for species action plans and habitat action plans relevant to the Proposed Development.

[4] https://jncc.gov.uk/our-work/uk-bap/#:~:text=The%20UK%20Biodiversity%20Action%20Plan%20(UK%20BAP)%20was%20published%20in,1992%20in%20Rio%20de%20Janeiro.

Technical guidance

11.3.3 Publications that provide guidance that is relevant to the assessment of potentially significant effects on ecology are listed below:

- Chartered Institute of Ecology and Environmental Management (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Version 1.1 updated April 2022. Chartered Institute of Ecology and Environmental Management, Winchester;
- Scottish Government (2013). The Scottish Biodiversity List (SBL);
- SNH (2018). Environmental Impact Assessment Handbook;
- NatureScot., Natural England., Natural Resource Wales, Renewable UK, Scottish Power Renewables, Ecotricity Ltd, University of Exeter, Bat Conservation Trust. (2021). Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation.
- SEPA (2008). Engineering in the water environment good practice guide: construction of river crossings;
- SEPA (2017). LUPS-GU4 Land Use Planning Systems SEPA Guidance Note 4;
- SEPA (2017). LUPS-GU31 Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, Version 3;
- CIRIA C648 (2006) Control of water pollution from linear construction projects;
- Scottish Renewables. SEPA., Forestry Commission Scotland., Historic Environment Scotland (2019). Good Practice during Wind Farm Construction (4th Edition).

11.3.4 Technical guidance used to define the survey methods and inform this assessment are referenced in **Technical Appendices 11A - 11E**.

11.4 Data gathering methodology

Study Area

11.4.1 The “Study Area” encompasses the area over which all desk-based and field data were gathered to inform the assessment presented in this chapter. Due to the presence of multiple ecological features and many potential effects, the level and type of data collection varies across the Study Area. The Study Area comprises:

- the Development Site (as defined in **Chapter 3: Project Description**);
- the desk study area for statutory and non-statutory ecological sites;
- the desk study area for legally protected and notable ecological features; and
- the field survey areas.

11.4.2 The extent of the desk study area(s) and field survey area (see **Table 11.3**) were determined based on best practice guidance and a high-level overview of the types of ecological features present, and the potential effects that could occur (**Technical Appendix 11.A**). The Study Area was defined on a precautionary basis to ensure that, as

a minimum, the Zone of Influence[5] (ZoI) relevant to all ecological features (see **Table 11.8** and **Section 11.7**) were covered during baseline data collection activities.

11.4.3 As the design of the Proposed Development has evolved iteratively, the Study Area, and its constituent parts, has been regularly reviewed to ensure that its extent was adequate to enable the assessment of all potentially significant effects of the ecological features identified. Changes to the initial developable area, or the precise nature of the development, have been reviewed in light of the ecological features present (this being informed by the data gathering exercise) and the potential effects that could occur. At each stage of design evolution, the extent of the Study Area, including all of its components, was tested using the methodology described in **Section 11.7** to ensure adequate information was available on which to base an assessment. These ecological features and respective Study Area(s) are defined in the following paragraphs.

Desk study

11.4.4 A desk-based data-gathering exercise was undertaken to obtain existing information relating to relevant ecological features, these being: statutory and non-statutory biodiversity sites; habitats and species of principal importance[6]; legally protected and controlled species; and other conservation notable species that have been recorded over the previous 12 years (i.e. since 2010). The Desk Study Methodology and data compiled within the desk Study Area is presented in **Technical Appendix 11A**. **Table 11.2** lists the data compiled within the desk Study Area (which is the Development Site and the additional areas of search beyond).

11.4.5 Where appropriate, data were drawn from existing ecological records and site information obtained through field surveys conducted in 2013, 2014, 2015, 2020 and 2021 as part of previous baseline studies undertaken at the proposed Lorg Wind Farm Site.

Table 11.2 Information relevant to the desk study

Ecological Feature	Example / Description	Desk Study Areas
Statutory sites designated under international conventions or European Directives	Wetlands of International Importance (also known as Ramsar sites), Special Areas of Conservation (SACs) and Special Protection Areas (SPAs).	The Proposed Development area and within 2 km of the boundary of it.
Statutory sites designated under national legislation	Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNR) and Local Nature Reserves (LNRs)	The Development Site and within 2 km of the boundary of it.
Locally designated sites	Often termed as Local Wildlife Sites (LWS), County Wildlife Sites (CWS), Sites of Interest for Nature Conservation (SINC), Local Nature Conservation Sites (LNCS).	The Development Site and within 2 km of the boundary of it.
Scottish Biodiversity List; Red listed species[7], and legally protected species.	Flora, fauna and habitats of principal importance for the conservation of biodiversity in Scotland. Species recorded on The International Union for Conservation of Nature (IUCN) Red List of Threatened Species and / or local Red Lists for the UK or relevant sub-units (e.g. regions or counties)	The Development Site and within 2 km of the boundary of it (5 km for bat species).

[5] The Zone of Influence (ZoI) in this context is the area over which an individual ecological feature may be subject to a potentially significant effect resulting from changes in the baseline environment due to the Proposed Development.
[6] Scottish Biodiversity List features
[7] Red listed species for the purpose of this assessment refer to those noted using IUCN criteria as being “Near Threatened”, “Vulnerable”, “Endangered” and “Critically Endangered”, and those on present on local Red Lists in the categories “Nationally Scarce” and “Nationally Rare”.

Ecological Feature	Example / Description	Desk Study Areas
	and legally protected habitats and species include those listed on Schedule 1, 5 and 8 of the Wildlife and Countryside Act 1981 (as amended in Scotland), those included on Schedules 2 and 5 of the Habitats Regulations. Badgers are protected under the Protection of Badgers Act 1992.	
Legally controlled species	Legally controlled species include those listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended in Scotland)	The Development Site and within 2 km of the boundary of it.

11.4.6 **Table 11.3** lists the organisations and other sources that have supplied data, together with the nature of the information provided.

Table 11.3 Sources of Desk Study Data

Source	Summary of Information provided
NatureScot's interactive map facility at (http://sitelink.nature.scot/home)	Access to data and information on key statutory designated sites across Scotland.
Scottish Environment Protection Agency (SEPA) website (www.sepa.org.uk)	Information on the classification of the ecological status of waterbodies under the Water Framework Directive (WFD) and Freshwater Fish Directive (FFD)
National Biodiversity Network (NBN)	Commercially available records of protected and / or notable species from within the last ten years.
Forest and Land Scotland (FLLS)	Extents of woodland and forests (including ancient woodland inventory areas) and FLS approved areas for planation.
South West Scotland Environmental Information Centre (SWSEIC)	Records of protected / notable species within a 2 km radius of the boundary of the Development Site ~ (extended to 5 km for bat records).

Survey work

11.4.7 A list of the ecological field surveys carried out to inform the preparation of this chapter is provided in **Table 11.4**. The detailed methodologies for, and results of, these surveys can be found in **Technical Appendices 11B-11E**.

Table 11.4 Summary of Ecological Surveys

Survey	Relevant guidance	Field Survey Area	Survey period	Reference
National Vegetation Classification (NVC) survey	NVC: Users' Handbook (Rodwell, 2006); and Rodwell 1991a, 1991b, 1992, 1995, 2000b) for the identification of vegetation communities present.	Development Site with 250m buffer	August 2020	**Technical Appendix 11.B**
Phase 1 habitat survey	Stace (2010) for higher plants and *Atherton et al*. 2010 for bryophytes (mosses and liverworts). The cover of plant species	Development Site with 250m buffer	August 2020	**Technical Appendix 11.B**
Otter survey	Monitoring the Otter (Chanin, 2003).	Development Site within 250 m buffer	May 2021	**Technical Appendix 11.C**
Water vole surveys	Water vole conservation handbook (Dean et al., 2016).	Development Site with 250 m buffer	May 2021	**Technical Appendix 11.C**
Bat Surveys	2016 Bat Conservation Trust (BCT) Guidelines (Collins, 2016), NatureScot (2021)	Development Site	Spring/Summer/ Autumn 2020	**Technical Appendix 11.D**
Badger surveys	Surveying Badgers (Harris et al. 1989); and Neal & Cheeseman (1996)	Development Site with 250 m buffer	July 2021	**Technical Appendix 11.C**
Aquatic and fisheries surveys	The Scottish Fisheries Co-ordination Centre (SFCC) protocol for electrofishing Freshwater Pearl Mussel Survey Protocol (SNH, no date) Sampling of Freshwater Benthic Invertebrates (SEPA, 2001)	Strategic locations identified in habitat assessment	August/ September 2021	**Technical Appendix 11.E**

Baseline Surveys

11.4.8 Baseline surveys followed nationally recognised guidelines (e.g. Cresswell et al 2012, JNCC 2010, Chartered Institute of Ecology and Environmental Management [CIEEM] Sources of Survey Methods[8]) and the competency of the surveyors was assessed against the CIEEM's Competencies for Species Survey Guidance[9], to ensure that all surveying and reporting was carried out by suitably experienced and trained ecological surveyors. Where sub-consultants were used for the completion of field surveys e.g. fish habitat

[8] http://www.cieem.net/sources-of-survey-methohds-sosm
[9] http://www.cieem.net/competencies-for-species-survey-css

surveys, the personnel were experienced technical specialists who also fulfilled the CIEEM requirements for competency.

11.4.9 The field surveys focussed on the area within the Development Site boundary, plus buffer areas as defined for each receptor below. The relevant study / survey areas are described in the relevant Technical Appendices and illustrated on the associated figures.

Phase 1 Habitat and NVC survey

11.4.10 A Phase 1 Habitat and NVC survey, including recording wetland habitats / Ground Water Dependent Terrestrial Ecosystems (GWDTEs) was completed by Wood Consultant Ecologist David Knox MCIEEM. The survey was undertaken during July and August 2013 with additional areas covered in December 2013 and January 2015. Further surveys were undertaken on 6-9 August 2020 in order to update existing surveys and to cover additional areas, due to re-design of the Proposed Development. The Survey Area is described and illustrated within **Technical Appendix 11.B** and **Figure 11.2** and **Figure 11.3**, covering at least: (i) 100 m from roads, tracks and trenches; and (ii) 250 m from turbine bases and hard standings, the proposed borrow pit search areas and foundations within the Development Site boundary, as per SEPA requirements.

11.4.11 The survey allowed the identification and mapping of the dominant NVC habitats in accordance with standard guidance (Rodwell 1991a, 1991b, 1992 and 1995)[10] and included the mapping of any habitat of conservation significance and wetland habitats with potential to be GWDTEs. Plant identification and classification was based on Stace (2010) for higher plants and Atherton *et al* (2010) for bryophytes.

11.4.12 A hand-held GPS was used to ensure that communities were mapped accurately, and quadrats were used to determine community types, with plant coverage within each quadrat estimated using the Domin scale. Data were analysed using TABLETFIT NVC analysis software (2011 version) which provides a percentage best fit output with respect to NVC communities and sub-communities. The Study Area was separated into polygons / stands of vegetation and the main NVC communities within each polygon identified (**Technical Appendix 11.B, Figure 11.3**). Mosaic habitats (two or more communities in one polygon) are also presented on the figures which separately indicates 50:50 mosaics from mosaics where one community is dominant.

11.4.13 For any potential GWDTEs identified within the NVC Study Area, further hydrological assessment of these was undertaken to assess their level of groundwater dependency. For the potential GWDTEs that were subsequently assessed as likely to be groundwater dependent (referred to as 'assessed' GWDETEs), the likely effects of the Proposed Development on these features were then qualitatively assessed in terms of ecological interest. Further detailed methodology for hydrological assessment of potential GWDTEs and confirmation of assessed GWDTEs is provided within **Chapter 13: Geology, Hydrology and Hydrogeology**.

Peatland Condition survey

11.4.14 As large areas of the Development Site (particularly the eastern section) are located on peatland the Peatland Condition Assessment (PCA) was consulted during the surveys and consideration given to the condition of the peatland based on this guide (Peatland Action, 2016). A Peatland Condition Assessment walkover survey of the Site and buffer zone was undertaken from the 20 - 21 June 2022.

11.4.15 PCA bases the condition of blanket bog on indicators such as bog-moss cover, extent of bare peat and evidence of grazing and burning (Peatland Action, 2016). Further detailed

[10] In addition to the Rodwell NVC texts, Averis et al (2004) provides a concise and up-to-date description of NVC communities and sub-communities of UK upland areas.

methodology for peatland condition assessment is provided within **Technical Appendix 11.B**.

Otter survey

11.4.16 A detailed otter survey was carried out on all watercourses and waterbodies within the Study Area in July-August 2013, December 2013 and September 2014 following standard methods. (e.g. Chanin 2003, (**Technical Appendix 11.C**). Surveying was then repeated, but within a smaller survey area, in October 2015, April 2017, June 2020 and May 2021 to update the baseline. During the surveys, searches for otter and evidence of their activity were carried out along sections of watercourse within a minimum 250 m from proposed turbine locations and their associated infrastructure, and 100 m either side of proposed access tracks and watercourse crossings in accordance with SNH guidance (SNH, 2008). Searches were completed along a corridor of at least 10 m width along each bank. An examination of obvious features such as crevices and dense vegetation was undertaken along with careful searches of all habitat suitable for use as resting places (holts, couches etc.).

11.4.17 The presence / absence of otters was determined on the basis of field signs of their activity including spraints, footprints, tracks, slides and resting places / potential resting places. Any sightings of otter were also recorded (see **Technical Appendices 11.C and Figure 11.3**).

11.4.18 All otter field signs were recorded and mapped, with standard key parameters including weather / watercourse flow conditions and habitats suitability recorded. In addition, the presence of field evidence of mink was recorded.

Water vole survey

11.4.19 A detailed water vole survey was carried out on all watercourses and waterbodies within the Study Area in July-August 2013, December 2013 and September 2014 following standard methods (Dean *et al*. 2016) (see **Technical Appendix 11.C).** Surveying was then repeated in a smaller survey area in October 2015, April 2017, June 2020 and May 2021 in order to update the baseline survey results. Searches were made for signs of water vole along all watercourses within the same Study Area as adopted for otter**,** covering a corridor of up to 10 m on either bank. Any signs including burrow entrances, tunnels in vegetation (runs), droppings or small groups of droppings (latrines), footprints, feeding stations (chopped grass / sedges / rush) and grazed lawns were recorded. The presence or absence of otter, mink and rat was also recorded during the surveys to provide information about the presence of predator species.

11.4.20 Habitat information and habitat suitability for supporting water vole was also assessed and recorded along with details of watercourses flow conditions (see **Technical Appendix 11.C**).

Bat surveys

11.4.21 A suite of bat surveys was undertaken during 2020 according to the prevailing NatureScot and Bat Conservation Trust (BCT) guidelines focusing on bats and wind turbines (NatureScot, 2021 and Collins, 2016). The level of bat survey effort was based upon the level of survey effort required for a proposed wind farm site assessed as being Low Risk to bat populations (**Technical Appendix 11.D**, Table 2.1), as outlined in the BCT guidelines. This decision was based upon the scarce roosting opportunities within and in close proximity to the Development Site; and the domination of open upland grassland and bog habitats which, away from the Water of Ken and its main tributaries (e.g. Lorg Burn, Altry Burn and Afton Burn), offers limited foraging and commuting potential for the high and low-risk bat species likely to be present. In addition, the presence of higher

quality habitat within the wider landscape and the lack of records for high risk bat species within 10 km of the Development Site also contributed to the assessment that the Development Site is of Low risk to bat populations.

11.4.22 Three bat roost emergence surveys were undertaken at Lorg farmhouse in summer and autumn 2020 to gather information about bat roosting behaviour at the farmhouse and associated outbuildings. Surveyors were stationed outside different parts of the building and Duet bat detectors connected to digital recorders or AnaBat detectors were used to record bat calls for identification purposed. Emergence surveys commenced approximately 20 minutes before sunset and continued up to approximately 90 minutes after sunset.

11.4.23 The detailed methods and results from the 2020 surveys are presented in **Technical Appendix 11.D**.

Bat surveys - Historical

11.4.24 Bat surveys were previously undertaken in 2012 by Fairbairn, Douse and Moore (FDM) Ecology. The surveys incorporated a walkover undertaken on 25 April 2012 to search for the presence of potential bat roost habitats, and a seasonal programme of automated bat activity surveys whereby ten static AnaBat SD2 detectors were deployed for a minimum of 5 nights during spring (May 2012, summer (July 2012) and autumn (September 2012) alongside additional detectors placed at reference sites at Lorg Farm, the Water of Ken and the edge of a forestry planation. Detectors were pre-programmed to record between 30 minutes after sunrise on each recording night, bat activity was analysed using Bat Activity Indices (bat passes per unit time). Further automated bat detector surveys (Wildlife Acoustics SM4BATFS) were undertaken during 2020, where detectors were deployed within the Study Areas to record echolocation calls throughout the entire night, for a minimum of ten consecutive nights over three monitoring periods during the active bat season (April to October). The automated detectors were placed at 11 proposed turbine locations in order to provide a representative sample of bat activity at or close to these points. An additional detector was deployed in June within the base of the valley, near the Water of Ken, as a reference monitoring location. The detector was deployed in order to align with the distribution of automated detectors during the surveys carried out in 2012[11].

11.4.25 In April 2013, two meteorological masts (met masts) fitted with SM2 (Songmeter) bat detectors (Wildlife Acoustics) were installed within the Development Site under the direction of Amec Foster Wheeler bat specialists (as reported in **Technical Appendix 11.D**). Each SM2 bat detector was set up with a 'high microphone' at approximately 50 m and a 'low microphone' at approximately 1.5 m in order to provide simultaneous data 'at height' and 'at ground level' respectively between 30 minutes before sunset and 30 minutes after sunrise. The detectors were checked manually at regular intervals for troubleshooting and data collection purposes between April and October 2013. Bat activity indices were also calculated as a measure of relative activity at the anemometry masts.

11.4.26 Three bat roost emergence surveys were undertaken by Amec Foster Wheeler at Lorg farmhouse in summer and autumn 2013 to gather information about bat roosting behaviour at the farm and associated outbuildings.

Badger survey

11.4.27 A badger survey was undertaken within 150 m of the Development Site boundary in July 2021 in accordance with Neal & Cheeseman (1996). Surveys were undertaken in

[11] Natural Power (2012). Afton 2 Baseline Ecology Report.

combination with surveys for other protected species such as otter and water vole following standard methods (Harris et al. 1989, SNH 2003) (see **Technical Appendix 11.C**). The survey aimed to identify and examine areas where badgers might occur by noting any evidence of their presence. This included mammal paths / runs, identification of badger guard hairs, paw prints, evidence of foraging, dung pits, latrines and badger setts. A mammal path was assumed to be used if the character of the path (in terms of size) was appropriate and / or if any other signs were in close vicinity (e.g. a badger sett).

11.4.28 Ground conditions were wet over the majority of the survey area, and thus considered sub-optimal (but not totally unsuitable) for badger sett building, with the search for badger setts therefore focused on the lower reaches and wooded areas.

11.4.29 Historical surveys included badger surveys across the Development Site in June 2012, September 2013, May 2015 and June 2020.

Fisheries Habitat Survey

11.4.30 In response to the scoping response from both Marine Science Scotland (MSS) and Galloway Fisheries Trust (GFT) a targeted fisheries habitat survey was undertaken for freshwater fish on the watercourses within the Development Site[12]. At this stage, the Proposed Development was located within the upper Dee catchment and the surveys assessed this area only. A modified Hendry and Cragg-Hine (1997) walkover survey was undertaken by the GFT during September 2013 at a total of 12 specific survey areas within the Development Site in order to identify the status and locations of spawning gravels and juvenile fish habitat areas within the watercourses. During the surveys, the predominant habitat type was recorded within each survey areas, including substrate type and bank structure, and obstructions to fish movement were also recorded.

11.4.31 Following re-design of the wind turbine layout, the Proposed Development straddles two catchments: the Nith and the Dee catchment. Targeted fisheries surveys, utilising electrofishing techniques, were undertaken by GFT and Nith District Salmon Fisheries Board (NDSFB) in 2021 to determine the presence of salmonid species. Electrofishing surveys were undertaken at strategic locations determined by initial walkover habitat surveys (2013) focussing on areas most likely to support salmonid species.

11.4.32 Fresh Water Pearl Mussel (FWPM) surveys were also undertaken at suitable sites in the Nith catchment. No FWPM were undertaken in the Dee catchment, as no suitable sites were identified. Aquatic invertebrate sampling was undertaken to determine water quality at sites within both catchments.

11.4.33 Details of the survey methods employed, together with photographs of the survey areas are detailed in **Technical Appendix 11.E**.

Herpetofauna (Amphibians and Reptiles)

11.4.34 The majority of the Development Site was assessed as being largely unsuitable for amphibians and, due to the lack of connectivity to high quality habitats, lack of areas suitable for shelter and grazing pressures from domestic livestock, it was considered to be of low potential to support reptiles.

11.4.35 No specific survey was undertaken for herpetofauna, however the isolated terrestrial habitat features such as stone walls, embankments, slopes, interface or edge habitats, and shade free areas near dense vegetation, which could potentially support them, were recorded where present during the completion of other surveys. Best practice methods

[12] Excluding those watercourses which are located within the Nith catchment as these were not included in the Development Site at the time of the survey.

were followed as appropriate, for example where considering the suitability of the habitat to support reptiles (Edgar et al. 2010).

Other Protected and / or Notable Species

11.4.36 Habitats within the Development Site were assessed during the protected species surveys for their potential to support other protected and notable species. The general suitability of terrestrial habitats for invertebrates such as butterflies, bees and moths, e.g. botanical diversity, larval food plants of notable butterfly species, was assessed. The general suitability of watercourses to support aquatic invertebrates was also assessed, e.g. overhanging vegetation, channel width, depths, flow, bank and substrate material. Any sightings of notable ecological features (including legally protected species) made during other surveys within the Study Area were also recorded.

11.5 Overall Baseline

11.5.1 The description of the ecological features below provides a summary of the ecology baseline as determined through desk study and field survey. Further detailed descriptions of the desk study and field survey results are provided in **Technical Appendices 11.A-11.E**.

Current baseline

Site Context and Surrounding Habitat

11.5.2 The Development Site is located at the northern end of a 10 km long single-track road leading off from the B729 (**Figure 11.1-Figure 11.4**). Landscape within the Development Site is defined by steep hillslopes of Ewe Hill, Lorg Hill, Alwhat and Alhang Hill to the north – west, and Altry to the south – east. Lorg Farmhouse, an unoccupied stone building, is positioned at the base of a steep sided valley in the centre of the Development Site. Elevation within the Development Site ranges from approximately 280 m Above Ordnance Datum (AOD) at the base of the valley to 642 m AOD at the summit of Alhang.

11.5.3 Several watercourses exist within the Development Site, which flow into the Water of Ken. The Water of Ken intersects the centre of the Development Site, flowing in a north – east to south – west direction.

Statutory Nature Conservation Sites

11.5.4 There are no statutory designated sites designated for their ecological interest present within the Development Site or within a 10 km radius.

Non statutory designated sites

11.5.5 Non-statutory sites within 2 km of the Development Site boundary include Afton Uplands provisional Local Wildlife Site (pLWS) and a single stand of ancient woodland listed within the Ancient Woodland Inventory[13] (**Table 11. 5**).

[13] The Ancient Woodland Inventory records where Scotland's ancient and mature woodland can be found http://gateway.snh.gov.uk/natural-spaces/dataset.jsp?dsid=AWI

11.5.6 The Development Site is situated within the Galloway and Southern Ayrshire Biosphere Reserve. This UNESCO Biosphere reserve was designated because of the combination of the area's "unique landscapes and wildlife areas and rich cultural heritage"[14].

Table 11.5 Non-statutory designated sites within 2 km of the Development Site boundary

Site	Designation	Grid Reference	Description	Distance and orientation from Development Site
Afton Uplands pLWS	Provisional Local Wildlife Site	NS 64963 08249	An extensive upland site which encompasses a range of upland mire, montane heath and grassland habitats. Alpine clubmoss and juniper are present, while stiff sedge is frequent over the summit of Craigbraneoch and Blackcraig.	The Development Site overlaps Afton Uplands pLWS.
Un-named woodland	Ancient Woodland Inventory	NX 69800 97200	In Scotland, Ancient Woodland is defined as land that is currently wooded and has been continually wooded since at least 1750. Its age means that it is important for biodiversity and cultural identity.	Located approximately 1.9km south – east of the Development Site boundary.

Existing and Historical Survey Records

Otter

11.5.7 Otter surveys were carried out across the Development Site between years 2012[15] and 2015[16]. Evidence of otter activity (in the form of spraints and resting sites) was identified along the Water of Ken, Lorg, Altry Burn, Clashwarrant Burn, Spout Burn, Afton Burn, Sandy Syke Burn and Grains Burn. The Water of Ken and Lorg Burn were considered to provide the most suitable habitat for otter, however, all watercourses on the Development Site were considered to provide ample opportunities for commuting.

Water vole

11.5.8 No evidence of water vole was identified during field surveys carried out between 2015 and 2021. Watercourses within the Development Site were generally considered to provide sub-optimal habitat for water vole due to their fast-flowing nature and potential for rapidly changing water levels following periods of heavy rainfall. Some areas of suitable water vole habitats were however identified along the Lorg Burn (in the vicinity of Lorg Farmhouse) and in the lower reaches of the watercourse running downgradient from Small Cleugh and Rough Cleugh.

Badger

11.5.9 The Development Site is characterised by steep sided hill slopes with altitudes ranging from 270 m to 630 m above sea level. While acid grassland habitat within the Development Site may as suitable foraging habitat for badger, these areas are limited due to large sections of the Development Site being comprised of blanket bog habitat, which

[14] http://www.gsabiosphere.org.uk/

[15] Amec Foster Wheeler (2015). Lorg Wind Farm Environmental Statement, Technical Appendix 11F.
[16] Amec Foster Wheeler (2015). Lorg Wind Farm Environmental Statement, Technical Appendix 11B and 11C

tends to be waterlogged in nature, and is thus considered unsuitable for badger sett construction.

11.5.10 Two active badger setts were recorded within the wider Study Area with several badger latrines also recorded adjacent to the setts.

Fish Habitat

11.5.11 Fish habitat surveys undertaken on 12 sections of watercourse with the upper Kirkcudbrightshire Dee river catchment[17] revealed suitable habitat for a range of fish species. However, due to impassable barriers at Kendoon Dam, it is likely that Atlantic salmon is absent from watercourses upstream, and thus the only resident fish that is likely to be present is the brown trout.

Bats

11.5.12 Static bat detector surveys carried out during 2012[Error! Bookmark not defined.] confirmed that four bat species/ species groups utilise the Development Site, including common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), Daubentons bat (*Myotis Daubentonii*), and brown long-eared bat (*Plecotus auritus*). Very low levels of activity were recorded on open hill tops within the Development Site, while significantly higher levels of activity were recorded at reference locations (positioned within areas of suitable habitat along the peripheries of the Development Site). The majority of activity recorded within the Development Site was considered to represent commuting bats that may occasionally forage across open land as they pass between areas of more suitable habitat.

11.5.13 In addition to surveys carried out in 2012, static detectors were deployed at two meteorological (met) mast locations in 2013[18], known as 'Lorg East' and 'Lorg West'. A total of 303 bat contacts[19] were recorded between April and October 2013 which is considered to represent very low levels of bat activity. Almost all bat contacts recorded were related to activity at ground level as opposed to at activity at height[20]. Bat species/ species groups identified during the monitoring period included Nyctalus bat species, common pipistrelle, soprano pipistrelle, and Myotis bat species. As per 2012 results, the data suggested that small numbers of bats utilise the Development Site for commuting and opportunistic foraging opportunities between roosts and areas of higher foraging value, which are assumed to be elsewhere in the Water of Ken catchment.

11.5.14 A suite of emergence surveys conducted at Lorg Farmhouse during 2013[Error! Bookmark not defined.] confirmed the presence of a soprano pipistrelle roost. Due to the level of bat activity recorded outside the farmhouse, there was also potential for the building to be utilised as a roost for common pipistrelle and Daubentons bat species. Given its isolation from suitable foraging habitat, the farmhouse was assessed to offer only limited opportunity for small numbers of bats and was not considered suitable for larger maternity colonies.

[17] Amec Foster Wheeler (2015). Lorg Wind Farm Environmental Statement, Technical Appendix 11E
[18] Amec Foster Wheeler (2015). Lorg Wind Farm Environmental Statement, Technical Appendix 11.D
[19] A total of 303 bat contacts were recorded, of which 283 of which were attributed to Lorg East met mast with the remaining 20 contacts attributed to Lorg West met mast.
[20] Due to issues associated with electrical interference, it was not possible to obtain data relating to bat activity at height for Lorg West met mast. At Lorg East met mast only one bat contact (a soprano pipistrelle) was recorded at height in August 2013.

Field Surveys

Habitats

11.5.15 A detailed summary of the habitats / vegetation communities present across the Development Site is presented in **Technical Appendix 11.B**.

11.5.16 **Table 11.6** summarises the status and classification of the vegetation communities recorded within the Survey Area and identifies where these have the potential to be GWDTEs under SEPA guidance (SEPA, 2010).

Table 11.6 Vegetation communities recorded on main site

Phase 1 Habitat Type	NVC Community	NVC Sub-communities	Area (ha)	Potential Ground Water Terrestrial Ecosystem (SEPA, 2010)
Semi-improved acid grassland	**U2** *Deschampsia flexuosa* grassland	**U2b** *Vaccinium myrtillus* sub-community	728	-
	U4 *Festuca ovina – Agrostis capillaris – Galium saxatile* grassland	**U4b** *Holcus lanatus – Trifolium repens* sub-community **U4d** *Luzula multiflora – Rhytidiadelphus loreus* sub-community		
	U5 *Nardus stricta – Galium saxatile* grassland	**U5a** Species-poor sub-community **U5c** *Carex panicea - Viola riviniana* sub-community		-
	U6 *Juncus squarrrosus – Festuca ovina* grassland	**U6a** *Sphagnum* sub-community **U6d** *Agrostis capillaris – Luzula multiflora* sub-community		Moderate
Bracken	**U20** *Pteridium aquilinum – Galium saxatile* community	**U20a** *Anthoxanthum odoratum* sub-community	54	-
Semi-improved neutral grassland	**MG9** *Holcus lanatus - Deschampsia cespitosa* grassland	Too limited to determine	1	Moderate
Acid/neutral flush	**M4** *Carex rostrata – Sphagnum fallax* mire	(M4 has no sub-communities)	92.8	-
	M6 *Carex echinata – Sphagnum fallax/denticulatum* mire	**M6c** *Juncus effusus* sub-community **M6d** *Juncus acutiflorus* sub-community		High
Wet dwarf-shrub heath	**M15** *Trichophorum cespitosum – Erica tetralix* wet heath	**M15d** *Vaccinium myrtillus* sub-community	2.7	Moderate

Phase 1 Habitat Type	NVC Community	NVC Sub-communities	Area (ha)	Potential Ground Water Terrestrial Ecosystem (SEPA, 2010)
Blanket bog	**M17** *Trichophorum cespitosum – Eriophorum vaginatum* blanket mire	**M17c** *Juncus squarrosus – Rhytidiadelphus loreus* sub-community	312	-
Blanket bog	**M18** *Erica tetralix – Sphagnum papillosum* blanket mire	**M18a** *Sphagnum magellanicum – Andromeda polifolia* sub-community		-
Blanket bog	**M19** *Calluna vulagris – Eriophorum vaginatum* blanket mire	**M19a** *Erica tetralix* sub-community		-
Wet modified bog	**M20** *Eriophorum vaginatum* mire	**M20a** species-poor sub-community	30	-
Wet modified bog	**M25** *Molinia caerulea – Potentilla erecta* mire	**M25b** *Anthoxanthum odoratum* sub-community		Moderate
Marsh/marshy grassland	**M23** *Juncus effusus / acutiflorus – Galium palustre* rush-pasture	**M23a** *Juncus acutiflorus* sub-community	257	High

Groundwater Dependent Terrestrial Ecosystems

11.5.17 The NVC survey identified the presence of a number of potential GWDTEs within the Development Site (**Technical Appendix 11.B**). A full description of this assessment and the GWDTEs is provided in **Chapter 13: Geology, Hydrology and Hydrogeology**.

11.5.18 The NVC survey identified the presence of six plant communities within the Study Area that are potential GWDTEs, as displayed in **Table 11.6**.

11.5.19 Communities listed as having high groundwater dependence are potentially sensitive to development, notably through direct land take as well as through disruption in water flows. As a result, where possible, they should be avoided together with appropriate buffers, or suitable mitigation should be implemented.

11.5.20 SEPA recommends buffers of 100 m from roads, tracks and trenches and 250 m from borrow pits and turbine foundations. In some cases, it may be possible to reduce this buffer, based on topography and hydrological flows. For example, M23 rush pasture can occur where groundwater is not involved and only surface flow is present. Communities listed as having moderate groundwater dependence may also be sensitive to development, though, as with the example above, these communities are not always dependent on groundwater flow, especially in areas of high rain fall, where surface flow may be the driver instead.

Watercourses and waterbodies

11.5.21 The Development Site is situated on the watershed between the Nith and Dee catchments.

11.5.22 In general, watercourses are very narrow, shallow and fast-flowing, reflecting the proximity to the sources of these watercourses, whilst gravels and pools are present in some areas, the burns are typically rocky.

11.5.23 Many of these watercourses are tributaries of the Water of Ken, which drains to south of the Development Site, and Afton Water, which flows to the north of the Development Site.

Species

Otter

11.5.24 The survey carried out in May 2021 identified evidence of otter activity along most watercourses within the Study Area, including the Water of Ken, Coranbae Burn, Altry Burn, Small Burn, Lorg Burn and Afton Water. A total of four resting places (three holts and one couch) were also identified within the Study Area. These resting places were located on the north and south bank of Coranbae Burn, the east bank of the Water of Ken and the west bank of Lorg Burn. In addition, two potential resting laces (holts) were recorded along the Altry Burn and Alwhat Burn during the survey.

11.5.25 Further details on the findings of the otter field surveys are provided in **Technical Appendix 11.C**.

Water vole

11.5.26 No evidence of active water vole habitat was recorded along any of the watercourses or marshy grassland / flush habitat within the Study Area, and no records of water vole were returned as part of the desk study.

11.5.27 While much of the Study Area is subject to heavy grazing by sheep and this has limited habitat for water vole, areas of potentially suitable water vole habitat were also noted within rush vegetation alongside the minor un-named watercourse located east of Lorg Farmhouse, and in the lower reaches of Small Cleugh and Rough Cleugh.

11.5.28 Further details on the findings of the water vole field surveys are detailed in **Technical Appendix 11.A**.

Bats

11.5.29 **Technical Appendix 11.D** presents the findings of the static detector, bat activity transect and emergence / re-entry surveys undertaken in 2020. A summary of the findings is provided below.

Habitat Assessment

11.5.30 The landscape within the Study Area is dominated by open moorland (comprised primarily of rush pasture, purple moor grass mire, blanket bog, acid grassland, and flush habitat) that is managed for livestock grazing. Commercial forestry plantation surrounds much of the periphery of the Study Area. While open moorland is generally considered to support low suitability for foraging bats, it may serve as a commuting pathway between areas of more suitable foraging and roosting habitat. In addition, while coniferous plantation generally provides low suitability for roosting habitat, tree lines may serve as edge habitat and provide a means of navigation for commuting and foraging purposes.

11.5.31 Lorg Farmhouse is located at the base of a valley within the centre of the Study Area. The Water of Ken runs approximately 220 m south of the farmhouse, while Lorg Burn and its tributaries are positioned approximately 200 m south-west of the building. Two small stands of broadleaved woodland are positioned immediately adjacent to the building. Habitat within the valley that surrounds Lorg Farmhouse is therefore considered to offer greatest commuting and foraging potential within the Study Area.

Roost Habitat

11.5.32 Roosting *Pipistrellus* bats were confirmed at Lorg Farmhouse during presence / absence surveys. The farmhouse was assessed to offer only limited opportunity for small numbers of bats and was not considered suitable for larger maternity colonies. Based on activity levels recorded at reference locations, these roosting bats utilise the stands of broadleaved woodland and watercourses within the centre of the Study Area for commuting and foraging purposes on a regular basis.

Activity Survey

11.5.33 Automated detectors deployed at / near each proposed turbine location recorded a total of 2,907 contacts from at least five species [common pipistrelle, soprano pipistrelle, brown long-eared bats, and bats of the genera *Nyctalus* and *Myotis*] over 427 monitoring nights.

11.5.34 The most frequently encountered species group was *Pipistrellus* (relating to contacts from either common or soprano pipistrelle), accounting for 31.07% of contacts. The second most encountered species / species group was common pipistrelle, accounting for 24.12% of contacts. Noctule and *Nyctalus* bats species account for 14.76% and 15.28% of total contacts respectively. Soprano pipistrelle accounts for 12.46% of total contacts. The remaining limited number of contacts were attributed to *Myotis* species (1.86%).

11.5.35 Through comparing data to similar sites within a 100 km radius using the online Ecobat tool[21] bat activity levels across the Study Area were assessed as follows:

- Common pipistrelle – data suggests an overall 'low' level of activity across the Study Area (median percentile of 1), with periods of 'moderate' activity also recorded during the survey period (max percentile of 60). The respective reference range was 2,933, thus indicating high confidence in the accuracy of the comparison.
- Soprano pipistrelle – data indicates an overall 'moderate' level of activity across the Study Area (median percentile of 46), with occasions of 'high' activity also recorded during the survey period (max percentile of 81). The respective reference range was 3,170, indicating high confidence in the accuracy of the comparison.
- *Pipistrellus* species – data indicates an overall 'low to moderate' level of activity across the Study Area, (maximum percentile 31) with periods of 'moderate to high' levels of activity also recorded (maximum percentile 68). The respective reference range was 2,976, thus allowing confidence in the level of comparison.
- *Nyctalus* species – data indicates and overall 'moderate to high' level of activity across the Study Area (median percentile 73), with occasions of 'high' activity also recorded during the survey period (maximum percentile of 93). The respective reference range was 1,921, allowing confidence in the accuracy of comparison.
- *Myotis* species – data indicates an overall 'low' level of activity across the Study Area (median percentile of 1), with occasions of 'moderate to high' activity also recorded during the survey period (max percentile of 77). The respective reference range was 1,123, indicating high confidence in the accuracy of the comparison.
- Brown long eared bat - data indicates an overall 'low' level of activity across the Study Area (median percentile of 1), with occasions of 'low to moderate' activity also recorded (max percentile of 31). Due to a lack of available records for this species within 100 km of the Development Site for comparison (respective reference range of 117), there is a low degree of confidence in these results.

[21] http://www.ecobat.org.uk

Freshwater Fish

11.5.36 Only trout fry[22] and parr[23] were recorded within the wind farm Study Area. The presence and age classes of fish found through the Development Site is shaped by the altitude and location, upstream of the Afton Reservoir and associated dam which poses as a barrier to upstream migration of fish.

Freshwater Pearl Mussel (FWPM)

11.5.37 No FWPM were recorded during the surveys.

Freshwater Invertebrates

11.5.38 The results show that healthy populations of aquatic invertebrates are present on the Afton Water and Alwhat Burn.

Future baseline

11.5.39 Determining a future baseline draws upon information about the likely future use and management of the Development Site in the absence of development, known population trends (for species), climate change and any other proposed developments (consented or otherwise) that may act cumulatively with the Proposed Development to affect ecological features.

11.5.40 It is unlikely that in the absence of the Proposed Development, any future baseline would be markedly different from the current baseline. Land use / management is currently anticipated to remain largely unchanged in the absence of development and it is therefore considered appropriate to use the current baseline for the purpose of this assessment.

11.6 Consultation

11.6.1 **Table 11.7** provides a summary of consultee comments about the Proposed Development and how these have been considered in this assessment.

[22] Fry refers to a young fish less than one-year old resulting from spawning at the end of 2020.
[23] Parr refers to a young fish of greater than one year and greater than two years old (where present) from spawning in 2019 or previously.

Table 11.7 Summary of issues raised during consultation regarding Ecology

Issue raised	Consultee(s)	Response and how considered in this chapter	Section Ref
In NatureScot's response to the scoping report they stated that they were satisfied with the proposed scope and work undertaken to date and had no additional comments.	NatureScot	N/A	-
The site adjoins a Local Nature Conservation Site (Afton Uplands pLWS) and impacts on this designated site will need to be reported alongside any necessary mitigation to overcome impacts as necessary. Other than that, the Planning Authority has nothing particular to respond with on these matters and would suggest the applicant ensure the requirements and advice of NatureScot, RSPB and any relevant fisheries boards or the Ayrshire Rivers Trust, are taken into account to inform the scope of assessment of such matters for reporting within the EIA Report.	East Ayrshire Council	An assessment of potential effects on Afton Uplands pLWS is provided in Section 11.10 Environmental measures to avoid / minimise effects are set out in **Table 11.10**.	**Section 11.10, Table 11.10**.
The information on the presence of fish is important and endorses the Nith District Salmon Fishery Board (NDSFB) policy of insisting that a full aquatic audit be undertaken as part of the environmental information ingathered to protect the environment in the vicinity of any wind farm development. This would include Freshwater Pearl Mussel, aquatic invertebrate and fish surveys.	NDSFB	NDSFB and GFT undertook a full fisheries audit of watercourses draining the Development Site in 2020 and the results of these surveys have been used to inform the assessment within this Chapter.	**Technical Appendix 11.E**.

11.7 Scope of the assessment

11.7.1 The method for determining the scope of the assessment within the ecology chapter differs from that used in other technical chapters within this EIA Report in order to correspond with topic specific guidance (i.e. CIEEM, 2018). However, the relevant receptors (i.e. ecological features), the spatial and the temporal scope are all defined in this section. The methodology followed has multiple stages, enabling the scope of the assessment to be progressively refined.

Ecological Features

Scoping – Determining Importance of Ecological Features

11.7.2 The method for determining the scope of the assessment corresponds with topic specific guidance (i.e. CIEEM, 2018). The relevant receptors, IEFs, the spatial and the temporal scope are all defined in this section. The methodology followed has multiple stages, enabling the scope of the assessment to be progressively refined.

11.7.3 For this ecological assessment, the first stage in determining the scope of the assessment is to identify which ecological features identified through the desk study and field surveys (see **Section 11.5**) 'are important'[24] in the context of the Proposed Development.

[24] Importance relates to the quality and extent of designated sites and habitats, habitat / species rarity and its rate of decline. Ecological features that are not considered to be important are those that are sufficiently widespread,

Following CIEEM (2018) guidance, the importance of ecological features is first determined with reference to UK legislation and policy and then with regard to the extent of habitat or size of population that may be affected by the Proposed Development.

11.7.4 As the importance of ecological features is determined with regards to the extent of habitats or size of population that may be affected by the Proposed Development, the level of importance can differ from that which would be conferred by legislative protection of identification as a conservation notable species and from one development to another. For example, water vole is important at a national level because it is a Scottish Biodiversity List (SBL) species and has experienced a population decline of more than 25 % in the last 25 years. However, a small population that could be affected by a development would be assessed as being of less than national importance if there is alternative well-connected and suitable habitat nearby that has the capacity to support individuals that may be displaced.

11.7.5 Wherever possible, information regarding the extent and population size, population trends and distribution of the ecological features has been used to inform the categorisation described in **Table 11.8** to determine importance for the purposes of this assessment. Where detailed criteria or contextual data are not available, professional judgement was used to determine the level of importance.

11.7.6 An explanation of all determinations of importance are provided in this section, **Table 11.9** (for scoped in ecological features) and **Technical Appendix 11.F** (for all ecological features both those scoped in and out) to ensure transparency.

unthreatened and resilient and with populations that will remain viable and sustainable irrespective of the Proposed Development.

Table 11.8 Importance of the Proposed Development for Ecological Features

Geographic context of importance	Example / description
International or European	1. European sites including SPAs, SACs, candidate SACs and Sites of Community Importance (SCI), potential SPAs (pSPA) and possible SACs (pSACs) should also be considered in the same manner in accordance with National Planning Policy. 2. Areas of habitat or populations of species[25] which meet the published selection criteria based on discussions with NatureScot and field data collected to inform the Ecological Impact Assessment (EcIA) for designation as a European site or Ramsar site, but which are not themselves currently designated at this level.
National	1. A nationally designated site including SSSIs and National Nature Reserves (NNRs). 2. Areas (and the populations of species which inhabit them) which meet the published selection criteria guidelines for selection of biological SSSIs but which are not themselves designated based on field data collected, and in agreement with SNH. 3. Scottish Biodiversity List (SBL) habitats and species, Red listed and legally protected species that are not addressed directly in Part 2 of the "Guidelines for Selection of Biological SSSIs" but can be determined to be of national importance using the principles described in Part 1 of the guidance. 4. Areas of Ancient Woodland e.g. woodland listed within the Ancient Woodland Inventory.
Regional	1. SBL species considered to be of regional importance in the context of published information on population size and distribution.
County	1. Local Nature Reserves (LNRs) and Non-statutory designated sites. 2. Areas which based on field data collected to inform the EcIA meet the published selection criteria for those sites listed above (for habitats or species, including those listed in relevant Local Biodiversity Action Plans) but which are not themselves designated.
Local	1. SBL habitats and species, Red listed and legally protected species that based on their extent, population size, quality etc. are determined to be at a lesser level of importance than the geographic contexts above. 2. Common and widespread semi-natural habitats occurring in proportions greater than may be expected in the local context. 3. Common and widespread native species occurring in numbers greater than may be expected in the local context.
Negligible	1. Common and widespread semi-natural habitats and species that do not occur in levels elevated above those of the surrounding area. 2. Areas of heavily modified or managed land uses (e.g. hard standing used for car parking, as roads etc.)

11.7.7 Where protected species are present and there is the potential for a breach of the legislation, those species should always be considered as 'important' features. With the exception of such species receiving specific legal protection, or those subject to legal control (e.g. invasive species), all ecological features that were determined to be of negligible importance have been scoped out of the assessment at this stage.

11.7.8 Furthermore, ecological features of local importance were also scoped out at this stage where there was a specific technical justification to do so. This is because effects on them would not influence the decision-making about whether or not consent should be granted for the Proposed Development (in other words a significant effect in EIA terms could not occur). This approach is consistent with that described in CIEEM 2018. Specific justification for exclusion of each of these ecological features is provided in **Technical Appendix 11.F**.

[25] This includes habitats and species listed under Annex I and Annex II of the Habitats Directive.

11.7.9 All legally protected species and ecological features that are of sufficient importance were then taken through to the next stage of the scoping assessment.

Spatial Scope

11.7.10 The construction, operation and decommissioning phases of the Proposed Development may result in the following direct and indirect environmental changes that could significantly affect ecological features/receptors:

- Land take for construction or decommissioning of infrastructure (turbine bases, access tracks, site compounds);
- Direct loss, harm or disturbance during construction or decommissioning;
- Changes to the surface hydrology;
- Increased light, noise and vibration (disturbances);
- Increased vehicle movement; and
- Pollution associated with accidental spillage of fuels, oils, run-off and dust emission i.e. via direct contact, air or water.

11.7.11 Key to establishing which environmental changes may result in likely significant effects, is the determination of a Zone of Influence (ZoI) for each important ecological feature identified. ZoIs differ depending on the type of environmental change (i.e. the change from the existing baseline) as a result of the Proposed Development and the ecological feature being considered.

11.7.12 The most straightforward ZoI to define is the area affected by land-take and direct land-cover changes associated with the Proposed Development. This ZoI is the same for all affected ecological features.

11.7.13 By contrast, for each environmental change that can extend beyond the area affected by land-take and land-cover change (e.g. increased noise associated with construction activities within the land-take area), the ZoI may vary between ecological features, dependent upon their sensitivity to the change and the precise nature of the change. For example, a water vole might only be disturbed by noise generated close to its burrow, while nesting marsh harrier might be disturbed by noise generated at a much greater distance, and other species (e.g. many invertebrates) may be unaffected by changes in noise. In view of these complexities, the definition of the ZoI that extends beyond the land-take area was based upon professional judgement informed (as far as possible) by a review of published evidence (e.g. disturbance criteria for various species) and discussions with the technical specialists who are working on other chapters of the EIA Report.

11.7.14 It should be noted that the avoidance of potentially significant effects through the design process is implicitly taken into account through the consideration of each ZoI, as are standard construction practices that are common-place. When scoping in or out ecological features from further assessment, environmental measures (see **Section 11.8**) associated with general good practice that are described within the Code of Practice for planning and development (BSI, 2013) and Good Practice during Wind Farm Construction (Scottish Renewables *et al*., 2015) have been taken into account (e.g. dust suppression, appropriately scheduled vegetation removal etc.).

Temporal scope

11.7.15 The temporal scope of the ecological assessment is consistent with the period over which the Proposed Development would be carried out and therefore covers a.) construction; b.)

operation, and c.) decommissioning periods (as outlined in **Chapter 3: Description of the Proposed Development**).

a) Construction of the Proposed Development would be completed over a period of up to 24 months. Working hours are likely to vary through the year, depending on day length, but would typically be between 07:00 to 19:00 hours on week days (Monday to Friday) and 07:00 to 13:00 hours on Saturdays (**Chapter 3: Description of the Proposed Development**). Quiet on-site working activities (such as electrical commissioning) have been assumed to extend outside the core working times (where required).

b) Operation of the Proposed Development is anticipated to run for 35 years.

c) Decommissioning would involve complete removal of wind turbines (towers, nacelle, hub, blades and electrical kiosk) plus the control building and associated equipment, the components will be reused or recycled. As with the turbine bases, the foundations themselves will be cut down to below ground level and left in situ covered in soil / peat which will be re-vegetated.

11.7.16 The ZoI for each of the ecological features scoped into the assessment on the basis of their importance is provided in **Technical Appendix 11.F**, together with a justification for scoping them in or out of the assessment on the basis of the spatial scope of the effects of the Proposed Development.

11.7.17 Ecological features that are scoped into the assessment (i.e. those of sufficient importance occurring within a relevant ZoI) are summarised in **Table 11.9**, along with a summary of the explanation behind their inclusion. For each ecological feature presented in **Table 11.9**, the potential environmental changes and potential significant effects resulting from the Proposed Development are provided.

Table 11.9 Likely Effects, ZoIs and Justification for Scoped in Ecological Features

Ecological Feature	Importance – Legislation and Policy	Importance – Proposed Development	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
Afton Uplands pLWS	County	Local	Direct loss and temporary damage to terrestrial habitats (construction, operation, decommissioning). Reduction in habitat quality as a result of hydrological connectivity and pollution incidents.	Within the construction/ maintenance/ decommissioning area. 10 m beyond construction maintenance areas	Afton Uplands pLWS overlaps with the Development Site Boundary. There will be direct habitat loss of the pLWS as a result of the Proposed Development. There is also potential for hydrological effects pathways which could increase sediment loading and pollutants entering the pLWS which could lead to reduction in habitat quality of the pLWS features. As such, this site is included in further assessment within this chapter.
Blanket bog (M15, M17, M18, M19, M25, M20)	European	County	Direct habitat loss as a result of the Proposed Development. Reduction in habitat quality as a result of hydrological connectivity and pollution incidents including dust deposition	Within construction / maintenance areas 10 m beyond construction maintenance areas	Blanket bog is a SBL Priority habitat and includes habitats / vegetation communities listed in the Habitats Regulations. However, based on the evidence presented in **Technical Appendix 11.B**, the peatland condition of blanket bog habitats within the Development Site are largely modified through drainage or grazing, with limited 'near natural' bog communities. Blanket bog will be subject to both direct and indirect effects as a result of the Proposed Development. Direct habitat loss will result from construction activities and there is potential for indirect effects as a result from changes in hydrology and through pollution and dust deposition which may affect habitats within 10 m around construction activities. The potential effects of the Proposed Development on potential GWDTEs (including M25) are assessed within **Chapter 13: Geology, Hydrology and Hydrogeology**
Otter	European	Local	Disturbance / displacement to local otter populations. Direct damage to resting sites and disturbance to individuals using resting sites due to elevated levels of activity (such as increased noise, lighting and	Up to 200m beyond construction/ maintenance/ decommissioning	Otter is a European protected species (EPS) and an SBL Priority species. The Proposed Development footprint is within the home range of otters and therefore construction activity may give rise to the disturbance to the local otter population in addition to the potential to impact upon their prey species – either from the placement of infrastructure or due to noise disturbance.

Ecological Feature	Importance – Legislation and Policy	Importance – Proposed Development	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
			human presence) during construction / operation and decommissioning related works. Temporary severance of otter habitat and commuting routes. Direct mortality due to construction related activities. Reduction in habitat quality due to severance of habitat connectivity, diffuse pollution, and impacts on prey availability.	area (based on NatureScot protected species advice) Within the construction/ maintenance/ decommissioning area Within the construction/ maintenance/ decommissioning area Up to 10km downstream for hydrological connectivity.	Evidence of otter activity, in the form of spraints, along most watercourse was recorded within the Study Area, along with resting sites. The Proposed Development could therefore lead to temporary habitat severance and fragmentation of territories during construction or decommissioning phases, particularly during the construction of water crossings. The Proposed Development has the potential to lead to an increase in otter mortality as a result of traffic collision during construction or decommissioning
Badger	Local	Local	Direct mortality as a result of construction related activities. Disturbance / displacement of badger during construction and decommissioning due to elevated levels of noise, lighting, and human presence during construction / operation related works Temporary severance of badger foraging habitat and commuting routes	Within construction / maintenance areas Within construction / maintenance areas Within construction / maintenance areas	Badger activity was confirmed within the Study Area by the presence of active setts. The Proposed Development could lead to indirect disturbance to badger populations through elevated levels of noise, vibration and human presence during the construction phase, with temporary disturbance to regular commuting and foraging routes throughout the Site.

Ecological Feature	Importance – Legislation and Policy	Importance – Proposed Development	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
Bats (commuting and foraging)	International	Local	Disturbance and / or displacement of commuting and foraging bats Direct effect in the form of injury / mortality form collision with turbines during the operational phase.	Within the turbine envelope Within the turbine envelope	Bat activity surveys carried out in 2020 identified at least five species of bat utilising the Study Area for commuting and foraging purposes. These include common pipistrelle, soprano pipistrelle, Pipistrellus species, Noctule / *Nyctalus* species, *Myotis* species, and brown long-eared bat. Based on levels of activity recorded the site is considered to support a locally important population of bat species.

11.8 Environmental measures embedded into the development proposals

Mitigation by Design

11.8.1 An iterative design process has been carried out, and a range of environmental measures have been embedded into the Proposed Development as outlined in **Chapter 3: Description of the Proposed Development**. **Table 11.10** outlines how these embedded measures would influence the ecological assessment.

Land take and Design Optimisation

11.8.2 Ecological features have been considered at all stages of the design, from early feasibility to final layout. This has helped to avoid or greatly reduce impacts on Important Ecological Features (IEFs) and other ecological features.

11.8.3 Site infrastructure has been designed as far as reasonably practicable to use the minimum land take. For instance, all access track has been designed to be linear, without loops, to avoid creating islands of habitat fragmentation.

11.8.4 The layout of the Proposed Development within the Afton Uplands pLWS has avoided important vegetation communities for which the site has been notified, including upland mire, montane heath and species-rich grassland communities. The layout of the Proposed Development across the rest of the Development Site has also wherever possible, avoided peatland habitat, and where avoidance has not been possible, has been designed to avoid habitats of highest ecological importance and highest sensitivity to effects. This process has been informed by the NVC survey data, Peatland Condition Assessment (PCA) **(Technical Appendix 11B**), with preference for development avoiding blanket bog or in areas broadly categorised as modified/drained or actively eroding, and upon areas of shallower peat.

11.8.5 The proposed borrow pit search areas, the substations, temporary construction compounds and storage/laydown areas have been sited to avoid sensitive vegetation communities.

11.8.6 Another key design consideration has been the avoidance of habitats with potential groundwater dependency, which has been largely achieved by siting the majority of the Proposed Development outwith habitats with potential dependency on groundwater (GWDTEs) and making use of existing tracks. Access to the Proposed Development will utilise the existing access track to the consented Afton Wind Farm to the north of the Proposed Development and also the Lorg Road from the B729 entering the Development Site from the public road from the south of the Development Site.

Watercourse crossings

11.8.7 The sensitive designs (e.g. of watercourse crossing and culverts) presented in **Chapter 3: Description of the Proposed Development** of this EIA Report have been developed to safeguard the water environment and will help effectively mitigate construction-related direct and indirect impacts to fish and other aquatic features. The Proposed Development has been designed to minimise watercourse crossings.

Watercourse buffers

11.8.8 The layout of the Proposed Development has also been designed with a buffer of 50 m around watercourses and waterbodies, where possible, excluding watercourse crossings in order to minimise construction risks on the aquatic environment.

Bat habitat features

11.8.9 In line with current guidance (NatureScot *et al*, 2021) turbines will be positioned at least 50 m (measured from blade-tip) from any features (i.e. key watercourses and woodland edge) likely to be used by commuting and foraging bats to reduce collision risk. Buffer distances have been applied during the design phase in order to avoid areas of habitat with potential to be utilised by commuting and foraging bats. Buffer distances were estimated using the following formula:

$b = \sqrt{((50+bl)^2-(hh-fh)^2}$

(Where b = buffer distance; bl = blade length; hh = hub height; fh = feature height

[all in metres])

11.8.10 The buffer distance for the Proposed Development has been based on a turbine hub height of 119 m, blade length of 81 m and a feature height (fh) 25 m for coniferous woodland or 0 m for watercourses. All turbines would therefore be located at least 87.49 m away from woodland habitat features and 46.42 m from well utilised watercourses to ensure there is a suitable buffer between turbine blade tips and any habitat feature that may be utilised by commuting and foraging bats.

11.8.11 **Table 11.10** outlines how embedded mitigation measures (project assumptions) implanted during construction and operational phases of the Proposed Development influence the ecological assessment.

11.8.12 Full details of construction mitigation measures will be provided in a Construction Environment Management Plan (CEMP) to be agreed with DGC and EAC, in consultation with NatureScot and SEPA, post-consent but prior to construction. A summary of the measures to be included within the CEMP is provided below (**Table 11.10**) and in **Chapter 3: Description of the Proposed Development**.

Table 11.10 Summary of the embedded environmental measures and how these influence the Ecological Assessment

Ecological feature	Changes and effects	Embedded measures and influence on assessment
CONSTRUCTION PHASE		
Afton Uplands pLWS; Blanket bog communities (M17, M18, M19, M20 and M25)	Direct habitat loss as a result of the Proposed Development. Reduction in habitat quality as a result of hydrological connectivity and pollution incidents including dust deposition	The layout of the Proposed Development within the Afton Uplands pLWS has avoided important vegetation communities for which the site has been notified, including upland mire, montane heath and species-rich grassland communities. However, an Ecological Clerk of Works (ECoW) will provide advice to minimise preventable impacts on blanket bog habitats, including preservation of the topsoil/ acrotelm from the habitat that is lost and laying it over the top of the areas to be reinstated (e.g. over the 'cut and fill'). This will provide a local seed source as well as viable root matter for the areas being reinstated. Therefore, the reinstated vegetation is likely to be similar, if not the same, habitat type as previously present. As part of an overarching CEMP, a Peat Management Plan would be developed and submitted pursuant to an anticipated condition of the deemed planning permission, in consultation with a suitably experienced peatland Ecologist, Hydrologist and the relevant consultees, in advance of construction works commencing. This would include the method of removal and storage for vegetated turves and peat together with good practice reinstatement measures for the re-use of excavated peat within the Development Site. Best practice techniques of vegetation and habitat reinstatement would be adopted and implemented in areas of disturbed vegetation, such as cut track sides, cranepads, substation and borrow pits. Early reinstatement of all disturbed areas would be undertaken to minimise the effects of soils and peat exposure erosion. Any plant material used in reinstatement techniques would be of local provenance and be appropriate for locations being restored. Reinstatement techniques would be agreed in consultation with relevant consultees before construction operations begin; and An Outline Habitat Management Plan (OHMP) (**Technical Appendix 11.H**) would be implemented with the aim of ensuring successful restoration of affected blanket bog within candidate Habitat Management Units (HMUs) on -site. The HMP would be submitted pursuant to a condition of the deemed planning permission, following consultation with NatureScot and SEPA.
Otter	Killing/injury/disturbance due to construction works, including lighting, noise and human activity	A Species Protection Plan (SPP) for otter would be prepared to ensure compliance with legislation. It would include details of pre-construction surveys to check on the presence of otters and the following suite of embedded measures that would be implemented across the Development Site to avoid causing harm to, or disturbing this species.

Ecological feature	Changes and effects	Embedded measures and influence on assessment
		Site supervision would be provided by a suitably experienced ECoW, who would be responsible for ensuring the successful implementation of embedded measures, including pollution prevention, monitoring of buffers around construction areas and reference to areas of high ecological sensitivity, and adherence to current construction best practice.
Bats	Disturbance and/ or displacement of commuting and foraging bats	Directional lighting and light spill within 50m of watercourses would be avoided during the hours of darkness (taken to be 30 minutes before sunset to 30 minutes after sunrise). No security lighting to be left on in-situ overnight where practicable. Turbines would be sited the minimum distance from suitable habitat features (equating to a stand-off area of 50 m from blade tip to habitat feature), based upon the calculation set out in **Section 11.8.9**) and in accordance with current guidance (NatureScot et al., 2021).
Badger	Loss/fragmentation of habitat Killing/injury/disturbance due to construction works, including lighting, noise and human activity	Evidence of badger was confirmed within the wider Study Area. A pre-construction badger survey will be carried out within a minimum of 50 m of all proposed infrastructure. In the event that the presence of badger setts is confirmed, a mitigation scheme will be agreed and will be implemented prior to construction.
OPERATION PHASE		
Afton Uplands pLWS	Reduction in habitat quality as a result of pollution incidents	The majority of the specific measures applied during ongoing and operational activities relate to the application of good practice in terms of managing and controlling activities to minimise the risk of pollution upon receptors and hydrological features. A detailed explanation of the general site pollution control, emergency procedures and contingency planning is set out within **Chapter 13: Geology, Hydrology and Hydrogeology**. The potential risks to surface water during operation are likely to be limited and localised based on the planned turbine servicing works and the nature and volume of potentially polluting substances required. The operator would ensure a site-specific risk assessment is completed and that control measures are implemented to ensure all environmental risks are minimised. Storage, use and disposal of oils would be in accordance with good practice and SEPA guidance.
Otter, badger, bats	Disturbance, Kill /injure /destroy habitat, affect distribution.	All operational and maintenance work requirements would be undertaken within working areas clearly defined in advance of works and the storage of materials would be restricted to areas of hardstanding e.g. permanent tracks, crane pads or substation and control building, and associated infrastructure. Strict speed limits would be followed on access tracks during all phases of development, and 'otter crossing' signs would be placed on the access tracks at all water crossings

Ecological feature	Changes and effects	Embedded measures and influence on assessment
		There would be no works undertaken within 50m of the disused Lorg Farmhouse to avoid disturbance to the bat roost.
Bats	Disturbance and/ or displacement of commuting and foraging bats Injury/ mortality resulting from collision with turbines/ barotrauma during the operational phase.	In accordance with current guidance (SNH et al., 2021), turbines would be sited the minimum distance from suitable habitat features (equating to a stand-off area of 50 m from blade tip to habitat feature), based upon the calculation set out in **Section 11.8.9**). Good practice environmental measures would be adopted to minimise the risk of bats colliding with turbines during operation, in accordance with current guidance (SNH et al., 2021). Turbines will have a minimum 50m stand-off distance between blade tips and high-value bat habitats, such as woodland and riparian features. Although this offset has been included in the design of the Proposed Development, this standoff buffer will be maintained throughout the operational life of the Proposed Development by ensuring that tree regeneration does not encroach on the buffer. Based on location-specific results of bat activity monitoring and assessment, turbines that pose the greatest potential collision risk to 'high risk' bat species are Turbine 1, Turbine 2, Turbine 4, Turbine 5 and Turbine 6 (**Technical Appendix 11D**). In order to reduce the potential for bat casualties to occur at these locations, mitigation in the form of 'feathering' would be implemented. This process involves pitching turbine blades out of the wind to reduce rotation speeds while idling, in turn reducing the risk of bat injury/ mortality. Feathering is considered good practice and is recommended for all turbines.
DECOMMISSIONING PHASE		
All ecological features	Similar changes and effects to construction phase	During the decommissioning of the Proposed Development, potential effects on ecological features are expected to be similar to those encountered during the construction phase and therefore similar environmental measures would be required. Any new legislation published prior to decommissioning would be adhered to and incorporated into an Environmental Management Plan prior to decommissioning taking place.

11.9 Assessment Methodology

Introduction

11.9.1 The generic project-wide approach to the assessment methodology is set out in **Chapter 4: Approach to Preparing the Environmental Impact Assessment Report** and specifically in **Section 4.5**. However, whilst this has informed the approach that has been used in this ecological assessment, it is necessary to align to the standard industry guidance provided by CIEEM (2018) and the good practice during wind farm construction (NatureScot, 2021).

11.9.2 The assessment has been based upon not only the results of the desk study and field surveys, but also relevant published information (for example on the status, distribution, sensitivity to environmental changes and ecology of the features scoped into the assessment, where this information is available), and professional knowledge of ecological processes and functions.

11.9.3 For each scoped-in ecological feature (see **Table 11.9**), potential effects were assessed against the current baseline conditions for that feature during construction, operation and decommissioning.

11.9.4 Throughout the assessment process, the initial results of the assessment regarding potentially significant effects have been used to inform whether additional baseline data collection is required, together with the identification of environmental measures that should be embedded into the Proposed Development to avoid or reduce adverse effects or to deliver enhancements (see **Section 11.8**). The results of the assessment, as set out in **Section 11.10** to **11.17**, therefore reflect the final scheme design (i.e. incorporating the environmental measures described in **Section 11.8** and **Table 11.10**).

11.9.5 The spatial extent of the assessment (see **Table 11.9**) reflects the area occupied by the ecological feature that is being assessed and, as a minimum, the ZoI of the changes that may affect it.

11.9.6 Where part of a designated site is located within the ecological ZoI relating to a particular biophysical change as a result of the Proposed Development, an assessment has been made of the effects on the designated site as a whole. A similar approach has been taken for areas of notable habitat.

11.9.7 For species that occur within the ZoI, the assessment has considered the total area that is used by the affected individuals or the local population of the species (e.g. for foraging or as breeding territories) rather than the footprint of the Development Site.

11.9.8 For any potential GWDTEs identified within the NVC Study Area, further hydrological assessment of these was undertaken to assess their level of groundwater dependency. For the potential GWDTEs that were subsequently assessed as likely to be groundwater dependent (referred to as ‘assessed’ GWDTEs where this was considered to be the case), the likely effects of development on these features was then determined (in terms of ecological interest) through qualitative assessment. Further detailed methodology for hydrological assessment of potential GWDTEs and confirmation of assessed GWDTEs is provided within **Chapter 13: Geology, Hydrology and Hydrogeology**

Significance Evaluation Methodology

Overview

11.9.9 CIEEM (2018) defines a significant effect as one "that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general".

11.9.10 When considering potentially significant effects on ecological features, whether these be adverse or beneficial, the following characteristics of environmental change are taken into account[26]:

- Extent – the spatial or geographical area over which the environmental change may occur;
- Magnitude – the size, amount, intensity or volume of the environmental change;
- Duration – the length of time over which the environmental change may occur;
- Frequency – the number of times the environmental change may occur;
- Timing – the periods of the day/year etc. during which an environmental change may occur; and
- Reversibility – whether the environmental change can be reversed through restoration actions.

Magnitude of Change

11.9.11 A scale for the magnitude of the environmental change as a result of the Proposed Development has been described in **Table 11.11** to provide an understanding of the relative change from the baseline position, be that an adverse or beneficial change.

[26] The definitions of the characteristics of environmental change are based on the descriptions provided in CIEEM 2018. Other chapters in this EIA Report may use some of the same terms albeit with a different definition.

Table 11.11 Ecology Guidelines for the Assessment of the Scale of Magnitude

Scale of change	Criteria and resultant effect
High	The change permanently (or over the long-term) affects the conservation status of a habitat/species, reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area and relative to the wider habitat resource/species population, a large area of habitat or large proportion of the wider species population is affected. For designated sites, integrity is compromised. There may be a change in the level of importance of the receptor in the context of the project ZoI.
Medium	The change permanently (or over the long term) affects the conservation status of a habitat/species reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area and relative to the wider habitat resource/species population, a small-medium area of habitat or small-medium proportion of the wider species population is affected. There may be a change in the level of importance of this receptor in the context of the project ZoI.
Low	The quality or extent of designated sites or habitats or the sizes of species' populations, experience some small-scale reduction or increase. These changes are likely to be within the range of natural variability and they are not expected to result in any permanent change in the conservation status of the species/habitat or integrity of the designated site. The change is unlikely to modify the evaluation of the receptor in terms of its importance in the context of the project ZoI.
Very Low	Although there may be some effects on individuals or parts of a habitat area or designated site, the quality or extent of sites and habitats, or the size of species populations, means that they would experience little or no change. Any changes are also likely to be within the range of natural variability and there would be no short-term or long-term change to conservation status of habitats/species receptors or the integrity of designated sites.
Neutral	A change, the level of which is so low, that it is not discernible on designated sites or habitats or the size of species' populations.

Determining Significance - Adverse and Beneficial Effects

11.9.12 Adverse effects are assessed as being significant if the favourable conservation status of an ecological feature would be lost as a result of the Proposed Development. Beneficial effects are assessed as those where a resulting change from baseline improves the quality of the environment (e.g. increases species diversity, increases the extent of a particular habitat etc., or halts or slows down an existing decline). For a beneficial effect to be considered significant, the conservation status would need to positively increase in line with a magnitude of change of "high" as described in **Table 11.11**.

11.9.13 Conservation status is defined as follows (as per CIEEM, 2018):

- "*For habitats, conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and typical species within a given geographical area; and*
- *For species, conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area*".

11.9.14 The decision as to whether the conservation status of an ecological feature would alter has been made using professional judgement, drawing upon the information produced through the desk study, field survey and assessment of how each feature is likely to be affected by the Proposed Development.

11.9.15 A similar procedure is used where designated sites may be affected by the Proposed Development, except that the focus is on the effects on the integrity of each site; defined as:

- "*The coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified*".

11.9.16 The assessment of effects on integrity draws upon the assessment of effects on the conservation status of the features for which the site has been designated. Where these features are not clearly defined, which is often the case for non-statutory biodiversity sites, it is necessary to use professional judgement to identify the interest features or obtain additional information about the interest features from NatureScot, Scottish Wildlife Trust or the local planning authority responsible for identifying these sites, so that sufficient information on which to base an assessment is available.

11.10 Assessment of Effects

11.10.1 This section considers the potential impacts and associated effect significance of the construction, operation and decommissioning phases of the Proposed Development.

Construction Phase Effects

11.10.2 The assessment of likely effects associated with construction of the Proposed Development is based on the activities described in **Chapter 3: Description of the Proposed Development**.

Designated Sites

Afton Uplands pLWS

11.10.3 The Development Site is located within Afton Uplands pLWS. An extensive upland site which encompasses a range of upland mire, montane heath and grassland habitats. Habitats recorded within the Development Site however, comprise extensive acid grassland and marshy grassland, grading into flushed hillsides and smaller pockets of blanket bog.

11.10.4 *Direct habitat loss and temporary disturbance during construction*: The Proposed Development would result in permanent loss of habitat within the pLWS due to land take (prior to any habitat reinstatement or restoration) associated with the construction of access tracks, wind turbine foundations and crane pads (associated with T11, T12, T13, T14 and T15) and borrow pit search areas.

11.10.5 The anticipated permanent loss of habitat within the pLWS is 3.95 ha out of a total area of the pLWS of 4,100 ha which equates to approximately 0.1% of the pLWS. Habitats that will be directly lost as a result of the Proposed Development include primarily acid grassland with smaller areas of marshy grassland, acid flush and smaller pockets of blanket bog. The majority of the habitats within the pLWS are widespread and in the local area more sensitive, less widespread habitats including M3, M6, M19, M18 have been avoided as far as possible. Therefore, impacts on Afton Uplands pLWS are considered low and **not significant**.

11.10.6 Impacts on specific habitat types (e.g. blanket bog) are considered in more detail in **Section 11.9.11**.

11.10.7 *Reduction in habitat quality as a result of hydrological connectivity and pollution incidents*: Potential effects on the hydrology of surface waters are addressed in detail in **Chapter 13: Geology, Hydrology and Hydrogeology**.

11.1.1 Given the presence of water features throughout the Site, the Proposed Development includes an extensive suite of embedded environmental measures to protect surface watercourses. These are detailed in **Section 11.6** and **Chapter 13: Geology, Hydrology and Hydrogeology**. Through the implementation of embedded measures, the Proposed Development is anticipated to cause temporary (short term) change to the local hydrology regime (low magnitude), with negligible effects to the interest features of the pLWS. The effect on site integrity would be **not significant**.

Habitats

11.10.8 The Proposed Development would result in permanent habitat loss due to land take associated with the construction of access tracks, wind turbine foundations, crane pads, construction compounds, and other associated infrastructure.

11.10.9 Based on the scoping rationale provided in **Technical Appendix 11F**, blanket bog communities (M17, M18, M19, M29, M25) have been identified as an IEF. **Table 11.12** sets out the percentage of habitat loss, disturbance and / or modification by habitat type within the Study Area. Direct habitat loss during construction includes the working areas for each turbine site (turbine base and hard standing area) and the area of proposed new access track. Indirect habitat modification is calculated as a 10m buffer around areas of direct habitat loss as this is considered to represent the worst-case scenario of habitat that is likely to be indirectly modified by the Proposed Development.

11.10.10 As well as direct habitat loss, areas of temporary habitat loss expected during construction have also been identified, including temporary working areas surrounding built infrastructure which will be subject to physical disturbance (for drainage, cable trenches, banked cut faces / batters etc) would be subject to a 4 m buffer surrounding infrastructure to allow machinery to work outside the permanent footprint of any infrastructure component. These areas would be subject to restoration following details of which would be provided within the CEMP.

Table 11.12 Habitat Loss, disturbance or modification from Proposed Development during construction

		Direct Habitat Loss		Temporary habitat loss /disturbance (Ha)		Indirect Habitat Modification	
Habitat	**Total Habitat in Study Area (Ha)**	**Area Lost**	**Percentage Loss (%)**	**Area disturbed**	**Percentage disturbed (%)**	**Area Modified (Ha)**	**Percentage Modified (%)**
Semi-improved acid grassland	792	6.24	0.79	8.1	1.02	-	
Blanket bog	303	5.75	1.9	0.4	0.13	19.31	6.37
Marshy grassland	257	2.54	0.99	0.67	0.26	9.8	3.81
Acid/neutral flush	106	1.7	1.6	1.62	1.53	4.17	3.93
Bracken	54	0.13	0.24	-	-	-	-
Wet modified bog	26	0.06	0.23	0.07	0.27	0.3	1.15
Wet dwarf-shrub heath	3	0.04	1.3	N/A	N/A	0.22	7.33
Semi-improved neutral grassland	1	-	-	N/A	N/A		

Blanket bog communities (M17, M18, M19 and M25) and Wet modified bog (M20)

11.10.11 *Direct habitat loss as a result of the Proposed Development*: A total of four turbine locations are located on blanket bog habitat, NVC communities M17c, M17c mosaic with acid flush/acid grassland and M19a. The anticipated direct loss of blanket habitat during construction of the Proposed Development is expected to be 5.75ha.

11.10.12 **Table 11.12** sets out the percentage of direct and temporary habitat loss by habitat type within the Study Area, respectively. Direct habitat loss during construction includes the working areas for each turbine site (turbine base and hardstanding area), the area of proposed new stone track, the working areas for the substation, and temporary development areas. Indirect habitat modification is calculated as a 10m buffer around the areas of direct habitat loss as this is considered to represent the worst-case scenario of habitat that is likely to be indirectly modified by the Proposed Development.

11.10.13 As well as direct habitat losses, areas have been identified where temporary habitat loss would be expected during construction, including temporary laydown areas and construction compounds. Additionally, those areas surrounding built infrastructure which will be subject to physical disturbance (for drainage ditches, cable trenches, banked cut faces/batters etc.) would be subject to a 4m buffer surrounding infrastructure to allow machinery to work outwith the permanent footprint of any infrastructure component. These areas would be subject to restoration as detailed in the outline CEMP (**Technical Appendix 11H**).

11.10.14 A Peatland Condition Assessment (**Technical Appendix 11B**) provides an additional approach for helping to determine peatland condition and therefore helping to avoid or reduce impacts to the best quality blanket bog habitat. This approach considers presence of all peatland habitats including blanket bog.

11.10.15 The least modified blanket bog community, which was considered closest to 'Near-Natural' (albeit still modified), was the M18. This community was located outside the developable area and zone of influence (likely connectivity) from the scheme. The M18 community comprised a blanket mire community mainly composed of a 'carpet' of *Sphagnum capillifolium* and *Sphagnum papillosum*, along with low, but constant, cover of common and hare's-tail cottongrasses. This also included low cover of *Sphagnum magellanicum*, which is a species indicative of intact blanket mires. Although some grazing impacts were evident the bog-moss carpet was fairly intact.

11.10.16 Most of the rest of the blanket bog recorded was considered to be Modified through drainage, grazing and possibly other historic management practices such a burning, this included much of the M17, M19 and M20. There were multiple drainage ditches present in the eastern section of the Study Area. Some of the drainage ditches appeared to be effectively draining the bog, although some appeared to be less effective. Some of the blanket bog (particularly degraded areas of M17c and M19) was also considered likely to be Actively Eroding and Drained through erosion features.

11.10.17 Effects would be minimised through the implementation of good practice embedded mitigation (**Table 11.10**), including proposals for full habitat re-instatement of temporarily disturbed habitat and the re-use of excavated peat within the Site (Details are provided in **Technical Appendix 6A** – Peat Management Plan).

11.10.18 The area of direct loss (5.81 ha) comprises 1.76 % of the blanket bog resource within the Study Area, which is assessed as being of Local importance for this habitat. A Project Management Plan (PMP will set out good practice guidelines to ensure peat is protected as far as possible and reinstated wherever possible.

11.10.19 Direct and temporary disturbance blanket bog during construction activities is anticipated to be of a low magnitude of change in the short to medium term. The resultant effect on its conservation status is **not significant**.

Reduction in habitat quality as a result of hydrological connectivity and pollution incidents including dust deposition

11.10.20 The assessment of local hydrology **Chapter 13: Geology, Hydrology and Hydrogeology** states that measures would be included to ensure that pre-development runoff rates are maintained and that rates of runoff to watercourses are not increased. Effects would be further minimised through the implementation of proposals (**Table 11.10**) for full habitat re-instatement or restoration of temporarily disturbed habitat and the re-use of excavated peat within the Development Site. The Proposed Development is therefore anticipated to cause temporary (short-term) change to the local hydrology regime (low magnitude), with likely short-term changes in the composition of blanket bog vegetation of Local Importance up to ten metres from proposed infrastructure. Although the magnitude and duration of the impact would depend on the nature of the pollution event, based on a precautionary approach, it has been considered to result in an adverse effect at the local level but this effect is considered to be not significant, particularly as the effect would be localised to watercourse crossing areas, with most standing or running water habitat protected from construction activities by a 50m buffer.

Otter

11.10.21 Otter presence within the Development Site was confirmed by field surveys undertaken most recently in 2021. Evidence of otter activity was recorded along most watercourses within the Study Area, including the Water of Ken, Coranbae Burn, Altry Burn, Small Burn, Lorg Burn and Afton Water. A total of four resting places (three holts and one couch) were also identified within the Study Area. These resting places were located on the north and south bank of Coranbae Burn, the east bank of the Water of Ken and the west bank of Lorg Burn. In addition, two potential resting laces (holts) were recorded align the Altry Burn and Alwhat Burn during the survey.

11.10.22 The baseline status of the otter populations within the Development Site is detailed in the appended survey report (**Technical Appendix 11C**)

11.10.23 Due to the extent of available watercourses (and therefore foraging and commuting habitat) within the Study Area that will remain undisturbed during construction and decommissioning, the availability of habitat resource is not considered to be a limiting factor within the Development Site. In light of this and the embedded mitigation outlined in **Table 11.10**, construction related disturbance/displacement effects to otters within the Development Site would therefore be temporary and sporadic, and the magnitude of change would be low and therefore considered **not significant**.

11.10.24 There is also potential for construction activities to cause fragmentation of otter habitat and prevent the free movement of otters across their territories.

11.10.25 Access tracks have avoided crossing watercourses where possible, but due to the number of watercourses on the Development Site, and limitations regarding access locations, it is not possible for the Proposed Development to take place without some being crossed.

11.10.26 Whilst otters utilise most watercourses within the Development Site, otter territories are likely to cover many kilometres of watercourses within the wider catchment, which are likely to be largely unaffected by construction or decommissioning works. The Proposed Development is likely therefore to represent only a very small proportion of an otter's foraging territory, with alternative routes available, and as such, works would not be expected to result in permanent blockage of existing commuting routes.

11.10.27 On this basis, and in light of the embedded mitigation outlined in **Table 11.10**, the temporary loss or barrier effects during the construction of watercourse crossings would result in a low magnitude of change to the otter population and is therefore considered **not significant**.

11.10.28 The construction phase of the Proposed Development would bring an increased level of machinery and vehicular movement to the area, giving rise to potential for otter to be hit by vehicles. However, a SPP for otter would be produced as part of the CEMP for the Proposed Development, which would be established in advance of works commencing. This SPP will include results of pre-construction surveys carried out to determine the presence of otter and a range of embedded mitigation measures (including work exclusion zone distances for resting places, mammal friendly crossing points, and vehicle speed limits) (see **Table 11.10**). With the adoption of this embedded mitigation, the risk of direct mortality to individuals during the construction and decommissioning phases is low and would result in a low magnitude of change to the otter population and is therefore considered **not significant**.

11.10.29 The Development Site layout has been designed wherever possible to avoid sensitive otter features (including resting sites and commuting routes alongside watercourses and associated riparian zones). It is also necessary to protect food resource for this species by avoiding pollution of watercourses from the Proposed Development. With the adoption of the embedded mitigation detailed in **Table 11.10**, pollution of watercourses and subsequent degradation of food resource for otter is considered neutral for all phases of the Proposed Development. The overall magnitude of change to the otter population is also considered neutral and the resultant effect is considered **not significant**.

Badger

11.10.30 The survey identified evidence of badger activity within the Study Area. Signs of badger commuting and foraging (latrines, pathways, feeding signs, and prints) were recorded north west of the Study Area. Increased levels of noise, vibration, and human activity during the construction phase operations would therefore create potential for disturbance and displacement of badgers that commute, forage, and reside within the Development Site. Areas of badger activity were taken into account when designing the Proposed Development, to avoid potential disturbance/ displacement where possible and no infrastructure is present within at least 50m of known active badger setts.

11.10.31 On this basis, and in light of the embedded mitigation outlined in **Table 11.10**, construction related disturbance and/or displacement effects to badger within the Development Site would be temporary, the magnitude of change would be low, and resultant effect considered **not significant**.

11.10.32 There is also potential for construction activities to sever foraging and commuting routes within the Development Site. However, due to the large extent of available foraging and commuting habitat within the Study Area that will remain undisturbed during construction, the availability of badger foraging resource is not considered to be a limiting factor. In addition, as access routes have been designed to utilise existing tracks where possible, and turbines and associated infrastructure are sited within areas of open habitat, the magnitude of change regarding badger commuting and foraging routes is considered to be low, and resultant effect considered **not significant**.

11.10.33 The construction phase of the Proposed Development would bring an increased level of machinery and vehicular movement to the area, giving rise to potential for badger to be hit by vehicles. However, a SPP for badger would be produced as part of the CEMP for the Proposed Development. This SPP will include results of pre-construction surveys carried out to determine the presence of badger and a range of embedded mitigation measures (including vehicle speed limits) (see **Table 11.10**). With the adoption of this embedded mitigation, the risk of direct mortality to individuals during the construction phase is low,

the magnitude of change with respect to badger populations is low, and therefore **not significant**.

Bats

11.10.34 There is potential for disturbance and/ or displacement of commuting and foraging bats during the construction period as a result of increased noise and artificial lighting levels within the Development Site during hours of darkness.

11.10.35 There is also potential for disturbance/ displacement of roosting bats within the disused Lorg Farmhouse as a result of noise, vibration, and artificial lighting associated with access track and watercourse crossing improvements.

11.10.36 However, with the adoption of the mitigation measures detailed in **Table 11.10**, the potential magnitude of change is considered to be low and the resultant effect on bat populations considered to be **not significant**.

Operational Phase Effects

Afton Uplands pLWS

11.10.37 During the operational phase, no significant effects on designated sites are predicted. The Proposed Development and its normal maintenance activities will not result in effects on the pLWS.

11.10.38 The operational phase is not anticipated to involve any works which will directly or indirectly impact watercourses that run through the pLWS. The potential risks to surface water during operation are likely to be limited and localised based on the planned turbine servicing works and the nature and volume of potentially polluting substances required. The operator would ensure a site-specific risk assessment is completed and that control measures are implemented to ensure all environmental risks are minimised. Storage, use and disposal of oils would be in accordance with good practice and SEPA guidance. Assuming that these measures are implemented correctly, magnitude of change is considered to be negligible and thus **not significant**.

Habitats

11.10.39 During the operational phase, no significant effects on valued habitats are predicted. Once constructed, the Proposed Development and its normal maintenance activities will not result in effects on habitats. There is some limited potential for incidents and spillages associated with service activities but this is very low. The magnitude of change is considered to be negligible and this **not significant**.

Protected Species

11.10.40 Maintenance of the Proposed Development is likely to result in occasional vehicle movements and personnel presence throughout the operation of the Proposed Development. However, this activity will be limited to the Proposed Development infrastructure and wind turbine generators, with limited disturbance of the surrounding environment (including riparian habitats, with the exception of occasional culvert maintenance). Due to the infrequency and localised nature of operational activities, the potential detrimental effect for protected mammal species is considered to be of negligible magnitude and is therefore **not significant**.

Bats

11.10.41 The main risk to bats from operational wind farm developments relates to:

- Direct collision with fast-moving turbine blades resulting from trauma injuries; and
- Barotrauma (i.e. internal haemorrhaging in the lungs resulting from rapid changes in air pressure behind moving turbine blades).

11.10.42 The degree of population-level risk from collision with wind turbines/barotrauma for those bat species identified to utilise the Development Site are shown in **Table 11.13**.

Table 11.13 Level of Potential Vulnerability of Populations of Bat Species in Scotland

		Collision Risk		
Relative abundance		**Low**	**Medium**	**High**
	Common species			Common pipistrelle Soprano pipistrelle
	Rarer species	Brown long-eared bat Daubenton's bat		
	Rarest species	Whiskered bat Brandt's bat		Nathusius' pipistrelle Noctule Leisler's bat

Table extracted from SNH *et al.* (2021).

Yellow – low population vulnerability; Amber – medium population vulnerability; Red – high population vulnerability.

11.10.43 Results of the bat activity survey indicate that at least three bat species classified as 'high risk' of turbine collision have been confirmed to utilise the Development Site – these are common pipistrelle, soprano pipistrelle, and Noctule/ *Nyctalus* species.

Common *pipistrelle*

11.10.44 **Table 11.13** illustrates that common pipistrelle is a species of medium population vulnerability that is classified as high risk of collision with wind turbines. Results of the potential collision risk assessment (as required by SNH *et al*., 2021) indicates that the Development Site is considered to pose an overall 'low' collision risk at seven monitoring locations, and 'medium' collision risk at two monitoring locations (Location A in Summer and Autumn and location E in Autumn) (See Figure 2.1 – **Technical Appendix 11.D**).

11.10.45 However, through taking into account the embedded mitigation described in **Table 11.10** (maintaining a minimum buffer distance between turbines and habitat features that may be utilised by commuting and foraging bats, and application of blade feathering at turbines posing a high collision risk during seasons of greatest bat activity), the potential magnitude of change in terms of risk to populations of common pipistrelle is considered to

be low and the resultant effect on common pipistrelle populations considered **not significant**.

Soprano *pipistrelle*

11.10.46 **Table 11.13** illustrates that soprano pipistrelle is also a species of medium population vulnerability that is classified as high risk of collision with wind turbines. Results of the potential collision risk assessment indicate that the Development Site is considered to pose an overall medium collision risk to this species during typical levels of activity, with a high collision risk demonstrated at certain locations during peak levels of activity (Turbine 1 during Summer and Autumn (monitoring location A); and Turbine 2 (monitoring location B), and Turbine 4 (monitoring location D), Turbine 5 (monitoring location E), and Turbine 6 (monitoring location F) during Autumn).

11.10.47 However, through taking into account the embedded mitigation described in **Table 11.10** (maintaining a minimum buffer distance between turbines and habitat features that may be utilised by commuting and foraging bats, and application of blade feathering at turbines posing a high collision risk during seasons of greatest bat activity), the potential magnitude of change in terms of risk to populations of soprano pipistrelle is considered to be low and the resultant effect on common pipistrelle populations considered **not significant**.

Noctule/ Nyctalus species

11.10.48 Results of the site-wide potential collision risk assessment for *Nyctalus* species display a median risk category score of 15 and a maximum risk category score of 18, indicating that the overall collision risk for *Nyctalus* bat species within the Study Area is 'high' (**Table 11.13**).

11.10.49 Based on median risk category scores presented within collision risk data in **Technical Appendix 11D** (Annex H), monitoring locations that represent a 'high' overall collision risk to *Nyctalus* species are as follows:

- Location A during Autumn;
- Location B during Autumn;
- Location D during Autumn;
- Location E during Autumn;
- Location F during Autumn; and
- Location H during Autumn.

11.10.50 These monitoring locations were positioned within the south-east of the Study Area in open upland habitat, suggesting that *Nyctalus* may utilise the open landscape and associated linear features (watercourses and coniferous woodland edge) as a commuting route during the transitionary period of the active bat season.

11.10.51 However, through taking into account the embedded mitigation described in **Table 11.10** (maintaining a minimum buffer distance between turbines and habitat features that may be utilised by commuting and foraging bats, and application of blade feathering at turbines posing a high collision risk during seasons of greatest bat activity), the potential magnitude of change in terms of risk to populations of *Nyctalus* is considered to be low and the resultant effect considered **not significant**.

Decommissioning Effects

Afton Uplands pLWS

11.10.52 In common with the construction and operational phases, no significant effects, either positive or negative are predicted on this site. Impacts from decommissioning works are anticipated to be of a similar nature to the construction phase impacts and therefore similar mitigation would be required.

Habitats

11.10.53 Decommissioning impacts would involve personnel and machinery accessing locations across the Study Area to dismantle and remove infrastructure, including turbines, hardstanding and site buildings, as detailed in **Chapter 3: Description of the Proposed Development**. The wind turbines and associated infrastructure would be removed to ground level, with the concrete turbine foundations left in-situ and broken down to approximately 1m below ground level. Substation foundations would also be removed. The access tracks and electrical cables would be left in-situ to minimise habitat disturbance. These impacts would be short-term, intermittent and temporary and last weeks or months at any given location. Existing access tracks would be used to access the infrastructure to be decommissioned. As a result, effects on habitats are predicted to be short term and temporary, with habitats allowed to recover and regenerate following the removal of infrastructure.

Protected Species

11.10.54 Decommissioning activities are considered to be of a similar nature to those of the Proposed Development during construction; therefore, potential exists for direct and indirect effects to protected and/ or notable species. Decommissioning activities may result in a localised increase in noise, vibration, traffic, and presence of people, which in turn has potential cause disturbance and/ or displacement of otter, badger and bats. Subject to the development and implementation of a Decommissioning Plan prior to decommissioning taking place, this effect is considered to be of low magnitude and is therefore **not significant**.

11.11 Ecological Enhancement Measures

11.11.1 An Outline Habitat Management Plan (**Technical Appendix 11H**) sets out criteria for identifying and delivering blanket bog habitat management on-site. A core aim of the habitat management proposals will be to help conserve, enhance and restore degraded or modified blanket bog habitats. Suitable areas for peatland restoration have been identified and comprise historically drained or modified peatland including areas of actively eroding peat (i.e. gulleys and haggs). The extent of these areas would be subject to refinement prior to completion of the final Habitat Management Plan, but restoration would aim to restore peatland/blanket bog habitat within the identified candidate management units. These areas have the potential for recovery and would respond to a programme of damming and in some places the removal of grazing.

11.11.2 The peatland restoration proposals outlined will provide a variety of benefits to this habitat, the assemblage of species that depend upon it and in terms of associated ecosystem services benefits e.g. the carbon storage and downstream water quantity and quality.

11.12 Residual Effects

11.12.1 The summary assessment below deals in an integrated way with the effects of all phases of the Proposed Development. Potential effects are considered together as the assessment focuses on the favourable conservation status of each feature and as such, is assessed throughout the lifespan of the Proposed Development. Often changes to a feature would occur during several stages of the Proposed Development and the resultant effect may reverse during different phases. For example, during construction a population may decline, however, this effect may be reversed during operation. **Table 11.14** summarises the significance of effect for each IEF and the residual significance.

Table 11.14 Summary of Residual Effects

Ecological Receptor	Summary of predicted effects (during construction, operation and decommissioning)	Significance[3]	Mitigation	Significance of Residual Effect and Summary rationale
Afton Uplands pLWS	(Direct loss and temporary damage to terrestrial habitats (construction, operation, decommissioning). Reduction in habitat quality as a result of hydrological connectivity and pollution incidents.	Not significant	No further mitigation beyond embedded mitigation as detailed in **Table 11.10**. Ecological enhancement will be provided in the form of peatland restoration within the Site (see **Technical Appendix 11H OHMP**).	**Not Significant** The Proposed Development would result in a non-significant loss or modification of largely widespread habitats within the local area.
Blanket bog communities (M17, M18, M19, M20, M25)	Direct habitat loss as a result of the Proposed Development. Reduction in habitat quality as a result of hydrological connectivity and pollution incidents including dust deposition	Not Significant	No further mitigation beyond embedded mitigation as detailed in **Table 11.10**.	**Not Significant** The Proposed Development would result in a non-significant loss or modification of blanket bog habitats within the Site, which would be offset through the compensatory peatland restoration proposed delivered through an HMP expected to be required by a Planning Condition.
Otter	Disturbance/ displacement to local otter population. Direct damage to resting sites and disturbance to individuals using resting sites due to elevated levels of disturbance (such as increased, lighting and human disturbance) during construction/operation and decommissioning related works Temporary severance of otter habitats and commuting routes Direct mortality due to construction related activities.	Not Significant	No further mitigation beyond embedded mitigation as detailed in **Table 11.10**.	**Not Significant** Due to the extent of available watercourses surrounding the Development Site that will remain undisturbed during construction, availability of foraging, shelter habitat resource is not considered to be a limiting factor within the Development Site. Sensitive design layout and the protection of watercourses, as well as the implementation of an otter SPP and other embedded mitigation measures during construction would ensure that the magnitude of any

Ecological Receptor	Summary of predicted effects (during construction, operation and decommissioning)	Significance[3]	Mitigation	Significance of Residual Effect and Summary rationale
	Reduction in habitat quality as a result of hydrological connectivity and pollution incidents and impacts on prey.			disturbance / displacement effects would be low. The overall effect of the Proposed Development on otter will be low magnitude in the short term and the effects on the conservation status on otter would be not significant.
Badger	Direct mortality as a result of construction related activities Disturbance/ displacement of badger during construction and operation due to elevated levels of noise, lighting, and human presence during construction/ operation related works Temporary severance of badger foraging habitat and commuting routes	Not Significant	No further mitigation beyond embedded mitigation as detailed in Table 11.10.	**Not Significant** Embedded mitigation measures during construction, operation and decommissioning would reduce the risk of effects on these species and would ensure that the magnitude of any disturbance / displacement effects would be low. The overall effect of the Proposed Development on badger will be low magnitude in the short term and the effects on badger would be not significant.
Bats (community and foraging)	Disturbance and/ or displacement of commuting and foraging bats Direct effect in the form of injury/ mortality from collision with turbines during the operational phase.	Not Significant	No further mitigation beyond embedded mitigation as detailed in Table 11.10.	**Not Significant** With the implementation of the proposed bat mitigation measures and other good practice measures, no significant negative residual effects are predicted.

1. The sensitivity/importance/value of a feature is defined using the criteria set out in Table 11.8 and is defined as negligible, local, county, regional, national, international.
2. The magnitude of change on a receptor resulting from activities relating to the development is defined using the criteria set out in Table 11.11 and is defined as neutral, low, medium and high
3. The significance of the environmental effects is based on the combination of the sensitivity/importance/value of a feature and the magnitude of change subject to the evaluation methodology outlined 11.8.9 – 11.8.16.

11.13 Assessment of cumulative effects

11.13.1 As outlined in **Section 4.8**, consideration has been given as to whether any IEFs that have been taken forward for assessment in this chapter are likely to be subject to cumulative effects because of effects generated by other developments.

11.13.2 Significant effects may not occur when considering the Proposed Development in isolation, but when potentially significant effects are considered in combination with nearby existing or proposed developments, significant cumulative effects may arise during each phase of the development. The context in which cumulative effects are considered depends upon the ecology of the species or habitat in question. The need to consider cumulative effects is a requirement of the EIA process, as specified by the EIA Regulations.

11.13.3 Within 20km of the Site there are a number of existing, consented and potential schemes:

- 15 operational sites;
- 17 consented sites;
- 9 application stage sites; and
- 4 scoping stage sites.

11.13.4 A cumulative assessment summary is presented in **Table 11.15**.

Table 11.15 Summary of cumulative sites

Site	Phase	Impacts to blanket bog	Impacts to Provisional Afton Uplands LWS	Impacts to bats
Euchanhead	Application	*The proposals would result in the direct loss and indirect/temporary loss of up to 9.79 ha of locally-regionally important blanket bog (typically degraded) and up to 3.24 ha of locally important wet modified bog habitat. The loss will be compensated for through measures aimed at restoring up to 23 ha of peatland habitat delivered through an HMP.* Therefore, some cumulative effects are likely, however it is considered that these will be of low magnitude and not significant.	Euchanhead Wind Farm is within the Afton Uplands pLWS, therefore impacts to habitats will be cumulative.	Cumulative effects are possible, although meaningful assessment is impossible. Following the implementation of the proposed environmental measures there is no potential for significant residual effects at Lorg Wind Farm and therefore the possibility of significant cumulative effects due to Lorg Wind Farm is very low.
Sanquhar	Operational	EIA assessment documents unavailable.	No cumulative effect. Not within the Afton Uplands pLWS.	As above.
Sanquhar II	Application	*The loss of blanket bog, wet modified bog and dry modified bog is approximately 7.3% and therefore assessed as being of medium magnitude, of moderate significance and permanent. However, some habitat enhancement work/bog restoration is proposed to offset this.* Therefore, some cumulative effects are likely, however it is considered that these will be of low magnitude and not significant.		As above.
Sanquhar 6	Consented	*Negative impact of low magnitude of low significance. Some positive impacts due to habitat restoration. Some cumulative effects likely*. Impacts considered to be of low magnitude and not significant.	No cumulative effect. Not within the Afton Uplands pLWS.	As above.
Conharrow Variation	Application	Bog and mire communities within the Development Site have low cover and occurred within coniferous plantation. They were valued as being less that local value and excluded from impact assessment. They were not considered of sufficient value for inclusion	No cumulative effect. Not within the Afton Uplands pLWS.	As above.

Site	Phase	Impacts to blanket bog	Impacts to Provisional Afton Uplands LWS	Impacts to bats
		within a cumulative impact assessment and therefore no cumulative impacts are predicted.		
Shepherds Rig	Application	No cumulative effect – blanket bog not recorded on site.	No cumulative effect. Not within the Afton Uplands pLWS.	As above.
Pencloe	Consented	Habitat restoration is anticipated to have significant, positive effects for bog habitats. Therefore, negative cumulative effects are unlikely and no significant cumulative impacts are predicted.	No cumulative effect. Not within the Afton Uplands pLWS.	As above.
Windy Rig	Under construction	Habitats not referenced in available summary tables. No impact assumed, no cumulative effect.	No cumulative effect. Not within the Afton Uplands pLWS.	As above.
Windy Standard 1, 2 (extension) and 3	Operational (1&2) Planning (3)	EIA assessment documents unavailable.	EIA assessment documents unavailable.	As above
Afton	Operational	EIA assessment documents unavailable.	Afton Wind Farm is within the Afton Uplands pLWS, therefore impacts to habitats will be cumulative.	As above
Hare Hill and Ext	Operational	*Total blanket bog and wet heath habitat impacted during construction will be 55,719m2 which is 0.018% (including cable trenches) of the regional resource and is therefore a minor negative impact and, in light of this, slight adverse and not significant* (SPR, 2007). Some cumulative effects are likely, however it is considered that these will be of low magnitude and not significant.	Hare Hill Wind Farm Extension is largely within the Afton Uplands pLWS., therefore impacts to habitats will be cumulative.	As above
Whiteside Hill	Operational	EIA assessment documents unavailable.	No cumulative effect. Not within the Afton Uplands pLWS.	As above

Site	Phase	Impacts to blanket bog	Impacts to Provisional Afton Uplands LWS	Impacts to bats
Whether Hill	Operational	No impact, no cumulative effect.	No cumulative effect – not within the Afton Uplands pLWS.	As above
Glenmuckloch	Consented	Minor adverse effects predicted on mire and bog habitats. Therefore some cumulative effects considered likely, however these are considered to be of low magnitude and not significant.	No cumulative effect – not within the Afton Uplands pLWS.	As above
Lethans	Consented	*Blanket bog recorded (Applied Ecology, 2019). Some habitat loss anticipated, however habitats are small in area and restricted to forest rides so loss is likely to be low*. EIA report unavailable. Therefore, some cumulative effects are likely however it is considered that these will be of low magnitude and not significant.	No cumulative effect – not within the Afton Uplands pLWS.	As above
Twentyshilling	Under construction	No impact, no cumulative effect.	No cumulative effect – not within the Afton Uplands pLWS.	As above
Sandyknowe	Consented	Moderate positive impacts are predicted for blanket bog. Therefore, negative cumulative effects are unlikely and no significant cumulative impacts are predicted.	No cumulative effect – not within the Afton Uplands pLWS.	As above

11.13.5 Assessment of cumulative effects has been limited to the Afton Uplands pLWS, blanket bog and bats:

- The majority of wind farm developments for which EcIA documents were available (Hare Hill Ext, Pencloe, Sandy Knowe, Lethans, Glenmuckloch, Sanquhar II and Cornharrow Resubmission) involved the loss of at least some bog and flush habitats. However, the loss was typically small and at some sites was more than off-set through habitat creation/restoration. Therefore no significant cumulative effects on blanket bog habitats are considered likely.
- Three wind farm sites for which EcIA documents (Hare Hill and Ext, Afton and Sanquhar II) were available overlap the Afton Uplands pLWS. Loss of upland habitats was either minimal of off-set through habitat restoration (e.g. Afton Wind Farm). In addition, loss of habitat due to the Proposed Development is small (15.75 ha) representing a very small proportion of the pLWS. Therefore no significant cumulative effects on the Afton Uplands pLWS are considered likely.
- Meaningful cumulative assessment for bats is not possible. However, following the implementation of proposed embedded measures there is no potential for significant residual effects at the Proposed Development and therefore the possibility of significant cumulative effects is very low.

11.14 Consideration of optional additional mitigation or compensation

11.14.1 No additional mitigation measures are proposed to further reduce the Proposed Development effects that are identified in this EIA Report. This is because all relevant and implementable measures have been embedded into the development proposals and are assessed above in this chapter. These measures are considered to be likely to be effective and deliverable, and address the likely significant effects of the Proposed Development.

11.15 Implementation of environmental measures

11.15.1 **Table 11.16** describes the environmental measures embedded within the Proposed Development and the mechanism by which they would be implemented (e.g. planning condition) and who is responsible for their implementation.

Table 11.16 Summary of environmental measures to be implemented

Environmental measure	Responsibility for implementation	Compliance mechanism
CONSTRUCTION PHASE		
Preparation and implementation of a final Peat Management Plan and Construction Environmental Management Plan (CEMP)	Developer	Planning condition
Protected species pre-construction surveys including otter and badger	ECoW	Planning condition (CEMP)
Preparation and implementation of Otter Species Protection Plan	Developer	Planning condition (CEMP)
Preparation of reinstatement and restoration plan	Developer	Planning condition
Adherence to Pollution Prevention Plan as fully detailed in Chapter 13: Geology, Hydrology and Hydrogeology.	Construction Manager and ECoW.	Planning condition (CEMP)
Watercourse exclusion zones (50m buffers) and restrictions on timing of works within these zones implemented through the CEMP	Developer/Contractor	Planning condition
Culvert designs and construction in accordance with SEPA good practice. Construction/installation and monitoring requirements implemented via the CEMP	Developer/Contractor	Planning condition
OPERATION PHASE		
Monitoring of effects on freshwater ecology through an Environmental Monitoring Plan (fish, freshwater invertebrates and water quality).	Developer	Planning condition
DECOMMISSIONING PHASE		
Preparation and implementation of a Restoration and Decommissioning Plan.	Developer	Planning condition

11.16 References

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12. Ornithology

12.1 Introduction

12.1.1 This chapter of the EIA Report assesses the likely significant effects[1] of the Proposed Development with respect to ornithology. The chapter should be read in conjunction with the development description provided in **Chapter 3: Description of the Proposed Development,** and with respect to relevant parts of **Chapter 11: Ecology**, where common receptors have been considered and there is an overlap or relationship between the assessment of effects. The Chartered Institute of Ecology and Environmental Management (CIEEM, 2022) "*Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (Version 1.2)*" refer to receptors being 'ecological features', defined in the guidance as pertaining to habitats, species and ecosystems. However, for the purposes of this EIA Report, for which separate ecology and ornithology chapters have been produced, the term 'ornithological feature' is adopted to differentiate terminology and avoid any confusion between the two chapters.

12.2 Limitations of this assessment

12.2.1 The results of a desk study and field surveys (**Appendices 12A-D and Confidential Appendices 12E-H**) have been used to determine the baseline context of the study area. While the desk study extended beyond the Development Site, access to undertake field surveys beyond part of this was not possible due to access restrictions (**see Appendices 12A-D**). The baseline data used to inform the assessment presented within this chapter was therefore limited by a lack of access to areas adjacent to the Development Site. In addition, the Development Site boundary has expanded by approximately 151 ha since the desk study and field surveys were undertaken. However, it is considered that the information available provides a robust basis for undertaking an Ecological Impact Assessment (EcIA) as:

- Desk study data is available for adjacent areas and this suggests that these are not markedly different to the Development Site in respect of the potential presence of notable ornithological features[2] and those with legal protection;
- Aerial imagery and observation from within the study area indicates that habitats within adjacent areas where access was not possible are likely to be similar to those accessible areas within the overall study area. It is reasonable to assume therefore that ornithological features in adjacent areas where access was not possible are not markedly different from those that occur within the Development Site; and
- The likelihood of potentially significant effects generally diminishes with distance from a proposed development, particularly where these relate to direct effects.

12.2.2 Field surveys predominantly followed the survey guidance that is widely recognised by NatureScot (2017 v2). However, where deviations occurred due to issues including adverse weather, health and safety concerns and problems with land access, these are described in the accompanying survey reports (**Appendices 12A-D**).

[1] In this Ornithology Chapter, the term "potentially significant effects" is used in the sections prior to the "scope of the assessment" (Section 12.8) being determined, as it accords with CIEEM (2022) guidance. The term "likely significant effects" is used once the scope of the assessment has been determined. The use of this term is not to be confused with Likely Significant Effects (LSEs) as used in the context of a Habitats Regulations Assessment.
[2] Notable ornithological features are those with conservation designations, but no legal protection.

12.2.3 It is therefore considered that the above limitations do not affect the robustness of the assessment of the likely significant effects of the Proposed Development.

12.3 Relevant legislation, planning policy and technical guidance

Legislative context

12.3.1 The following legislation is relevant to the assessment of the effects on ornithology receptors[3]:

- *The Conservation of Habitats and Species Regulations 2017 (as amended)* (the Habitats Regulations);
- *The Wildlife & Countryside Act 1981 (as amended)* (WCA)*;*
- *The Nature Conservation (Scotland) Act (2004)*; and
- *The Wildlife and Natural Environment (Scotland) Act 2011.*

Planning policy context

12.3.2 A summary of the relevant planning policies is given **in Table 12.1**. The full policies are included at **Appendix 12K**.

Table 12.1 Planning policy issues relevant to ornithology

Policy reference	Policy issue	Considered in Section
National planning policies		
Scottish Planning Policy (SPP), the Scottish Government, June 2014 (https://www.gov.scot/publications/scottish-planning-policy/pages/2/)	The planning system should protect and enhance natural heritage. Significant protection and consideration will be needed for wind farms that may affect Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Ramsar sites, Sites of Special Scientific Interest (SSSIs) and National Nature Reserves (NNRs).	**12.10-12.14, 12.5 and 12.7**
The Scottish Biodiversity List (SBL) (https://www.nature.scot/scottish-biodiversity-list)	Public bodies must carry out a biodiversity duty in relation to bird species on this list (which include 15 species recorded during the surveys).	**12.5, 12.7, 12.10 and 12.12-12.13**

[3] The Chartered Institute for Ecology and Environmental Management refer to biodiversity receptors within technical guidance as ecological features, though the term ornithological receptors has been adopted for the purposes of this Chapter.

Policy reference	Policy issue	Considered in Section
The 2020 Challenge for Scotland's Biodiversity, Scottish Government, 2013 (The 2020 Challenge) (https://www.gov.scot/publications/2020-challenge-scotlands-biodiversity-strategy-conservation-enhancement-biodiversity-scotland/)	Favourable condition is targeted for SPAs, SACs, Ramsar sites, SSSIs, NNRs and Local Nature Reserves (LNRs). Meeting conservation objectives for priority species (including SBL birds) is also a government priority.	**12.5, 12.7, 12.10 and 12.12-12.13**
Development plan policies		
Dumfries and Galloway Local Development Plan 2 (LDP2) Policy NE4	Proposals likely to have a significant effect on SACs, SPAs, candidate SACs (cSACs), proposed SPAs or Ramsar site will require an appropriate assessment under the Habitats Regulations.	**12.5, 12.7 and 12.11**
Dumfries and Galloway LDP2 Policy NE6	Developments must either avoid adverse effects on the integrity of SSSIs or, if they cannot, must outweigh this harm on grounds of national importance.	**12.5, 12.7 and Appendix 12I**
Dumfries and Galloway LDP2 Policy IN1	Wind developments will be judged on their merits in several areas including their impact on biodiversity. Detailed consideration will be needed for wind farms that may affect SPAs, SACs, Ramsar sites, SSSIs or NNRs.	**12.5, 12.7, 12.10-12.14 and Appendix 12I**
Dumfries and Galloway LDP2 Policy IN2	Wind developments will be judged partly in reference to how well they avoid biodiversity impacts.	**12.5, 12.7 and 12.10-12.14**
East Ayrshire Local Development Plan (LDP) Policy ENV6	Development likely to affect SPAs, SACs or Ramsar sites significantly will need a Habitats Regulations Appraisal (and must have no adverse effect on their integrity). Development must either avoid adverse effects on the integrity of SSSIs or, if they cannot, must outweigh this harm on grounds of national importance. Development affecting areas of local nature conservation importance need to demonstrate avoidance or mitigation of impacts. Any	**12.3, 12.5, 12.7, 12.10-12.14 and Appendix 12I**

Policy reference	Policy issue	Considered in Section
	impacts on protected species must be considered fully.	
East Ayrshire LDP Policy RE1	Renewable energy developments must not have unacceptable adverse impacts on natural heritage (including birds).	**12.10-12.14**

Technical guidance

Overarching guidance

12.3.3 The Chartered Institute of Ecology and Environmental Management has produced relevant general guidance on impact assessment in ecology and ornithology:

- *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Version 1.2* (dated September 2018 and updated April 2022).

Guidance specific to wind farms

12.3.4 NatureScot (formerly Scottish Natural Heritage) have also published a technical guidance series covering bird surveys and assessment for wind farms:

- *Recommended bird survey methods to inform impact assessment of onshore wind farms* (NatureScot, 2017 v2);
- *Assessing significance of impacts from onshore wind farms outwith designated areas* (NatureScot, 2018a);
- *Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model* (NatureScot, 2018b);
- *Assessing the cumulative impacts of onshore wind farms on birds* (NatureScot, 2018c);
- *Assessing Connectivity with Special Protection Areas (SPAs)* (NatureScot, 2016a);
- *Dealing with construction and birds* (NatureScot, 2016b);
- *A review of disturbance distances in selected bird species* (Ruddock & Whitfield, 2007); and
- *Good Practice during Wind Farm Construction* (3rd Edition; Scottish Renewables, SNH, SEPA, Forestry Commission Scotland and Historic Environment Scotland, 2015).

12.4 Data gathering methodology

Study area

12.4.1 The study area encompasses the area over which all desk-based and field data was gathered to inform the assessment presented in this chapter. Due to the presence of

multiple ornithological features and many potential effects, the level and type of data collection varies across the study area. The "study area" comprises:

- The Development Site (as defined in **Chapter 3: Description of the Proposed Development** and illustrated in **Chapter 1: Introduction, Figure 1.1**);
- The desk study area for legally protected and notable ornithological features (**Figure 12.1**);
- The desk study area for statutory and non-statutory ornithological sites (**Figure 12.2**); and
- The field survey areas (**Figure 12.3**).

12.4.2 The extent of the desk study and field survey areas were determined based on best practice guidance, and a high-level overview of the types of ornithological features present and potential effects that could occur (see **Table 12.1**). The study area was defined on a precautionary basis to ensure that, as a minimum, the Zone of Influence (ZoI)[4] relevant to all ornithological features was covered during baseline data collection activities.

12.4.3 As the design process has evolved iteratively, the study area, and its constituent parts, has been regularly reviewed to ensure that its extent was adequate to enable the assessment of all potentially significant effects of the ecological features identified. Changes to the initial Developable Area, and the precise nature of the Proposed Development, have been reviewed in light of the ornithological features present (informed in turn by the data gathering exercise) and potential effects that could occur.

Desk study

12.4.4 The desk study was initially undertaken for the 2015 Environmental Statement (ES) but was subsequently updated in 2019 (Wood, 2019a and Wood, 2019b). A summary of the organisations that have supplied data, together with the nature of that data, is presented in Error! Reference source not found..

Table 12.2 Sources of Desk Study Data

Source	Summary of information provided
Department for Environment, Food and Rural Affairs (DEFRA) MAGIC website	Locations of statutory designated sites within 20 km of the Development Site.
NatureScot SiteLink website	Details of cited features of designated sites.
RSPB	Black grouse records (including lek sites) and other notable species records within 1.5 km - 4 km of the Development Site.
Dumfries and Galloway Raptor Study Group (D&GRSG)	Records of protected raptors and other species of designated conservation concern within 2 km, and eagles within 6 km of the Development Site (all including nest site locations).
Scottish Raptor Study Group (SRSG)	Annual publications detailing population and productivity estimates based on monitored populations for raptor species at the national, regional and county level.

[4] In this context, the ZoI is the area over which an individual ornithological feature may be subject to a potentially significant effect resulting from changes in the baseline environment due to the Proposed Development.

Source	Summary of information provided
South Strathclyde Raptor Study Group (SSRSG)	Records of protected raptors and other species of designated conservation concern.

12.4.5 Additional primary sources of contextual information were:

- Bird Atlas 2007-2011 (Balmer *et al.,* 2013);
- Lorg Wind Farm 2015 ES (Wood, 2019a; and Wood 2019b);
- The Birds of Scotland (Forrester *et al.,* 2007);
- The Scottish Raptor Monitoring Scheme Annual Report 2012 (Etheridge *et al.,* 2013);
- The Scottish Raptor Monitoring Scheme Report 2016 (Challis *et al.,* 2018);
- The Scottish Raptor Monitoring Scheme Report 2020 (Challis *et al.,* 2022); and
- Literature review to assess bird species connectivity to Special Protection Areas (Pendlebury *et al.,* 2011).

Survey work

12.4.6 A list of the ornithological field surveys carried out to inform the preparation of this Chapter is provided in **Table 12.3**. The detailed methodologies for, and results of, these surveys can be found in **Appendices 12A-D**. Following NatureScot (2016c) guidance, Confidential **Appendices 12E-H** present data and figures of flight activity, roosting locations and breeding locations associated with sensitive species. These should be read in conjunction with **Appendices 12A-D**.

12.4.7 **Table 12.3** lists the data compiled within the field survey area(s) as detailed in **Appendices 12A-D**. It should be noted that the extent of these surveys was informed by a scoping process that included consultation with relevant stakeholders (**see Section 12.4**).

Table 12.3 Summary of Ornithological Surveys

Survey	Relevant Guidance	Field Survey Area	Survey period	Reference
Vantage Point (VP) surveys	NatureScot (2017).	Development Site and (where appropriate) 500 m buffer.	25/04/2018-15/08/2018 17/10/2018-26/03/2019 04/04/2019-13/08/2019 19/09/2019-18/03/2020	**Appendices 12A, 12B, 12C and 12D**
Moorland Bird Survey (MBS)	NatureScot (2017).	Consented Development Site and 500 m buffer plus Access Track and 500 m buffer (where	10/04/2018-11/07/2018 17/04/2019-24/07/2019	**Appendices 12A and 12C**

Survey	Relevant Guidance	Field Survey Area	Survey period	Reference
		access available).		
Breeding raptor surveys	Hardey *et al.* (2013) and NatureScot (2017).	Consented Development Site and (where access available) 2 km buffer.	11/04/2018-26/07/2018 28/03/2019-09/07/2019	**Appendices 12A and 12C**
Black grouse lek surveys	NatureScot (2017).	Consented Development Site and (where access available) 1.5 km buffer.	12/04/2018-16/08/2018 28/03/2019-10/05/2019	**Appendices 12A and 12C**

12.4.8 Preliminary surveys were also undertaken by Amec Foster Wheeler (now WSP) and Natural Power between 2010 and 2014. These are summarised as follows:

- VP surveys comprising a total of 42 hours of survey effort from each of four VP locations during the 2010/11 non-breeding season (September/October to mid-March) and again during the 2013 breeding season (April to August), and 36 hours of survey effort at each of four VP locations during both the 2011/12 non-breeding season and 2012 breeding season.
- 36 hours from an additional VP between November 2013 and March 2014 and 42 hours from the same VP between April and August 2014;
- Moorland breeding wader surveys from April to July 2012 and 2013, following the Brown and Shepherd (1993) / Calladine *et al.* (2009) method;
- Breeding raptor surveys April to July 2012 and 2013, following methods in Hardey *et al.* (2013) As there was no access to the 2 km buffer, data from the Dumfries and Galloway Raptor Study Group was sought to fill this gap;
- Black grouse lek surveys April to May 2012 and 2013, following the method in Gilbert *et al.* (1998). Access was restricted to the Development Site and the open areas within the 1.5 km buffer to the north;
- Moorland breeding wader surveys April 2014 to July 2014, following the amended Brown and Shepherd (1993) / Calladine *et al*. (2009) method. These covered the area then proposed as an extension to the existing wind farm, (i.e. an early version of the Proposed Development boundary), access track and a 500 m buffer (where access was available);
- Breeding raptor surveys April to July 2014, following the methods of Hardey *et al.* (2013). These surveyed the then ‘extension’ and surrounding land out to 2 km from what was then proposed as the Development Site boundary (where access was available) along with the access track and surrounding land to 500 m; and
- Black grouse lek surveys April to May 2014, following the method in Gilbert *et al.* (1998). These aimed to detect all lekking males within the extension area (and buffer

to 1.5 km) and within 500 m of the proposed access track (where access was available).

12.5 Overall baseline

12.5.1 A summary of the ornithological baseline as determined through desk study and field survey is provided below. Further species-specific baseline details are provided in **Section 12.11**, and detailed descriptions are provided in **Appendices 12A-D** and Confidential **Appendices 12E-H**.

Current baseline

Development Site context and surrounding habitats

12.5.2 The Development Site is divided into two areas by the steep-sided valley formed by the Water of Ken. Lorg Farmhouse is located on the relatively flat land found north of the river and alongside the Lorg Burn. The valley of the Lorg Burn in the north-west of the Development Site is steeply sloped and surrounded by a semi-circle of high ridges and peaks, including Ewe Hill, Alwhat, Meikledodd Hill and Lorg Hill. The Development Site consists mainly of grass-dominated moorland, with a small area of coniferous plantation woodland encroaching into the north-western corner. Relatively mature plantation forestry covers much of the land to the east of the Development Site as well as land to the south of the proposed access track. Land to the northwest of the Development Site along the Afton Water is also partially forested, but the majority of nearby land north and south of the Development Site comprises similar moorland. The moorland is used primarily for sheep grazing, with habitats predominantly consisting of upland grassland and bog. Several watercourses cross or border the Development Site. These include the Water of Ken in the east of the Development Site, Afton Water and Alwhat Burn in the west.

12.5.3 The Development Site borders the operational Afton Wind Farm to the west.

Statutory nature conservation sites (international)

12.5.4 The Development Site is not subject to any statutory nature conservation designation (e.g. SPA, SAC, SSSI), nor any non-statutory designation (e.g. Sites of Importance for Nature Conservation [SINC]). No reserves managed by the Scottish Wildlife Trust, RSPB or similar organisations are located within the Development Site. Statutory sites are illustrated in **Figure 12.2.**

12.5.5 There is one site of International / European importance for its bird populations within 20 km of the Site: Muirkirk and North Lowther Uplands SPA. This is located approximately 7.5 km to the north-east of the Development Site, and is designated for:

- Golden plover, hen harrier, merlin, peregrine and short-eared owl.

Statutory nature conservation sites (national)

12.5.6 No statutory nature conservation sites designated under national conventions were recorded within the study area.

Non-statutory nature conservation sites

12.5.7 No non-statutory nature conservation sites were recorded within the study area.

Species

12.5.8 Full details of the updated Desk Study can be found in **Appendix 12B**. The exercise identified the following as key species of conservation concern (herein "target species"):

- Relevant SPA qualifying interests: hen harrier, golden plover, short-eared owl, merlin and peregrine;
- Annex I and/or Schedule 1 listed species, including those known to be present in the surrounding area: osprey, goshawk, red kite, dotterel, dunlin and barn owl;
- Waterfowl and Annex I waders on late autumn and early spring passage, including pink-footed goose, whooper swan, and other goose and swan species (excluding feral and introduced breeding species such as Canada goose); and
- Other species of conservation concern: black grouse and long-eared owl.

12.5.9 **Table 12.4** provides a brief summary of all target species recorded during bird surveys. A detailed summary of the species recorded across the Development Site is presented in **Appendices 12A-D**. Following NatureScot (2017) guidance, **Confidential Appendices 12E-H** present data and figures of flight activity associated with sensitive species.

12.5.10 **Table 12.4** indicates whether the bird is a qualifying feature of Muirkirk and North Lowther Uplands SPA, is listed on Annex 1 of the Birds Directive, Schedule 1 of the WCA or is a species of principal importance on the Scottish Biodiversity List (SBL). The species status on the Birds of Conservation Concern (BoCC) list (Stanbury *et al.*, 2021) is displayed as green, amber or red. For convenience, species have been arranged alphabetically as opposed to taxonomically.

Table 12.4 Summary of Ornithological Survey Results April 2018 – March 2020

Species	Status	Number of territories / pairs within Development Site	Summary
Barn owl	Schedule 1, SBL, BoCC Green List	0	Pellets recorded at a location within the Development Site, indicating a confirmed roost and potential nest site. One incidental record in addition.
Black grouse	SBL, BoCC Red List	1	A single male lekking near High Countam in 2018, plus droppings along southern boundary of Development Site. One incidental record in 2019.
Black kite	Annex 1 Birds Directive	0	One record of black kite in 2018, circling to the south of Afton Reservoir immediately north of the Site.
Common sandpiper	BoCC Amber List	2	Two pairs bred within the Development Site along the Water of Ken in 2018. One off-site and one on-site territory in 2019.
Curlew	SBL, BoCC Red List	3-7	Seven pairs on-site in 2018. Three territories in 2019.
Dunlin	SBL, BoCC Red List	0	Two records from VP surveys in 2018 and 2019.
Golden eagle	Annex 1 Birds Directive, Schedule 1, SBL, BoCC Green List	0	A single flight of an immature bird within the 2 km raptor survey buffer was recorded in 2018. A female and an immature bird were recorded over the Development Site on separate VP surveys in 2020. The three golden eagle records all relate to separate birds.
Golden plover	Muirkirk and North Lowther Uplands SPA, Annex 1 Birds Directive, SBL, BoCC Green List	1	Three flights (comprising between one and 50 birds) recorded during VP surveys. Two records of calling birds in 2018 indicating a possible breeding territory. One incidental record in 2019.
Goshawk	Schedule 1, BoCC Green List	0	23 flights recorded during VP surveys. One probable off-site breeding attempt within 2 km of the Development Site in 2018 and two probable attempts in buffer in 2019. Nine incidental records between 2018 and 2020.
Greylag goose	BoCC Amber List	0	Six flights recorded during VP surveys, plus six incidental records.
Hen harrier	Muirkirk and North Lowther Uplands SPA, Annex 1 Birds Directive, Schedule	0	12 flights were recorded during VP surveys.

Species	Status	Number of territories / pairs within Development Site	Summary
	1/1A, SBL, BoCC Red List		
Merlin	Muirkirk and North Lowther Uplands SPA, Annex 1 Birds Directive, Schedule 1, SBL, BoCC Red List	0	Eight flights recorded during VP surveys. One incidental record in 2019. Likely successful off-site breeder in 2018 at one location within 2 km.
Osprey	Annex 1 Birds Directive, Schedule 1, SBL, BoCC Amber List	0	Regularly reported commuting within the 2km buffer in 2018.
Oystercatcher	BoCC Amber List	1	A single pair bred on pasture adjacent to the Water of Ken in 2018. Three incidental records additionally.
Peregrine	Muirkirk and North Lowther Uplands SPA, Annex 1 Birds Directive, Schedule 1, SBL, BoCC Green List	1	16 flights recorded on VP surveys. One pair bred at a known eyrie outside the 2km buffer in 2018. One confidential record from the Development Site in 2019. Seven incidental records.
Pink-footed goose	BoCC Amber List	0	Six observations during VP surveys. Seven incidental records.
Red kite	Annex 1 Birds Directive, Schedule 1, SBL, BoCC Green List	0	105 observations on VP surveys, including various flights over the Development Site. 22 incidental records. Possible off-site breeding within 2 km buffer in 2019.
Snipe	BoCC Amber List	3-13	Recorded widely across the Development Site. Nine pairs bred in south-east of the Development Site in 2018, with two further pairs on Alwhat, another on Alhang and one on the Alhang Burn. Three territories within MBS area in 2019.
Whooper swan	Schedule 1, SBL, BoCC Amber List	0	A single bird flew over during a VP survey in March 2020.

Previous field surveys

12.5.11 Notable findings from the 2010-2014 surveys undertaken by Amec Foster Wheeler (now WSP) and Natural Power are summarised as follows:

- In 2012, a single black grouse was observed lekking within the Development Site, on the south-eastern slopes of Ewe Hill near the boundary of the Development Site. Small numbers of individual black grouse were recorded in 2013 and 2014 utilising areas to the North and South of the Development Site;

- Densities of breeding wader species were low, with a single possible snipe territory recorded in 2012, a single curlew territory and two snipe territories recorded during surveys of the Development Site in 2013, and single curlew and snipe territories identified during breeding wader surveys of the access track in 2014; and
- No Annex 1 and/or Schedule 1 listed raptor/owl species were identified as nesting within / adjacent to the raptor survey area.

Future baseline

12.5.12 Determining a future baseline draws upon information about the likely future use and management of the Development Site in the absence of the Proposed Development, known population trends (for species), climate change and any other proposed developments (consented or otherwise) that may act cumulatively with the Proposed Development to affect ornithological features.

12.5.13 Land use/management is currently anticipated to remain largely unchanged in the absence of the Proposed Development. Agriculture in the form of grazing is expected to continue.

12.5.14 Climate change may lead to wetter and windier weather during the breeding season period, which may negatively affect productivity. However, certain breeding species may benefit from the warmer and wetter conditions predicted.

12.5.15 The influence of other developments on bird species will be addressed through the cumulative assessment at **Section 12.17**.

12.5.16 Overall, it is likely that the general bird assemblage would remain relatively constant compared to the current baseline situation. However, there are several factors that would act over the short and long-term to modify distribution and abundance of species. In the absence of empirical data on long-term population trends, though it is considered that the current baseline is equally likely, or even more likely, to persist over the anticipated lifespan of the Proposed Development rather than there being a fundamental change. It is therefore considered appropriate to use the current baseline for the purpose of this assessment.

12.6 Consultation

12.6.1 **Table 12.5** provides a summary of the issues concerning the Proposed Development that have been raised by consultees (including in response to the Scoping Report). **Table 12.6** provides a summary of relevant responses to the Gatecheck Report submitted to the Scottish Government Energy Consents Unit in May 2022. Both tables also detail the responses given.

Table 12.5 Summary of consultee comments regarding ornithology

Issue raised	Consultee(s)	Comments	Response in this chapter	Section reference
Displacement and collision risk	East Ayrshire Council	*"The Planning Authority notes that previous studies have indicated some presence of raptor species, Owl and Black Grouse. However, studies as late as 2020 have indicated that target species are relatively low in number. The main risk appear to be displacement and collision risk, with minimal loss of nesting and foraging habitat."*	In response, the Ornithological Impact Assessment will follow the CIEEM (2022) guidelines. It will focus on assessing the potential impact of the Proposed Development on any relevant designated sites and any birds of high nature conservation value. Where necessary, mitigation and enhancement measures will be considered.	**12.10-12.14**
Baseline data	NatureScot	*"We note that the survey work undertaken thus far has recorded 14 target species. Although the scoping report suggests there is relatively low levels of flight activity, there is no information presented on flight duration and we cannot comment on this statement at this stage. Clearly the cumulative assessment will be important an element of the assessment, as will ongoing consultation with the RSPB and local raptor study group, which we are pleased to see there is commitment to. We are satisfied with the survey and proposed assessment methodology."*	In response, the EIA Report and supplementary baseline appendices will provide all recorded flight line data.	**12.5 and Appendices 12A to 12H**
Red kite and peregrine activity levels	RSPB	*"We agree with the methodologies and level of the ornithological surveys that have already been carried out as part of the assessment process. We note that, in paragraph 10.2.5* [of the Scoping Opinion], *it is stated that there were high levels of flight activity detected for both red kite (110 record totalling 117 individual flights) and peregrine (25 records totalling 27 individual flights), both of which are known to breed in the area. We recently consulted on other applications around the Lorg site, where cumulative impacts*	In response, the assessment will follow the CIEEM (2022) guidelines. It will focus on assessing the potential impact of the Proposed Development on any relevant designated sites and any birds of high nature conservation value. Where necessary, mitigation and enhancement measures will be considered. Potential impacts include: - Direct habitat loss due to land take by wind turbine bases, tracks and ancillary structures; - Disturbance and displacement of birds from the proximity of the wind turbines. Such disturbance may occur as a consequence of construction work, or due to the presence	**12.14-12.17**

Issue raised	Consultee(s)	Comments	Response in this chapter	Section reference
		on these species were of significant concern. Therefore, as part of the EIA process for this site, we would expect to see a detailed analysis of said impacts, potentially including a population viability assessment."	of operational turbines close to nest sites or feeding areas or on habitual flight routes; and - The effects of collision with rotating turbine blades (i.e. killing or injury of birds), which is of particular relevance for sites located in areas with high raptor activity or which support large concentrations of waterfowl. It is not considered that a population viability assessment for either red kite or peregrine is required. The very low levels of flight activity recorded during surveys for these two species indicates that cumulative impacts are unlikely to be of significance.	
Nesting of Schedule 1 species	RSPB	*"We are also aware of potential schedule 1 species which may be nesting within the wind farm boundary, that may not have been detected by the desk study carried out in 2019. Therefore, we would recommend that a new data request is made to the Dumfries and Galloway Raptor Study Group."*	An updated data search was therefore requested from, and provided by, the Dumfries and Galloway Raptor Study Group in August 2021. This data did not provide anything additional to data already provided previously other than updated occupancy data for two peregrine falcon nest sites within a 5 km buffer of the Proposed Development.	**12.4-12.6**

Table 12.6 Summary of responses to Gatecheck Report regarding ornithology

Issue raised	Consultee(s)	Comments	Response in this chapter	Section Ref
Baseline data	East Ayrshire Council	*"With regards to ornithology, the applicant will submit an impact assessment based on the appropriate environmental management guidelines. This will include the effects of habitat loss, displacement and collision. The Council would reiterate that the views of NatureScot and RSPB should be taken into account in assessing ecology and ornithology impacts."*	Impact Assessment is based on CIEEM (2022) guidelines, and covers effects of habitat loss, displacement and collision. RSPB and NatureScot's views have been considered, and extensive use is made of NatureScot guidance.	**12.3-12.4, 12.7-12.10, 12.16, Appendices 12A-12J**
	NatureScot	*"At this stage I am happy that the gate check report has acknowledged comments made in our consultation response and suggests that they will be addressed in the EIA."*	No further response required beyond items listed in **Table 12.5**.	As per **Table 12.5**

12.7 Scope of the assessment

12.7.1 With the exception of **Chapter 11: Ecology**, the method for determining the scope of the assessment within this chapter differs from that used in other technical chapters within this EIA Report in order to correspond with topic-specific guidance. However, the relevant receptors (i.e. ornithological features), the spatial and the temporal scope are all defined in this chapter. The method has multiple stages enabling the scope of the assessment to be refined progressively.

Scoping of Ornithological Features - Determining Importance

12.7.2 The first stage in determining the scope of the assessment is to identify which ornithological features identified through the desk study and field surveys (see **Section 12.8**) are 'important'[5] in the context of the Proposed Development. Following CIEEM (2022) guidance, the importance of ecological features is determined both with reference to UK legislation and policy and with regard to the extent of habitat or size of population that may be affected by the Proposed Development.

12.7.3 The importance of ornithological features is determined with regard to the extent of habitat or size of population that may be affected by the Proposed Development. Each status can thus differ from that which would be conferred by legislative protection, or by identification as a conservation notable species. For example, skylark is important at a national level: it is an SBL species and features on the Birds of Conservation Concern red list. However, a small population that could be affected by a development would be assessed as being of less than national importance due to the large, albeit declining, UK-wide population (around 1.5 million pairs).

12.7.4 To inform the categorisation described in **Table 12.7**, up-to-date information regarding the extent and population size, population trends and distribution of the ornithological features has been used wherever possible. This enables importance at the project level to be determined. Where detailed criteria or contextual data are not available, professional judgement was used to determine importance.

12.7.5 An explanation of all determinations of importance of scoped-in ornithological features is provided in this section and **Table 12.8**. For transparency, **Appendix 12I** provides a summary of assessed importance for all ornithological features, i.e. those scoped in and out.

Table 12.7 Importance of Ornithological Features

Geographic context of importance	Example / Description
International / European	1. International / European sites including SPAs, SACs and Ramsar sites. Candidate SACs and Sites of Community Importance (SCIs), proposed SPAs (pSPAs) and proposed SACs (pSACs) should also be considered in the same manner, in accordance with National Planning Policy.

[5] Importance relates to the quality and extent of designated sites and habitats, habitat/species rarity and their rate of decline. Ornithological features that are not considered to be important are those that are sufficiently widespread, unthreatened and resilient, with populations that will remain viable and sustainable irrespective of the Proposed Development.

Geographic context of importance	Example / Description
	2. Areas of habitat or populations of species[6] which meet the published selection criteria (based on discussions with NatureScot and field data collected to inform the EIA) for designation as an international / European site, but which are not themselves currently designated at this level.
National	1. A nationally designated site; includes SSSIs and NNRs. 2. Areas (and the populations of bird species which inhabit them) which meet the published selection criteria guidelines for selection of biological SSSIs, but which are not themselves designated based on field data collected, and in agreement with NatureScot. 3. Scottish Biodiversity List (SBL) habitats and species, Red-listed and legally protected species that are not addressed directly in Part 2 of the "Guidelines for Selection of Biological SSSIs" but can be determined to be of national importance using the principles described in Part 1 of the guidance.
Regional	1. Regionally occurring populations of SBL species will be considered of regional importance in the context of published information on population size and distribution.
County	1. Local Nature Reserves (LNRs) and non-statutory designated sites. 2. Areas which, based on field data collected to inform the EIA, meet the published selection criteria for those sites listed above (for habitats or species, including those listed in relevant Local Biodiversity Action Plans) but are not themselves designated.
Local	1. SBL habitats and species, Red-listed and legally protected species that (based on their extent, population size and quality etc.) are determined to be at a lesser level of importance than the geographic contexts above. 2. Common and widespread native species occurring within the study area in numbers greater than may be expected in the local context.
Negligible	1. Common and widespread species that do not occur in levels elevated above those of the surrounding area.

12.7.6 All ornithological features that were determined to be of negligible importance have been scoped out of the assessment at this stage. Further, where there was a specific technical justification to do so, ornithological features of local importance were also scoped out at this stage. This is because effects on them would not influence the decision-making about whether or not consent should be granted for the Proposed Development (i.e. a significant effect in EIA terms could not occur). This approach is consistent with that described in CIEEM (2022) guidance. Specific justification for exclusion of each of these ornithological features is provided in **Appendix 12I (Tables 12I.1-2)**.

12.7.7 All ornithological features that are of sufficient importance were then taken through to the next stage of the scoping assessment.

[6] This includes habitats and species listed under Annex I and Annex II of the Habitats Directive.

Spatial scope

12.7.8 The spatial scope of the assessment of ornithological interest covers the area of the Proposed Development, together with the ZoIs that have formed the basis of the study area described in **Section 12.5**.

12.7.9 The Proposed Development may result in a number of direct and indirect environmental changes that could significantly affect ornithological features/receptors. These could occur at the construction, operation and/or decommissioning phases:

- Construction and decommissioning disturbance: Activities including use of plant and the presence of workforce resulting in an increase in aural and visual stimuli due to noise and vibration; movement of construction vehicles resulting in disturbance or temporary displacement of breeding and foraging birds (potential effects are likely to be greatest during the breeding season and behavioural sensitivity to the effects will vary between species);
- Operational disturbance: The operation of turbines and associated human activities for maintenance purposes also has the potential to cause disturbance and displace birds from the Proposed Development. However, it is recognised that disturbance effects during the operational phase will be lower than during the construction phase (Pearce-Higgins *et al*., 2012).
- Operational displacement leading to barrier effects: Individual turbines or the whole of the Proposed Development may present a barrier to the movement of birds, restricting or displacing birds from much larger areas. The effect this would have on a population is subtle and difficult to predict with any great certainty. If birds must regularly fly over or around obstacles or are forced into suboptimal habitats, this may result in reduced feeding efficiency and greater energy expenditure. By implication, this will reduce the efficiency with which they accumulate energy reserves, potentially affecting breeding success;
- Collision risk: Collision with a turbine rotor is almost certain to result in the death of the bird. It should be noted that operational disturbance and collision risk effects are mutually exclusive in a spatial sense: i.e. a bird that avoids the wind farm area due to disturbance cannot be at risk of collision with the turbine rotors at the same time. However, they may not be mutually exclusive in a temporal sense; should a bird initially avoid the turbines, but later habituate to it and return, it would then be at risk of collision;
- Changes to the surface hydrology that could lead to detrimental changes in wetland flora and fauna as a result of increased drainage and/or dewatering; and
- Increased pollution risk associated with accidental spillage of fuels, oils, run-off and dust emission i.e. via direct contact, air or water, leading to harm or degradation to species and habitats.

12.7.10 The determination of a ZoI for each important ornithological feature identified is key to establishing which environmental changes may result in likely significant effects. ZoIs differ depending on the type of environmental change (i.e. the change from the existing baseline) resulting from the Proposed Development, and the ornithological feature being considered.

12.7.11 The most straightforward ZoI to define is the area affected by land-take and direct land-cover changes associated with the Proposed Development. This ZoI is the same for all affected ornithological features.

12.7.12 By contrast, for each environmental change that can extend beyond this area (e.g. increased noise associated with construction activities within the land-take area), the ZoI

may vary between ecological features. This is dependent upon their sensitivity to the change and the precise nature of the change. For example, a puffin might only be disturbed by noise generated close to its burrow, while nesting goshawk might be disturbed by noise generated at a much greater distance, and other species (e.g. many invertebrates) may be unaffected by changes in noise. In view of these complexities, the definition of the ZoI that extends beyond the land-take area was based upon professional judgement informed (as far as possible) by a review of published evidence (e.g. disturbance criteria for various species) and discussions with the technical specialists who are working on other chapters of the EIA Report.

12.7.13 It should be noted that the avoidance of potentially significant effects through the design process are implicitly taken into account through the consideration of each ZoI. The same applies to standard construction practices that are commonplace. When scoping ornithological features in or out of further assessment, environmental measures (see **Section 12.9**) that are described within BS 42020 (Code of Practice for Planning and Development) (BSI, 2013) and Good Practice during Wind Farm Construction (Scottish Renewables et al., 2019) have been accounted for and referenced in **Appendix 12I**.

Temporal scope

12.7.14 The temporal scope of the assessment of ornithological interest is consistent with the period over which the development would be carried out. It therefore covers the construction and operational periods (see **Chapter 4: Approach to Preparing the EIAR**), namely:

- Construction of the Proposed Development will be completed over a period of approximately 24 months. Construction activities are assumed to take place between 07:00 to 19:00 hours on weekdays (Monday to Friday) and 07:00 to 13:00 hours on Saturdays; and
- Operation of the Proposed Development is anticipated to last 35 years.

12.7.15 Decommissioning would involve complete removal of wind turbines (towers, nacelle, hub, blades and electrical kiosk) plus the control building and associated equipment, the components will be reused or recycled. As with the turbine bases, the foundations themselves will be cut down to below ground level and left in situ covered in soil / peat which will be re-vegetated. The effects of the environmental changes are considered with respect to their duration, frequency, timing and reversibility for each of the ornithological features scoped in (see **Table 12.8**).

Potential receptors

12.7.16 **Table 12.8** notes both the level of importance of an ornithological feature in the context of legislation and policy, and the level of importance of the feature in the context of the Development Site. The rationale for this is that while e.g. peregrine may be considered to be of international importance if it is a designated feature of Muirkirk and North Lowther Uplands SPA, the importance assigned to it as an ornithological feature within the context of a Development Site would be reduced if this species was only recorded once in flight over the Site.

12.7.17 For each ornithological feature presented in **Table 12.8**, the potential environmental changes and potential significant effects resulting from the Proposed Development are provided.

Table 12.8 Likely Effects, ZoIs and Justification for Ornithological Features Scoped In

Ornithological Feature	Importance – Legislation and Policy	Importance – Proposed Development	Environmental changes and Likely Significant Effects	Zone of Influence	Relevant Assessment Criteria and Scoped-in Justification
Black grouse	Regional	Local	Construction activity including use of plant and the presence of workforce resulting in an increase in aural and visual stimuli due to noise and vibration, and movement of construction vehicles resulting in temporary disturbance or displacement of breeding black grouse. Potential disturbance and displacement to birds due to the operation of turbines and associated human activities for maintenance purposes.	Within 500 m of Proposed Development footprint (based on disturbance distances described by Ruddock & Whitfield, 2007). Within 500 m of Proposed Development footprint (based on disturbance distances described by Ruddock & Whitfield, 2007).	Turbine 9 occurs within 500 m of the lek identified. Turbine 9 occurs within 500 m of the lek identified.
Goshawk	National	National	Construction activity including use of plant and the presence of workforce resulting in an increase in aural and visual stimuli due to noise and vibration, and movement of construction vehicles resulting in temporary disturbance or displacement of breeding goshawk. Potential disturbance and displacement to birds due to the operation of turbines and associated	Within 500 m of Proposed Development footprint (based on disturbance distances described by Ruddock & Whitfield, 2007). Within 500 m of Proposed Development footprint (based on disturbance distances	Exact locations of breeding birds are unknown but may fall within 500 m of footprint. Although effects during the operational phase will be less than that experienced during the construction phase,

Ornithological Feature	Importance – Legislation and Policy	Importance – Proposed Development	Environmental changes and Likely Significant Effects	Zone of Influence	Relevant Assessment Criteria and Scoped-in Justification
			human activities for maintenance purposes.	as described by Ruddock & Whitfield, 2007).	goshawk may still be disturbed during this phase.
			Potential collision with operational turbines.	Within 500 m of the Proposed Development boundary (based on guidance in NatureScot 2017).	Flight activity indicates that there is potential for significant effects to occur on the national and/or regional population.
Peregrine	International / European	Regional	Construction activity including use of plant and the presence of workforce resulting in an increase in aural and visual stimuli due to noise and vibration and movement of construction vehicles resulting in temporary disturbance or displacement of breeding peregrine.	Within 500 m of Proposed Development footprint (based on disturbance distances described by Ruddock & Whitfield, 2007).	Breeding evidence noted within 500 m of footprint. A 500 m buffer (within which no turbines have been sited) has been established around the sensitive location: this may reduce but not eliminate potential disturbance.
			Potential disturbance and displacement to birds due to the operation of turbines and associated human activities for maintenance purposes.	Within 500 m of Proposed Development footprint (based on disturbance distances described by Ruddock & Whitfield, 2007).	Although effects during the operational phase will be less than that experienced during the construction phase, species may still be disturbed during this phase.
			Potential collision with operational turbines.	Within 500 m of the Proposed Development boundary (based on guidance in NatureScot 2017).	Flight activity indicates that there is potential for significant effects to occur on the regional population.

Ornithological Feature	Importance – Legislation and Policy	Importance – Proposed Development	Environmental changes and Likely Significant Effects	Zone of Influence	Relevant Assessment Criteria and Scoped-in Justification
Red kite	National	Local	Construction activity including use of plant and the presence of workforce resulting in an increase in aural and visual stimuli due to noise and vibration, and movement of construction vehicles resulting in temporary disturbance or displacement of breeding red kite. Potential disturbance and displacement to birds due to the operation of turbines and associated human activities for maintenance purposes. Potential collision with operational turbines.	Within 300 m of Proposed Development footprint (based on disturbance distances as described by Ruddock & Whitfield, 2007). Within 300 m of Proposed Development footprint (based on disturbance distances as described by Ruddock & Whitfield). Within 500 m of the Proposed Development boundary (based on guidance in NatureScot 2017 V.2).	Exact location of active nest site was not found but may fall within 300 m of footprint. Although effects during the operational phase will be less than that experienced during the construction phase, species may still be disturbed during this phase. Flight activity indicates that there is potential for significant effects to occur on the local population.

12.8 Environmental measures embedded into the development proposals

12.8.1 A range of environmental measures have been embedded into the Proposed Development as outlined in **Chapter 3: Description of the Proposed Development**. **Table 12.9** outlines how these embedded measures will influence the ornithology assessment.

Table 12.9 Summary of the embedded environmental measures and how these influence the ornithology assessment

Receptor	Changes and effects	Embedded measures and influence on assessment
Breeding bird species	Construction and decommissioning disturbance	The following measures would be incorporated into the Proposed Development in order to minimise construction effects to breeding bird species: 1. As part of an overarching Construction Environmental Management Plan (CEMP), a Breeding Bird Protection Plan (BBPP) would be developed in consultation with the relevant consultees in advance of construction works commencing. Construction Method Statements (CMSs) would be developed to detail the mitigation approach for all bird receptors. These would cover the Proposed Development and receptor-specific requirements of the embedded mitigation as outlined in the remainder of this table; 2. Site supervision would be provided by a suitably experienced Environmental Clerk of Works (EnCoW), who would be responsible for ensuring the successful implementation of embedded measures, including pollution prevention, monitoring of buffers around construction areas and reference to areas of high ecological sensitivity, and adherence to current construction best practice; 3. Pre-construction verification check surveys would be undertaken for all protected bird species where potential significant effects or legal breaches could occur otherwise; 4. Maintain species-specific buffers detailed in the BBPP from nests during the breeding or roosting season until young fledge, or develop method statements outlining methods to allow works to continue safely within buffer areas where appropriate. For example, in some cases, there may be a requirement to install suitable screening around working areas to allow it to continue within a buffer area. An ornithologist may be required to monitor the nesting birds during the working phase in certain areas and halt any significantly disturbing activities in consultation with the EnCoW; 5. An emergency procedure would be implemented by site workers if a nest of a breeding bird is encountered. The EnCoW would inspect the site and define appropriate measures (if required); 6. When construction activities are taking place at more than one location at any one time, this would be subject to EnCoW approval, to avoid any cumulative impact on breeding bird activity; and

Receptor	Changes and effects	Embedded measures and influence on assessment
		7. By excluding construction activities from the relevant buffer zone when the species taken forward for assessment are breeding, this eliminates the majority of potential impacts on these species. It is expected that these measures would be incorporated into the CEMP which would be specified by planning condition.
Breeding bird species	Operational disturbance	Mitigation is proposed to be of a similar nature to construction where impacts (and consequent effects) occur, but proportionally reduced in scale.
Waterbirds	Changes to surface hydrology	A construction area stand-off of at least 50 m has been applied to all watercourses and water bodies (except for watercourse crossings). All watercourse crossings would be designed in accordance with the SEPA (2010) Good Practice Guide for the Construction of River Crossings and, where culverts are required, have been designed in accordance with the CIRIA (2010) Culvert Design and Operation Guide. This will minimise any incidental impacts on waterbirds to negligible levels.
All bird species	Pollution incidents	A Pollution Prevention Plan (PPP) and Pollution Incident Response Plan (PIRP) will be prepared, subject to consultation with SEPA and NatureScot, in advance of any construction activities. It will then be implemented as part of the overall CEMP. This will set out site management and working practices and draw heavily upon SEPA's Pollution Prevention and Control Guidelines (PPGs) or Guidance for Pollution Prevention (GPPs), whichever are operative at the time. This will minimise any pollution impacts on bird species to negligible levels.
Peregrine	Construction and decommissioning disturbance	A 500 m turbine exclusion buffer has been designed into the Proposed Development to reduce effects on breeding peregrines. The observation of this buffer will be secured by appropriate marking-out and information measures in the proposed CEMP. Owing to the sensitivity of this information, the CEMP must be marked as confidential.
Peregrine	Operational disturbance	Adherence to the specified buffer will also reduce operational disturbance impacts. This requirement will be communicated to relevant site personnel in a suitable manner (to be specified by the proposed BBPP).

12.9 Assessment methodology

Introduction

12.9.1 The generic project-wide approach to the assessment methodology is set out in **Chapter 4: Approach to Preparing the EIAR**, and specifically in **Sections 4.5 to 4.7**. This has informed the approach that has been used in this ornithology assessment. However, it is necessary to align it with standard industry guidance provided by CIEEM (2022).

12.9.2 The assessment has been based upon not only the results of the desk study and field surveys, but also professional knowledge of ecological processes and functions, and relevant published information. The latter includes information on the status, distribution, sensitivity to environmental changes and ecology of the ornithological features scoped into the assessment, where available.

12.9.3 For each scoped-in ornithological feature (see **Table 12.8**), effects were assessed against the current baseline conditions for that feature during construction, operation and decommissioning.

12.9.4 The initial results of the assessment regarding potentially significant effects were used to inform whether additional baseline data collection is required, together with the identification of environmental measures that should be embedded into the Proposed Development to avoid or reduce adverse effects or to deliver enhancements (see **Section 12.9**). The results of the assessment, as set out in **Section 12.11**, therefore reflect the final scheme design (i.e. incorporating the environmental measures described in **Section 12.9** and **Table 12.9**).

12.9.5 The spatial extent of the assessment (see **Table 12.8**) reflects the area occupied by the ornithological feature that is being assessed and, as a minimum, the ZoI of the changes that are likely to affect it.

12.9.6 Where part of a designated site is located within the ornithological ZoI relating to a particular biophysical change as a result of the Proposed Development, an assessment has been made of the effects on the designated site as a whole. A similar approach has been taken for any areas of notable bird habitat.

12.9.7 For species that occur within the ZoI, the assessment has considered the total area that is used by the affected individuals or the local population of the species (e.g. for foraging or as breeding territories).

Significance Evaluation Methodology

Overview

12.9.8 CIEEM (2022) defines a significant effect as one “that either supports or undermines biodiversity conservation objectives for ‘important ecological features’ […] or for biodiversity in general”. When considering potentially significant effects on ornithological features (whether adverse or beneficial), the following characteristics of environmental change are taken into account[7]:

- Extent – the spatial or geographical area over which the environmental change may occur;

[7] The definitions of the characteristics of environmental change are based on the descriptions provided in CIEEM (2022). Other chapters in this EIA Report may use some of the same terms with a different definition.

- Magnitude – the size, amount, intensity or volume of the environmental change;
- Duration – the length of time over which the environmental change may occur;
- Frequency – the number of times the environmental change will occur;
- Timing – the periods of the day/year etc. during which an environmental change may occur; and
- Reversibility – whether the environmental change can be reversed through restoration actions.

Magnitude of Change

12.9.9 The characteristics described above are all important in assessing effects by using information about the way in which habitats and species are likely to be affected. However, a scale for the magnitude of the environmental change resulting from the Proposed Development has been described in **Table 12.10**. This is to provide an understanding of the relative change from the baseline position, be that adverse or beneficial change.

Table 12.90 Guidelines for the Assessment of the Scale of Magnitude

Scale of change	Criteria and resultant effect
High	The change permanently (or over the long term) affects the conservation status of a habitat/species, reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area. Relative to the wider habitat resource/species population, a large area of habitat or large proportion of the wider species population is affected. For designated sites, integrity is compromised. There may be a change in the level of importance of the receptor in the context of the project.
Medium	Relative to the wider habitat resource/species population, a small-medium area of habitat or small-medium proportion of the wider species population is affected. There may be a change in the level of importance of this receptor in the context of the project.
Low	The quality or extent of designated sites or habitats, or the sizes of species' populations, experience some small-scale reduction or increase. These changes are likely to be within the range of natural variability and they are not expected to result in any permanent change in the conservation status of the species/habitat or integrity of the designated site. The change is unlikely to modify the evaluation of the receptor in terms of its importance.
Very Low	Although there may be some effects on individuals or parts of a habitat area or designated site, the quality or extent of sites and habitats or the size of species populations means that they would experience little or

Scale of change	Criteria and resultant effect
	no change. Any changes are also likely to be within the range of natural variability and there would be no short-term or long-term change to conservation status of habitats/species receptors or the integrity of designated sites.
Neutral	A change, the level of which is so low that it is not discernible on designated sites or habitats or the size of species' populations. Alternatively, changes that balance each other out over the lifespan of a project.

Determining Significance - Adverse and Beneficial Effects

12.9.10 Adverse effects are assessed as being significant if the favourable conservation status of an ecological feature would be lost as a result of the Proposed Development. Beneficial effects are assessed as those where a resulting change from the baseline improves the quality of the environment (e.g. increases species diversity, increases the extent of a particular habitat etc., or halts or slows down an existing decline). For a beneficial effect to be considered significant, the conservation status would need to positively increase in line with a magnitude of change of "high" as described in **Table 12.10**.

12.9.11 Conservation status is defined as follows (as per CIEEM (2022) guidance):

- For habitats, *"conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area;"*
- For species, *"conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area."*

12.9.12 NatureScot (2018a) detail that a species' conservation status is favourable when:

- Population dynamics indicate that the species is maintaining itself on a long-term basis and is therefore likely to persist in the habitat it occupies;
- The natural range of the species is not being reduced, nor is likely to be reduced for the foreseeable future; and
- There is (and will probably *continue* to be) a sufficiently large habitat to maintain its populations on a long-term basis.

12.9.13 NatureScot (2018a) recommends that the concept of maintaining a favourable conservation status of a species should be applied at the level of its Scottish population, to determine whether an impact is sufficiently significant to be of concern. This is a test which makes good ecological sense and maintains compatibility with the aims of UK legislation and Government policy (such as SPP).

12.9.14 Nonetheless, developments should be assessed, alone or in combination, at a regional (or analogous) scale for their impacts on a species population size, trend and range. An adverse impact on a species at a regional scale (within Scotland) may adversely affect its national conservation status (for example where a specific region holds the majority of the national population). For wind farms which do not have an impact on designated sites, NatureScot (2018a) highlights the relevance of the Natural Heritage Zone (NHZ) as the basis for the geographical range selection. The boundaries of the NHZs have been drawn to reflect biogeographical differences between different zones, with a high level of

environmental coherence within each zone. The Proposed Development is within NHZ 19 (Western Southern Uplands and Inner Solway).

12.9.15 NHZ-level population estimates are available for a number of breeding bird populations and key wintering waterfowl populations (Wilson *et al*., 2015).

12.9.16 In some cases, such as wintering goose and swan populations that are highly mobile, it may be necessary to undertake assessment at a much broader scale such as that of the entire Scottish population. Passage migrants and some wintering populations may show high levels of movement within the non-breeding season, and it is therefore difficult to define coherent regional populations with any confidence. This would be especially true where there is substantial site-based turnover in species' populations.

12.9.17 Alternative geographical areas to NHZs may be acceptable as the basis for assessment where there are definable regional or biogeographical populations that do not conform to NHZ boundaries (for example the distinct regional populations of red kites in Scotland). For some migratory species, patterns of migration may determine the spatial scale at which impacts should be considered. For example, corncrakes migrate up the west coast of Ireland and Scotland; any impacts during migration would be likely to affect their whole population. In considering a species' distribution, it is also important to consider its distribution across its range.

12.9.18 Regional populations may be of particular importance to a species conservation status at a national or international level where:

- They are core or 'stronghold' areas and the overall viability of the population is dependent on the maintenance of such areas; or
- They are 'edge of range' populations, which may (over time) be important in maintaining range as well as providing the potential for expansion or range shift.

12.9.19 For example, the Scottish golden eagle population encompasses areas that can be considered to be core and edge populations. The 'golden eagle framework' (Whitfield et al., 2008) indicates the variation in vulnerability of the golden eagle in both core and edge-of-range areas to additional impacts (such as those from wind farms) across Scotland.

12.9.20 The decision as to whether the conservation status of an ornithological feature would alter has been made using professional judgement. This draws upon the information produced through the desk study, field survey, and assessment of how each feature is likely to be affected by the Proposed Development by:

- Preventing a recovering species from reaching favourable conservation status, at a national or international level;
- Changing a species' status from favourable to unfavourable.
- For a species that is already in decline, the assessment should focus on whether the proposal would undermine the potential for halting its decline and allowing it to recover to favourable conservation status.

12.9.21 A similar approach is used where designated sites may be affected by the Proposed Development, except that the focus is on the effects on the integrity of each site. This is defined as:

- "*The coherent sum of the site's ecological structure, function and ecological processes, across its whole area, which enables it to sustain the habitats, complex of habitats and/or populations of species for which the site is designated.*"

12.9.22 The assessment of effects on integrity draws upon the assessment of effects on the conservation status of the features for which the site has been designated. Where these

features are not clearly defined (often the case for non-statutory biodiversity sites), it is necessary to use professional judgement to identify the interest features or obtain additional information so that sufficient information on which to base an assessment is available. Relevant sources of information include NatureScot, the Scottish Wildlife Trust or the Council responsible for identifying these sites.

12.9.23 As has been provided in this Report, an EIA Report should set out the consequences for the integrity of the species population in terms of its size, trend, distribution (where known) and the area of suitable habitat.

12.10 Assessment of Effects: Barn owl

Baseline conditions

Current baseline

12.10.1 Barn owl is a Schedule 1 species, is included on the Scottish Biodiversity List (SBL) and is a BoCC Green-listed species (Stanbury et al., 2021). The Scottish breeding population is c. 1,000 pairs (Scottish Raptor Study Group, n.d.). While no NHZ population estimate is available, at least 28 pairs breed in Galloway (Barn Owl Trust, 2022).

12.10.2 Barn owl pellets were recorded at a confidential location within the Development Site, with one incidental bird also recorded. No breeding evidence was noted. However, the location has the potential to support breeding barn owls and is believed to have been used by breeding birds previously.

12.10.3 The Development Site and field Survey Area are considered of local importance for barn owl, containing up to 0.1% of the national breeding population. Please see **Appendices 12A to 12C** and **Confidential Appendix 12E** for full details.

Predicted future baseline

12.10.4 Climate change may lead to wetter and windier weather during the barn owl breeding season, which may negatively affect productivity. However, the quickly-warming climate has also been shown to have positive effects on barn owls in the north of their range (Barn Owl Trust, 2022), so the predicted adverse effects from climate change in Scotland may well be balanced out or outweighed by beneficial ones.

12.10.5 Land use is currently anticipated to remain largely unchanged in the absence of the Proposed Development.

12.10.6 The level of open land within the ZoI is similar to that of the region as a whole. These trends are therefore likely to be no more or less strong within the ZoI than across the whole region. The predicted future baseline for this species is thus the continued presence of up to 0.1% of the national population.

Predicted effects and their significance

Construction and decommissioning disturbance

12.10.7 The potential nesting location falls 45m from the Proposed Development's access track at the nearest point. As barn owls are relatively resilient to disturbance, this distance falls towards the outer limit of the appropriate disturbance buffer (Ruddock & Whitfield, 2007). Construction and decommissioning impacts will be temporary and sporadic, as works

within 50 m of the potential nesting site will only occur for a minority of the construction and decommissioning periods. Effects are likely to be more evenly spread across time, but equally limited. Moreover, the embedded measures detailed in **Table 12.9** include the agreement and implementation of a BBPP and CMSs. These essentially mean that works within the 50 m ZoI will be prohibited (or shielded from the potential nesting site) during any times the Environmental Clerk of Works establishes that nesting occurs.

12.10.8 Considering the distances and embedded measures involved, the magnitude of change to the local barn owl population is considered neutral. The resultant effect on barn owl conservation status is not likely to be significant.

Operational disturbance

12.10.9 Breeding barn owl may also be subject to operational disturbance in the absence of mitigation. However, in light of the embedded measures outlined in **Table 12.9**, operational disturbance and displacement effects upon barn owl within the 50 m ZoI would constitute a neutral magnitude of change. Maintenance activities during the operational phase will be sporadic, leading to negligible likelihood of potential conflicts with barn owls.

12.10.10 The magnitude of change to the local barn owl population is therefore considered to be neutral. As a result, the effects of operational disturbance are not considered significant.

Summary of effects on barn owl

12.10.11 **Table 12.1** summarises effects on barn owl. No significant effects from construction, operational or decommissioning disturbance are predicted for this Schedule 1 and SBL species. This accords with Scottish Planning Policy, the objectives of The 2020 Challenge, Dumfries and Galloway LDP2 Policies IN1 and IN2, and East Ayrshire LDP Policies NORTH-EAst6 and RE1.

Table 12.11 Summary of Significance of Adverse Effects on Barn Owl

Summary of predicted effects	Importance of Ecological Feature[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Construction and decommissioning disturbance	Local	Neutral	Not significant	Barn owl is already resilient to relatively high levels of disturbance. Embedded mitigation will further shield any breeding activity from disturbance.
Operational disturbance	Local	Neutral	Not significant	Embedded mitigation and sporadic nature of maintenance activities suggest there will be negligible potential for conflict.

Summary of predicted effects	Importance of Ecological Feature[1]	Magnitude of change[2]	Significance[3]	Summary rationale
All other effects	n/a	n/a	n/a	Scoped out (see **Tables 12I.1** and **12I.2i Appendix 12I**).

1. The importance of the feature is defined as per Table 12.9, Section 12.9, using the criteria set out in Table 12.8, and methodology in Section 12.7.
2. The magnitude of change on a receptor resulting from activities relating to the Proposed Development is defined using the criteria set out in Section 12.9, and Table 12.90 above and is defined as neutral, very low, low, medium, and high.
3. The significance of the environmental effects is either significant or not significant subject to the evaluation methodology outlined in Section 12.10.

12.11 Assessment of effects: Black grouse

Baseline conditions

Current baseline

12.11.1 Black grouse is included on the Scottish Biodiversity List (SBL) and is a BoCC Red-listed species (Stanbury *et al*., 2021). The Scottish breeding population (measured by the number of displaying [lekking] males) is 3,344; of which the Western Southern Uplands and Inner Solway Natural Heritage Zone supports 121 lekking males (Wilson *et al.*, 2015).

12.11.2 The desk study identified seven historical black grouse leks within 1.5 km of the Development Site. Five non-lekking records were also returned within the ZoI for black grouse.

12.11.3 Black grouse activity within the Development Site and field Survey Area was limited to one lekking male recorded on the Development Site boundary on High Countam in 2018, one incidental record (a male in low flight during a VP survey in December 2018) and extensive droppings approximately 50 m south of the Development Site, between Coranbae and Cairn Hill. Previous field studies in support of the 2015 ES found similar levels of black grouse activity at the Site.

12.11.4 The Development Site and field Survey Area are considered of local importance for black grouse, containing 0.8% of the NHZ breeding population measured by lekking males. Please refer to **Appendices 12A-D** for full details.

Predicted future baseline

12.11.5 Climate change may lead to wetter and windier weather during the breeding season period, which may negatively affect productivity. However, black grouse is well adapted for life in wet landscapes (Game & Wildlife Conservation Trust, 2011), so any negative effect from climate change is likely to be very minor.

12.11.6 Land use is currently anticipated to remain largely unchanged in the absence of the Proposed Development. Agriculture in the form of grazing is expected to continue. Nonetheless, land management is contributing to the regional decline of the species. Maturing plantations are causing barrier effects, reducing nesting and feeding habitat quality, and increasing abundance of generalist predators.

12.11.7 The level of forested land within the ZoI is similar to that of the region as a whole. These trends are therefore likely to be no more or less strong within the ZoI than across the whole region. The predicted future baseline for this species is thus the continued presence of up to 0.8% of the NHZ population.

Predicted effects and their significance

Construction and decommissioning disturbance

12.11.8 The lek identified occurs approximately 260 m from Turbine 9 and approximately 265 m from the proposed access track. Construction and decommissioning-related disturbance/displacement impacts are therefore possible. However, works will commence no earlier than 07:00 each day, limiting the potential overlap with lekking (an early-morning activity). All other turbines are more than 500 m from the lek.

12.11.9 Construction and decommissioning impacts will be temporary and sporadic, as works within 500 m of the lek will only occur for a minority of the construction and decommissioning periods. Effects are likely to be more evenly spread across time, but equally limited. Moreover, the embedded measures detailed in **Table 12.9** include the agreement and implementation of a BBPP and CMSs. These essentially mean that works within the 500 m ZoI will be prohibited (or shielded from the lek) during any times the Environmental Clerk of Works establishes that the lek is in use.

12.11.10 Considering the embedded measures outlined, the magnitude of change to the local black grouse population is considered very low. The resultant effect on its conservation status is not likely to be significant.

Operational disturbance

12.11.11 In terms of operational disturbance, a single lek falls within the 500 m ZoI. However, in light of the embedded measures outlined in **Table 12.9**, operational disturbance and displacement effects upon black grouse within the ZoI would constitute a very low magnitude of change. Maintenance activities during the operational phase will be sporadic, leading to very few potential conflicts with black grouse.

12.11.12 The magnitude of change to the local black grouse population is therefore considered to be very low. As a result, the effects of operational disturbance are not considered significant.

Summary of effects on black grouse

12.11.13 **Table 12.2** summarises effects on black grouse. No significant effects from construction, operational or decommissioning disturbance are predicted for this SBL species. This accords with Scottish Planning Policy, the objectives of The 2020 Challenge, Dumfries and Galloway LDP2 Policies IN1 and IN2, and East Ayrshire LDP Policienorth-eastNE6 and RE1.

Table 12.12 Summary of significance of adverse effects on black grouse

Summary of predicted effects	Importance of Ecological Feature[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Construction and decommissioning disturbance	Local	Very low	Not significant	Timing restrictions and embedded mitigation will shield lekking activity from disturbance.
Operational disturbance	Local	Very low	Not significant	Embedded mitigation and sporadic nature of maintenance activities will lead to very low potential for conflict.
All other effects	n/a	n/a	n/a	Scoped out (see **Tables 12I.1** and **12I.2in Appendix 12I**).

1. The importance of the feature is defined as per Table 12.9, Section 12.9, using the criteria set out in Table 12.8, and methodology in Section 12.7.
2. The magnitude of change on a receptor resulting from activities relating to the Proposed Development is defined using the criteria set out in Section 12.9, and Table 12.90 above and is defined as neutral, very low, low, medium, and high.
3. The significance of the environmental effects is either significant or not significant subject to the evaluation methodology outlined in Section 12.10.

Assessment of effects: Goshawk

Baseline conditions

Current baseline

12.11.14 Goshawk is a Schedule 1 listed species and a BoCC Green-listed species (Stanbury et al., 2021). The breeding population of goshawk within Scotland is estimated at 281 breeding pairs, with the Western Southern Uplands and Inner Solway Natural Heritage Zone supporting 31 pairs (Challis et al., 2022; Wilson et al., 2015).

12.11.15 The updated desk study identified goshawk presence in the area surrounding the Development Site.

12.11.16 Between 2018 and 2020, goshawk activity recorded within the Field Survey Area comprised 23 flights recorded during VP surveys, one probable breeding attempt within the raptor survey buffer in 2018, two such probable attempts in 2019, one additional flight recorded during raptor surveys, and nine incidental records.

12.11.17 The two probable breeding territories represent c. 6.5% of the regional NHZ population, 0.71% of the Scottish national population and 0.3% of the estimated UK population (Eaton *et al.*, 2020). However, most of the flight and breeding activity is focused more than 500 m beyond the Proposed Development footprint. Please refer to **Appendices 12A-H** for full details.

Predicted future baseline

12.11.18 Land use is currently anticipated to remain largely unchanged in the absence of the Proposed Development. Agriculture in the form of grazing is expected to continue. Climate changes are unlikely to lead to adverse effects on goshawk breeding and may in fact increase productivity (Bangerter *et al.*, 2021). However, this is considered likely to scale relatively evenly across the regional and national populations. While there is potential for goshawk numbers to increase in the short to medium term, the proportion of the NHZ and national populations using the Field Survey Area is thus considered likely to remain stable.

Predicted effects and their significance

Construction and decommissioning disturbance

12.11.19 The two nest sites could not be pinpointed, but one of these may fall within 500 m of the turbines. It must therefore be assumed that one goshawk territory identified falls within the relevant ZoI. Construction and decommissioning-related disturbance/displacement impacts on goshawk within the ZoI would be temporary and sporadic. This is partly because works within 500 m of the territory centre will only occur for a minority of the construction and decommissioning periods. Effects are likely to be more evenly spread, but equally limited.

12.11.20 The embedded measures detailed in **Table 12.9** include the agreement and implementation of a BBPP and CMSs. These essentially mean that works in the 500 m ZoI will be prohibited (or shielded from the territory centre within it) during any times the Environmental Clerk of Works established that goshawk is breeding.

12.11.21 In light of these embedded measures, the magnitude of change to the regional goshawk population is considered low. The magnitude of change to the national population is predicted to be very low, and the effect on the species conservation status is considered not significant.

Operational disturbance

12.11.22 In terms of operational disturbance, one goshawk territory potentially falls within the 500 m ZoI. In light of the embedded measures outlined in **Table 12.9**, operational disturbance and displacement effects upon goshawk within the ZoI would constitute a low magnitude of change.

12.11.23 Thus, the magnitude of change to the national and regional goshawk populations is considered to be very low. Favourable conservation status is unlikely to be affected. As a result, there is likely to be no significant adverse effect on goshawk in terms of operational disturbance.

Potential collision with operational turbines

12.11.24 The Collision Risk Model (CRM) (**Appendix 12J**) calculated a theoretical collision rate of 0.044 birds per year (which included all flights from VP surveys within Collision Risk Zone (CRZ) at Potential Collision Height [PCH]), representing 0.07% of the NHZ population and 0.008% of the national population[8]. Therefore, it is anticipated that there will be no potential for significant effects on the national or NHZ population. Given the very low level

[8] This considers the 'worst case scenario' using 2018 breeding season flight data. If all flight data is modelled, this provides an annual collision related death rate of 0.026 birds per year (0.04% of the NHZ population and 0.005% of the national population).

of collisions predicted, potential collision with operational turbines has been scoped out of any further assessment.

Summary of effects on goshawk

12.11.25 A summary of the results of the assessment of goshawk is provided in the overall summary in **Table 12.5**. No significant effects are predicted for this species. This accords with Scottish Planning Policy, the objectives of The 2020 Challenge, Dumfries and Galloway LDP2 Policies IN1 and IN2, and East Ayrshire LDP Policies NE6 and RE1.

12.12 Assessment of effects: Peregrine

Baseline conditions

Current baseline

12.12.1 Peregrine is Annex 1 listed, is a Schedule 1 listed species, is on the SBL and is a BoCC Green-listed species (Stanbury *et al.*, 2021).

12.12.2 The breeding population of peregrine within Scotland is estimated at 485 breeding pairs; with the Western Southern Uplands and Inner Solway Natural Heritage Zone supporting 34 pairs (Wilson *et al.*, 2015).

12.12.3 The desk study returned records of a known peregrine breeding site outside the 2 km raptor survey buffer, plus a nesting location within the Development Site.

12.12.4 Activity recorded in the Field Survey Area between 2018 and 2020 comprised two breeding records, 16 flight records and seven incidental records. One of the breeding records occurred within the Development Site. This breeding population represents 5.9% of the regional NHZ population and 0.4% of the national population. Please refer to **Appendices 12A-H** for full details.

Predicted future baseline

12.12.5 Land use is currently anticipated to remain largely unchanged in the absence of the Proposed Development. Agriculture in the form of grazing is expected to continue. Increased heavy rainfall due to climate change may well lead to adverse effects on peregrine breeding productivity (Zubergoitia *et al.*, 2019). However, this is considered likely to scale relatively evenly across the regional population. While there is potential for peregrine numbers to decrease in the long term, the proportion of the NHZ population using the Field Survey Area is thus considered likely to remain stable.

Predicted effects and their significance

Construction and decommissioning disturbance

12.12.6 One of the two confirmed breeding territories falls within the relevant ZoI (500 m). However, construction and decommissioning-related disturbance/displacement impacts on peregrine within the ZoI will be temporary and sporadic. A 500 m exclusion zone (see **Table 12.9**) has been included in the project design to ensure turbines (and the vast majority of access infrastructure) are kept over 500 m from the nest site. Works within the ZoI will occur for a minority of the construction and decommissioning periods. The resultant effects are likely to be more evenly spread in time, but nonetheless limited in

extent. Moreover, the embedded measures detailed in **Table 12.9** include the agreement and implementation of a BBPP and CMSs. These essentially mean that works in the 500 m zone will be prohibited during any times peregrine breeding is recorded.

12.12.7 In light of the embedded measures outlined in **Table 12.9**, the magnitude of change to the regional peregrine population is considered low. The effect of this disturbance on peregrine conservation status is considered not significant.

Operational disturbance

12.12.8 In terms of operational disturbance and displacement, one peregrine territory falls within the 500 m ZoI. Operational disturbance impacts will occur over a longer period than construction and decommissioning. However, due to the temporary and relatively benign nature of maintenance operations, they are predicted to be of lower impact.

12.12.9 In light of the embedded measures outlined in **Table 12.9**, operational disturbance and displacement effects upon peregrine within the ZoI would amount to a low magnitude of change.

12.12.10 Favourable conservation status is therefore unlikely to be affected. As a result, there is likely to be no significant adverse effect on peregrine as a result of operational disturbance or displacement.

Potential collision with operational turbines

12.12.11 The CRM (**Appendix 12J**) calculated an annual theoretical collision rate of 0.017 birds per year (which included all flights from VP surveys within CRZ at PCH), representing circa 0.025% of the NHZ population[9]. It is anticipated that there will be no potential for significant effects on the NHZ population. Given the extremely low level of collisions predicted, potential collision with operational turbines has been scoped out of any further assessment.

Summary of effects on peregrine

12.12.12 **Table 12.3** summarises effects on peregrine. No significant effects from construction, operational or decommissioning disturbance or collision are predicted for this SBL species (including its SPA population). This accords with Scottish Planning Policy, the objectives of The 2020 Challenge, Dumfries and Galloway LDP2 Policies IN1 and IN2, and East Ayrshire LDP Policies NORTH-EAst6 and RE1. Under the Habitats Regulations 2019, Dumfries and Galloway LDP2 Policnorth-eastNE4 and East Ayrshire LDP Policy ENV6, no appropriate assessment of the Muirkirk and North Lowther Uplands SPA is required in connection with birds.

Table 12.13 Summary of significance of adverse effects on peregrine

Summary of predicted effects	Importance of Ecological Feature[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Construction and decommissioning disturbance	Regional	Low	Not significant	Embedded mitigation will shield peregrines from disturbance.

[9] This considers the 'worst case scenario' using 2019 breeding flight data. If all flight data is modelled, this provides an annual collision related death rate of 0.014 birds per year (circa 0.02% of the NHZ population).

Summary of predicted effects	Importance of Ecological Feature[1]	Magnitude of change[2]	Significance[3]	Summary rationale
				Works are of limited extent.
Operational disturbance	Regional	Low	Not significant	Embedded mitigation and nature of maintenance activities will mean effects are lower than for construction and decommissioning.
Potential collision with operational turbines	Regional	Very low	Not significant	Worst-case annual predicted collisions amount to 0.07% of the NHZ population, with a maximum loss of one to two birds predicted during the lifetime of the Proposed Development.
All other effects	n/a	n/a	n/a	Scoped out (see **Tables 12I.1** and **12I.2**).

1. The importance of the feature is defined as per Table 12.9, Section 12.9, using the criteria set out in Table 12.8, and methodology in Section 12.7.
2. The magnitude of change on a receptor resulting from activities relating to the Proposed Development is defined using the criteria set out in Section 12.9, and Table 12.90 above and is defined as neutral, very low, low, medium, and high.
3. The significance of the environmental effects is either significant or not significant subject to the evaluation methodology outlined in Section 12.10.

Assessment of effects: Red kite

Baseline conditions

Current baseline

12.12.13 The Western Southern Uplands and Inner Solway NHZ population was estimated at 83 pairs in 2013 (Wilson *et al.*, 2015). In 2020, there were 346 known home ranges within Scotland, with 226 breeding attempts monitored by the Scottish Raptor Monitoring Scheme (Challis *et al.*, 2022). 145 home ranges and 119 breeding attempts were recorded in Dumfries and Galloway in 2020. However, as of 2020/21, red kite had not yet been confirmed to breed in Ayrshire (Chris Rollie, D&G RSG *pers comm*).

12.12.14 There were 105 red kite observations on VP surveys, including various flights over the Development Site. There were a total of 22 incidental records of red kite. During 2018, the majority of sightings early in the breeding season seemingly referred to the same non-breeding sub-adult bird. In June, July and August 2018, adults were noted and are likely to comprise foraging birds which bred outwith the Development Site. Possible breeding was recorded within the 2 km raptor survey buffer in 2019. However, no nest was found despite intensive searches. Using the precautionary approach, it is thus considered that

the raptor survey buffer supports up to c. 0.8% of the regional breeding population. Please refer to **Appendices 12A-H** for full details.

Predicted future baseline

12.12.15 Land use is currently anticipated to remain largely unchanged in the absence of the Proposed Development. Agriculture in the form of grazing is expected to continue. Climate change could lead to changes in red kite breeding productivity. However, climate does not appear to be one of the main limiting factors in the current UK context of a growing red kite population (Stevens *et al*., 2020). Moreover, red kite population size changes are considered likely to scale relatively evenly across the local population. As red kite expands its range into Ayrshire and northern Dumfries and Galloway, initial increases are predicted. However, the proportion of the local and regional populations using the field Survey Area is then considered likely to return to current levels in the context of this expansion.

Predicted effects and their significance

Construction and decommissioning disturbance

12.12.16 As the potential nest site could not be pinpointed, it must be assumed that red kite breed within the relevant ZoI (300 m). Construction and decommissioning-related disturbance/displacement impacts on red kite within the ZoI will be temporary and sporadic. Development in this area of the Development Site is limited to a small portion of access road construction almost 300 m from the nearest possible nesting location. Any works within 300 m of the possible nest site would thus occur for only a small minority of the construction and decommissioning periods. Effects are likely to be more evenly spread, but equally limited.

12.12.17 The embedded measures detailed in **Table 12.9** include the agreement and implementation of a BBPP and CMSs. These essentially mean that works will be excluded from the 300 m zone (or shielded from the territory centre within it) during any times red kite breeding is found to occur.

12.12.18 In light of these embedded measures, the magnitude of change to the local red kite population is considered low. The effect on this disturbance on red kite conservation status is considered not significant.

Operational disturbance

12.12.19 In terms of operational disturbance and displacement, one red kite territory is assumed to fall within the 300 m ZoI. However, the assumed nest site is at the outer edge of the ZoI, and disturbance will be limited to occasional travel along the access road.

12.12.20 Operational disturbance impacts will occur over a longer total period than construction and decommissioning. However, due to the temporary and relatively benign nature of maintenance operations, they are predicted to be of lower impact. Considering the embedded measures outlined in **Table 12.9**, operational disturbance and displacement effects upon red kite within the ZoI would amount to a very low magnitude of change.

12.12.21 Favourable conservation status is therefore very unlikely to be affected. As a result, there is likely to be no significant adverse effect on red kite as a result of operational disturbance or displacement.

Potential collision with operational turbines

12.12.22 The CRM (**Appendix 12J**) calculated a theoretical collision rate of 0.33 birds per year (which included all flights from VP surveys within CRZ at PCH), representing circa 0.2% of the NHZ population10. Therefore, it is anticipated that there will be no potential for significant effects on the NHZ population. Given the very low level of collisions predicted, potential collision with operational turbines has been scoped out of any further assessment.

Summary of effects on red kite

12.12.23 A summary of the results of the red kite assessment is provided in **Table 12.**. No significant effects from construction, operational or decommissioning disturbance or collision are predicted for this SBL species. This accords with Scottish Planning Policy, the objectives of The 2020 Challenge, Dumfries and Galloway LDP2 Policies IN1 and IN2, and East Ayrshire LDP Policies NE6 and RE1.

Table 12.14 Summary of significance of adverse effects on red kite

Summary of predicted effects	Importance of Ecological Feature[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Construction and decommissioning disturbance	Local	Low	Not significant	Embedded mitigation will shield red kites from disturbance. Works are of limited extent.
Operational disturbance	Local	Very low	Not significant	Embedded mitigation and nature of maintenance activities will mean effects are lower than for construction and decommissioning.
Potential collision with operational turbines	Local	Very low	Not significant	Worst-case annual predicted collisions amount to 0.08% of the NHZ population, with a maximum loss of four birds predicted during the lifetime of the Proposed Development.
All other effects	n/a	n/a	n/a	Scoped out (see **Tables 12I.1** and **12I.2**).

1. The importance of the feature is defined as per Table 12.9, Section 12.9, using the criteria set out in Table 12.8, and methodology in Section 12.7.
2. The magnitude of change on a receptor resulting from activities relating to the Proposed Development is defined using the criteria set out in Section 12.9, and Table 12.90 above and is defined as neutral, very low, low, medium, and high.

[10] This considers the 'worst case scenario' using 2018 breeding season flight data. If all flight data is modelled, this provides an annual collision related death rate of 0.26 birds per year (0.16% of the NHZ population).

3. The significance of the environmental effects is either significant or not significant subject to the evaluation methodology outlined in Section 12.10.

Assessment summary

12.12.24 A summary of the assessment is provided in **Table 12..** This deals in an integrated way, with the effects of all phases of the Proposed Development. Potential effects are considered together as the assessment focuses on the favourable conservation status of each feature and as such, is assessed throughout the lifespan of the Proposed Development. Often, changes to a feature would occur during several stages of the Proposed Development and the resultant effect may reverse during different phases. For example, during construction a local population may decline as a result of disturbance, however, this effect may be reversed during operation.

Table 12.15 Summary of significance of adverse effects

Ecological feature	Summary of predicted effects	Importance of Ecological Feature[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Barn owl	Construction and decommissioning disturbance	Local	Neutral	Not significant	Barn owl is already resilient to relatively high levels of disturbance. Embedded mitigation will further shield any breeding activity from disturbance.
	Operational disturbance	Local	Neutral	Not significant	Embedded mitigation and sporadic nature of maintenance activities suggest there will be negligible potential for conflict.
Black grouse	Construction and decommissioning disturbance	Local	Very low	Not significant	Timing restrictions and embedded mitigation will shield lekking activity from disturbance.
	Operational disturbance	Local	Very low	Not significant	Embedded mitigation and sporadic nature of maintenance activities will lead to very low potential for conflict.
Goshawk	Construction and decommissioning disturbance	National	Very low	Not significant	Embedded mitigation will shield goshawks from disturbance. Works are of limited extent.
	Operational disturbance	National	Very low	Not significant	Embedded mitigation will shield goshawks from disturbance.

Ecological feature	Summary of predicted effects	Importance of Ecological Feature[1]	Magnitude of change[2]	Significance[3]	Summary rationale
	Potential collision with operational turbines	National	Very low	Not significant	Worst-case annual predicted collisions amount to 0.07% of the NHZ population.
Peregrine	Construction and decommissioning disturbance	Regional	Low	Not significant	Embedded mitigation will shield peregrines from disturbance. Works are of limited extent.
	Operational disturbance	Regional	Low	Not significant	Embedded mitigation and nature of maintenance activities will mean effects are lower than for construction and decommissioning.
	Potential collision with operational turbines	Regional	Very low	Not significant	Worst-case annual predicted collisions amount to 0.025% of the NHZ population.
Red kite	Construction and decommissioning disturbance	Local	Low	Not significant	Embedded mitigation will shield red kites from disturbance. Works are of limited extent.
	Operational disturbance	Local	Very low	Not significant	Embedded mitigation and nature of maintenance activities will mean effects are lower than for construction and decommissioning.
	Potential collision with operational turbines	Local	Very low	Not significant	Worst-case annual predicted collisions amount to 0.08% of the NHZ population.

1. 1.The importance of the feature is defined as per Table 12.9, Section 12.9, using the criteria set out in Table 12.8, and methodology in Section 12.7.
2. The magnitude of change on a receptor resulting from activities relating to the Proposed Development is defined using the criteria set out in Section 12.9, and Table 12.90 above and is defined as neutral, very low, low, medium, and high.
3. The significance of the environmental effects is either significant or not significant subject to the evaluation methodology outlined in Section 12.10.

Assessment of cumulative effects

12.12.25 As outlined in **Table 9.4 of Chapter 9: Landscape and Visual Impact Assessment**, consideration has been given as to whether any of the ornithological receptors that have been taken forward for assessment in this chapter are likely to be subject to cumulative ornithology effects because of ornithology effects generated by other developments.

12.12.26 Significant effects may not occur when considering the Proposed Development in isolation, but in combination with other developments, cumulative effects may be significant. The context in which cumulative effects are considered depends upon the ecology of the species or habitat in question. The need to consider cumulative effects is a requirement of the EIA process, as specified by the EIA Regulations.

12.12.27 Specific guidance has also been provided for assessment of cumulative impacts of onshore wind farms on bird populations (NatureScot, 2018c). Projects to be included in such an assessment must include existing projects as well as those consented but not yet built.

12.12.28 In order to undertake a cumulative impact assessment, it is necessary to define:

- The ornithological features affected by the Proposed Development that may be subject to significant cumulative effects in combination with other projects; and
- The relevant projects for which cumulative effects must be considered.

12.12.29 Upon defining these, a cumulative impact assessment is undertaken by drawing on the assessment of effects for ornithological features affected by the Proposed Development that are also considered in the EIAs of other projects. This cumulative assessment considers all wind farms in the NHZ that are operational, consented but not yet built or at the application stage.

12.12.30 The purpose of the cumulative impact assessment is to determine whether effects are likely to affect the Favourable Conservation Status of an ornithological feature. Where the species is associated with an SPA or other designated site, effects are assessed in context with this population or area. Where species are not associated with an SPA, effects are assessed in a regional context, this being NHZ 19 in the case of the Proposed Development.

12.12.31 The only effects with potential for cumulative impacts were those associated with black grouse, goshawk, peregrine and red kite. Therefore, the only receptors taken forward for cumulative assessment are the NHZ black grouse, goshawk, peregrine and red kite populations.

Black grouse

12.12.32 For the Proposed Development, very low magnitude effects on black grouse are predicted at the local level. The predicted effects of the closest cumulative developments identified in **Table 9.4 of Chapter 9: Landscape and Visual Impact Assessment** are detailed in Error! Reference source not found.**6**.

Table 12.16 Cumulative assessment data for black grouse

Wind Farm	Status	No. of Turbines	Baseline, Mitigation, Impacts and / or Effects
Afton	Operational	27	Surveys up to 2016 found no lekking black grouse at this site. A CEMP has been agreed to restrict certain activities around lekking hours in case any black grouse breeding is encountered (Natural Power, 2016).

Wind Farm	Status	No. of Turbines	Baseline, Mitigation, Impacts and / or Effects
Euchanhead	Application	21	No black grouse were recorded; the species was scoped out of further assessment (Scottish Power Renewables, 2020).
Sanquhar II	Application	50	An overall significant positive effect on black grouse was identified as a result of the cumulative effects of habitat improvements (Milne & Bell, 2019b).
Windy Rig	Operational	12	Low to negligible impacts were predicted at the regional level. The site contains up to 1.1% of the regional breeding population.
Windy Standard	Operational	36	Despite several years of black grouse surveys, no lekking has been recorded at the site since 2010. However, non-breeding presence has been identified (Thackeray, 2021). Overall positive effects are predicted (Milne & Bell, 2019a).
Windy Standard Extension	Consented	30	No significant concerns raised by NatureScot. Subject to monitoring to safeguard bird species (Christie, 2007). Further details not provided.

12.12.33 Given the very low level of effects identified for the Proposed Development, there is considered to be negligible potential for significant adverse cumulative effects in association with these cumulative sites. Moreover, **no significant adverse cumulative effects** on black grouse have been identified in combination with project sites further from the Development Site.

Goshawk

12.12.34 For the Proposed Development, low-magnitude effects on goshawk are predicted at the regional level. At the national level, effects are predicted to be of very low magnitude.

12.12.35 Error! Reference source not found. summarises cumulative impacts and effects for goshawk in relation to the cumulative sites identified in **Table 9.4 of Chapter 9: Landscape and Visual Impact Assessment**. These can be summarised as follows (preserving the original language of the relevant reports as much as logically feasible):

- Limited non-breeding displacement – one site;
- Limited/minor displacement – three application sites;
- Minor disturbance and/or displacement effects – one consented site and six application sites;
- Minor/low construction and operation impacts – one site;
- Minor effects during decommissioning – one site;
- Minor habitat loss – one application site;
- Low to negligible habitat loss with low disturbance and displacement – one application site;
- Slight nesting disturbance – one application site;

- Effects of unknown level, but adequately mitigated – one site; and
- Negligible or no effects identified – all other sites.

12.12.36 In combination with the Proposed Development, worst-case cumulative effects on goshawk from disturbance, displacement and habitat loss are considered **low to medium adverse**. This is considered **not significant**.

Peregrine

12.12.37 For the Proposed Development, low-magnitude effects on peregrine are predicted at the regional level.

12.12.38 Error! Reference source not found. summarises effects for peregrine in relation to the cumulative sites identified in **Table 9.4 of Chapter 9: Landscape and Visual Impact Assessment**. In short, these comprise:

- Minor disturbance and displacement: two operational/consented sites and two application sites;
- Minor disturbance and displacement during construction, and minor to medium disturbance/displacement during operation: one application site;
- Low disturbance: one operational/consented site and one application site;
- Low disturbance during breeding: one application site;
- Low/limited displacement: two sites;
- Low to very low disturbance and displacement: one site; and
- Minor/low adverse effects of unknown type: two sites.

In combination with the Proposed Development, worst-case cumulative effects on peregrine from disturbance and displacement are considered **low to medium adverse**. This is considered **not significant**.

Red kite

12.12.39 For the Proposed Development, low-magnitude effects on red kite were identified at the local level.

12.12.40 Error! Reference source not found. summarises effects for red kite in relation to the cumulative sites identified in **Table 9.4 of Chapter 9: Landscape and Visual Impact Assessment**. Overall, these comprise:

- Very minor collateral benefits – one site;
- Minor adverse effect from construction and operation displacement – one application site;
- Slight displacement and temporary disturbance – one site;
- Limited temporary non-significant disturbance and displacement (non-breeding season) – one site;
- Negligible to minor displacement/disturbance – one site;
- Negligible to minor effect / very small impact (unknown type) – two sites; and
- Negligible or no effects identified – all other sites (where information available).

12.12.41 In combination with the Proposed Development, worst-case cumulative effects on red kite from disturbance and displacement are considered **low adverse**. This is considered **not significant.**

Table 12.110 Cumulative assessment data for goshawk, peregrine and red kite

Wind Farm	Status	No. of Turbines	Goshawk	Peregrine	Red Kite
Afton	Operational	27	0 collision-related deaths predicted.	One pair breeding on periphery of site. Minor residual impacts during construction and operation.	No information found.
Andershaw	Operational	11	0 collision-related deaths predicted.	0 collision-related deaths predicted. No further information found.	No further information found.
Auchrobert	Operational	12	0 collision-related deaths predicted.	Negligible effects predicted from disturbance and habitat loss.	Not recorded in significant numbers.
Bankend Rig	Operational	11	0 collision-related deaths predicted.	None recorded breeding. No action required in Conservation Management Plan.	No action required in Conservation Management Plan. Very minor collateral benefits could reasonably be expected.
Bankend Rig II	Consented	3	Scoped out of assessment due to limited activity recorded.	Negligible effects and no increase in mortality predicted.	Only recorded once - negligible effects anticipated.
Benbrack	Consented	18	0.2 collision-related deaths predicted per year*. All other potential impacts scoped out.	Scoped out.	Scoped out.
Blackcraig	Consented	23	0 collision-related deaths predicted.	Species not raised as a significant concern.	No potentially significant impacts after mitigation.
Broken Cross (2T)	Consented	2	Species not raised as a significant concern.	Species not raised as a significant concern.	Species not raised as a significant concern.

Wind Farm	Status	No. of Turbines	Goshawk	Peregrine	Red Kite
Broken Cross (10T)	Consented	10	Species not recorded.	No direct impacts predicted. Low negative displacement impact of temporary duration predicted during construction.	Species not recorded during surveys.
Calder Water	Operational	13	Species not recorded.	Rarely recorded. No nesting. Not recorded flying at turbine height.	Not recorded at site.
Chapelton Farm	Operational	3	No information found.	No information found.	No information found.
Clyde	Operational	152	0 collision-related deaths predicted.	Limited information available, but species does not appear to have been raised as a significant concern.	Species not raised as a significant concern.
Clyde Extension	Operational	54	0 collision-related deaths predicted.	0.017 collision-related deaths predicted per year.	No records during raptor surveys. Species not raised as a concern.
Cornharrow	Consented	8	0.118 collision-related deaths predicted per year.	0.017 collision-related deaths predicted per year.	No significant impacts predicted at below local level.
Crookedstane	Consented	4	0 collision-related deaths predicted.	Non-breeder. Negligible residual effects predicted.	Only one flight recorded - negligible effects anticipated.
Cumberhead	Consented	14	0.118 collision-related deaths predicted per year.	Negligible effects predicted.	Not recorded.
Cumberhead West	Consented	21	Negligible effects predicted.	Scoped out of further assessment due to limited presence in area.	Not recorded during surveys.

Wind Farm	Status	No. of Turbines	Goshawk	Peregrine	Red Kite
Dalquhandy	Consented	15	No residual effects predicted.	Scoped out due to limited presence.	Scoped out due to limited presence.
Dalswinton	Operational	15	Two historic breeding records nearby. Not raised as a particular concern.	Occasionally present as a non-breeder. Not raised as a particular concern.	Occasionally present as a non-breeder. Not raised as a particular concern.
Dersalloch	Operational	23	0 collision-related deaths predicted.	Species not raised as a significant concern.	Species not raised as a significant concern.
Douglas West	Operational	13	No residual effects predicted.	Scoped out due to limited presence in survey area.	Scoped out due to limited presence in survey area.
Douglas West Extension	Consented	13	Negligible effects predicted.	Scoped out due to limited presence in survey area.	Present in local area but not assessed as a significant concern.
Draffanmarshill Farm	Operational	2	Considered absent.	Considered absent.	Considered absent.
Dungavel	Operational	13	0.044 collision-related deaths predicted per year.	0-0.02 collision-related deaths predicted per year.	Only one wintering flight recorded - negligible effects anticipated.
Enoch Hill	Consented	16	11 flights, two breeding territories and four incidental records in survey area. Worst-case predicted deaths 0.03 per year.	Three flights recorded with no evidence of breeding, thus scoped out of further assessment.	Species not found during surveys.
Fell	Consented	9	Disturbance considered unlikely. No breeding bird displacement and limited displacement predicted overall. Only one flight recorded;	Scoped out of full assessment due to limited use of area.	No breeding disturbance predicted. Limited temporary impacts and no significant effect.

Wind Farm	Status	No. of Turbines	Goshawk	Peregrine	Red Kite
			negligible collision risk.		
Galawhistle	Operational	22	0-0.125 collision-related deaths predicted per year.	No residual effect predicted.	No information found.
GlaxoSmithKline (Irvine) T3-4	Operational	2	Species not recorded.	Species not recorded.	Species not raised as a significant concern.
Glenkerie Extension	Consented	6	Species not recorded.	Negligible impacts predicted.	Species not recorded.
Glenmuckloch	Consented	8	Negligible effects predicted.	Negligible effects predicted.	Species not recorded.
Glenshimmeroch	Consented	10	Negligible effects predicted.	Negligible effects predicted.	Very small impact predicted. No significant concerns raised by Applicant or RSPB.
Hagshaw Hill Extension	Operational	20	No information available.	No information available.	No information available.
Hagshaw Hill Repowering	Consented	14	0 collision-related deaths predicted.	Scoped out due to limited presence in survey area.	Scoped out due to limited presence in survey area.
Hare Hill	Operational	20	0 collision-related deaths predicted.	Species not recorded.	Little information available – effects negligible to minor.
Hare Hill Extension	Operational	35	Scoped out.	Two regularly occupied breeding territories within approximately 3 km; a single historic site >1 km from turbines. Peregrine forage within and adjacent to the development. Low residual	Scoped out.

Wind Farm	Status	No. of Turbines	Goshawk	Peregrine	Red Kite
				disturbance effects predicted.	
Harestanes	Operational	68	Limited information available, but some adverse effects identified that required planning conditions to ensure appropriate mitigation. Goshawk use of the site has continued during monitoring.	Limited information available, but some low adverse effects identified. Site use has continued during monitoring.	Little information available, but appears not to be at risk from this development.
High Park Farm	Operational	1	No significant concerns identified.	No significant concerns identified.	No significant concerns identified.
Kennoxhead	Under Construction	19	0 collision-related deaths predicted.	No residual effects predicted.	Not recorded.
Kennoxhead Extension	Consented	8	Minor residual effects on one possible territory from disturbance and displacement.	Scoped out due to limited presence in survey area.	Scoped out due to limited presence in survey area.
Kilgallioch	Operational	96	0-0.005 collision-related deaths predicted per year.	Negligible residual effects predicted.	Negligible residual effects predicted.
Knockman Hill	Consented	5	Not recorded.	Not recorded.	Single bird recorded twice – negligible effects anticipated.
Kype Muir	Operational	26	0 collision-related deaths predicted.	Negligible effects predicted.	Negligible effects predicted.
Kype Muir Extension	Operational	15	Scoped out due to limited presence.	Scoped out due to limited presence.	Scoped out due to limited presence.
Ladehead Farm	Operational	3	Limited information available but appears not to have been raised as a significant concern.	Limited information available but appears not to have been raised as a significant concern.	Limited information available but appears not to have been raised as a significant concern.

Wind Farm	Status	No. of Turbines	Goshawk	Peregrine	Red Kite
Lethans	Consented	22	0.15 collision-related deaths predicted per year.	Low levels of activity. Limited displacement and no disturbance predicted after mitigation.	Not recorded.
Lion Hill	Consented	4	0 collision-related deaths predicted.	Single non-breeding male recorded. Negligible residual effects predicted.	Species not recorded during surveys.
Lochhead Cluster	Operational	5	Considered low risk for raptors. No adverse impacts predicted.	Considered low risk for raptors. No adverse impacts predicted.	Considered low risk for raptors. No adverse impacts predicted.
Mark Hill	Operational	28	Limited information but appears not to have been raised as a significant concern.	Limited information but appears not to have been raised as a significant concern.	Limited information but appears not to have been raised as a significant concern.
Middle Muir	Operational	15	0 collision-related deaths predicted.	Not recorded at site.	Not recorded at site.
Minnygap	Operational	10	No adverse effect.	No adverse effect.	No adverse effect.
Mochrum Fell	Consented	8	0.04-0.16 collision-related deaths predicted per year over 25 years.	Negligible effects predicted.	Potential concerns relate to collision risk rather than other impacts.
Myres Hill	Operational	2	Limited information but appears not to have been raised as a concern.	Limited information but appears not to have been raised as a concern.	Limited information but appears not to have been raised as a concern.
North Kyle	Consented	54	Up to 0.11 collision-related deaths predicted per year over 25 years.	Negligible effect predicted.	Low level of activity and no breeding – scoped out.

Wind Farm	Status	No. of Turbines	Goshawk	Peregrine	Red Kite
Nutberry	Operational	6	0 collision-related deaths predicted.	Bred nearby but few flights over Site; little potential for conflict with wind farm.	Limited activity; not breeding.
Overhill	Consented	10	Negligible residual effects predicted.	Scoped out due to limited presence.	Scoped out due to limited presence.
Penbreck	Consented	9	0 collision-related deaths predicted.	No displacement, disturbance or habitat loss impacts predicted.	Not recorded during surveys.
Pencloe	Consented	19	No flights recorded during surveys.	One pair breeding on periphery of site. Minor construction/ decommissioning and negligible to minor operation displacement and disturbance.	Not recorded.
Plascow	Operational	3	No adverse effects noted.	The only adverse effects predicted relate to collision risk. Subject to post-construction monitoring.	No adverse effects predicted, but subject to post-construction monitoring.
Sandy Knowe	Operational	24	0 collision-related deaths predicted.	A single flight was recorded outwith the breeding season.	Negligible adverse effects predicted.
Sanquhar	Operational	9	0 collision-related deaths predicted.	Recorded flying over the site.	Unknown.
Sanquhar Six	Consented	6	Low impacts during construction and operation. Negligible habitat loss.	Low-magnitude effects (including displacement) predicted – limited information.	Limited information – appears not to have been recorded at site.
Sneddon Law	Under Construction	15	0.048 collision-related deaths predicted per year.	No nesting recorded. Low to very low impacts predicted from disturbance and displacement.	Not recorded during surveys.

Wind Farm	Status	No. of Turbines	Goshawk	Peregrine	Red Kite
South Kyle	Operational	50	No nest sites found but activity suggested breeding in the area. Minor effects arising from other impacts during construction, operation and decommissioning.	Minor disturbance and displacement effects predicted. Negligible habitat loss and degradation.	Limited activity (non-breeding). Negligible to minor disturbance and displacement effects predicted. Up to minor habitat loss and degradation.
Sunnyside	Operational	2	Not recorded during surveys.	Not recorded during surveys.	Not recorded during surveys.
Torrs Hill	Consented	2	No at-risk flights recorded.	No information available.	No information available.
Troston Loch	Consented	14	0.14 collision-related deaths predicted per year. Other effects negligible.	Negligible residual effects.	Negligible disturbance effects.
Twentyshilling Hill	Operational	9	No effects identified.	Negligible residual effects.	No effects identified.
West Browncastle	Operational	12	Not recorded.	Negligible disturbance effects. Only four flights and no breeding recorded.	One flight recorded. Minimal impacts and effects predicted.
Wether Hill	Operational	14	0 collision-related deaths predicted.	One pair breeding on periphery of site. One collision-related death reported in 2013 did not relate to the breeding pair.	RSPB state red kite population has increased in Dumfries and Galloway since the later extension surveys (2012/13). Five nests within 7km of extension, i.e. present close to original Wether Hill site.

Wind Farm	Status	No. of Turbines	Goshawk	Peregrine	Red Kite
Whitelaw Brae	Consented	14	Scoped out due to limited breeding suitability and presence.	Scoped out due to limited presence and lack of breeding.	Not recorded.
Whitelee	Operational	144	No information available.	No information available.	No information available.
Whitelee Extension 1	Operational	36	Limited information, but no significant concern appears to have been raised.	Limited information, but no significant concern appears to have been raised.	Limited information, but no significant concern appears to have been raised.
Whitelee Extension 2	Operational	39	Limited information, but no significant concern raised.	Limited information, but no significant concern raised.	Limited information, but no significant concern raised.
Whiteside Hill	Operational	10	0 collision-related deaths predicted.	Recorded flying over the site. No significant effects anticipated.	Limited information, but species does not appear to have been raised as a concern, with no significant effects predicted.
Windy Rig	Operational	12	Negligible effects predicted.	Nearest known peregrine eyrie is within 5 km of the Development Site. No residual impacts affecting birds within Proposed Development.	0.012 collision-related deaths predicted per year, and negligible effects predicted from other potential sources of impact.
Windy Standard	Operational	36	No adverse effects anticipated.	Non-breeder. No adverse effects anticipated.	Recorded sporadically. No adverse effects anticipated.
Windy Standard Extension	Consented	30	Breeding but no adverse effects or collision-related deaths predicted.	No adverse effects predicted.	No adverse effects predicted.

Wind Farm	Status	No. of Turbines	Goshawk	Peregrine	Red Kite
Windy Standard Phase III	Consented	20	No adverse effects or collision-related deaths predicted.	No adverse effects predicted.	No adverse effects predicted.
Bankend Rig II Variation	Application	3	Negligible effects likely due to limited presence.	Negligible displacement and habitat loss. Low temporary disturbance impact in breeding season.	Only two flights recorded – negligible effects likely.
Carrick	Application	13	Low to negligible habitat loss and low disturbance and displacement effects predicted.	Residual effects concern collision risk.	Not recorded.
Clauchrie	Application	18	Minor adverse effect from displacement.	Two historic records only – no significant effects predicted.	Infrequently recorded – negligible effects anticipated.
Cornharrow Variation	Application	7	No additional effects or collision-related deaths predicted in comparison with main application.	No additional effects or collision-related deaths predicted in comparison with main application.	No additional effects or collision-related deaths predicted in comparison with main application.
Daer	Application	17	Minimal to no effects predicted.	Negligible effects predicted.	Negligible disturbance and displacement effects predicted.
Euchanhead	Application	21	Negligible residual effects predicted.	Negligible residual effects predicted.	Low site use and no nesting, thus scoped out.
Fell Variation	Application	9	Disturbance considered unlikely. No breeding bird displacement and limited displacement predicted overall. Only one flight recorded;	Scoped out of full assessment due to limited use of area.	Slight displacement and temporary disturbance effects possible.

Wind Farm	Status	No. of Turbines	Goshawk	Peregrine	Red Kite
			negligible collision risk.		
Grayside	Application	21	Scoped out due to limited presence and collision risk, and lack of breeding.	Scoped out due to limited presence and lack of breeding.	Scoped out due to limited presence and lack of breeding.
Greenburn	Application	16	Minor disturbance and displacement effects predicted. Scoped out of CRM.	Minor disturbance and displacement effects predicted.	Not recorded during surveys.
Hare Craig	Application	8	Negligible collision risk. Disturbance and displacement of minor significance (likely overestimate as only one non-breeding bird recorded).	Negligible residual effects.	Not recorded.
Harestanes South Extension	Application	8	No effect from direct habitat loss. Slight nesting disturbance predicted during construction. Other effects negligible.	Scoped out of full assessment due to limited use of area.	Scoped out of full assessment due to limited use of area.
Low Drumclog	Application	3	Very minimal risk due to limited presence.	Not recorded.	Not recorded.
Mill Rig	Application	6	Species recorded on only few occasions.	Temporary low disturbance impact during construction. Negligible displacement predicted.	Species recorded on only few occasions. Only one flight within turbine envelope.
Mochrum Fell Variation	Application	9	Negligible collision mortality predicted. Minor adverse effect from displacement during construction and operation.	Not recorded.	Minor adverse effect predicted from construction and operation displacement.
Overhill Variation	Application	10	Negligible collision mortality and minor operational	Scoped out of full assessment due	Scoped out of full assessment

Wind Farm	Status	No. of Turbines	Goshawk	Peregrine	Red Kite
			displacement predicted. Moderate to minor habitat loss and disturbance will be mitigated by pre-commencement survey and a BBPP.	to limited use of area.	due to limited use of area.
Penbreck Variation	Application	8	Negligible collision mortality predicted. Minor effects (habitat loss, displacement through construction and operation disturbance).	Not recorded during surveys.	Scoped out – significant effects unlikely.
Rigmuir	Application	3	Limited information but does not appear to be of any concern.	Limited information but does not appear to be of any concern.	Limited information but does not appear to be of any concern.
Sanquhar II	Application	50	Negligible construction and collision impacts and negligible displacement predicted.	Minor construction and operation impacts predicted from displacement, disturbance and potential collision.	Negligible construction impacts predicted. Red Kite Protection Plan devised to reduce operational impacts, which derive from collision risk.
Scoop Hill	Application	75	Minor displacement and/or disturbance effects during construction.	Habitat loss and displacement/ disturbance: minor during construction and minor to medium during operation.	Negligible construction effects. Operational effects concern collision risk.
Shepherd's Rig	Application	19	0.018 annual collision-related deaths predicted. Negligible effects from other impacts.	Negligible effects predicted.	Negligible effects predicted.

* Period over which annual deaths are estimated is taken to be 30 years unless otherwise specified.

Summary of cumulative effects

12.12.42 In summary, the cumulative assessment predicts no significant adverse effects on black grouse, peregrine, goshawk or red kite in combination with other developments. No significant cumulative effects are predicted for these species during construction, or due to operational disturbance and displacement.

12.13 Conclusions of significance evaluation

12.13.1 With reference to the outcomes summarised in Error! Reference source not found.**1** to **12.15** and the cumulative effects assessment, no significant effects are predicted on ornithological interest after mitigation.

12.13.2 This accords with Scottish Planning Policy, the objectives of The 2020 Challenge, Dumfries and Galloway LDP2 Policies IN1 and IN2, and East Ayrshire LDP Policies NE6 and RE1. The requirements of Dumfries and Galloway LDP2 Policy NE4 and East Ayrshire LDP Policy ENV6 have also been met. If the Proposed Development is implemented in accord with the recommendations detailed in **Section 12.8**, all legal requirements (including under the Habitats Regulations 2019) in respect of wild birds will be met.

12.14 Implementation of environmental measures

12.14.1 **Table 12.111** describes the environmental measures embedded within the Proposed Development and the means by which they will be implemented. These will be secured through the recommended planning conditions.

Table 12.111 Summary of environmental measures to be implemented – relating to ornithology

Environmental measure	Responsibility for implementation	Compliance mechanism	EIA Report section reference
Breeding Bird Protection Plan	Developer/Contractor	Planning condition or CEMP	**Section 12.8**
Sensitive design of watercourse crossings and culverts	Developer/Contractor	Planning condition or CEMP	**Section 12.8**
Pollution Prevention Plan and Pollution Incident Response Plan	Developer/Contractor	Planning condition or CEMP	**Section 12.8**
500 m turbine exclusion buffer for peregrine	Developer/Contractor	CEMP	**Section 12.8**
500 m operational disturbance buffer for peregrine	Developer/Contractor	BBPP (via planning condition or CEMP)	**Section 12.8**

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13. Geology, Hydrology (including flood risk) and Hydrogeology

13.1 Introduction

13.1.1 This chapter of the EIA Report assesses the potential effects of the Proposed Development with respect to Geology, Hydrology (including flood risk) and Hydrogeology. The chapter should be read in conjunction with the Development Site design provided in **Chapter 3: Description of the Proposed Development**. It should also be read with respect to the relevant parts of **Chapter 6: Renewable Energy, Carbon Balance and Peat** and **Chapter 11: Ecology**, where common receptors have been considered and where there is an overlap or relationship between the assessment of effects.

Limitations of this assessment

13.1.2 Whilst there are some information gaps, as listed below, none significantly affect the ability to undertake an assessment of effects with respect to Geology, Hydrology (including flood risk) and Hydrogeology:

- surface water flow monitoring has not been undertaken on the Proposed Development, and surface water quality monitoring has been limited;
- no monitoring data from SEPA are available regarding groundwater levels across the Proposed Development;
- whilst abstraction licences and private water supplies (PWSs) in the area have been identified through consultation with the Scottish Environment Protection Agency (SEPA), Dumfries and Galloway Council (DGC) and East Ayrshire Council (EAC), not all details of these licences are known e.g. historic abstraction quantities or water quality; and
- DGC has stated that the locations of PWSs have not been updated or verified recently. Both DGC and EAC emphasise that there may be other properties in the area that have not registered their PWSs with the Council.

13.2 Assessment Method

Relevant legislation, planning policy, technical guidance

Legislative context

13.2.1 The following legislation is relevant to the assessment of the effects on Geology, Hydrology (including flood risk) and Hydrogeology receptors (in chronological order, oldest first):

- Control of Pollution Act 1974 (as amended);
- Agriculture Act 1986;
- Environment Protection Act 1990;

- Land Drainage Acts of 1991 and 1994;
- Water Resources Acts of 1991 and 1994;
- Environment Act 1995;
- Pollution Prevention and Control Act 1999;
- European Union (EU) Water Framework Directive (2000/60/EC) establishing a framework for Community action in the field of water policy (WFD);
- Control of Substances Hazardous to Health Regulations 2002 (COSHH);
- Water Environment and Water Services (Scotland) Act 2003 (WEWS), as amended by the Environment (EU Exit) (Scotland) (Amendment etc.) Regulations 2019;
- Landfill (Scotland) Regulations 2003;
- The Water Environment (Register of Protected Areas) (Scotland) Regulations 2004;
- Nature Conservation (Scotland) Act 2004;
- European Liability Directive (2004/35/EEC) on environmental liability with regard to the prevention and remedying of environmental damage;
- Private Water Supplies (Scotland) Regulations 2006;
- Water Environment (Oil Storage) (Scotland) Regulations 2006;
- Groundwater Daughter Directive (2006/118/EC) on the protection of groundwater against pollution and deterioration;
- EU Floods Directive (2007/60/EC);
- The Environmental Liability (Scotland) Regulations 2009, as amended by the Environment (EU Exit) (Scotland) (Amendment etc.) Regulations 2019;
- The Flood Risk Management (Scotland) Act 2009;
- Flood Risk Regulations 2009;
- Water Environment (Groundwater and Priority Substances) (Scotland) Regulations 2009;
- Flood and Water Management Act 2010;
- The Water Quality (Scotland) Regulations 2010;
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR);
- The Waste Management Licensing (Scotland) Regulations 2011;
- The Water Environment (Controlled Activities) (Scotland) Amendment Regulations 2013 ;
- Water Environment (Drinking Water Protected Areas) (Scotland) Order 2013;
- Water Act 2014;
- The Construction Design and Management Regulations 2015;
- The Water Environment (Miscellaneous) (Scotland) Regulations 2017;
- Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017;

- Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, as amended;
- Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017; and
- The Environment Act 2021.

13.2.2 The requirements of various EU directives such as the WFD (2000/60/EC), the European Liability Directive (2004/35/EEC) and the Groundwater Daughter Directive (2006/118/EEC) have been transposed into domestic legislation by the Environment (EU Exit) (Scotland) (Amendment etc.) Regulations 2019. Previously the WFD and now the Environment (EU Exit) (Scotland) (Amendment etc.) Regulations 2019 and supporting domestic legislation established a legal framework for the protection, improvement and sustainable use of surface waters, transitional waters, coastal waters and groundwater resources.

13.2.3 The regulation of activities relating to the water environment is implemented through the Water Environment (Controlled Activities) (Scotland) Regulations 2011, as amended (CAR). This covers activities including abstraction, discharges, impoundments and engineering works that could impact on a watercourse. Depending on the size and nature of the activity, General Binding Rules (GBRs) need to be followed, or the activity registered, or a full licence obtained.

Planning policy context

National policies

13.2.4 The Scottish Government's National Planning Framework (NPF) 3 was published in June 2014 and sets the long-term context for development planning in Scotland. However, NPF3 does not contain any specific policies with regard to Geology, Hydrology (including flood risk) and Hydrogeology, or onshore wind energy developments.

13.2.5 On 8th November the Revised Draft National Planning Framework was laid before the Scottish Parliament for approval and it includes policies pertaining to renewable energy and flooding as summarised in **Table 13.1**.

13.2.6 The Scottish Government's Scottish Planning Policy (SPP) was published in June 2014 and sets out national planning policies that reflect the priorities of the Scottish Ministers for the operation of the planning system and the development and use of land through sustainable economic growth. SPP paragraphs 161 -166 relate to onshore wind farms in general, whilst SPP paragraphs 254 - 268 specifically cover flooding and drainage, and so both sets of policies are summarised at the head of **Table 13.1**.

13.2.7 National planning policy is supported by Planning Circulars, Planning Advice Notes (PANs) and Specific Advice Sheets (SASs), and by Ministerial / Chief Planning Letters to Planning Authorities, which set out detailed advice from the Scottish Government in relation to planning issues. The PANS and SASs considered most relevant to the Proposed Development are also summarised in **Table 13.1** (in chronological order, oldest first).

13.2.8 There have been no other changes to the key national planning policy documents since their publication. However, the following relevant changes to national guidance and advice publications have occurred:

- the Scottish Government's Chief Planner issued a letter regarding renewable energy targets and the consideration of socio-economic impacts (dated 11th November 2015) and Draft Advice on Net Economic Benefit and Planning (March 2016);

- the Carbon and Peatland Map 2016 was published by Scottish Natural Heritage (SNH, now NatureScot) on 29th June 2016 and identifies areas considered likely to host Scotland's nationally important resource of deep peat, carbon rich soils and priority peatlands habitats. Under Table 1 of the SPP these are to be identified on wind energy spatial frameworks as *"Group 2 – Areas of Significant Protection"*; and
- in June 2016, the Scottish Government published its draft Peatland and Energy Policy Statement, which provides the basis from which the Scottish Government and its agencies will act in developing and implementing policies in relation to peatland and energy. This policy is a material consideration for new energy developments and the impact they may have on peatland habitats.

Development Plan policies

13.2.9 The statutory development plans applicable to the Proposed Development comprises the DGC Local Development Plan 2 (LDP2) (adopted October 2019) and the EAC Local Development Plan (LDP) (adopted April 2017), due to be superseded by the LDP2 (published for consultation from May-July 2022), together with statutory Supplementary Planning Guidance (SPG), including that for Wind Energy Development: Development Management Considerations (adopted February 2020). The LDP policies particularly relevant to water are also listed in **Table 13.1**. The Wind Energy Development SPG requires such development proposals demonstrate that they have been designed to minimise any detrimental impact on the water environment.

Table 13.1 Planning policy issues relevant to Geology, Hydrology (including flood risk) and Hydrogeology

Policy reference	Policy issue	Considered in Section
NPF4 policies		
Policy 5	Development proposals on peatland, carbon-rich soils and priority peatland habitat will only be supported for the generation of energy from renewable sources that optimises the contribution of the area to greenhouse gas emissions reductions targets. Where development is proposed on peatland, carbon-rich soils or priority peatland habitat, a detailed site specific assessment will be required to identify: i. the baseline depth, habitat condition, quality and stability of carbon rich soils; ii. the likely effects of the development on peatland, including on soil disturbance; and iii. the likely net effects of the development on climate emissions and loss of carbon. This assessment should inform careful project design and ensure, in accordance	**Chapter 6: Renewable Energy and Peat**

Policy reference	Policy issue	Considered in Section
	with relevant guidance and the mitigation hierarchy, that adverse impacts are first avoided and then minimised through best practice. A peat management plan (PMP) will be required to demonstrate that this approach has been followed, alongside other appropriate plans required for restoring and / or enhancing the site into a functioning peatland system capable of achieving carbon sequestration.	
Policy 11	Development proposals for all forms of renewable, low-carbon and zero emissions technologies will be supported. These include wind farms including repowering, extending, expanding and extending the life of existing wind farms. In addition, project design and mitigation will demonstrate how the impacts effects on hydrology, the water environment and flood risk are addressed.	13.6, 13.8
Policy 22	Development proposals will manage all rain and surface water through sustainable urban drainage systems (SUDS), which should form part of and integrate with proposed and existing blue-green infrastructure. All proposals should presume no surface water connection to the combined sewer. Development proposals should also seek to minimise the area of impermeable surface. Furthermore, development proposals which create, expand or enhance opportunities for natural flood risk management, including blue and green infrastructure, will be supported.	13.6 (paragraphs 13.6.7, 13.6.8 and 13.6.37)
National planning policies		
Scottish Government SPP 2014, paragraphs 161 – 166	These policies provide guidance to planning authorities on the setting out of a spatial framework for identifying areas that are likely to be most appropriate for onshore wind farms. The framework aims to deliver consistency nationally. It is also complemented by a more detailed and exacting development management process where the merits of an individual proposal will be carefully considered against the full range of environmental, community and cumulative impacts.	13.5, 13.7 and 13.9
Scottish Government SPP 2014, paragraphs 254 - 268	The SPP provides guidance to planners and developers on how to approach the issues of flood risk and drainage. It	13.4 (paragraphs

Policy reference	Policy issue	Considered in Section
	establishes that a precautionary approach to flood risk from all sources should be taken, alongside ensuring development proposals will increase the flood resilience of their surroundings. Development proposals that will have a significant probability of being affected by flooding or increase the probability of flooding occurring elsewhere are not permitted by the SPP.	13.4.47 – 13.4.51)
Scottish Government Controlling the Environmental Effects of Surface Mineral Workings (PAN 50), October 1996	This PAN gives good practice advice for planners and developers on the more significant environmental effects arising from mineral working operations, including borrow pits.	13.6 (paragraph 13.6.39)
Scottish Government Planning and Sustainable Urban Drainage Systems (PAN 61), July 2001	This PAN gives good practice advice for planners and developers on the use of SUDS and complements the SUDS Design Manual for Scotland and Northern Ireland.	13.6 (paragraph 13.6.37)
Scottish Government Water and Drainage (PAN 79), September 2006	This PAN clarifies the role of the planning authority in setting the direction of development to inform the planning and delivery of new water infrastructure in a coordinated way. It explains the role of Scottish Water (SW) and SEPA and encourages joint working to ensure a common understanding of capacity constraints and agreement on the means of their removal. It advises on the appropriateness of private schemes and the handling of SW developments.	N/A
Scottish Government Wind Farm Developments on Peat Land, May 2013	The Scottish Government has supported the development of the carbon calculator for use in the consideration of carbon savings from wind farm developments on peatlands. Originally published in 2008, a revised version launched in June 2011 has refined the calculator following feedback and further research and is an even more effective tool.	**Chapter 6: Renewable Energy and Peat**
SAS (updated 28 May 2014): Onshore Wind Turbines	This provides advice for planning authorities on planning issues to be considered in relation to onshore wind farms, including water.	**Chapter 13: Geology, Hydrology (including flood risk) and Hydrogeology**
SAS: Peatland Survey 2017: Guidance on Developments on Peat Land	This guidance defines a consistent sampling methodology to quantify and qualify the peat material on site and	**Chapter 6: Renewable**

Policy reference	Policy issue	Considered in Section
	provides advice as to how to publish peat surveys as part of a developer's wider site investigations.	**Energy and Peat**
Development plan policies – DGC LDP2		
Policy NE11: Supporting the Water Environment	This policy states that DGC *"will not permit development which would result in deterioration in the status of a waterbody or which would likely impede the improvements in waterbody status as set out in the Solway Tweed River Basin Management Plan (2015)"*. Also, in relation to potential culverting of watercourse, it states *"then permission could be granted if the Council is satisfied that there would be acceptable mitigation measures to protect habitats, passage of fauna, and river form and flow."*	13.6 and 13.8
Policy IN7: Flooding and Development	This policy states that *"Where proposed development could lead to an unacceptable on-site or off-site flood risk, as defined by the Risk Framework in SPP, then it will not be permitted. Where a proposed development could lead to an unacceptable flood risk, it may be that a Flood Risk Assessment (FRA) is able to clarify to the satisfaction of the Council and SEPA that the level of risk both on and off site would be acceptable."*	13.4 (paragraphs 13.4.47 - 13.4.51)
Policy IN8: SUDS	This policy states that *"SUDS will be a required part of all proposed development as a means of treating the surface water and managing flow rates and must form part of any planning permission in principle proposal*. *Planning applications must include details of the proposed SUDS to show how they will:* • *ensure the system is designed to avoid flood risk from exceedance flows;* • *be accommodated within the proposed site, and understood as an essential factor in determination of the overall capacity of any site;* • *be based on a unified approach to cover surface water drainage from on-site roads and from the remainder of the site;*	**Chapter 3: Project Description** 13.6 (paragraph 13.6.37)

Policy reference	Policy issue	Considered in Section
	• *contribute positively to the biodiversity, general amenity and water quality of the area of the proposal;* • *include a coordinated approach between new developments that are adjacent to one another; and* • *include the arrangements for its long-term maintenance."*	
Policy NE14: Carbon Rich Soil	This policy states that "*developments proposed on areas of carbon rich soil will need to clearly justify the loss of the carbon sink. Development may be permitted if it can be demonstrated that in accordance with the Scottish Government's 'carbon calculator' or other equivalent independent evidence the balance of advantage in terms of climate change mitigation lies with the development proposal."*	**Chapter 6: Renewable Energy and Peat**
Policy NE15: Protection and Restoration of Peat Deposits as Carbon Sinks	"*The Council will support peatland restoration, including rewetting.* *Developments proposed affecting peat deposits not already designated for habitat conservation reasons may be permitted in the following circumstances:* *(a) In areas of degraded peatland where all of the following apply:* • *The deposits have been significantly damaged by human activity; and* • *The conservation value is low; and* • *Restoration to functioning peatland is not possible.* *In all such cases appropriate site restoration measures, to something other than functioning peatland, will be required; or* *(b) Where renewable energy generating development is proposed and it can be demonstrated (in accordance with the Scottish Government's 'carbon calculator' or other equivalent independent evidence) that the balance of advantage in terms of climate change mitigation lies with the energy generation proposal."*	**Chapter 6: Renewable Energy and Peat**
Development plan policies – EAC LDP		

Policy reference	Policy issue	Considered in Section
Policy ENV10: Carbon Rich Soils	"*The Council will support and promote the restoration of peatland habitats, where there is potential for such habitats to become active carbon stores and to help to reduce net carbon emissions*. *However, development may be permitted for renewable energy generating developments on carbon rich soils where it can be demonstrated (in accordance with the Scottish Government's 'carbon calculator' or other equivalent evidence) that the balance of advantage in terms of climate change mitigation lies with the energy generation proposal, and that any significant effects on these areas can be substantially overcome by siting, design or other mitigation.*"	**Chapter 6: Renewable Energy and Peat**
Policy ENV11: Flood Prevention	"*The Council will take a precautionary approach to flood risk from all sources and will promote flood avoidance in the first instance. Flood storage and conveying capacity will be protected and development will be directed away from functional flood plains and undeveloped areas of medium to high flood risk.* *The Council will also encourage new flood management measures, including flood protection schemes, restoring natural features, enhancing flood storage capacity and* *avoiding the construction of new culverts and the opening of existing culverts*." EAC states that "*the Flood Risk Framework, contained in SPP, will be used in the assessment of development proposals. This sets out the type of development that will be appropriate in each category of flood risk and indicates where FRA are likely to be required. All FRAs will be required to be carried out to the satisfaction of SEPA*."	13.4 (paragraphs 13.4.47 - 13.4.51)
Policy ENV12: Water, air and light and noise pollution	"*In line with the WFD, the Council will give priority to maintaining and improving the quality of all water bodies and ground water. There will be a presumption against any development that will have an adverse impact on the water environment in terms of pollution levels and the ecological value of water habitats.*	13.6

Policy reference	Policy issue	Considered in Section
	Where developments are proposed on or close to existing water bodies, design solutions should explore how best to maintain their water quality. Maintenance access buffer strips of a minimum 6 metres in width should be provided between the development and the adjacent watercourse. *The Council will not be supportive of developments which will, or which have the potential to, cause significant adverse impacts on water bodies as a result of morphological changes to water bodies such as engineering activities in the form of culverts or changes to the banks or bed*." Finally, the Council state that "*the development will be required to manage surface water through SUDS*."	

Technical guidance

13.2.10 Relevant policy and general guidance utilised includes the following (in alphabetical order, by lead author organisation and then report number or chronological, oldest first):

- British Standards:
  - BS 6031:2009 Code of Practice for Earth Works (2009);
  - BS 5930:2015+A1:2020 Code of Practice for Site Investigations (2020); and
  - BS 10175:2011+A2:2017 Code of Practice for Investigation of Potentially Contaminated Sites (2017).
- Construction Industry Research and Information Association (CIRIA) reports:
  - Report C532: Control of Water Pollution from Construction Sites (2001);
  - Report C624: Development and Flood Risk - guidance for the construction industry (2004);
  - Report C648: Control of Water Pollution from Linear Construction Projects (2006);
  - Report C649: Control of Water Pollution from Linear Construction Projects - Site Guidance (2006);
  - Report C698: Site Handbook for the Construction of SUDS (2007);
  - Report C741: Environmental Good Practice on Site Guide, Fourth Edition (2015);
  - Report C750: Groundwater Control - Design and Practice, second edition (2016);
  - Report C753: The SUDS Manual (2015); and
  - Report C786: Culvert, Screen and Outfall Manual (2019).

- Department for Food, Environment and Rural Affairs (Defra) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (2009);
- Forestry Commission (FC), Forestry Commission Scotland (FCS) and co-authored reports:
  - FC Forestry Practice Guide: Whole-Tree Harvesting: A Guide to Good Practice (1997);
  - FCS and SNH Floating Roads on Peat (2010);
  - FC Forests and Water Guidelines, 5th Edition (2011);
  - FC Forests and Soil Guidelines (2011); and
  - FC The UK Forestry Standard (2017).
- Ministry of Agriculture, Forestry and Food (MAFF) Good Practice Guide for Handling Soils (2000);
- Scotland and Northern Ireland Forum for Environmental Research (SNIFFER): A Functional Wetland Typography for Scotland (2009);
- SEPA lead author publications:
  - Engineering in the Water Environment: Good Practice Guide – Temporary Construction Methods (2009);
  - Regulatory Position Statement - Developments on Peat (February 2010);
  - Guidance on Developments on Peatland – Site Surveys, SEPA, SNH and The James Hutton Institute (2017);
  - Guidance: Life Extension and Decommissioning of Onshore Wind Farms (2016);
  - Guidance WST-G-052: Development on Peat and Off-site Uses of Waste Peat (2017);
  - Planning Information Note 3: Flood Risk Advice for Planning Authorities (August 2017);
  - Technical Flood Risk Guidance for Stakeholders (July 2018);
  - SEPA Flood Risk Standing Advice for Planning Authorities and Developers (November 2020);
  - CAR: A Practical Guide (2022); and
  - CAR Flood Risk Standing Advice for Engineering, Discharge and Impoundment Activities (undated).
- SEPA Land Use Planning System Guidance Notes (LUPS-GU):
  - No. 4: Planning Guidance on On-shore Windfarm Developments (2017);
  - No. 8: SEPA Standing Advice for Planning Authorities and Developers on Development Management Consultations (2016);
  - No. 24: SEPA Flood Risk and Land Use Vulnerability Guidance (2018);
  - No. 27: Use of Trees Cleared to Facilitate Development on Afforested Land (2014);

- No 31: Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (2017); and
- No. 50: Controlling the Environmental Effects of Surface Mineral Workings.

- SEPA Policies:
  - No. 19: Groundwater Protection Policy for Scotland (2009); and
  - No. 41: Development at Risk of Flooding: Advice and Consultation (October 2016).
- SEPA Guidance for Pollution Prevention (GPP) Notes and (under review) Pollution Prevention Guidance (PPG) Notes:
  - GPP 1 Understanding your Environmental Responsibilities – Good Environmental Practices (October 2020));
  - GPP 2: Above Ground Oil Storage Tanks (January 2018);
  - GPP 3: Use and Design of Oil Separators in Surface Water Drainage Systems (March 2022);
  - GPP 4: Treatment and Disposal of Wastewater where there is no Connection to the Public Foul Sewer (November 2017);
  - GPP 5: Works and Maintenance in or near Water (February 2018);
  - PPG 6: Working at Construction and Demolition Sites (2012);
  - GPP 8: Safe Storage and Disposal of Used Oils (July 2017);
  - GPP 13: Vehicle Washing and Cleaning (April 2017);
  - PPG 18: Managing Fire Water and Major Spillages (June 2000);
  - GPP 20: Dewatering of Underground Ducts and Chambers (January 2018);
  - GPP 21: Pollution Incident Response Planning (June 2021); and
  - GPP 26: Safe Storage of Drums and Intermediate Bulk Containers (February 2019);
- SEPA Position Statements (PSs) and Supporting Guidance (SG), namely:
  - WAT-PS-06-02 Culverting of Watercourses (June 2015);
  - WAT-PS-07-02 Bank Protection (April 2012);
  - WAT-PS-10-01 Assigning Groundwater Assessment Criteria for Pollutant Inputs (August 2014);
  - WAT-SG-21: Bank Protection Environmental Standards for River Morphology (July 2012);
  - WAT-SG-23: Engineering in the Water Environment, Good Practice Guide, Bank Protection Rivers and Lochs, Version 1 (April 2008);
  - WAT-SG-25: Engineering in the Water Environment, Good Practice Guide, River Crossings, Version 2 (November 2010);
  - WAT-SG-26: Engineering in the Water Environment, Good Practice Guide, Sediment Management, Version 1 (June 2010);

- WAT-SG-29: Engineering in the Water Environment, Good Practice Guide, Temporary Construction Methods, Version 1 (March 2009);
- WAT-SG-31: Prevention of Pollution from Civil Engineering Contracts: Special Requirements, Version 2 (June 2006);
- WAT-SG-75: Sector Specific Guidance: Construction Sites (February 2018); and
- WAT-SG-78: Sediment Management Authorisation (December 2012);

- Scottish Government publications:
  - River Crossings and Migratory Fish: Design Guidance (2000);
  - Scotland's Zero Waste Plan (June 2010);
  - PAN 1/2013 - Environmental Impact Assessment (August 2013).
  - Online Flood Risk Planning Advice (June 2015); and
  - Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Second Edition) (April 2017).
- SNH lead author publications:
  - Guidelines on the Environmental Impacts of Wind Farms and Small Scale Hydroelectric Schemes (2001);
  - Constructed Tracks in the Scottish Uplands (June 2013);
  - Siting and Designing Wind Farms in the Landscape (2014); and
  - Environmental Impact Assessment Handbook V5 (2018).
- Scottish Renewables (SR) lead publications:
  - SR and SEPA Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste (January 2012); and
  - SR, SNH, SEPA, FCS, Historic Environment Scotland (HES), Marine Scotland Science (MSS) and Association of Environmental and Ecological Clerks of Works (AEECoW), Good Practice During Wind Farm Construction, Fourth edition (2019).
- Local and Regional Land Drainage Byelaws.

Consultation

13.2.11 **Table 13.2** provides a summary of the issues about the Proposed Development that have been raised by consultees and the responses provided in this chapter and elsewhere.

Table 13.2 Summary of issues raised during consultation regarding Geology, Hydrology (including flood risk) and Hydrogeology

Issue raised	Consultee(s)	Response and how considered in this chapter	Considered in Section
The applicant should contact SW, as the Afton Reservoir is a SW asset and any potential pollution or disruption impacts should be discussed.	EAC	The SW scoping response is summarised within this table, below. Mitigation measures are described to minimise disruption to Afton Water tributaries.	Table 13.2 13.6 and 13.8
Areas of potential surface water flooding are limited to a low risk area to the west, close to the Development Site boundary (within EAC) and an area (minor in scale) at high risk to the very north fringe of the Development Site boundary, where headwaters converge with the Afton Reservoir.	EAC	Flood risk is assessed within the baseline section. Mitigation measures would ensure there is no significant increase in flood risk from the Proposed Development.	13.4 13.6
EAC Environmental Health Service should be contacted to assist in the identification of any PWS in and around the Development Site. It is important to ensure the identifiable locations are ascertained for the EIA Report. The EIA Report should risk assess any PWS potentially affected by the Proposed Development, and in assessing the risk should not only consider the source, its catchment and the receptor, but also identify / map out and consider the pathway from the source to the receptor. Details of any mitigation and/or contingency measures that may be required should be detailed within the EIA Report.	EAC	EAC was contacted regarding the location of PWSs. None were found to be located within 2 km of the boundary of the Development Site.	13.4
The Ayrshire Rivers Trust (ART) and the Nith District Salmon Fisheries Board (NDFSB) should be contacted to discuss their expectations and requirements regarding the extent of hydrological assessment required to inform the assessment of hydrological impacts which also links to the potential ecological impacts on aquatic life.	EAC	The Proposed Development is not within any of the catchments considered by ART. However, the NDSFB and Galloway Fisheries Trust (GFT) were contacted. The NDSFB response is summarised below.	**Table 13.2**

Issue raised	Consultee(s)	Response and how considered in this chapter	Considered in Section
		Mitigation measures are described to minimise disruption to watercourses. Pre-construction monitoring has also been proposed. Potential ecological impacts on aquatic life are discussed in Chapter 11: Ecology.	13.6 and 13.8 **Chapter 11: Ecology**
GFT state that generally it agrees with the scoping plan outline. GFT and Kirkcudbrightshire Dee District Salmon Fishery Board (KDDSFB) should be included in the consultation list as the Water of Ken would potentially be impacted by the Proposed Development.	GFT	Water quality of the Water of Ken catchment is considered within this chapter.	13.4
The NDSFB is primarily concerned with any activity within their area of jurisdiction with the potential to adversely impact on the fish community or the environment in which they reside. It states that it can confirm the presence of fish in most of the upper tributaries within the Afton catchment, which includes part of the Lorg Wind Farm footprint. A full aquatic audit should be undertaken as part of the environmental information being gathered to protect the environment in the vicinity of any wind farm development.	NDSFB	Water quality of the upper tributaries of the Nith catchment is considered within this chapter. Baseline fisheries surveys have been undertaken for the two different catchments by NDSFB and GFT. The baseline survey reports have been considered in and are appended to Chapter 11: Ecology.	13.4 **Chapter 11: Ecology**
SEPA state that the Development Site should be designed to avoid deep peat deposits, groundwater dependent terrestrial ecosystems (GWDTEs) and the numerous watercourses on site. Also, that appropriate buffer distances should be incorporated e.g. 50m buffer to water features.	SEPA	A Peat Landslide Risk Assessment (PLRA) has been undertaken. A GWDTE Risk Assessment has been undertaken. All water environment receptors have been identified, assessed and appropriate mitigation measures prescribed.	**Chapter 6: Renewable Energy and Peat** **Appendix 13A** 13.4, 13.6, 13.7 and 13.8

Issue raised	Consultee(s)	Response and how considered in this chapter	Considered in Section
SW has no objection to the Proposed Development but states that the Development Site is within the drinking water catchments within which its abstractions from Afton Reservoir and Carsfad Loch Reservoir are located. Also, the intakes within these catchments are sufficient distance such that it is likely to be low risk, but care should be taken and water quality protection measures must be implemented.	SW	Mitigation measures are described to minimise disruption to Afton Water (and therefore, Afton Reservoir) and Water of Ken (and therefore, Carsfad Loch) tributaries.	13.6 and 13.8

Predicting effects

13.2.12 The generic project-wide approach to the assessment methodology is set out in **Chapter 4: EIA Approach**, and specifically in **Sections 4.5** to **4.7**. However, whilst this has informed the approach that has been used in this the Geology, Hydrology (including flood risk) and Hydrogeology assessment, it is necessary to set out how this methodology has been applied, and adapted as appropriate, to address the specific needs of this assessment.

13.2.13 The significance of the effects resulting from the Proposed Development is primarily determined by reference to the value (importance) of a given feature and the magnitude of change. In terms of the Geology, Hydrology (including flood risk) and Hydrogeology, the key types of effects relate to water quantity (level and flow) and quality. However, depending on the effects on surface water flows, there may also be effects on immediate and downstream morphology and sediment dynamics and flood risk.

13.2.14 The assessment is therefore based on both receptor value and the nature and magnitude of the effect as a result of the Proposed Development. All mitigation considered necessary is identified and residual effects with this mitigation in place determined. It is intended that no residual significant effects remain following adoption of the proposed mitigation, but whether this is achievable is investigated in the reminder of this chapter.

13.2.15 **Table 13.3** provides a summary of the criteria that is used in the assessment of the feature value and introduces the concept of receptor type (groups of receptors whose value is assessed using the same criteria). The criteria are semi-quantitative and therefore professional judgement is required in the assessment.

Table 13.3 Summary of value of Hydrology (including flood risk) and Hydrogeology receptors

Value	Criteria	Receptor type*	Examples
High	Features with a high yield, quality or rarity with little potential for substitution.	Aquatic environment	Conditions supporting a site with an international conservation designation (Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar), where the designation is based specifically on aquatic features. WFD surface water body (or part thereof) with overall High status, also any associated upstream non-reportable WFD surface water body or non-WFD surface water body. WFD surface water body (or part thereof) with High status for morphology.
	Water use supporting human health and economic activity at a regional scale.	Water use	CAR-licensed public surface water or groundwater supply (and associated catchment) or permitted discharge.
	Features with a high vulnerability to flooding.	Flood risk	Land use type defined as ‘Essential Infrastructure’ (i.e. critical national

Value	Criteria	Receptor type*	Examples
			infrastructure, such as essential transport and utility infrastructure) and 'Most Vulnerable Use' (e.g. police/ambulance stations that are required to operate during flooding, mobile homes intended for permanent residential use) in the SPP and SEPA (2018a) flood risk land use vulnerability classification.
Medium	Features with a medium yield, quality or rarity, with a limited potential for substitution.	Aquatic environment	Conditions supporting a site with a national conservation designation (e.g. Site of Special Scientific Interest (SSSI), National Nature Reserve (NNR)), where the designation is based specifically on aquatic features. WFD surface water body (or part thereof) with overall Good status/potential, also any associated upstream non-reportable WFD surface water body or non-WFD surface water body. WFD groundwater body (or part thereof) with overall Good status.
	Water use supporting human health and economic activity at a local scale.	Water use	CAR-licensed non-public surface water and groundwater supply abstraction (and associated groundwater catchment) which is relatively large relative to available resource, or where raw water quality is a critical issue, e.g. industrial process water, or permitted discharge.
	Features with a medium vulnerability to flooding.	Flood risk	Land use type defined as 'Highly Vulnerable Use' in the SPP and SEPA (2018a) flood risk land use vulnerability classification e.g. most types of residential development, hostels and hotels, landfill and waste management facilities.
Low	Features with a low yield, quality or rarity, with some potential for substitution.	Aquatic environment	Conditions supporting a site with a local conservation designation, where the designation is based specifically on aquatic features, or an undesignated but highly/moderately water-dependent ecosystem, including a GWDTE. WFD surface water body (or part thereof) with overall Moderate or lower status/potential, also any

Value	Criteria	Receptor type*	Examples
			associated upstream non-reportable WFD surface water body or non-WFD surface water body. Groundwater body (or part thereof) with overall Poor status.
	Water use supporting human health and economic activity at household/individual business scale.	Water use	CAR-registered non-public surface water and groundwater supply abstraction (and associated catchment), which is relatively small relative to available resource, or where raw water quality is not critical, e.g. cooling water, spray irrigation, mineral washing or permitted discharge. Unregistered potable surface water and groundwater abstraction (and associated catchment) e.g. private domestic water supply, well, spring or permitted discharge.
	Features with a low vulnerability to flooding.	Flood risk	Land use type defined as 'Least Vulnerable' in the SPP and SEPA (2018a) flood risk land use vulnerability classification e.g. most types of business premises.
Very Low	Commonplace features with very low yield or quality with good potential for substitution.	Aquatic environment	Conditions supporting an undesignated and low water-dependent ecosystem, including a GWDTE, ancient woodland and pond. Non-reportable WFD surface water body (or part thereof), or non-WFD surface water body, not associated with any downstream WFD surface water body. Non-reportable WFD groundwater body (or part thereof), or non-WFD groundwater body including non-abstraction springs.
	Water use does not support human health, and of only limited economic benefit.	Water use	Unregistered non-potable surface water and groundwater abstraction (and associated catchment) e.g. livestock supply.
	Features that are resilient to flooding.	Flood risk	Land use type defined as 'Water-compatible use' in the SPP and SEPA (2018a) flood risk land use vulnerability classification and undeveloped land e.g. flood control

Value	Criteria	Receptor type*	Examples
			infrastructure; water transmission infrastructure.

*Receptor types map onto the **Table 13.3** receptor lists as follows:
- aquatic environment – aquifers and WFD groundwater bodies, watercourses and WFD surface water bodies, conditions supporting GWDTEs and designated conservation sites;
- water use – springs, abstractions; and
- flood risk – humans, properties and infrastructure.

13.2.16 The magnitude of change on the receptors is independent of the value of the receptor, and its assessment is semi-quantitative and again reliant in part on professional judgement. **Table 13.4** provides examples of how various levels of change have been determined with respect to water features.

Table 13.4 Summary of Geology, Hydrology (including flood risk) and Hydrogeology magnitude of change

Magnitude	Criteria	Receptor type	Example*
High	Results in major change to feature, of sufficient magnitude to affect its use/integrity.	Aquatic environment	Deterioration in river flow regime, morphology or water quality, leading to sustained, permanent or long-term breach of relevant conservation objectives (COs) or non-temporary downgrading (deterioration) of WFD surface water body status (including downgrading of individual WFD elements) or dependent receptors, or resulting in the inability of the surface water body to attain Good status in line with the measures identified in the River Basin Management Plan (RBMP). Deterioration in groundwater levels, flows or water quality, leading to non-temporary downgrading of status of WFD groundwater body or dependent receptors, or the inability of the groundwater body to attain Good status in line with the measures identified in the RBMP.
		Water use	Complete or severely reduced water availability and/or quality, compromising the ability of water users to abstract.
		Flood risk	Change in flood risk resulting in potential loss of life or major damage to the property or infrastructure.
Medium	Results in noticeable change to feature, of	Aquatic environment	Deterioration in river flow regime, morphology or water quality,

Magnitude	Criteria	Receptor type	Example*
	sufficient magnitude to affect its use/integrity in some circumstances.		leading to periodic, short-term and reversible breaches of relevant COs, or potential temporary downgrading of surface water body status (including potential temporary downgrading of individual WFD elements), or dependent receptors, although not affecting the ability of the surface water body to achieve future WFD objectives. Deterioration in groundwater levels, flows or water quality, leading to potential temporary downgrading of status of WFD groundwater body or dependent receptors, although not affecting the ability of the groundwater body to achieve future WFD objectives.
		Water use	Moderate reduction in water availability and/or quality, which may compromise the ability of the water user to abstract on a temporary basis or for limited periods, with no longer-term impact on the purpose for which the water is used.
		Flood risk	Change in flood risk resulting in potential for moderate damage to the property or infrastructure.
Low	Results in minor change to feature, with insufficient magnitude to affect its use/integrity in most circumstances.	Aquatic environment	Slight change in river flow regime or water quality, but remaining generally within COs, and with no short-term or permanent change to WFD surface water body status (of overall status or element status) or dependent receptors. Slight deterioration in groundwater levels, flows or water quality, but with no short-term or permanent downgrading of status of WFD groundwater body or dependent receptors.
		Water use	Minor reduction in water availability and/or quality, but unlikely to affect the ability of a water user to abstract.
		Flood risk	Change in flood risk resulting in potential for minor damage to property or infrastructure.

Magnitude	Criteria	Receptor type	Example*
Very Low	Results in little or no change to feature, with insufficient magnitude to affect its use/integrity	Aquatic environment	None or very slight change in river flow regime or water quality, and no consequences in terms of COs or surface water body status or dependent receptors. No or very slight change in groundwater levels or quality, and no consequences in terms of status of WFD groundwater body or dependent receptors.
		Water use	No or very slight change in water availability or quality and no change in ability of the water user to exercise licensed rights or continue with small private abstraction.
		Flood risk	Increased frequency of flood flows, but which does not pose an increased risk to property or infrastructure.

*For the purposes of this assessment of change, relevant WFD elements for surface water body classification include:
- all biological quality elements e.g. fish, macrophytes, invertebrates;
- all physico-chemical quality elements e.g. dissolved oxygen, phosphate;
- hydromorphological supporting elements;
- Priority Hazardous Substances;
- Priority Substances;
- Specific Pollutants; and, for Artificial and Heavily Modified Water Bodies,
- the mitigation measures assessment.For the purposes of this assessment of change, relevant WFD characteristics for groundwater body classification are quantity (groundwater level regime) and chemistry (conductivity and source of pollutants), as determined by the following tests:
- water balance (quantitative);
- Drinking Water Protection Areas (DWPAs, chemical);
- General Quality Assessment (GQA, chemical);
- saline and other intrusions (quantitative and chemical);
- surface water (quantitative and chemical); and
- GWDTEs (quantitative and chemical).

13.2.17 The EIA Regulations require that a final judgement is made about whether the effects are likely to be significant. The significance of water-related effects is derived by considering both the value of the feature and the magnitude of change. In this assessment, effects are significant or not significant according to the matrix in **Table 13.5**, with '*major*' and '*moderate*' effects taken to be '*significant*'. Significance can be '*beneficial*', '*adverse*' or '*neutral*'.

Table 13.5 Level of effect

Receptor Value	Magnitude of change			
	High	**Medium**	**Low**	**Very Low**
High	Major (Significant)	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)
Medium	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)
Low	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)
Very Low	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)	Negligible (Not significant)

Note: 'Significant' effects are those identified as 'Major'. 'Moderate' effects would normally be deemed to be 'significant'. However, there may be some exceptions, depending on the environmental topic and the application of professional judgment.

13.2.18 It is important to recognise that '*significant*' effects on receptors in the water environment do not necessarily mean that the same outcomes would occur in respect of the same receptors that may also be ecology receptors. Indeed, because of the different value and magnitude criteria used by the two assessments, it is possible that effects assessed as '*not significant*' in one environmental topic assessment, e.g. the water environment, can still sit alongside effects assessed as '*significant*' in another environmental topic assessment, e.g. ecology, and vice-versa.

13.3 Data gathering methodology

Study area

13.3.1 Both desk study and survey data for this EIA Report chapter have been gathered with respect to a defined study area. The study area is focussed on the Development Site and a 2 km buffer area immediately beyond it (**Figure 13.1**). Data for beyond the study area have also been collected where catchment areas for distant water features may intersect the study area, such as those relating to watercourses, downstream flood risk and conservation sites.

Desk study

13.3.2 The appraisal of existing (baseline) conditions for the purposes of this assessment has involved the collection and interpretation of a wide range of data and information from published sources, plus consultations relating to the local and wider hydrological environment with statutory bodies, principally SEPA, DGC and EAC. The data collected, and other sources of information, are listed in **Table 13.6**. The assessment is also inter-related with, and uses information from, other chapters of this EIA Report, such as **Chapter 6: Renewable Energy and Peat** and **Chapter 11: Ecology**, and also from the **2015 Environmental Statement (ES)**.

Table 13.6 Sources of desk study information for Geology, Hydrology (including flood risk) and Hydrogeology

Source	Data
Topography	Ordnance Survey (OS) Explorer 1:25,000 map sheet 328 (Sanquhar & New Cumnock) OS Landranger 1:50,000 map sheet 77 (Dalmellington 7 New Galloway) OS MasterMap OS 1;10,000 Raster map Historical mapping and aerial photography https://pastmap.org.uk/map
Climate	Natural Environment Research Council (NERC), UK Hydrometric Register 2008 (Centre for Ecology & Hydrology, CEH) CEH Flood Estimation Handbook (FEH) Rainfall data https://www.metoffice.gov.uk/ National River Flow Archive (NRFA) Station Mean Flow Data for 79001 - Afton Water at Afton Reservoir (ceh.ac.uk) SEPA rainfall data (Drumjohn and Craigdarroch gauging stations) https://www2.sepa.org.uk/rainfall/data/index/115557 https://www2.sepa.org.uk/rainfall/data/index/115541 UK Climate Projections 2018 (UKCP18) https://www.metoffice.gov.uk/research/collaboration/ukcp
Soils and land use	National Soil Map of Scotland (Macaulay Institute for Soil Research) http://soils.environment.gov.scot/ The Carbon and Peatland 2016 Map for Scotland https://soils.environment.gov.scot/maps/thematic-maps/carbon-and-peatland-2016-map/ **Chapter 6: Renewable Energy and Peat, Appendix 6B Peat Landslide Risk Assessment** Site visits (2nd September 2013 and 4th March 2015)
Geology, ground conditions and hydrogeology	British Geological Survey (BGS) Scotland Sheets 15W (New Cumnock) (1999) and 9W (New Galloway) (1998) 1:50,000, Solid editions BGS Scotland Sheets 15W (New Cumnock) (1999) Solid & Drift edition and 9W (New Galloway) (1979), Drift edition 1:50,000 BGS 1:10000 DiGMap BG 2009 BGS online mapping http://mapapps.bgs.ac.uk/geologyofbritain/home.html BGS Borehole data

Source	Data
	http://mapapps2.bgs.ac.uk/geoindex/home.html?layer=BGSBoreholes BGS GeoSure and EnviroSure reports Geological Conservation Review (GCR) sites https://sitelink.nature.scot/home BGS/Natural Environment Research Council (NERC). A GIS of Aquifer Productivity in Scotland. Explanatory Notes. Commissioned Report CR/04/047N http://nora.nerc.ac.uk/504764/1/CR-04-047N_SEPA%20Aq%20productivity.pdf BGS Aquifer Classification (Scotland's Environment) https://map.environment.gov.scot/sewebmap/ Superficial Aquifers map for Scotland (BGS/SEPA, 2004) The Hydrogeological Map of Scotland (BGS, 1988) Vulnerability of Groundwater in the Uppermost Aquifer (Scotland) (SEPA/BGS/ SNIFFER, 2004) BGS Groundwater Vulnerability (Scotland) http://www.bgs.ac.uk/discoverymetadata/13603084.html
Hydrology and flows	River Network Map - CEH National River Flow Archive (NRFA) www.ceh.ac.uk/data/nrfa/index.html CEH FEH CD-ROM UK CEH NRFA: SEPA Gauge 79003 https://nrfa.ceh.ac.uk/data/station/meanflow/79003
Flood risk	SEPA Flood Map http://map.sepa.org.uk/floodmap/map.htm CEH FEH CD-ROM
RBMP and water quality	Scottish Government The RBMP for Scotland River Basin District 2015-2027 Scottish Government interactive mapping https://map.environment.gov.scot/sewebmap/?layers=riverClass SEPA interactive mapping facility for the Scotland RBMP https://www.sepa.org.uk/data-visualisation/water-classification-hub/ Water Body data sheets https://www2.sepa.org.uk/WaterBodyDataSheets SEPA data request: information on river water quality
CAR licences and PWSs	Licenced sites data download from SEPA website https://www.sepa.org.uk/environment/environmental-data/ Scottish Government interactive mapping https://map.environment.gov.scot/sewebmap/?layers=licensedSites

Source	Data
	SEPA data request: information regarding CAR licences DGC and EAC data request: information regarding PWSs Scottish Government. DWPAs https://www.gov.scot/publications/drinking-water-protected-areas-scotland-river-basin-district-maps/
Wetlands and peatlands	NatureScot information on protected areas https://sitelink.nature.scot/ Scottish Government interactive mapping https://map.environment.gov.scot/sewebmap/ Ecology surveys - as per **Chapter 11: Ecology**

13.3.3 A summary of the organisations consulted to supply data, together with the nature of that data, is as follows:

- SEPA:
  - rainfall records;
  - aquifer status, groundwater level and quality data;
  - river water quality data and observed flow gauging data;
  - flood information data; and
  - CAR licence data.
- DGC and EAC:
  - location and details regarding PWSs.

Survey work

13.3.4 A number of field surveys have been undertaken to inform this EIA Report chapter and associated appendix, including the following:

- Walkover surveys undertaken in September 2013 and March 2015 for the purpose of inspection of watercourse conditions and to acquire a general understanding of the land use and topographical setting of the Development Site.
- National Vegetation Classification (NVC) surveys were undertaken in July, August and December 2013 and January 2015 and informed the GWDTE Assessment. Further surveys were undertaken from 6-9th August 2020 in order to update existing surveys and to cover additional areas, due to re-design of the Proposed Development.
- Extensive Phase 1 and Phase 2 peat surveys were undertaken by Wood for the 2015 ES and 2017 Further Environmental Information (FEI) and, more recently, a further Phase 2 survey was undertaken from 20th June to 1st July 2022.

13.4 Overall baseline

Current baseline

Introduction

13.4.1 This section characterises the local Geology, Hydrology (including flood risk) and Hydrogeology environment so that the most likely effects of the Proposed Development can be determined, and appropriate mitigation identified. It also provides the point of reference against which the success of the adopted mitigation measures can be assessed.

13.4.2 The following description is based on the desk study utilising the data sources listed in **Table 13.6** together with the findings of the survey work introduced earlier.

Topography

13.4.3 The Development Site covers an area of approximately 1,243 hectares (ha) and for ease of description it is divided into three sections, namely the south-eastern section (land within the DGC administration boundary); the north-western section (also land within the DGC boundary); and the western section (land within the EAC boundary).

13.4.4 Ground elevations in the Development Site range from 642 metres Above Ordnance Datum (mAOD) on the summit of Alhang (NGR 264225 601030) to 267 mAOD on the southern Development Site boundary (NGR 266360 599770) (**Figure 13.1**). The Development Site access road rises from 267 mAOD at the southern Development Site entrance to ~620 mAOD on Alwhat (NGR 264760 602144) in the north-west of the Development Site. In the south-eastern section of the Development Site, the access track rises from ~286 mAOD near Lorg Bridge (NGR 266840 600630) to ~520 mAOD on Black Hill (NGR 268440 599050).

13.4.5 The topography gradients within the Development Site are extremely steep. For example, the average gradient from the southern Development Site boundary to the summit of Meikledodd Hill (NGR 266050 602740) is 12%.

Rainfall

13.4.6 The average annual rainfall (1961 to 2017) for the study area is 2367 mm, as determined from the CEH NRFA website for a gauge at Afton Water at Afton Reservoir (79001), with the average monthly totals presented in **Table 13.7**.

Table 13.7 Average monthly rainfall (calculated from CEH NRFA Data for 1961 – 2017)

Month	Rainfall (mm)
January	278.4
February	193.8
March	194.6
April	129.0
May	133.5
June	127.0
July	142.1
August	174.0
September	202.3
October	259.8
November	261.8
December	270.3
TOTAL	**2366.6**

13.4.7 The Met. Office (1981-2010) annual rainfall value for the Western Scotland district is 1787 mm. This is similar to the SEPA average annual rainfall at Drumjohn (NGR 252494 597541) gauging station (115557), approximately 11 km south-west of the Development Site at an elevation of approximately 225 mAOD, of 1767 mm (for period 2013-2021), and at Craigdarroch (NGR 273942 590947) gauging station (115541), approximately 10 km south-east of the Development Site at an elevation of approximately 150 mAOD, of 1687 mm (for period 1990-2021).

Soils and land use

13.4.8 The Soil Survey of Scotland map for this area indicates that the soil type present within the Development Site is predominantly peaty in nature. The vast majority of the north-western and western sections of the Development Site are underlain by peaty podzols and peaty gleys. These are derived from lower Paleozoic greywackes and shales. Within the Lorg Burn valley, the soils are also derived from greywackes and shales and comprise rankers, podzols, brown forest soils, peaty podzols, peat and peaty gleys. In the south-eastern section of the Development Site, soils are again predominantly derived from the same parent material, and comprise peaty podzols, peaty gleys and peat. However, in the south-eastern corner of the Development Site, within the area encompassing High (NGR 268910 600120) and Low Countam (NGR 268200 601390), Fans of Altry (NGR 268190 599870) and Coranbae Hill (NGR 268000 599000), the Soil Survey of Scotland map indicates that the soils are blanket peat.

13.4.9 Peat depth surveys have been undertaken, and the areas of peat are highlighted on **Figures 9** and **10** of the PLRA (**Chapter 6: Appendix 6B**). The interpolated peat depth

map indicates that the Development Site contains three principal bogs where deep peats of >0.5m are located. These include the following:

- in the south-east in the Fans of Altry area between High Countam, Black Hill, Cairn Hill, Altry Hill and Craigstewart;
- in the north-west in the lower lying slopes Ewe Hill, Brown Hill, Alwhat and Alhang; and
- through the Afton Water valley in the far north-west of the Development Site.

13.4.10 The deepest areas of peat have been identified at the head of the Altry Burn and Pulmulloch Burn (NGR 267935 599715) and to the north-east of the Fans of Altry (NGR 268345 600066). In addition, areas of deep peat >1.0 m have been identified across the flatter lower slopes in the north-west of the Development Site including in the valley between Alhang and Millaneoch Hill (NGR 263320 601580) and along the lower slopes adjacent to Afton Water (NGR 263650 602250). Elsewhere, peat deposits were found to be generally less than 1 m in thickness.

13.4.11 The FEH CD-ROM has been used to calculate the Standard Percentage Runoff (SPR), an indication of soil permeability. Based on an 8.19 km^2 catchment centred on NGR 267884 601380, the average SPR is 51.5%, which supports the observation that the soils are poorly drained.

13.4.12 The Development Site consists predominantly of moorland and land use is mainly sheep farming.

Geology

13.4.13 Superficial deposits within the Proposed Development are presented in **Figure 13.2**. This indicates that the solid geology is overlain by a mixture of peat, till and hummocky glacial deposits. There are also significant areas where no drift is mapped, probably indicating areas where bedrock is close to, or at, ground surface, and also a small extent of alluvium (indicated on online BGS mapping).

13.4.14 Peat deposits predominate in the south-east of the Development Site, from Altry Hill (NGR 267670 600250) to Craigstewart (NGR 268000 600000) and Coranbae Hill and east to the eastern Development Site boundary, also encompassing the Fans of Altry. Peat deposits are also prevalent in the western section of the Development Site, from the valleys of Alwhat/Brown Hill (NGR 265175 601940) and Alwhat/Alhang (NGR 264400 601510) and from Alhang to Wedder Hill (NGR 263450 602010). Additionally, small areas of peat are also present in the northern-most corner of the Development Site, on Meikledodd Hill (NGR 265880 602550) and also on Ewe Hill (NGR 265860 600860).

13.4.15 Deposits of till extend north from the southern boundary of the Development Site and west of Coranbae Hill and Craigstewart, through the centre of the Development Site to the northern Development Site boundary. It also extends south from the northern Development Site boundary, along part of the Pulmulloch Burn to Low Countam. In the north-western section of the Development Site till deposits occur along the Lorg Burn (NGR 265850 602000), Alwhat Burn (NGR 264340 602660), Afton Water (NGR 263870 602590) and on the western flank of Lagower Hill (NGR 263940 602065). These deposits comprise silty clay with stones and locally contain shells and are commonly stiff, unsorted and unconsolidated.

13.4.16 Hummocky glacial deposits are indicated from Lorg (NGR 266830 600890) northwards along Lorg Burn, then west along Alwhat Burn (NGR 265620 601400). A small patch of these deposits is also present at the northern Development Site boundary, immediately

north of the Water of Ken (NGR 267700 601325). These comprise poorly sorted stones in a silt and sand matrix.

13.4.17 The BGS online mapping (**Table 13.6**) indicates that alluvial deposits are not extensive and are confined to a short stretch of Lorg Burn and ~1.5 km of the Water of Ken. Alluvium is present along the Lorg Burn from its confluence with Rough Cleugh Burn (NGR 266605 600880) to Water of Ken (NGR 266780 600560), and along the Water of Ken from south-east of Lorg (NGR 267130 600750) to the southern boundary (NGR 266425 599780) of the Development Site.

13.4.18 **Figure 13.2** indicates that drift deposits are absent from the remainder of the Development Site, including large parts of the north-western section of the Development Site including Alwhat, Alhang, Brown Hill, Lorg Hill and Ewe Hill. This is also the case for large areas in the south-western section of the Development Site including Altry, Craigstewart, Coranbae and Black Hill. In these areas bedrock is likely to be at, or close to, ground surface. In addition, small patches of ground where bedrock is likely to be outcropping are also present on High Countam and Low Countam.

13.4.19 The solid geology of the Development Site is presented in **Figure 13.3**. The Development Site is located approximately 11 km south of the Southern Upland Fault, and the area is predominantly underlain by greywackes and shales of Ordovician age, with a south-west to north-east trending fault (the Leadhills Fault) splitting the Development Site on an approximate north-west/south-east axis. To the north-west, underlying the entire area encompassing Alhang, Alwhat, Brown Hill and Lorg Hill, the formation is locally known as the Kirkcolm Formation. Part of the Barhill subgroup of the Leadhills Supergroup, this comprises medium to thin-bedded quartzose greywacke and sandstones with some thick siltstone intercalations. To the south-east, underlying the area encompassing Altry Hill, Craigstewart, High Countam, Low Countam and Sour Snout (NGR 268115 600880), the dominant formation is known locally as the Portpatrick Formation. Part of the Scaur subgroup and the Leadhills Supergroup, this chiefly comprises medium to course-grained greywacke sandstones, commonly thick-bedded, with many andesitic clasts.

13.4.20 Along the north-western side of the Leadhills Fault, a narrow band of Moffat Shale is present. This comprises black and dark grey mudstones, locally with thin chert beds. Also, to the south of Lorg Hill (NGR 266660 601485), a band of rocks from the Crawford Group is present. These comprise red and greyish bedded chert and red-brown cherty mudstone. There is also a very minor occurrence of microgranodiorite (North Britain Siluro-devonian Calc-alkaline Dyke Suite) within this area (NGR 266740 601400 and NGR 266790 601540).

13.4.21 A number of intrusions and dykes of late Silurian to early Devonian age are present within the Development Site. Intrusions of microdioritic rocks include porphyritic microdiorite outcrop at Craigstewart, Coranbae Burn (NGR 266620 599290) and Ewe Hill.

13.4.22 Intrusions of microcrystalline granitic rocks including microgranodiorite outcrop widely throughout the Development Site, with the largest of these trending from north-east (NGR 267210 601220) to south-west (NGR 264915 599380) through Lorg. Another significant intrusion trends in the same direction on Ewe Hill, from Lorg Burn (NGR 266005 601630) to Spout Burn (NGR 265040 600905). Other minor microcrystalline granitic rock intrusions are present at Lorg Burn (NGR 266020 601645), Lorg Hill (NGR 266895 601630), Rough Craig (NGR 266890 601485), Craigfad (NGR 266130 600200) and two on the Pulmulloch Burn (NGR 268260 601090 and 268280 600800).

Hydrology

13.4.23 The Development Site lies within the surface water catchments of the Water of Ken, which drains to the south of the Development Site, and Afton Water, which flows to the north of the Development Site (**Figure 13.4)**.

13.4.24 The Water of Ken is confluent with the River Dee beyond Loch Ken (NGR 272690 566440), approximately 40 km downstream. Within the Development Site's south-eastern and north-western sections, a number of small watercourses are present, all of which are confluent with the Water of Ken. The Water of Ken itself flows in a general south-westerly direction through the centre of the Development Site, entering at the north-eastern Development Site boundary (NGR 268366 601695) and leaving at the southern Development Site boundary (NGR 266292 599487).

13.4.25 With respect to the Water of Ken tributaries, the Spout Burn (NGR 264580 601370) and Gills Burn (NGR 264310 600715), which are both confluent with Holm Burn, rise on Alhang, within the western section of the Development Site. Spout Burn flows south-east for approximately 500 m within the Development Site, then south, after leaving it, before joining Holm Burn at Upper Holm of Dalquhairn (NGR 265495 599340). Gills Burn flows south-westerly for approximately 200 m within the Development Site, then south a short distance downstream of it, entering Holm Burn (NGR 264135 599960) approximately 1.5 km upstream of the Holm Burn's confluence with Spout Burn.

13.4.26 In the north of the north-western section of the Development Site, Lorg Burn starts from a point (NGR 265640 602400) in the valley between Brown Hill and Meikledodd Hill and flows in a general south-easterly direction, confluent with the Water of Ken, just downstream of Lorg Bridge (NGR 266778 600571). Also, rising on Brown Hill, the Alwhat Burn (NGR 265046 602115) is confluent with the Lorg Burn (NGR 266365 601413). Four unnamed tributaries feed into the Alwhat Burn, one rising on Alwhat (NGR 264900 601650), two on Ewe Hill (NGR 265270 601340 and 265790 601330) and one on Brown Hill (NGR 265465 601610).

13.4.27 The Green Cleugh Burn is a tributary of the Lorg Burn, rising on Lorg Hill (NGR 266350 601810). Four further unnamed and small tributaries of Lorg Burn originate on Lorg Hill, one on the east of Brown Hill (NGR 266040 601877), one on Green Cleugh (NGR 266422 601457), one on Rough Craig (NGR 266712 601360) and one on Lorg (NGR 266800 600960). Two further tributaries of Lorg Burn emanate from Ewe Hill, namely the Rough Cleugh (NGR 266090 600950) and Small Cleugh Burns (NGR 265910 600790). The Rough Cleugh Burn forms a waterfall at the eastern cliff edge of Ewe Hill.

13.4.28 Three unnamed tributaries of the Water of Ken are also present within the north-western section of the Development Site. Two of these rise on the south-eastern foot of Lorg Hill (NGR 267594 601474 and 267505 601300) and one from ~150 m north-west of Lorg Bridge (NGR 266567 600675).

13.4.29 In the south-eastern section of the Development Site, numerous watercourses are present which are confluent with the Water of Ken. Altry Burn originates at NGR 267875 599690 and discharges to the Water of Ken to the north of Holm of Dalquhairn Bridge (NGR 266292 599487). The Small Burn, which rises from Craigstewart (NGR 267336 599990), and Coranbae Burn, which starts from a point to the south of the south-eastern section of the Development Site on Coronbae Hill (NGR 267437 598990), are both confluent with the Altry Burn.

13.4.30 The Pulmulloch Burn, which has its headwaters on Cairn Hill (NGR 267910 598960), drains north, through the Fans of Altry, with tributaries feeding in from High Countam (NGR 268945 600060), Low Countam (NGR 268530 600550) and Sour Snout. The Pulmulloch Burn discharges to the Water of Ken near the north-eastern Development Site boundary (NGR 268310 601657).

13.4.31 Approximately 380 m north-east of the Development Site, the Fortypenny Burn originates on Fortypenny Hill (NGR 269130 600790). It flows in a north-westerly direction parallel to the Development Site boundary, discharging into the Water of Ken ~150 m north of the northern Development Site boundary (NGR 268414 601814).

13.4.32 To the north of the Development Site, on Meikledodd and Lorg Hills, a number of tributaries, which are confluent with the Water of Ken, also rise. These include the Polvaddoch Burn (NGR 266195 603110), Pot Burn (NGR 266545 602425) and Pullosh Sikes (NGR 267380 601890).

13.4.33 Two further unnamed tributaries of the Water of Ken are located within the south-eastern section of the Development Site. One of these rises from the west of Altry Hill and the other from the sheepfold south-west of Lorg Bridge (NGR 266800 600414).

13.4.34 Afton Water flows north from the Development Site and is confluent with the River Nith at New Cumnock (NGR 262130 614010), approximately 13 km north of the northern Development Site boundary. Two tributaries of Afton Water are present within the western section of the Development Site, namely Alhang Burn and the headwater burn that forms the source of Afton Water itself (NGR 264180 601570). Afton Water is dammed approximately 2.1 km north of the Development Site, forming Afton Reservoir (NGR 263437 604134), which at its closest point lies 1.1 km to the north. Afton Reservoir is a SW asset from which water is abstracted for public water supply.

13.4.35 To the north of the Development Site a number of Afton Water tributaries rise between Brown and Blacklorg Hills. These include the Clashywarrant Burn (NGR 265234 602530), Meikledodd Burn (NGR 265284 602900), Sandyhole Burn (NGR 265665 603270), and Blacklorg Burn (NGR 265134 603660). These watercourses converge to form the Montraw Burn (NGR 264965 603270), which flows north-westerly, discharging into the Afton Reservoir approximately 0.7 km north-west of the Development Site.

13.4.36 The headwaters of the Dalwhat Water rise on the western flank of Black Hill (NGR 268440 598730), approximately 175 m south of the Development Site. The Fingland Burn (NGR 269263 598850) rises on the eastern flank of Black Hill approximately 290 m south-east of the Development Site boundary and is confluent with the Dalwhat Burn at NGR 269445 597460. The Dalwhat Water flows south-eastwards and away from the Development Site.

13.4.37 Approximately 370 m east of the Development Site, the Shinnel Water headwaters rise to the north-west of Colt Hill and include Fingland Burn (NGR 269290 599400) and Horse Grain (NGR 269700 599340). The Shinnel Water flows eastwards and away from the Development Site.

13.4.38 The Polskeoch Burn (NGR 269330 602480) forms the headwaters of the Scaur Water, rising approximately 450 m north of the Development Site. The watercourse flows in a general north-easterly direction, away from the Development Site.

13.4.39 From approximately 800 m north of the Development Site, between Littledodd and Blacklorg Hills, a number of tributaries of the Euchan Water rise. These include Mid Grain (NGR 266300 603630) and numerous unnamed tributaries originating from Euchan Hole (NGR 265900 604310). The Euchan Water flows generally north-eastwards and away from the Development Site.

13.4.40 Rising from Windy Standard (NGR 262345 601510), approximately 500 m south-west of the Development Site, the Water of Deugh flows in a north-westerly direction and away from the Development Site.

13.4.41 Approximately 14 km south-west, and downstream, of the Development Site boundary, the Water of Ken is dammed, forming Carsfad Loch (NGR 260700 586094). This loch is also a SW asset and is used for abstraction for drinking water. The Development Site therefore lies within the surface water catchment for Carsfad Loch.

13.4.42 The closest SEPA surface water gauging station to the Development Site is on the River Nith at Hall Bridge (Gauge 79003; NGR 268410 612970). This is located downstream of Afton Reservoir and flows at this gauge are described by SEPA as "*largely natural with controlled storage of Afton Reservoir having occasional significant effect"*. Flow data for this gauge is available from 1959-2021, and the mean flow over this period is 5.873 m^3/s (507.4 Ml/d), with a Q_{95} flow (i.e. the flow exceeded 95% of the time) of 0.379 m^3/s (32.7 Ml/d).

13.4.43 The baseflow index (BFI) is a measure of the proportion of river flow that is derived from storage near the surface. The BFI given for the SEPA gauge at Afton Reservoir is 0.11. This low BFI value suggests that baseflow is not a significant component of flow and is typical of catchments rich in peat.

13.4.44 The FEH CD ROM was also consulted to obtain catchment statistics for the specific catchments within the Development Site. For the catchment of the Water of Ken (centred on NGR 267884 601380), the FEH estimates a BFI value of 0.332. This suggests that baseflow within the Development Site catchment is a more significant component of river flow than within the Afton Water catchment and would be more typical of better-drained catchments rather than catchments dominated by peat-rich soils.

13.4.45 On the Development Site, the Water of Ken (upstream of High Bridge of Ken) WFD surface water body (ID: 10559, potential receptor W01 on **Figure 13.4**) is located within the catchment of the River Dee and is classified as of Poor overall status. Also located within the Development Site, the Afton Water WFD surface water body (ID: 10614, potential receptor W02) is within the catchment of the River Nith and is classified as of Good overall status. The Dalwhat Water (ID: 10605, potential receptor W03), located to the south-east of the Proposed Development, the Shinnel Water (ID: 10628, potential receptor W04), located to the west, the Scaur Water (ID: 10625, potential receptor W05), located to the north-east, and the Euchan Water (ID: 10617, potential receptor W06), located to the north, WFD surface water bodies are also within the catchment of the River Nith and are also all classified as of Good overall status. Finally, the Water of Deugh (upstream of Carsphairn Lane) WFD surface water body (ID: 10563, potential receptor W07) is located to the west of the Proposed Development and within the catchment of the River Dee. It is classified as of Poor overall status.

13.4.46 The Development Site lies within a Drinking Water Protected Area (DWPA) for surface water due to the presence of the SW Afton and Carsfad Loch Reservoirs within its surface water catchment.

Flood risk

13.4.47 Flood risk for the Development Site catchments has been assessed using SEPA's online flood mapping (**Table 13.6**). This indicates that none of the proposed areas for the location of infrastructure within the Development Site are at risk of flooding from fluvial or other sources. It is considered that any flood event on the Development Site would be contained within the steeply incised watercourse channels.

13.4.48 Downstream of the Development Site, the SEPA flood map indicates that the area from Holm of Dalquhairn Bridge (NGR 266170 599300) to Strahanna Bridge (NGR 264620 595890) is at localised risk from flooding from the Water of Ken. The probability of such an event is classed as Medium to High (0.5-10% Annual Exceedance Probability; AEP), or, in other words, a likelihood of occurrence once in every 200 years for the Medium risk scenario, or once in every 10 years for the High risk scenario.

13.4.49 Recent consultation comments from SEPA did not make reference to flood risk. However, consultation undertaken with SEPA for the 2015 ES regarding the requirement for an FRA indicated that there was no such requirement. SEPA stated that *"We consider that due to*

the remote location of the wind farm and the absence of any immediate downstream flood risk receptors the Proposed Development is unlikely to have a significant impact on downstream flood risk. We are also satisfied that any localised increase in flood risk can be managed by ensuring that any new crossings are appropriately sized."

13.4.50 Additionally, the DGC Flood Risk Management Team (FRMT) provided a consultation response for the 2017 FEI with regard to flood risk. It stated that due to the nature of the Proposed Development it has no objection, but advised the following:

- *"The developer needs to manage surface runoff from the Development Site during and after construction. Runoff should mimic that of existing conditions and not be increased*; and
- *The developer should consider the rate of runoff into the watercourses which are located within the Development Site. Any significant increase may increase the flood risk downstream."*

13.4.51 The consultation process for the Proposed Development did not include any further comments with regards to flood risk. In addition, SEPA flood mapping indicates that there has not been any significant change to the flood risk scenarios affecting the Proposed Development. Therefore, an FRA is not considered necessary, and there is no flood risk potential receptor.

Hydrogeology

13.4.52 The Hydrogeological Map of Scotland (BGS, 1988) indicates that the entire Development Site is underlain by a concealed bedrock aquifer which is of limited groundwater resource potential. The bedrock is of low permeability (hydraulic conductivity), and generally without groundwater except at shallow depths. These rocks comprise shales and greywackes where groundwater is confined to near-surface cracks and joints. Rare springs and boreholes provide weakly mineralised water except where contact is made with sulphide-rich black shales.

13.4.53 Furthermore, the bedrock aquifer underlying the Development Site has been classified by SEPA (**Table 13.6**) as a "*Low Productivity Aquifer*". It comprises highly indurated greywackes with limited groundwater in the near surface weathered zone and secondary fractures. The flow mechanism is virtually all through fractures and other discontinuities.

13.4.54 The Superficial Aquifers map for Scotland (BGS/SEPA, 2004) provides no indication of a drift aquifer being present at the Development Site. It is assumed, given the superficial geology described above, that the superficial aquifer for the majority of the Development Site is absent or is of low productivity. The areas in which alluvium and hummocky glacial deposits are mapped offer the opportunity for groundwater movement via intergranular flow. Therefore, in these areas of enhanced hydraulic conductivity the aquifer is considered to be moderately to highly productive.

13.4.55 SEPA has no groundwater level monitoring points within the study area. The presence of low hydraulic conductivity bedrock underlying a superficial aquifer of low productivity (dominantly peat and boulder clay) would suggest that groundwater levels in the superficial deposits are locally perched and, therefore, relatively high or even close to ground surface.

13.4.56 Protection of the aquifers is generally only provided by the overlying soils. The Vulnerability of Groundwater in the Uppermost Aquifer Map (SNIFFER, 2004) indicates that the classification of the study area is Class 4, i.e. the area is vulnerable to those pollutants not readily absorbed or transformed and may be vulnerable to individual events as well as to persistent activity. This rises to Class 5, i.e. the area is vulnerable to most

water pollutants with rapid impact in many scenarios, in the areas of the Development Site where the superficial aquifer is un-mapped and likely to be absent.

13.4.57 According to SEPA River Basin Management Plan (RBMP) mapping, the majority of the Development Site lies within the Galloway WFD groundwater body (ID: 150694, potential receptor GW01 on **Figure 13.4**), which is classified as Good for its overall status. However, underlying the north-western section of the Development Site (within the EAC administrative boundary), the WFD groundwater body is known as Upper Nithsdale (ID: 150663, potential receptor GW02) and is classified as of Poor overall status. This degraded status is likely to be a function of historical mining and quarrying for coal in the area. The superficial aquifer in the area is not identified as a WFD groundwater body and so is not considered a potential receptor.

13.4.58 The Development Site sits within a DWPA for groundwater, meaning that it has to be protected with the aim of avoiding any deterioration in quality that would compromise a relevant abstraction of water intended for human consumption. However, there are no known boreholes currently monitoring groundwater quality in the study area.

13.4.59 One spring has been identified within the study area from OS mapping. The Cold Well Spring (potential receptor S01 on **Figure 13.4**) issues from the northern slope of Blacklorg Hill (NGR 265493 604472) and forms the headwaters of the Kello Water which flows northwards and away from the Development Site and study area.

PWSs, abstractions and discharges

13.4.60 DGC has provided details of six PWSs located within a 2 km radius of the boundary of the Development Site. It has indicated that the co-ordinates provided are a combination of property and source locations. In addition, the presence of a PWS at Lorg Farmhouse has been confirmed by the landowner, although the property is uninhabited, and the supply is unused. It has also been confirmed that this property would not be occupied for the construction, operational or decommissioning phases of the Proposed Development.

13.4.61 EAC also provided a list of PWSs within its administrative boundary, many of which did not include co-ordinates. Of those with co-ordinates, none were found to be located within 2 km of the Development Site.

13.4.62 Details of the known PWS properties located within the study area are presented in **Table 13.8**, and the PWSs are mapped on **Figure 13.4**.

Table 13.8 PWSs located within 2 km of Development Site

Potential Receptor Ref	Supply Name	Easting	Northing	Supply Type	Distance from Development Site (km)
P01	Lorg Farmhouse	266755	601110	Spring	0
P02	Upper Holm Of Dalquhairn	265700	599574	Spring	0.9
P03	Nether Holm Of Dalquhairn	265375	598985	Spring	0.9
P04	Corlae Farmhouse	265830	597704	Borehole	1.75
P05	Corlae Byre Cottages	265940	597715	Borehole	1.75
P06	Craigiethorn Croft	265812	598116	Borehole	1.5
P07	Polskeoch Scar Valley	268800	602600	Spring	0.75

13.4.63 Following the introduction of CAR (2011), SEPA regulates activities such as abstraction, impoundment and engineering activities, as well as pollution of watercourses. SEPA has provided the records for thirty-three licensed activities within a 2 km radius of the boundary of the Development Site. The majority of these are for engineering activities e.g. culverting of a surface watercourse, or for sewage treatment effluent (STE) discharges to ground (septic tank discharges) or to surface water. In addition, two SW reservoirs are included in the list, one (Afton Reservoir) located within 2 km of the Development Site and the other (Carsfad Loch Reservoir) located outside the study area, but downstream of the Development Site. All these licences/registrations and associated activities are presented in **Table 13.9** and mapped on **Figure 13.4**.

Table 13.9 SEPA CAR licences and registrations located within 2 km of Development Site

Potential Receptor Ref	Licence No.	Easting	Northing	Site Name	Description	Distance from Development Site (km)
A0 A1 A2 A3	CAR/L/1000845 CAR/L/1000846 CAR/L/1003668 CAR/L/1003669	262657	605640	SW - Afton Water Treatment Works (Effluent)	Water Treatment Works (WTW) - effluent	3.0
A4 A5	CAR/L/1185229 CAR/L/1185576	261700 262370	600000 600010	Windy Rig Wind Farm	Surface water (other) construction SUDS	2.0 1.6
A6 A7	CAR/R/1018950 CAR/R/1018954	269480	597120	Cairnhead Forest	Bridging culvert on Lagdubh Burn	1.9
A8	CAR/R/1030849	265834	597898	New dwelling and outbuilding	STE to unnamed tributary of Shiel Burn	1.6
A9	CAR/R/1066496	268671	602307	Polskeoch, Scar Water	STE to soakaway	0.7
A10	CAR/R/1114126	268650	601820	Engineering works, Fortpenny Burn	Bridging culvert	0.3
A11	CAR/R/1114150	267540	602430	Engineering works on Pot Burn	Bridging culvert	0.8
A12	CAR/R/1114151	267580	602500	Engineering works on Polvaddoch Burn	Bridging culvert	0.8
A13	CAR/R/1114152	267623	602517	Engineering works on tributary of Polvaddoch Burn	Bridging culvert	0.9
A14	CAR/R/1113677	265529	599011	Holm of Dalquhairn, Dalry	Bank reprofiling	0.9
A15	CAR/R/1113678	265529	599011	Holm of Dalquhairn, Dalry	Bank reprofiling	0.9
A16	CAR/R/1154524	262630	604140	Afton Wind Farm – Farrans Construction Ltd	Bridging culvert	1.9
A17	CAR/R/1148667	265236	603737	South West Scotland Overhead Line – Amec Foster Wheeler (AFW)	Bridging culvert	1.1
A18	CAR/R/1154518	262630	604140	Afton Wind Farm – Farrans Construction Ltd	Sewage (private) secondary	1.9
A19 A21	CAR/R/1154520 CAR/R/1154523	262630	604148	Afton Wind Farm – Farrans Construction Ltd	Bridging culverts	1.9

Potential Receptor Ref	Licence No.	Easting	Northing	Site Name	Description	Distance from Development Site (km)
A20	CAR/R/1154522	262630	604140	Afton Wind Farm – Farrans Construction Ltd	Industrial or Commercial: Process Water	1.9
A22	CAR/R/1143505	265562	598770	Holm Burn, Dalry	Bank reprofiling	1.0
A23	CAR/R/1148794	270900	599390	Engineering Works, Nether Grain on Shinnel Water - FCS	Bridging culvert	2.0
A24	CAR/R/1149119	265834	597712	Corlae Farmhouse & Cottage	Sewage (Private) primary	1.8
A25 A26	CAR/R/1157188 CAR/R/1157191	263298	603811	South West Scotland Overhead Line – AFW	Bridging culvert – Swinkey Burn	1.2
A27	CAR/R/1159851	264030	603147	South West Scotland Overhead Line – AFW	Bridging culvert – Afton Water	0.1
A28	CAR/R/1167411	266820	602460	UN458 Road Construction – FCS	Bridging culvert	0.5
A29 A30	CAR/R/1160031 CAR/R/1160038	265173	603693	Tower C25 - C26 (Culvert 2) Tower C25 - C26 (Culvert 1) - AFW	Bridging culverts	1.1
A31	CAR/R/1161411	265868	597722	1 and 2 Corlae Byre	Sewage (Private) primary	1.8
A32	CAR/R/1170042	266833	604103	South West Scotland Connections Project – Wood	Bridging culvert	1.7
A33*	RES/R/1127948	263437	604134	Afton Reservoir	Surface water abstraction	0.7
A34*	RES/R/1127924	260700	586094	Carsfad Loch Reservoir	Surface water abstraction	14.5

Note:
*The information for A33 and A34 was obtained from the SEPA website: http://map.sepa.org.uk/atom/SEPA_Licensed_sites.atom.

Conservation sites

13.4.64 The closest conservation interests to the Development Site are the Fountainhead and the Polhote and Polneul Burns SSSIs, potential receptors C01 and C02 respectively. Both SSSIs are located ~8 km north of the Development Site boundary i.e. outwith **Figure 13.4**. Fountainhead SSSI (NGR 265700 610400) covers an area of ~5.68 ha, whilst Polhote and Polneul Burns SSSI (NGR 269100 611900 and 269600 611200) cover an area of ~32.11 ha. All of these SSSIs are designated for their geological exposures of Upper Carboniferous strata.

GWDTEs

13.4.65 GWDTEs, as defined by SEPA in LUP-GU31 (2017), exist across the Development Site (potential receptors GT01 – GT89). These areas have been identified from **Appendix 11B, Figure 3.4**.

13.4.66 The NVC survey (**Appendix 11B**) indicates that potentially high groundwater dependent M23 (rush-pasture) communities are present in the base of most of the main valleys associated with the Water of Ken, Afton Water, Lorg, Alwhat, Pulmulloch, Altry, and Small Burns, and in small patches elsewhere. Potentially high groundwater dependent M6 (mire) communities are much smaller in size and are concentrated on the upper and lower reaches of the Lorg Burn valley, the Water of Ken, and discrete patches west and east of Altry Hill and in the ridge between Alhang and Wedder Hill.

13.4.67 Potentially moderately groundwater dependent NVC communities are also present in parts of the Development Site. The most extensive of these is the U6 (grassland) community, which is most prevalent across the entire north-western part of the Development Site, and on Alwhat, Lagower Hill, Alhang, Brown Hill, Ewe Hill, Meikledodd Hill and Lorg Hill. Pockets of this grassland are also present across Altry Hill, in the eastern section of the Development Site. The next most prevalent moderately groundwater dependant NVC community present is the mire (M25) community, with pockets of this vegetation present on Low Countam and Coranbae Hill. A pocket of this habitat is also present near the base of Lorg Hill, just north of Water of Ken and at Quarrel End, to the south of Ewe Hill. Other moderately groundwater dependant NVC communities identified are grassland (MG9) and wet heath (M15), which are confined to small pockets in the centre and south of the Development Site.

13.4.68 Given the geology and groundwater potential within the Development Site, it is considered that many of these habitats are likely to be fed, almost entirely, by precipitation or very near-surface groundwater within shallow drift deposits and soils. It is considered that the groundwater component supporting these habitats therefore more resembles a surface (or near-surface) water regime, with very local and shallow rain-fed catchments for each GWDTE.

13.4.69 Nonetheless, despite the low productivity aquifers present at the Development Site, due to the presence of faulted bedrock that could offer flow pathways and the potential for some weathered bedrock providing localised groundwater storage some habitats may be truly groundwater dependent. As such, further assessment has been undertaken of all the potentially highly or moderately groundwater dependent habitats identified.

13.4.70 The GWDTE assessment has indicated that ten truly groundwater dependent habitats are present within the Proposed Development, with details presented within **Appendix 13A**.

Future baseline

13.4.71 Changes could potentially occur to the study area in the future in relation to climate and land use. **Section 13.5** below defines the period for which the assessment needs to be carried out and the developments/ changes that need to be considered within the assessment.

13.4.72 The conditions at the Development Site will be affected by climate change, which could affect the amount and intensity of rainfall, and temperature and evapotranspiration. The UK Climate Projections 2018 (UKCP18) include predictions for the area of the Proposed Development, within those for the west of Scotland. The central estimate under a medium emissions (Representative Concentration Pathway – RCP of 6.0) scenario predicts an increase in annual mean temperature of 1.1°C by the end of the 2050s. The medium emissions scenario also has a central estimate of a 10% decrease in summer

precipitation, with an increase of 9% in winter, by the end of the 2050s. This could change the hydrological characteristics of the Development Site and wider catchment areas over time.

13.4.73 Given the nature of the terrain and distance from any major urban areas land use change from its current rural nature is unlikely over the lifespan of the Proposed Development. Neither DGC's LDP2 or EAC's LDP give any indication of future land use changes in the area.

13.5 Scope of the assessment

Spatial scope

13.5.1 The spatial scope of the assessment of Geology, Hydrology (including flood risk) and Hydrogeology covers the study area (i.e. the Development Site including a 2 km buffer area) described in **Section 13.4**, on the basis that the majority of the effects on the water environment due to the Proposed Development are considered unlikely to extend beyond this area. The only potential receptors identified outside this study area are downgradient watercourses and conservation sites on the basis that any wind farm-inspired changes in the surface and groundwater environment could theoretically affect their flows/quality and water support respectively.

Temporal scope

13.5.2 The temporal scope of the assessment of Geology, Hydrology (including flood risk) and Hydrogeology is consistent with the construction and operational periods for the Proposed Development (see **Chapter 3: Description of the Proposed Development**). The construction period for the Proposed Development would be approximately 24 months in duration, with decommissioning anticipated at the end of a 35 year operational period.

Potential receptors requiring assessment

13.5.3 The receptors that are considered as requiring impact assessment (i.e. 'scoped in') are listed in **Table 13.10**, ordered broadly in accordance with their first appearance in the **Section 13.6** baseline i.e. surface water, groundwater and then composite receptors. They are also shown on **Figure 13.6**. The features are referred to by means of the one or two-letter category character and two-digit sequential number codes used in the baseline.

13.5.4 It is important to note that this chapter examines potential changes of the Proposed Development on the water environment supporting GWDTEs, not the habitats themselves, which is instead a matter for **Chapter 11: Ecology**.

Table 13.10 Geology, Hydrology (including flood risk) and Hydrogeology receptors requiring assessment

Receptor No.	Receptor	Location (NGR where appropriate)
Watercourses and associated WFD surface water bodies		
W01	Water of Ken WFD surface water body and associated tributaries including Spout, Gills, Holm, Lorg, Altry, Pullmulloch and Fortypenny Burns	266670 600390
W02	Afton Water WFD surface water body and associated tributaries including Alhang, Alwhat, Clashywarrant, Meikledodd, Sandyhole and Montraw Burns	263770 602325
Aquifers and associated WFD groundwater bodies		
GW01	Bedrock aquifer and Galloway WFD groundwater body	Beneath and beyond the Proposed Development
GW02	Bedrock aquifer and Upper Nithsdale WFD groundwater body	Beneath and beyond the Proposed Development
CAR Licenced Abstractions		
A33	Afton Reservoir	263437 604134
A34	Carsfad Loch Reservoir	260700 586094
Water conditions supporting GWDTEs		
GT37	GWDTE	See **Figure 13.6**
GT78	GWDTE	See **Figure 13.6**
GT80	GWDTE	See **Figure 13.6**
GT81	GWDTE	See **Figure 13.6**
GT82	GWDTE	See **Figure 13.6**
GT85	GWDTE	See **Figure 13.6**

13.5.5 Given the nature of the Proposed Development, it is the watercourse receptors that have initially been identified as likely to be most significantly affected. This is due to both the proximity of the proposed construction sites to the watercourses and because of the watercourse crossings. The proximity of the SW Afton Reservoir in a downstream catchment from the Development Site is also a focus of the assessment.

13.5.6 The following theoretical receptors have been 'scoped out' from being subject to further assessment because the potential effects are not considered likely to be significant:

- The underlying solid geology comprises a variety of sedimentary lithologies that outcrop across parts of the study area, but the geology is not considered to be of local or regional importance and no features of geological interest have been designated, e.g. GCR sites. Furthermore, disturbance of the geology during project construction

would be minimal, sufficient only to establish building, track and turbine foundations. Two borrow pits would be developed to meet this demand. On this basis, any geological effect would be insignificant, and it is proposed that geology is 'scoped out' as a receptor.

- Surface watercourses located either outwith a 250 m buffer of wind farm infrastructure, up gradient of Proposed Development infrastructure and/or in separate surface water catchments from development activities include the Dalwhat Water (potential receptor W03), Shinnel Water (potential receptor W04), Scaur Water (potential receptor W05), Euchan Water (potential receptor W06) and Water of Deugh (potential receptor W07) (and their associated tributaries). Therefore, with no obvious hydrological connection, impacts on water quality and / or flows to these watercourses are not considered likely, and the features are 'scoped out' from further assessment.
- SEPA flood risk mapping indicates that there are currently no flood risk issues potentially affecting the Proposed Development's infrastructure and watercourse crossing locations. Provided watercourse crossings are appropriately sized and surface run-off from the Development Site is managed such that no significant increase in flow rates occur, SEPA and the DGC FRMT do not foresee, from current information, a need for further detailed information on flood risk. Furthermore, any potential effect of the Proposed Development on the downstream flood risk was also of concern because unmitigated, elevated run-off from the Proposed Development could potentially be discharged to the fluvial network and give rise to flashier hydrographs and potentially increased incidences of flooding downstream. However, the increase in impermeable area would be minor, and design and adoption of standard best practice (including appropriately sized watercourse crossings) would ensure that construction and post-development run-off would not exceed pre-development rates. Furthermore, there are few property receptors immediately downstream. Therefore, flood risk has been 'scoped out' from further assessment.
- Cold Well Spring (potential receptor S01) has been 'scoped out' because it lies on the northern slope of Blacklorg Hill and is outwith the catchment of the Development Site.
- The PWS at Lorg Farmhouse (potential receptor P01) is known to be unused and the property uninhabited. It has been confirmed that this property would not be occupied for the construction, operational or decommissioning phases of the Proposed Development. The PWSs at Upper and Nether Holm of Dalquhairn (potential receptors P02 and P03 respectively) and Polskeoch Scar Valley (potential receptor P07) are all outwith the surface water catchments, and distant (>1 km) from, the nearest proposed wind farm infrastructure. The boreholes at Corlae (potential receptors P04 and P05) and Craigiethorn Croft (potential receptor P06) are also a significant distance from the nearest proposed wind farm infrastructure (>1.75 km) and located within separate catchments. Also, as they are likely to take their source from the bedrock aquifer, they are less likely to be impacted by any potential direct run-off associated with the Proposed Development activities. On this basis, all known PWSs have been 'scoped out' of the assessment.
- There are no SEPA CAR licensed activities located within the Development Site nor are there any within 100 m of proposed new access tracks, or within 250 m of the proposed location of the wind turbines or the borrow pits. CAR licenses A0 - A32 (listed in **Table 13.9**) have been 'scoped out' as they would not be impacted by Proposed Development activities, either because they are distant from the proposed infrastructure (A0 - A8, A14 - A16, A18, A20 - A24, A31 and A32) or are for engineering (A6, A7, A10 - A13, A17, A25 - A30) or discharge activities (A8 and A9), rather than abstraction.

- A number of GWDTEs have been 'scoped out' as they have been assessed as either not truly groundwater dependent or because their potential catchments, defined as part of the GWDTE Screening Reviews (**Appendix 13A**), do not intercept proposed infrastructure. This includes potential receptor habitats GT01 - GT36, GT38 - GT77, GT79, GT83, GT84 and GT86 - GT89.
- The conservation sites are not of hydrological or hydrogeological sensitivity but are designated for geological interest. The sites are also not in hydraulic connectivity with the Development Site. Therefore, the Fountainhead (potential receptor C01) and the Polhote and Polneul Burns (potential receptor C02) SSSIs are 'scoped out' of the assessment.

Potential significant effects

13.5.7 The potentially significant hydrological and hydrogeological effects that will be taken forward for assessment in the EIA are summarised in **Table 13.11**.

Table 13.11 Potentially significant Hydrology and Hydrogeology effects

Activity	Effects	Receptors
Land preparation (earthworks and excavation of the turbine foundations)	Ground disturbance leads to sediment loading and/ or the remobilisation of existing contamination resulting in the pollution of watercourses. Contamination of soils, surface waters and groundwater due to accidental release of pollutants during works. Excavation and fill leads to disruption of surface and near-surface flow paths and changes to the drainage regime, most typically increased runoff. Dewatering interception of groundwater leading to a loss of water resource and disruption of groundwater support (baseflow) to watercourses and GWDTEs.	Watercourses and associated WFD surface water bodies (W01 and W02) Aquifers and associated WFD groundwater bodies (GW01 and GW02) Licenced abstractions (A33 and A34) GWDTEs (GT37, 78, 80-82 and 85)
Soil compaction and temporary hardstanding	Contamination of soils, surface waters and groundwater due to accidental release of pollutants during works. Reduced infiltration capacity results in increased runoff, and reduced recharge to groundwater, leading to loss of water resource and disruption of baseflow to watercourses and GWDTEs.	Watercourses and associated WFD surface water bodies (W01 and W02) Aquifers and associated WFD groundwater bodies (GW01 and GW02) Licenced abstractions (A33 and A34) GWDTEs (GT37, 78, 80-82 and 85)

Activity	Effects	Receptors
Land clearance	Land clearance and ground disturbance leads to sediment and nutrient loading and/ or the remobilisation of existing contamination resulting in the pollution of watercourses. Contamination of soils, surface waters and groundwater due to accidental release of pollutants during works. Land clearance leads to disruption of surface and near-surface flow paths and changes to the drainage regime, most typically increased runoff. Land clearance leads to breakdown of peat structure and disturbance of peat hydrology.	Watercourses and associated WFD surface water bodies (W01 and W02) Aquifers and associated WFD groundwater bodies (GW01 and GW02) Licenced abstractions (A33 and A34) GWDTEs (GT37, 78, 80-82 and 85)
Peat working	Ground disturbance leads to sediment loading and/ or the remobilisation of existing contamination resulting in the pollution of watercourses. Contamination of soils, surface waters and groundwater due to accidental release of pollutants during works. Peat disturbance leads to disruption of surface and near-surface flow paths and changes to the drainage regime, most typically increased runoff. Peat disturbance leads to breakdown of peat structure and disturbance of peat hydrology.	Watercourses and associated WFD surface water bodies (W01 and W02) Aquifers and associated WFD groundwater bodies (GW01 and GW02) Licenced abstractions (A33 and A34) GWDTEs (GT37, 78, 80-82 and 85)
Material stockpiling/removal (quarrying)	Ground disturbance leads to sediment loading and/ or the remobilisation of existing contamination resulting in the pollution of watercourses. Contamination of soils, surface waters and groundwater due to accidental release of pollutants during works. Excavation and fill leads to disruption of surface and near-surface flow paths and changes to	Watercourses and associated WFD surface water bodies (W01 and W02) Aquifers and associated WFD groundwater bodies (GW01 and GW02) Licenced abstractions (A33 and A34)

Activity	Effects	Receptors
	the drainage regime, most typically increased runoff. Dewatering interception of groundwater leading to a loss of water resource and disruption of groundwater support (baseflow) to watercourses.	
Watercourse crossings	Bank and bed disturbance lead to sediment loading, changes in morphology and pollution of watercourses. Contamination of watercourses due to accidental release of pollutants during works.	Watercourses and associated WFD surface water bodies (W01 and W02) Licenced abstractions (A33 and A34)
Track and crane pad placement	Ground disturbance leads to sediment loading and/ or the remobilisation of existing contamination resulting in the pollution of watercourses. Contamination of soils, surface waters and groundwater due to accidental release of pollutants during works. Track and crane pad placement lead to disruption of surface and near-surface flow paths and changes to the drainage regime, most typically increased runoff. Dewatering interception of groundwater leading to a loss of water resource and disruption of groundwater support (baseflow) to watercourses and GWDTEs.	Watercourses and associated WFD surface water bodies (W01 and W02) Aquifers and associated WFD groundwater bodies (GW01 and GW02) Licenced abstractions (A33 and A34) GWDTEs (GT37, 78, 80-82 and 85)
Control building and potential substation placement	Ground disturbance leads to sediment loading and/ or the remobilisation of existing contamination resulting in the pollution of watercourses. Contamination of soils, surface waters and groundwater due to accidental release of pollutants during works. Control building and potential substation placement leads to disruption of surface and near-surface flow paths and changes to	Watercourses and associated WFD surface water bodies (W01 and W02) Aquifers and associated WFD groundwater bodies (GW01 and GW02) Licenced abstractions (A33 and A34)

Activity	Effects	Receptors
	the drainage regime, most typically increased runoff.	
Operational facilities and activities	Exposed ground leads to continued sediment loading and/ or the remobilisation of existing contamination resulting in the pollution of watercourses. Contamination of soils, surface waters and groundwater due to accidental release of pollutants during maintenance activities. Contamination of soils, surface waters and groundwater due to chemical leaks and concrete leaching. Continuation of flow disruption, reduced infiltration capacity and peat disruption effects.	Watercourses and associated WFD surface water bodies (W01 and W02) Aquifers and associated WFD groundwater bodies (GW01 and GW02) Licenced abstractions (A33 and A34) GWDTEs (GT37, 78, 80-82 and 85)

13.5.8 The main potential hydrological / hydrogeological effects associated with the Proposed Development relate to the construction phase, in particular from tracks, watercourse crossings and wind turbine foundations. Other activities of relevance include the establishment of crane pads, control building, substation and two borrow pits. These and other construction and operational site activities could potentially result in, for instance, the generation of additional, silt-laden runoff, and fuel, oil and chemical spillages, with resulting detrimental water quantity and quality effects on the above-named receptors. Mitigation measures are outlined in **Section 13.6** below that would reduce negative impacts.

13.5.9 Effects during decommissioning at the end of the operational phase would be likely to be similar to those during the construction phase but would depend on the exact nature of the decommissioning activities that take place. However, it is likely that the ground disturbance would be much less. Mitigation similar to that implemented during the construction and operational phases (updated to reflect changes in legislation/guidance) would also help ensure that the significance of such impacts is minimised, and it is therefore proposed that consideration of decommissioning effects is 'scoped out' of the impact assessment.

13.6 Environmental measures embedded into the development proposals

13.6.1 Embedded mitigation proposals are those mitigation measures that are inherent to the Proposed Development. Embedded mitigation includes all mitigation usually assumed to be in place during construction and operation and is generally regarded as industry standard or Best Practice. Construction and environmental management plans are introduced in **Chapter 3: Description of the Proposed Development**, whilst an overview of some of the general (not project specific) environmental management considerations is also included in **Chapter 3**. Water-related embedded mitigation measures are presented below.

Design evolution

Introduction

13.6.2 A qualitative, preliminary feasibility assessment for the potential location of the Proposed Development's wind turbines and infrastructure was undertaken as part of a desk-based study. The purpose of this study was to identify potential significant constraints that may be posed by the baseline conditions of the study area, so that the construction plan and layout of the Proposed Development (as described in **Chapter 3: Description of the Proposed Development**) could be developed / refined to account for these constraints, and so minimise the potential risks and impacts to certain receptors during construction and operation.

13.6.3 A review of the baseline information for the study area (**Section 13.4**) identified potential development constraints associated with the Proposed Development. This led to areas being discounted for the siting of turbines, access tracks and other infrastructure, and areas being considered for development only if appropriate mitigation could be provided.

13.6.4 The preliminary constraints map generated as part of the feasibility process identified areas of the study area with the key constraints, which were used to 'scope out' potential locations for the wind turbines, access tracks and other site infrastructure. To establish an indicative wind farm layout, buffer zones were placed around specific areas of the Development Site where significant constraints were identified to exclude these from the possible areas of the Proposed Development. The hydrological constraints are included in **Figure 13.6**.

Avoidance of steep gradients

13.6.5 Parts of the study area where steep slopes are present were identified as a significant constraint due to potential peat slide risks and enhanced runoff. For example, the gradient from the Water of Ken at Lorg Bridge (NGR 266731 600490) to the summit of Altry Hill (NGR 267665 600258) is 21%. These areas, along with other areas identified as having historic peat slides, have been avoided for construction of turbines, as well as for access tracks and other infrastructure.

Avoidance of deep peat deposits

13.6.6 Potential significant constraints were identified in areas of the Proposed Development where peat was shown to be deeper than 1 m (**Section 13.4**). Avoiding such areas serves to minimise the volume of peat needing to be excavated, but excavation of this depth of peat could also have significant local influences on hydrology and associated habitats.

Avoidance of flood zones

13.6.7 With respect to flood risk, no part of the Proposed Development is proposed on the areas with a high-medium likelihood of flooding within the Water of Ken, which are in any case entirely within the 50 m buffer (see below) for this watercourse.

Watercourse buffer zones

13.6.8 A 50 m buffer zone was applied to the entire Ordnance Survey (OS) watercourse network. As well as providing further reassurance regarding flood risk, this considers the risk of pollution to watercourses from construction activities and provides a buffer to reduce the risk of uncontrolled run-off to watercourses. The buffer zone is regarded as unsuitable for

development, with the exception of watercourse crossings where appropriate mitigation is provided (see later).

Abstraction buffer zones

13.6.9 All CAR licences and the majority of PWSs within the study area are believed to have been identified and characterised. None of the proposed infrastructure is located within a SEPA (LUPS-GU31) 250 m buffer for the remaining ('scoped in' to the assessment) abstractions.

Conservation site and GWDTE buffer zones

13.6.10 No significant constraints are required regarding risks to designated conservation sites. However, the Proposed Development layout aimed to minimise incursions of SEPA (LUPS-GU31) 100 m (shallow excavation, <1 m deep) and 250 m (deep excavation, >1 m deep) buffer areas around the potential GWDTEs identified earlier (**Section 13.4**).

Micro-siting

13.6.11 The Proposed Development layout is shown in **Figure 13.1**. **Chapter 3: Description of the Proposed Development** notes that the route of the access tracks and positions of individual turbines and other wind farm components would be micro-sited if unforeseen ground conditions are encountered in order to reduce potential environmental impacts. It is proposed that micro-siting of infrastructure within 50 m (turbines) and 100 m (internal wind farm tracks and other infrastructure such as substations and compounds) would be considered by the Environmental Clerk of Works (ECoW). A variation in indicated positions over these limits would require to be approved in writing in consultation with DGC and EAC.

Construction Site Licence

13.6.12 Under CAR (2011), a proposed construction site in Scotland may need to obtain a Construction Site Licence (CSL) prior to commencing work. A CSL for the Proposed Development is likely to be required since the construction site is greater than 4 ha in area and includes trackways of greater than 5 km in length. This licence application requires the holder to adhere to a Pollution Prevention Plan (PPP) that SEPA has reviewed and must consider the potential impacts of construction on the water environment. Further details of SEPA's requirements for a PPP to accompany a CSL is provided in guidance document WAT-SG-75 (SEPA (2018a).

Track design

13.6.13 **Chapter 3: Description of the Proposed Development** notes that on the areas of peat depths greater than 1 m, floating roads are proposed. In a floating road, the weight of the road is supported by the peat beneath, thereby avoiding the need to construct foundations extending through to the underlying solid stratum. The floating roads would be constructed in line with the good practice guidance produced by FCS and SNH (2010) and SR at al (2019) and would include the use of geogrids and geotextiles. The geotextile used would be selected to maintain load distribution, ensure separation of aggregate and peat, and prevent peat rutting, erosion and drainage. Aggregate choice would be sensitive to peat geochemistry and would be of sufficient grade to allow infiltration through to the geotextile. A typical floated road design is shown in **Figure 3.3**.

13.6.14 Even with floating roads, some interruption of surface and near-surface flows can occur. The track layout has therefore been designed to minimise the total track length, and to avoid, where possible, intersecting catchment areas in a manner that could significantly interrupt flow paths. Cross-drainage would be provided in areas where access tracks unavoidably intersect dominant flow pathways, as discussed below.

13.6.15 On areas of steeper gradient or where there are concerns about slope stability, the use of floating roads may not be appropriate and cut tracks would be considered. These would need to be cut all the way through the peat, thereby potentially increasing disturbance of the local hydrology. However, there is little coincidence of steep slope and deep peat on the Development Site, so the extent of these access tracks would be minimised. A typical cut road design is shown in **Figure 3.5**.

Drainage design

13.6.16 The need for drainage would be considered for all parts of the track network separately since slope and wetness vary considerably across the Development Site. In flat areas, drainage of floating roads is not required as it can be assumed that rainfall on to the access track would infiltrate to the ground beneath the access track or along the verges. Track-side drainage would be avoided where possible, to prevent any local reductions in the water table or influences on the access track structure and compression (the latter can occur where a lower water table reduces the ability of the peat to bear weight, increasing compression).

13.6.17 Where access tracks are to be placed on slopes, lateral drainage would be required on the upslope side of the access track. The length of drains would be minimised, to prevent either pooling on the upslope side or, at the other extreme, creating long flow paths along which rapid run-off could occur. Regular cross-drains would be required to allow flow to pass across the access track as recommended in SR et al (2019), with a preference for subsequent re-infiltration on the downslope side, rather than direct discharge to the drainage network.

13.6.18 Check dams may be implemented in drainage ditches where necessary to reduce flow velocities to aid in the sedimentation of silt from suspension and to also direct water into the cross drains so that natural flow paths are maintained as far as possible.

13.6.19 The ditch design would be considered in line with the recommendations of the SR et al (2019) guidance, including the use of flat-bottomed ditches to reduce the depth of disturbance.

13.6.20 Cross-drainage may be by culverts or pipes beneath the access track, again in line with the SR at al (2019) guidance. Drainage would be installed before or during access track construction, rather than afterwards, to ensure that the access track design is not compromised. The cross drainage would flow out into shallow drainage, which would allow diffuse re-infiltration to the peat on the downslope side. The cross drains would flow out at ground level and not be hanging culverts. The avoidance of steep gradients for the access tracks would also reduce the risk of erosion occurring at cross-drain outflows.

13.6.21 In instances of drainage close to surface watercourses, discharge from the drainage may be to surface water rather than re-infiltration. In these situations, Best Practice control measures including sediment settlement would be undertaken before the water is discharged into surface water systems. The discharges would be small and collected from only a limited area, rather than draining a large area to the same location. Sufficient attenuation storage would also be incorporated into site drainage systems to ensure that discharge rates to watercourses do not exceed pre-development rates and taking into account potential increases in peak rainfall intensity due to climate change.

13.6.22 Although drainage would be provided in areas of disturbance as required, areas of hardstanding would be minimised so that this need is reduced. This includes careful design of construction compounds and minimising the size of crane pads at each turbine location.

13.6.23 The detailed drainage design would be developed following consent being granted, but for the purpose of this EIA Report, the basic principles are that the drainage system would be developed:

- Based on SUDS principles; and
- In accordance with CAR.

13.6.24 As the Proposed Development Site area considerably exceeds 4 ha, discharges from construction phase site surface water drainage systems would require a CAR Complex Licence from SEPA. This would be subject to approval by SEPA through the CAR licence application process.

Cable trench design

13.6.25 Cables would be run alongside access tracks wherever possible. The trenches would be installed at the minimal depth practical, although this may reach 0.5 – 1 m deep. They would be dug and left open for the minimum time possible to ensure that they do not create open drainage routes. **Chapter 3: Description of the Proposed Development** notes that the cables would be laid directly into the trenches and soils quickly replaced to minimise the ingress of water into the trenches. The trenches would be backfilled as far as possible with excavated peat to minimise the change to flow paths. Where other material is used to backfill the trenches, clay cut-off barriers would be installed across the trench to prevent them creating preferential flow paths.

13.6.26 Cable laying methods that do not require a dug trench would be considered. FCS and SNH (2010) suggest that it may be possible to inset the cable in peat flanks alongside the edges of the floating roads, so that they are protected but do not need to be dug into the ground, disturbing the peat and associated flow paths.

Watercourse crossings design

13.6.27 The number of watercourse crossings has been minimised, but due to the number of watercourses and preferential flow pathways, and limitations regarding access locations, it is not possible for the Proposed Development to take place without some watercourse crossings. The types of water crossing available typically comprise bridges, culverts and causeways. Bridges in general are the preferred solution due to their lesser hydrological and ecological effects, but where there are small or indistinct channels with little topographic variability culverts are more appropriate.

13.6.28 Adherence to WAT-SG-25 (SEPA, 2010), River Crossings and Migratory Fish: Design Guidance (Scottish Government, 2000) and CIRIA Report C786: Culvert, Screen and Outfall Manual (2019), helps to minimise potential hydrological (including morphological) effects. All watercourse crossings would be designed to convey a 1 in 200 year return period flood event with an allowance for climate change, and each watercourse / flow pathway crossing has been considered individually with respect to topography and hydrology. None of the watercourse crossings are existing and will therefore have to be constructed as new culverts/bridges. The proposed locations and types of watercourse crossings are shown in **Figure 13.4** and summarised in **Table 13.12**.

Table 13.12 Schedule of watercourse crossings

Crossing No.	Location	Grid Reference (NGR)	Crossing Type
WC01	Alhang Burn	263775 601517	Culvert
WC02	Unnamed tributary of Lorg Burn	265966 601842	Culvert
WC03	Green Cleugh Burn	266354 601520	Culvert
WC04	Unnamed tributary of Lorg Burn	266634 601398	Culvert
WC05	Unnamed tributary of Water of Ken	266694 601331	Culvert
WC06	Unnamed tributary of Water of Ken	266770 601210	Culvert
WC07	Unnamed tributary of Water of Ken	266765 601074	Culvert
WC08	Unnamed tributary of Lorg Burn	266770 600966	Culvert
WC09	Unnamed tributary of Lorg Burn	266770 600938	Culvert
WC10	Water of Ken	266860 600640	Bridge
WC11	Altry Burn	266826 599476	Culvert
WC12	Pulmulloch Burn	268226 599660	Culvert
WC13	Unnamed tributary of Pulmulloch Burn	268564 599530	Culvert
WC14	Unnamed tributary of Pulmulloch Burn	268450 599770	Culvert
WC15	Unnamed tributary of Pulmulloch Burn	268577 600124	Culvert

13.6.29 The resulting final layout requires fifteen watercourse crossings comprising culverts and one bridge crossing in order to provide access to certain wind turbines. The new structures would likely comprise simple culvert type constructions using circular pre-cast culvert sections in concrete or structured wall plastic (**Chapter 3: Description of the Proposed Development** and **Figure 3.11**), with cross sectional areas that would not impede flow of water. The design of culverts would be to at least CIRIA Culvert Design and Operation Guide (C786) standard and the culvert structure would not affect either the channel or banks. The existing alignment of the watercourses would remain unchanged.

13.6.30 Bridges are the preferred solution for larger crossings due to their lesser hydrological and ecological effects and are particularly suited to higher flow watercourses. Bridge construction is unlikely to interfere with the watercourse to the same extent as culvert construction and can be built over the existing alignment of the river without the need for diversion. The Water of Ken (WC10) is a larger watercourse than others on site and therefore requires a bridge to cross. Foundations would be required on both banks (down to a competent bearing stratum) in order to support the bridge deck. A typical bridge section is shown in **Chapter 3: Description of the Proposed Development** and **Figure 3.12**.

13.6.31 The culverts and bridge would require some level of authorisation under CAR. According to CAR, a Practical Guide (2022), registration is required for *"single-track roads and single track railways, footpaths and/or cycle routes, where the affected watercourse is not more than 2m wide"*. Registration is also required for bottomless arch culverts over wider watercourses where no part of the structure encroaches on the channel bed, and provided the total length of structures on both banks does not exceed more than 20 m. Pipe or box culverts and/ or a bridge for watercourses exceeding 2 m in width would require a Simple CAR Licence.

13.6.32 All turbine cables need eventually to lead to the control building and substations. This means that the turbine cables would need to be brought to these facilities alongside the tracks crossing the Green Cleugh Burn, Water of Ken, Lorg Burn, Altry Burn, Pulmulloch Burn and some unnamed tributaries of these watercourses. This may require cable trenching to leave the access tracks to cross the watercourses. The WAT-SG-25 (SEPA, 2010) discusses cable crossings and identifies boring beneath the channels as having the least impact on watercourses. Directional drilling would therefore possibly be required to pass the cable beneath these burns and to ensure that there is no influence on the watercourses. GBR7 would be adhered to in laying the cable beneath the watercourses. A full geotechnical assessment would be undertaken at the detailed design stage following issue of consent.

Excavations and associated drainage

13.6.33 **Chapter 3: Description of the Proposed Development** identifies that excavations for turbine footings are likely to be 25 m in diameter and 3-4 m in depth (**Figure 3.13**), with the depth of excavation for crane pads and other infrastructure considerably less. Where possible, excavations required to facilitate the construction of foundations for the wind turbines, service trenches and each crane base would be designed so that they can freely drain by gravity. Cut-off drains would be installed around the excavation areas to prevent surface run-off entering the excavations.

13.6.34 Measures based on Best Practice guidelines from SEPA would be adopted during construction to prevent pollution, with all contractors aware of a pre-planned pollution incident response procedure (PIRP), as detailed in GPP 21. The turbine foundation design minimises excavation requirements in accordance with BS6031: 2009 Code of Practice for Earth Works.

13.6.35 Turbine construction would need to adopt mitigation measures to prevent contaminants entering the shallow groundwater system. The main potential groundwater effect arising from the construction of the wind turbine foundations and adjacent crane pads is the risk of leaking concrete residues into the water environment. Given the dominant soil type and areas of peat distribution, the near-surface groundwater at the Development Site is likely to be acidic. Therefore, to minimise the potential of concrete leaching and alkaline pollution of groundwater, suitable sulphate-resistant concrete would be used. The foundation design would be checked with SEPA and if necessary, the foundation excavations would incorporate an adequate barrier to prevent the mitigation of any onsite pollutants to the underlying groundwater.

13.6.36 Should ground conditions occur during excavation where gravity drainage is not possible (i.e. where low permeability rock or superficial deposits are present) the excavations would be dammed and drained by pumping. These dewatering activities would be undertaken in accordance with Best Practice (including WAT-SG-29 on Temporary Construction Methods) which would be detailed in the Construction Environmental Management Plan (CEMP) to be agreed by SEPA and the ECoW.

13.6.37 The design for the dewatering would ensure collection and settling of suspended sediment i.e. use of silt traps, fences, straw bales or lagoons. Any water removed from the

excavation would be treated and pumped to a bunded and vegetated settlement and infiltration swale, downgradient of the excavation and away from watercourses, and there would be no discharge of water directly into a watercourse. The potential for infiltration would need to be carefully assessed due to the prevalence of saturated conditions across the Development Site. Should this be an issue, a number of these swales could be used with a wide spatial distribution to prevent oversaturation. If large volumes of water are expected from dewatering, other SUDS elements such as french drains could also be utilised (subject to ground conditions). Should local topography or ground conditions prove unsuitable for construction of either infiltration swales or settlement lagoons, the use of portable silt trap devices such as 'Siltbuster' type tanks could be considered for removal of elevated suspended solids from water pumped from excavations. These activities would be designed and implemented in consultation with SEPA on a foundation-specific basis following completion of detailed ground investigations and micro-siting prior to construction.

13.6.38 The locations of swales or settlement lagoons, where required, would be on stable areas of shallow slope, to reduce the risk of failure. The size of the settlement lagoons would be appropriate to the amount of dewatering, but if large quantities of dewatering are anticipated, the potential for more than one lagoon or the use of portable silt trap devices would be considered on a foundation-by-foundation basis. If any discharge to surface watercourses is required, the water would be treated beforehand and the need for any consent from SEPA agreed (it is expected that in most cases the activities would be covered by General Binding Rules GBR3 and/or GBR15).

13.6.39 Two borrow pits have been proposed within the Proposed Development, with borrow pit search areas identified at Alhang (NGR 263550 601500) and Coranbae Hill (NGR 267560 599430) to supply crushed aggregate and rock during the construction phase. These pits and deeper excavations on the Proposed Development may require dewatering during rock removal. Based on the status of the bedrock aquifer (low hydraulic conductivity) any such dewatering is anticipated to involve small volumes of water with limited impacts to groundwater resources. Similar controls to those detailed above with respect to the turbine foundations would be employed to prevent contamination of surface waters with suspended sediment. The dewatering of excavations at greater than 10 cubic metres per day (m^3/d) would require CAR Registration, while over 50 m^3/d would require a CAR licence. Abstractions smaller than 10 m^3/d would be required to comply with GBR3.

Peat excavations and storage

13.6.40 Surface run-off from stockpiles of excavated peat, whether temporarily stored prior to backfilling or permanent stored in peat storage areas, has the potential to affect surface water quality due to the transportation of suspended solids in surface water run-off. Therefore, Best Practice measures, e.g. SR et al (2019) would be implemented to ensure that peat is appropriately stored.

13.6.41 During the design phase of the Proposed Development the selection of appropriate turbine sites has avoided areas wherever possible where substantial peat thicknesses have been identified. This helps to reduce the volumes of peat that are required to be excavated for the construction of concrete foundation slabs and therefore the need to manage materials. However, it has not been possible to avoid all areas where peat overlies the solid geology. Consequently, mitigation measures would be adopted to prevent changes which have the potential to influence water quality.

13.6.42 Surface run-off from stockpiled materials excavated has the potential to affect surface water quality if these are inappropriately excavated and stored. The peat storage areas

would be located at a distance from any watercourses and would be contained to prevent sediment or nutrient run-off from eventually reaching downstream watercourses.

13.6.43 The storage of peat during construction would minimise slumping and maintain stratification where possible using water derived from dewatering activities to keep the peat adequately saturated to prevent desiccation and degradation. It is anticipated that all excavated peat can be re-used on site, and so it is not expected that any peat would need disposal or long-term storage by way of a waste management licence. Neither is it expected that there would need to be storage of peat spoil for a period greater than one year (or where storage prior to disposal is greater than one year) and thus no requirement for a permit in accordance with the Landfill (Scotland) Regulations 2003.

13.6.44 The upper levels of excavated peat and turf can be used for resurfacing following construction (in non-hardstanding areas), thus maintaining the hydrological and biological characteristics of the location. This resurfacing would aim to restore a flat surface around the turbine for instance, preventing mounding. This would help to re-establish hydraulic continuity of the replaced peat and turf with surrounding saturation levels, thereby reducing the possibility of peat drainage and desiccation.

Forest felling

13.6.45 The Development Site comprises mainly moorland with no tree cover. Therefore, no forest felling would be required as part of the Proposed Development activities.

Site working practices

13.6.46 Site activities during construction and operation have been identified to have potential effects. These can be controlled by the implementation of pollution prevention and control measures and Best Practice, based on the technical guidance outlined earlier (**Section 13.2.10**).

13.6.47 The site induction for contractors would include a specific session on good practice to prevent and control water pollution from construction activities. Contractors would be made aware of their statutory responsibility not to *"cause or knowingly permit water pollution"*. As discussed earlier, a PPP and PIRP would be prepared for the Proposed Development, the latter in line with SEPA's Guidance for Pollution Prevention GPP 21, and all contractors would be briefed on these plans, with copies made available on site. Equipment to contain and absorb spills would also be readily available.

13.6.48 Fuel and oil may enter the groundwater by migration vertically into the underlying groundwater or by run-off into nearby surface waters, if accidentally released or spilled during storage and refuelling. To minimise potential releases into the water environment, fuel would be stored in either a bunded area or self-bunded above-ground storage tank (AST) on the Development Site during the course of the construction phase in accordance with the Water Environment (Oil Storage) (Scotland) Regulations 2006 and other SEPA pollution prevention guidelines, and GBR9. The bunded area would have a capacity of 110% of the fuel tank. All stores would be located at least 50 m from any watercourses.

13.6.49 In areas where there is a potential for hydrocarbon residues from run-off/ isolated leakages, such as in plant storage areas and around fuel storage tanks and in refuelling zones in the proposed temporary site compound, surface water drainage would be directed to a hydrocarbon interceptor prior to discharge. The interceptor would filter out hydrocarbon residues from drainage water and retain hydrocarbon product in the event of a spillage to prevent release into surface waters at the discharge point and deterioration of downstream water quality.

13.6.50 Plant and machinery used during the construction phase would be maintained to minimise the risks of oils leaks or similar. Maintenance and refuelling of machinery would be undertaken offsite or within designated areas of temporary hardstanding. In these designated areas contingency plans would be implemented to ensure that the risk of spillages is minimised. Placing a drip tray beneath a plant and machinery during refuelling and maintenance would contain small spillages.

13.6.51 **Chapter 3: Description of the Proposed Development** notes that a temporary onsite concrete batching plant may be required for the foundation works, and this would be located in a borrow pit area or adjacent to one of the site compounds. A number of mitigation measures would be employed to minimise any effect on the water environment, including concrete batching on an impermeable designated area at least 50 m from any watercourse, the washing of equipment and vehicles on a designated area that has been specifically designed to contain wet concrete / wash water and the discharge offsite of all excess wash water that cannot be reused.

13.6.52 The main potential hydrological effects during the operational phase of the Proposed Development relate to the servicing of the turbines and storage of oils lubricants involved in the process which may be accidentally released into the water environment. This includes the turbine gearbox oil changes, which are proposed to be undertaken every 18 months during the lifetime of the Proposed Development.

13.6.53 **Chapter 3: Description of the Proposed Development** notes that at the control building and substations the small quantity of sewage arising from the infrequent visits of maintenance staff would be discharged into a septic tank connected to a soakaway or by tankering and offsite disposal by a licensed operator, depending on the suitability of a soakaway and prior agreement with SEPA. Where a mains supply is not available, water would be provided by a bowser or smaller containers.

13.6.54 The potential risks posed to surface water and groundwater quality, specifically related to operation, are likely to be limited and localised based on the planned works and the nature and volume of substances required. Any potential risk to the environment would be identified by the operator prior to servicing being undertaken. The operator would ensure a site-specific risk assessment is completed and that control measures are implemented to ensure all environmental risks are minimised. However, as a pre-requisite the storage, use and disposal of oils would be done in accordance with Best Practice and SEPA guidance (GPP8).

13.6.55 Potential ongoing effects in relation to infrastructure remaining on the Proposed Development during operations (including the turbine locations and access tracks) were addressed during the discussion of construction mitigation within this section of the report. Ongoing maintenance would be carried out, for example, to maintain drainage and settlement ponds.

Construction Environmental Management Plan

13.6.56 In accordance with SR et al (2019) engineering activities that involve the construction of river crossings or drainage systems would be avoided where possible to ensure that the Development Site and surface water system remain in a near as natural a state as possible. However, there are circumstances where this is not achievable due to the nature of the Proposed Development and restrictions on the number of options for access. Prior to the commencement of construction activities, a CEMP would therefore be produced that would follow Best Practice guidance, as well as incorporating specific recommendations made in this EIA Report, and would therefore account for potential risks and ensure minimal effects on the Development Site hydrology and hydrogeology during construction. No works would be undertaken unless agreed in the CEMP.

13.6.57 The CEMP would include or be accompanied by a Water Management Plan (WMP), a PPP and a PIRP for construction activities at the Proposed Development. The WMP would set out the specific details of surface water drainage, management of dewatered groundwater from excavations and watercourse crossings. The PPP would set out specific measures to protect Hydrology and Hydrogeology receptors from pollution arising from construction activities and a programme for inspection and monitoring to ensure the effectiveness of these measures. The PIRP would describe the response plan for pollution incidents, should accidental spillages occur despite the control measures in place.

13.6.58 A range of environmental measures have been embedded into the Proposed Development as outlined above. A summary of how these embedded measures relate to each of the receptor groups in the assessment is presented in **Table 13.13**.

Table 13.13 Summary of embedded environmental measures

Receptor	Effects	Embedded Measures
Watercourses and associated WFD surface water bodies	Soil compaction and the introduction of areas of hardstanding during construction and throughout operation increasing runoff and sediment and nutrient loading, leading to changes in watercourse and loch flow/level, quality and morphology	Avoidance of steep gradients Avoidance of deep peat deposits Avoidance of flood zones Watercourse buffer zones Minimising areas of hardstanding Drainage design WMP CEMP Cable trench design Watercourse crossings design
	Disruption of flow paths and changes to drainage regime during construction and throughout operation can be associated with increases in runoff and less onsite water retention, leading to changes in watercourse and loch flow/level and morphology	Avoidance of steep gradients Avoidance of deep peat deposits Avoidance of flood zones Watercourse buffer zones Minimising areas of hardstanding Drainage design WMP CEMP Cable trench design Watercourse crossings design
	Disruption of ground during construction leading to increased sediment and nutrient loading, leading to changes in watercourse and loch quality and morphology	Avoidance of steep gradients Avoidance of deep peat deposits Avoidance of flood zones Watercourse buffer zones Minimising areas of hardstanding Drainage design WMP CEMP Cable trench design Watercourse crossings design
	Dewatering and/or drainage during construction associated with the excavation of the turbine foundations and borrow pit and track placement disrupting groundwater support (baseflow), leading to changes	Avoidance of flood zones Watercourse buffer zones Best Practice guidelines e.g. WAT-SG-29 Dewatering and associated drainage consistent with requirements of GBRs 3 and 15 WMP

Receptor	Effects	Embedded Measures
	in watercourse and loch flow/level	CEMP
	Discharge to surface water of groundwater intercepted during construction associated with the excavation of the turbine foundations and borrow pit and track placement, leading to changes in watercourse and loch flow/level, quality and morphology	Avoidance of flood zones Watercourse buffer zones Best Practice guidelines e.g. WAT-SG-29 Dewatering and associated drainage consistent with requirements of GBRs 3 and 15 WMP CEMP
	Site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of surface waters, leading to changes in watercourse and loch quality and morphology	Avoidance of flood zones Watercourse buffer zones Best Practice guidelines PPP PIRP in accordance with GPP 21 Fuel storage in accordance with Water Environment (Oil Storage) (Scotland) Regulations 2006 and GBR9 Hydrocarbon interceptors Regular vehicle maintenance in designated hardstanding areas Oil storage in accordance with GPP 8 CEMP
Aquifers and associated WFD groundwater bodies	Soil compaction and the introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels, leading to a loss of water resource	Minimising areas of hardstanding Drainage design WMP CEMP
	Dewatering during construction associated with the excavation of the turbine foundations and borrow pit, leading to a decline in groundwater levels	Best Practice guidelines e.g. WAT-SG-29 Dewatering and associated drainage consistent with requirements of GBRs 3 and 15 WMP CEMP
	Site activities during construction, operation and decommissioning resulting in the release of pollutants and the subsequent contamination of groundwater, leading to a loss of water resource	Best Practice guidelines PPP PIRP in accordance with GPP 21 Fuel storage in accordance with Water Environment (Oil Storage) (Scotland) Regulations 2006 and GBR9 Hydrocarbon interceptors Regular vehicle maintenance in designated hardstanding areas Oil storage in accordance with GPP 8 CEMP
CAR licenced abstraction (surface water)	Soil compaction and the introduction of areas of hardstanding during construction	Abstraction buffer zones Avoidance of steep gradients Avoidance of deep peat deposits

Receptor	Effects	Embedded Measures
	and throughout operation increasing runoff and sediment loading, leading to abstraction pollution.	Avoidance of flood zones Watercourse buffer zones Minimising areas of hardstanding Drainage design WMP CEMP Cable trench design Watercourse crossings design
	Disruption of ground during construction leading to increased sediment loading and abstraction pollution.	Abstraction buffer zones Avoidance of steep gradients Avoidance of deep peat deposits Avoidance of flood zones Watercourse buffer zones Minimising areas of hardstanding Drainage design WMP CEMP Cable trench design Watercourse crossings design
	Dewatering and/or drainage during construction associated with the excavation of the turbine foundations and borrow pits and track placement disrupting groundwater support (baseflow) to watercourses, leading to abstraction derogation.	Abstraction buffer zones Avoidance of flood zones Watercourse buffer zones Best Practice guidelines e.g. WAT-SG-29 Dewatering and associated drainage consistent with requirements of GBRs 3 and 15. WMP CEMP
	Discharge to surface water of groundwater intercepted during construction associated with the excavation of the turbine foundations and borrow pits and track placement increasing flows and sediment loading, leading to abstraction pollution.	Abstraction buffer zones Avoidance of flood zones Watercourse buffer zones Best Practice guidelines e.g. WAT-SG-29 Dewatering and associated drainage consistent with requirements of GBRs 3 and 15. WMP CEMP
	Site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of surface waters, leading to abstraction pollution.	Abstraction buffer zones Avoidance of flood zones Watercourse buffer zones Best Practice guidelines PPP PIRP in accordance with GPP 21**Error! Bookmark not defined.** Fuel storage in accordance with Water Environment (Oil Storage) (Scotland) Regulations 2006 and GBR9 Hydrocarbon interceptors Regular vehicle maintenance in designated hardstanding areas Oil storage in accordance with GPP 8 CEMP

Receptor	Effects	Embedded Measures
Water conditions supporting GWDTEs (surface water)	Soil compaction and the introduction of areas of hardstanding during construction and throughout operation increasing runoff and sediment and nutrient loading, leading to changed/polluted surface water support	Avoidance of steep gradients Avoidance of deep peat deposits Conservation site buffer zones Avoidance of flood zones Watercourse buffer zones Minimising areas of hardstanding Drainage design WMP CEMP Cable trench design Watercourse crossings design
	Disruption of flow paths and changes to drainage regime during construction and throughout operation increasing runoff and reducing onsite water retention, leading to changed surface water support	Avoidance of steep gradients Avoidance of deep peat deposits Conservation site buffer zones Avoidance of flood zones Watercourse buffer zones Minimising areas of hardstanding Drainage design WMP CEMP Cable trench design Watercourse crossings design
	Disruption of ground during construction resulting in increased sediment and nutrient loading, leading to polluted surface water support	Avoidance of steep gradients Avoidance of deep peat deposits Conservation site buffer zones Avoidance of flood zones Watercourse buffer zones Minimising areas of hardstanding Drainage design WMP CEMP Cable trench design Watercourse crossings design
	Dewatering and/or drainage during construction associated with the excavation of the turbine foundations and borrow pit and track placement disrupting groundwater support (baseflow) to watercourses leading to reduced surface water support	Conservation site buffer zones Avoidance of flood zones Watercourse buffer zones Best Practice guidelines e.g. WAT-SG-29 Dewatering and associated drainage consistent with requirements of GBRs 3 and 15 WMP CEMP
	Discharge to surface water of groundwater intercepted during construction associated with the excavation of the turbine foundations and borrow pit and track placement increasing flows and sediment loading, leading to changed and polluted surface water support	Conservation site buffer zones Avoidance of flood zones Watercourse buffer zones Best Practice guidelines e.g. WAT-SG-29 Dewatering and associated drainage consistent with requirements of GBRs 3 and 15 WMP CEMP

Receptor	Effects	Embedded Measures
	Site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of surface waters, leading to polluted surface water support	Avoidance of flood zones Watercourse buffer zones Best Practice guidelines PPP PIRP in accordance with GPP 21 Fuel storage in accordance with Water Environment (Oil Storage) (Scotland) Regulations 2006 and GBR9 Hydrocarbon interceptors Regular vehicle maintenance in designated hardstanding areas Oil storage in accordance with GPP 8 CEMP
Water conditions supporting conservation sites and GWDTEs (groundwater)	Soil compaction and the introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels, leading to reduced groundwater support	Conservation site buffer zones Minimising areas of hardstanding Drainage design WMP CEMP
	Dewatering during construction associated with the excavation of the turbine foundations and borrow pit and track placement lowering groundwater levels, leading to reduced groundwater support	Conservation site buffer zones Best Practice guidelines e.g. WAT-SG-29 Dewatering and associated drainage consistent with requirements of GBRs 3 and 15 WMP CEMP
	Site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of groundwater, leading to polluted groundwater support	Conservation site buffer zones Best Practice guidelines PPP PIRP in accordance with GPP 21 Fuel storage in accordance with Water Environment (Oil Storage) (Scotland) Regulations 2006 and GBR9 Hydrocarbon interceptors Regular vehicle maintenance in designated hardstanding areas Oil storage in accordance with GPP 8 CEMP
	Physical disturbance of the peat and groundwater throughflow could occur as a result of excavation works and peat stockpiling/removal, leading to reduced groundwater support	Avoidance of deep peat deposits Conservation site buffer zones CEMP Peat excavation and storage Best Practice

13.7 Assessment of Hydrology and Hydrogeology effects

Watercourses and associated WFD surface water bodies (W01 and W02)

13.7.1 Based on the water environment baseline presented in **Section 13.4**, **Section 13.5** identified that potential effects due to the proposed development on two surface water receptors within the study area required consideration as part of the assessment (**Table 13.10**). These comprise the Water of Ken WFD surface water body and associated tributaries (including the Spout, Gills, Holm, Lorg, Altry, Pullmulloch and Fortypenny Burns) (W01) and the Afton Water WFD surface water body and associated tributaries (including the Alhang, Alwhat, Clashywarrant, Meikledodd, Sandyhole and Montraw Burns) (W02).

13.7.2 Proposed works that would be in the catchments of the watercourses and WFD surface water bodies include the following:

- W01: The majority of the Proposed Development lies within the catchment of the Water of Ken including (from west to east) T11, T14, T1, T3, T2, T5, T4, T10, T7, T6, T8 and T9 and much of the new track. Works would therefore include twelve turbines and crane pads, new access track construction, a substation, a control building, a borrow pit and temporary site facilities including a temporary construction compound, and fourteen watercourse crossings including that of the Water of Ken (WC10). Other works would comprise soil compaction and temporary hardstanding, associated land clearance, peat workings, material storage and operational activities; and
- W02: The north-western part of the Proposed Development contains proposed infrastructure located within the surface water catchment of the Afton Water. Proposed development infrastructure/activities include three turbines (T13, T12 and T15) and crane pads, new access track construction, a borrow pit and temporary site facilities including a temporary construction compound, and the new Alhang Burn crossing (WC01). Other works would include soil compaction and temporary hardstanding, associated land clearance, peat workings, material storage and operational activities.

13.7.3 The Proposed Development would mainly reside in the W01 catchment. Therefore, the majority of the construction and operation works needs to be considered in regard to this receptor (**Table 13.11**).

13.7.4 **Table 13.13** observed that changes in flow and morphology and also sediment loading and pollution of watercourses and WFD surface water bodies could occur as a result of soil compaction and the introduction of areas of hardstanding during construction and throughout operation increasing runoff and sediment and nutrient loading; disruption of flow paths and changes to drainage regime during construction and throughout operation associated with increases in runoff and less onsite water retention; disruption of ground during construction increases sediment and nutrient loading; dewatering and/or drainage during construction associated with the excavation of the turbine foundations and a borrow pit and track placement disrupting groundwater support (baseflow) to watercourses; discharge to surface water of groundwater intercepted during construction associated with the excavation of the turbine foundations and a borrow pit and track placement changing flows and sediment loading; and site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of surface waters. These effects would be more prevalent in W01 rather than W02 because this is where the majority of the Proposed Development is intended.

13.7.5 The Water of Ken WFD surface water body is classified as Poor overall status and the Afton Water WFD surface water body as Good overall status, and therefore are regarded as of low and medium value respectively (**Table 13.3**).

13.7.6 Mitigation that looks to protect surface waters from the effects of such work is extensive (**Section 13.6** and **Table 13.13**). It includes strict adherence to a 50 m buffer zone applied to the entire surface water network, careful access track, cable trench drainage and watercourse crossing design and adherence to numerous relevant protocols, including the WMP and CEMP, SR et al (2019) Good Practice During Wind Farm Construction guidance, the WAT-SG-25 (SEPA, 2010) River Crossings Good Practice Guide, WAT-SG-29 on Temporary Construction Methods and any dewatering CAR registration or licence requirements. Any dewatering would necessitate the use of silt traps, fences, straw bales, settlement lagoons, swales and SUDS, and any discharge to surface water would require consent from SEPA and would be subject to conditions attached to the consent. Other pollution prevention and emergency response planning such as the PIRP are also relevant.

13.7.7 It is considered that these mitigation measures, taken together with dilution within the water bodies downgradient of the Development Site, are sufficient for change and WFD surface water bodies and associated watercourses with respect to soil compaction and hardstanding (surface water quantity and quality), disruption of flow paths (surface water quantity), disruption of ground (surface water quality), dewatering and/or drainage (surface water quantity), discharge to surface water (surface water quantity and quality) and site activities (surface water quality) to be of low to very low magnitude (**Table 13.4**).

13.7.8 On this basis, the level of effect on the WFD surface water bodies and the associated watercourses (W01 and W02) is negligible and negligible / minor respectively (not significant) (**Table 13.5**).

Aquifer and associated WFD groundwater bodies (GW01 and GW02)

13.7.9 Based on the water environment baseline presented in **Section 13.4**, **Section 13.5** identified that the potential effects due to the Proposed Development on the bedrock aquifer and associated Galloway and Upper Nithsdale groundwater bodies, namely GW01 and GW02 respectively, required consideration as part of the assessment (**Table 13.10**).

13.7.10 Proposed works that would overlie these WFD groundwater bodies include the following:

- GW01: Proposed development infrastructure/activities include (from west to east) T13, T14, T1, T3, T2, T5, T4, T10, T7, T6, T8 and T9 and much of the new track. Works would therefore include twelve turbines and crane pads, new access track construction, a substation, a borrow pit and temporary site facilities including a temporary construction compound. Other works would comprise soil compaction and temporary hardstanding, associated land clearance, peat workings, material storage and operational activities; and
- GW02: Proposed development infrastructure/activities include three turbines (T12, T11 and T15) and crane pads, new access track construction, a borrow pit, temporary site facilities including a temporary construction compound and the control building. Other works would include soil compaction and temporary hardstanding, associated land clearance, peat workings, material storage and operational activities.

13.7.11 For receptor GW01 the main works of relevance are the excavation and placement of twelve turbines, new access track construction, the borrow pit and any associated peat works and operational activities (**Table 13.11**). For receptor GW02 the main works of relevance are the excavation and placement of three turbines new access track construction, the borrow pit and any associated peat works and operational activities

13.7.12 **Table 13.13** indicated that loss or contamination of the groundwater resources could occur as a result of soil compaction and the introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels; dewatering during construction associated with the excavation of the turbine foundations and borrow pits reducing groundwater levels; and site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of groundwater.

13.7.13 The local bedrock aquifer is of low productivity and its associated Galloway and Upper Nithsdale WFD groundwater bodies are of Good and Poor overall status respectively. The GW01 and GW02 receptors are therefore considered to be of medium and low value respectively (**Table 13.3**).

13.7.14 Mitigation that looks to protect the aquifer and WFD groundwater bodies includes adherence to the WMP and CEMP, BS6031: 2009 Code of Practice for Earth Works, WAT-SG-29 on Temporary Construction Methods and any dewatering CAR registration or licence requirements (**Section 13.6** and **Table 13.13**). The limited extent of the proposed works compared to the area of both the proposed development and the aquifer, the low permeability of the aquifer and the anticipated effectiveness of the embedded environmental measures combine to limit the magnitude of change to the aquifer and the WFD groundwater bodies baseline condition.

13.7.15 The magnitude of change to the aquifer and WFD groundwater bodies with respect to the soil compaction and hardstanding (groundwater levels), turbine foundation and borrow pit dewatering works (groundwater levels), and site activities (groundwater quality) is therefore very low (**Table 13.4**).

13.7.16 On this basis, the level of effect on the aquifer and WFD groundwater bodies is negligible and not significant (**Table 13.5**).

CAR licenced abstractions (A33 and A34)

13.7.17 Based on the water environment baseline presented in **Section 13.4**, **Section 13.5** identified that the potential effects due to the Proposed Development on two potential CAR licenced abstractions required consideration as part of the assessment, namely Afton Reservoir (A33) and Carsfad Loch Reservoir (A34) (**Table 13.10**). These are both surface water abstractions used for public water supply. Their SEPA-GU31 250m buffers do not extend to within the red line boundary but their surface water catchments do.

13.7.18 Proposed works that would be in the catchments of the reservoirs include the following:

- A33: The north-western part of the Proposed Development contains proposed infrastructure located within the catchment of the Afton Reservoir. Proposed development infrastructure/activities include (from west to east) three turbines (T13, T12 and T15) and crane pads, new access track construction, a borrow pit and temporary site facilities including a temporary construction compound, and the new Alhang Burn crossing (WC01). Other works would include soil compaction and temporary hardstanding, associated land clearance, peat workings, material storage and operational activities; and
- A34: The majority of the Proposed Development lies within the catchment of the Carsfad Loch Reservoir including T11, T14, T1, T3, T2, T5, T4, T10, T7, T6, T8 and T9 and much of the new track. Works would therefore include twelve turbines and crane pads, new access track construction, a substation, a control building, a borrow pit and temporary site facilities including a temporary construction compound, and fourteen watercourse crossings including that of the Water of Ken (WC10). Other

works would comprise soil compaction and temporary hardstanding, associated land clearance, peat workings, material storage and operational activities

13.7.19 The Proposed Development would mainly reside in the A34 catchment. However, whilst the majority of the construction and operation works need to be considered in regard to this receptor, the more restricted works in the A33 catchment, are in closer proximity to the SW supply.

13.7.20 **Table 13.13** observed that derogation or contamination of these abstractions could occur as a result of soil compaction and the introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels and increasing runoff and sediment loading; disruption of ground during construction leading to increased sediment loading; dewatering during construction associated with the track placement leading to a decline in groundwater levels and baseflow to watercourses; discharge to surface water of groundwater intercepted during construction associated with track placement changing flows and sediment loading; and site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of groundwater and surface water.

13.7.21 In EIA terms, the CAR licenced abstractions are considered of high value (**Table 13.3**).

13.7.22 Mitigation that would serve to help protect the abstractions is extensive (**Section 13.6** and **Table 13.13**). It includes strict adherence to a 50 m buffer zone applied to the entire surface water network, careful access track, cable trench drainage and watercourse crossing design and adherence to numerous relevant protocols, including the WMP and CEMP, SR et al (2019) Good Practice During Wind Farm Construction guidance, the WAT-SG-25 (SEPA, 2010) River Crossings Good Practice Guide, WAT-SG-29 on Temporary Construction Methods and any dewatering CAR registration or licence requirements. Any dewatering would necessitate the use of silt traps, fences, straw bales, settlement lagoons, swales and SUDS, and any discharge to surface water would require consent from SEPA and would be subject to conditions attached to the consent. Other pollution prevention and emergency response planning such as the PIRP are also relevant.

13.7.23 The anticipated effectiveness of embedded mitigation measures, taken together with some dilution within the catchments downgradient of the Development Site, means that the magnitude of change to the potential abstraction with respect to soil compaction and hardstanding (groundwater levels, surface water quantity and quality), disruption of ground (surface water quality), track dewatering (groundwater levels and surface water quantity), discharge to surface water (surface water quantity) and site activities (groundwater and surface water quality) is low / very low (A33) and very low (A34) (**Table 13.4**).

13.7.24 On this basis, the level of effect on A33 and A34 is moderate (probably significant) to minor (not significant), and minor (not significant) respectively (**Table 13.5**). The additional mitigation described in **Section 13.8** is required to bring the level of effect on A33 down to minor (not significant).

Conditions supporting GWDTEs (GT37, GT78, GT80, GT81, GT82 and GT85)

13.7.25 Based on the water environment baseline presented in **Section 13.4**, **Section 13.5** identified that the potential effects due to the Proposed Development on potential GWDTEs (GT37, GT78, GT80-82 and GT85) required consideration as part of the assessment (**Table 13.10**).

13.7.26 **Table 13.13** observed that derogation or contamination of these sites could occur as a result of soil compaction and the introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels and increasing runoff and sediment and nutrient loading; disruption of flow paths and changes to drainage regime during construction and throughout operation increasing runoff and reducing onsite water retention; disruption of ground during construction leading to increased sediment and nutrient loading; dewatering and/or drainage during construction associated with the track placement reducing groundwater levels and disrupting groundwater support (baseflow) to GWDTEs; discharge to surface water of groundwater intercepted during construction associated with track placement increasing flows and sediment loading; site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of groundwater and surface waters; and physical disturbance of any peat and groundwater throughflow associated with the GWDTEs as a result of excavation works and peat stockpiling/removal.

13.7.27 In EIA terms, the GWDTEs are considered of Low value (**Table 13.3**).

13.7.28 In the most part, the presence of peat and / or till and low permeability bedrock ensures that any groundwater levels will be local and perched. Therefore, wider-scale groundwater supply to the GWDTEs identified is limited, with the majority of the supply coming instead from surface or very near-surface infiltration and surface runoff (**Appendix 13A**). Nevertheless, mitigation that could serve to protect the GWDTEs also includes SEPA (LUPS-GU31) buffer areas (**Section 13.6** and **Table 13.13**). Some parts of the GWDTEs do sit within the SEPA LUPS-GU31 infrastructure buffers, but the majority of the other mitigation presented in **Section 13.6** and **Table 13.13** is relevant to the protection of the quantity and quality of the surface water and groundwater support and maintaining the peat structure. This includes restricting the development on steep gradients and within deep peat deposits, adherence to the WMP and CEMP and careful infrastructure design. The embedded environmental measures discussed earlier with respect to watercourses are also relevant.

13.7.29 The magnitude of change to the GWDTEs with respect of soil compaction and hardstanding (groundwater levels, surface water quantity and quality), disruption of flow paths and changes to drainage regime (surface water quantity), disruption of ground (surface water quality), dewatering and/or drainage (groundwater levels and surface water quantity), discharge to surface water (surface water quantity and quality), site activities (groundwater and surface water quality) and disturbance of any associated peat (groundwater levels) is therefore considered to be low to very low (**Table 13.4**).

13.7.30 On this basis the level of effect on GWDTEs is negligible and not significant (**Table 13.5**).

Summary

13.7.31 A summary of the results of the assessment of the Hydrology and Hydrogeology prior to the implementation of additional mitigation is provided in Error! Reference source not found..

Table 13.14 Summary of significance of adverse effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
The Water of Ken WFD surface water body and associated tributaries (W01)				
Soil compaction and the introduction of areas of hardstanding during construction and throughout operation increasing runoff and sediment and nutrient loading, leading to changes in watercourse and loch flow/level, quality and morphology	Low	Low	Negligible (NS)	Limited extent of proposed works compared to area of the proposed development, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Disruption of flow paths and changes to drainage regime during construction and throughout operation associated with increases in runoff and less onsite water retention, leading to changes in watercourse and loch flow/level and morphology	Low	Low	Negligible (NS)	Limited extent of proposed works compared to area of the proposed development, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Disruption of ground during construction increases sediment and nutrient loading, leading to changes in watercourse and loch quality and morphology	Low	Low	Negligible	Limited extent of proposed works compared to area of the proposed development, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Dewatering and/or drainage during construction associated with the excavation of the turbine foundations and borrow pits and track placement disrupting groundwater support	Low	Very Low	Negligible (NS)	Limited extent of proposed works, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
(baseflow), leading to changes in watercourse and loch flow/level				
Discharge to surface water of groundwater intercepted during construction associated with the excavation of the turbine foundations and borrow pits and track placement, leading to changes in watercourse and loch flow/level, quality and morphology	Low	Very Low	Negligible (NS)	Limited extent of proposed works, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of surface waters, leading to changes in watercourse and loch quality and morphology	Low	Low	Negligible (NS)	Limited extent of proposed works compared to area of the proposed development, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
The Afton Water WFD surface water body and associated tributaries (W02)				
Soil compaction and the introduction of areas of hardstanding during construction and throughout operation increasing runoff and sediment and nutrient loading, leading to changes in watercourse and loch flow/level, quality and morphology	Medium	Low	Minor (NS)	Limited extent of proposed works compared to area of the proposed development, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Disruption of flow paths and changes to drainage regime during construction and throughout operation associated with increases in	Medium	Low	Minor (NS)	Limited extent of proposed works compared to area of the proposed development, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
runoff and less onsite water retention, leading to changes in watercourse and loch flow/level and morphology				
Disruption of ground during construction increases sediment and nutrient loading, leading to changes in watercourse and loch quality and morphology	Medium	Low	Minor (NS)	Limited extent of proposed works compared to area of the proposed development, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Dewatering and/or drainage during construction associated with the excavation of the turbine foundations and borrow pits and track placement disrupting groundwater support (baseflow), leading to changes in watercourse and loch flow/level	Medium	Very Low	Negligible (NS)	Limited extent of proposed works, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Discharge to surface water of groundwater intercepted during construction associated with the excavation of the turbine foundations and borrow pits and track placement, leading to changes in watercourse and loch flow/level, quality and morphology	Medium	Very Low	Negligible (NS)	Limited extent of proposed works, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of surface waters, leading to changes in watercourse and loch quality and morphology	Medium	Low	Minor (NS)	Limited extent of proposed works compared to area of the proposed development, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Bedrock aquifer and Galloway WFD groundwater body (GW01)				
Soil compaction and the introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels, leading to a loss of water resource	Medium	Very Low	Negligible (NS)	Limited extent of proposed works compared to area of both proposed development and aquifer, low permeability of aquifer and anticipated effectiveness of embedded environmental measures combine to limit magnitude of change to WFD groundwater bodies
Dewatering during construction associated with the excavation of the turbine foundations and borrow pits reducing groundwater levels, leading to a loss of water resource	Medium	Very Low	Negligible (NS)	Limited extent of proposed works compared to area of both proposed development and aquifer, low permeability of aquifer and anticipated effectiveness of embedded environmental measures combine to limit magnitude of change to WFD groundwater bodies
Site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of groundwater, leading to a loss of water resource	Medium	Very Low	Negligible (NS)	Limited extent of proposed works compared to area of both proposed development and aquifer, low permeability of aquifer and anticipated effectiveness of embedded environmental measures combine to limit magnitude of change to WFD groundwater bodies
Bedrock aquifer and Upper Nithsdale WFD groundwater body (GW02)				
Soil compaction and the introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels, leading to a loss of water resource	Low	Very Low	Negligible (NS)	Limited extent of proposed works compared to area of both proposed development and aquifer, low permeability of aquifer and anticipated effectiveness of embedded environmental measures combine to limit magnitude of change to WFD groundwater bodies
Dewatering during construction associated with the excavation of the turbine foundations and borrow pits	Low	Very Low	Negligible (NS)	Limited extent of proposed works compared to area of both proposed development and aquifer, low permeability of aquifer and

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
reducing groundwater levels, leading to a loss of water resource				anticipated effectiveness of embedded environmental measures combine to limit magnitude of change to WFD groundwater bodies
Site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of groundwater, leading to a loss of water resource	Low	Very Low	Negligible (NS)	Limited extent of proposed works compared to area of both proposed development and aquifer, low permeability of aquifer and anticipated effectiveness of embedded environmental measures combine to limit magnitude of change to WFD groundwater bodies
The Afton Reservoir CAR abstraction licence (A33)				
Soil compaction and the introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels and therefore baseflow for surface watercourses, and increasing runoff and sediment loading, leading to derogation and pollution of surface water abstractions	High	Low	**Moderate (PS)** [4]	Limited extent of proposed works compared to area of the proposed development, anticipated effectiveness of embedded environmental measures and some dilution combine to limit magnitude of change to reservoir
Disruption of ground during construction increases sediment loading, leading to pollution of surface water abstractions	High	Low	**Moderate (PS)** [4]	Limited extent of proposed works compared to area of the proposed development, anticipated effectiveness of embedded environmental measures and some dilution combine to limit magnitude of change to reservoir
Dewatering during construction associated with track placement reducing groundwater levels and baseflow to watercourses, leading to abstraction derogation	High	Very Low	Minor (NS)	Limited extent of proposed works compared to area of the proposed development, anticipated effectiveness of embedded environmental measures and some dilution combine to limit magnitude of change to reservoir

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Discharge to surface water of groundwater intercepted during construction associated with track placement changing flows and sediment loading, leading to changes in yield and pollution of surface water abstractions	High	Very Low	Minor (NS)	Limited extent of proposed works compared to area of the proposed development, anticipated effectiveness of embedded environmental measures and some dilution combine to limit magnitude of change to reservoir
Site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of groundwater and surface water, leading to pollution of surface water abstractions	High	Low	**Moderate (PS)[4]**	Limited extent of proposed works compared to area of the proposed development, anticipated effectiveness of embedded environmental measures and some dilution combine to limit magnitude of change to reservoir
The Carsfad Loch Reservoir CAR abstraction licence (A34)				
Soil compaction and the introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels and therefore baseflow for surface watercourses, and increasing runoff and sediment loading, leading to derogation and pollution of surface water abstractions	High	Very Low	Minor (NS)	Limited extent of proposed works compared to area of the proposed development, anticipated effectiveness of embedded environmental measures and some dilution combine to limit magnitude of change to reservoir
Disruption of ground during construction increases sediment loading, leading to pollution of surface water abstractions	High	Very Low	Minor (NS)	Limited extent of proposed works compared to area of the proposed development, anticipated effectiveness of embedded environmental measures and some dilution combine to limit magnitude of change to reservoir

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Dewatering during construction associated with track placement reducing groundwater levels and baseflow to watercourses, leading to abstraction derogation	High	Very Low	Minor (NS)	Limited extent of proposed works compared to area of the proposed development, anticipated effectiveness of embedded environmental measures and some dilution combine to limit magnitude of change to reservoir
Discharge to surface water of groundwater intercepted during construction associated with track placement changing flows and sediment loading, leading to changes in yield and pollution of surface water abstractions	High	Very Low	Minor (NS)	Limited extent of proposed works compared to area of the proposed development, anticipated effectiveness of embedded environmental measures and some dilution combine to limit magnitude of change to reservoir
Site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of groundwater and surface water, leading to pollution of surface water abstractions	High	Very Low	Minor (NS)	Limited extent of proposed works compared to area of the proposed development, anticipated effectiveness of embedded environmental measures and some dilution combine to limit magnitude of change to reservoir
Potentially high and moderate groundwater dependency onsite habitats (GT37, GT78, GT80, GT81, GT82 and GT85)				
Soil compaction and the introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels and increasing runoff and sediment and nutrient loading, leading to leading to reduced groundwater support and changed/polluted surface water support	Low	Low	Negligible (NS)	Some works within and close to GWDTEs, but dependence on local surface waters and anticipated effectiveness of embedded environmental measures limit magnitude of change

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Disruption of flow paths and changes to drainage regime during construction and throughout operation can be associated with increases in runoff and less onsite water retention, leading to altered surface water support	Low	Low	Negligible (NS)	Some works within and close to GWDTEs, but dependence on local surface waters and anticipated effectiveness of embedded environmental measures limit magnitude of change
Disruption of ground during construction resulting in increased sediment and nutrient loading, leading to polluted surface water support	Low	Low	Negligible (NS)	Some works within and close to GWDTEs, but dependence on local surface waters and anticipated effectiveness of embedded environmental measures limit magnitude of change
Dewatering and/or drainage during construction associated with the excavation of the turbine foundations and borrow pits and track placement lowering groundwater levels and disrupting groundwater support (baseflow) to watercourses, leading to reduced groundwater and surface water support	Low	Very Low	Negligible (NS)	Some works within and close to GWDTEs, but dependence on local surface waters and anticipated effectiveness of embedded environmental measures limit magnitude of change
Discharge to surface water of groundwater intercepted during construction associated with the excavation of the turbine foundations and borrow pits and track placement increasing flows and sediment loading, leading to changed and polluted surface water support	Low	Very Low	Negligible (NS)	Some works within and close to GWDTEs, but dependence on local surface waters and anticipated effectiveness of embedded environmental measures limit magnitude of change

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of groundwater and surface waters, leading to polluted groundwater and surface water support	Low	Low	Negligible (NS)	Some works within and close to GWDTEs, but dependence on local surface waters and anticipated effectiveness of embedded environmental measures limit magnitude of change
Physical disturbance of the peat and groundwater throughflow could occur as a result of excavation works and peat stockpiling/removal, leading to reduced groundwater support	Low	Low	Negligible (NS)	Some works within and close to GWDTEs, but minimising disturbance of deep peat and anticipated effectiveness of embedded environmental measures limit magnitude of change

1. The value of a receptor is defined using the criteria set out in **Table 13.3** above and is defined as very low, low, medium and high.
2. The magnitude of change on a receptor resulting from activities relating to the development is defined using the criteria set out in **Table 13.4** above and is defined as very low, low, medium and high.
3. The significance of the environmental effects is based on the combination of the sensitivity/importance/value of a receptor and the magnitude of change and is expressed as major (significant (S)), moderate (probably significant, PS) or minor/negligible (not significant, NS), in accordance with **Table 13.5** above.
4. Additional mitigation described in **Section 13.8** brings PS effects down to NS.

13.8 Consideration of additional mitigation

13.8.1 It is sensible to implement some additional precautionary mitigation measures to further protect the surface water environment, particularly in light of the identification of some 'probably significant' effects to Afton Reservoir (A33). These measures have been identified through the iterative process of scheme design and would be in addition to those outlined in **Section 13.6**. The additional measures outlined below have not been included in the significance assessment presented earlier (**Section 13.7** and **Table 13.14**).

13.8.2 Additional precautionary measures to protect the Afton Reservoir would include the following:

- the location of the borrow pit within the identified borrow pit search area in the reservoir's catchment would be optimised to minimise risk such that the distance to the nearest watercourse would large enough to provide a sufficient attenuation buffer, reducing the risk of uncontrolled run-off to watercourses;
- consideration would be given to utilising the horizontal directional drilling (HDD) technique to form the upgradient watercourse crossing WC01, thereby minimising impacts on the Alhang Burn which forms a tributary of the Afton Reservoir;
- as part of an early warning system, automated or manual high frequency water quality monitoring, e.g. of turbidity, would be undertaken both upstream and downstream of the borrow pit and watercourse crossing WC01, including within the Alhang Burn and the Afton Water watercourse. Monitoring could also be undertaken in the Alwhat Burn (confluent with Afton Water), downgradient of the T15 and its adjoining track, and also at a 'control' (unaffected) location in a neighbouring catchment, such as the Blacklorg Burn or Swinkey Burn; and
- should less than satisfactory water quality results be obtained, for example a breach of Environmental Quality Standards (EQS) that could be attributed to the works, then work would cease until mitigation and alternative working methods are in place and the water quality is returned to the baseline, unimpacted standard.

13.8.3 On this basis the PS level of effect assessed in **Section 13.7** with respect to A33 would be reduced to minor (not significant).

13.8.4 A water quality monitoring plan (WQMP) could also be developed to be establish whether there are any effects on surface water quality within the wider catchments downstream of the Development Site. The monitoring could include the following:

- water quality monitoring would be extended to include the various tributaries of the Water of Ken that drain the Development Site. This would include Alwhat Burn (confluent with Water of Ken), Lorg Burn, Water of Ken, Coranbae Burn and Pulmulloch Burn;
- in addition, water quality monitoring would be undertaken of the Water of Ken both upstream (control) and downstream (cumulative effects) of the Proposed Development, upstream beyond the Pulmulloch Burn confluence and downstream beyond the Holm Burn confluence; and
- water quality monitoring would also be undertaken downstream of Afton Reservoir.

13.8.5 Additional remedial action would be taken if pollution relating to the construction and operation of the Proposed Development was identified.

13.9 Assessment of cumulative effects

13.9.1 As outlined in **Section 4.8**, consideration has been given as to whether any of the Hydrology and Hydrogeology receptors that have been taken forward for assessment in this chapter are likely to be subject to cumulative effects because of equivalent effects generated by other existing, consented (but not yet built) and proposed developments for which applications have been submitted.

13.9.2 In terms of cumulative residual effects on the water environment, consideration has been given to developments that would impact upon the Water of Ken (W01) and Afton Water (W02) WFD surface water bodies and the Afton (A33) and Carsfad Loch Reservoirs (A34). The assessment presented here therefore assesses a zone of influence comprising the spatial area of the affected catchments, and within a 10 km radius of the Proposed Development (**Table 13.15**).

Table 13.15 Wind farm developments within 10 km of the Proposed Development

Name	Status	Location
Euchanhead	Application	0.6 km north-east of Proposed Development (River Nith catchment)
Afton	Existing	0.9 km north of Proposed Development (Afton Water catchment)
Appin	Scoping	1.3 km south-east of Proposed Development (River Nith catchment)
Windy Standard	Existing	1.4 km north-west of Proposed Development (Water of Deugh catchment)
Sanquhar II	Application	1.5 km north of Proposed Development (River Nith and Afton Water catchments)
Windy Rig	Existing	1.5 km south-west of Proposed Development (Water of Ken and Water of Deugh catchments)
Windy Standard Repower	Scoping	1.8 km north-west of Proposed Development (Water of Deugh catchment)
Windy Standard Extension	Existing	3.1 km north-west of Proposed Development (Water of Deugh catchment)
Sanquhar Six	Consented	3.9 km north of Proposed Development (River Nith catchment)
Cornharrow/ Cornharrow variation	Consented/ Application	4.1 km south of Proposed Development (Water of Ken catchment)
Whiteside Hill	Existing	4.4 km north-east of Proposed Development (River Nith catchment)
Pencloe	Consented	4.5 km north-west of Proposed Development (Afton Water and Water of Deugh catchments)
Wether Hill	Existing	4.9 km south-south-east of Proposed Development (Cairn Water/River Nith catchment)

Name	Status	Location
Windy Standard Phase III	Consented	5.0 km south-west of Proposed Development (Water of Deugh catchment)
Quantans Hill	Scoping	5.2 km south-west of Proposed Development (Water of Deugh catchment)
Hare Hill Extension	Existing	5.6 km north of Proposed Development (River Nith catchment)
Shepherd's Rig	Application	5.7 km south of Proposed Development (Water of Ken and Water of Deugh catchments)
Cloud Hill	Scoping	5.7 km north-east of Proposed Development (River Nith catchment)
Sanquhar	Existing	6.2 km north-north-east of Proposed Development (River Nith catchment)
South Kyle	Existing	6.3 km north-west of Proposed Development (River Nith and Water of Deugh catchments)
Hare Hill	Existing	6.7 km north of Proposed Development (Predominantly River Nith catchment but also Afton Water)
Enoch Hill	Consented	8.3 km north-west of Proposed Development (River Nith and Water of Deugh catchments)
Sandy Knowe	Existing	8.4 km north of Proposed Development (River Nith catchment)
Troston Loch	Consented	8.6 km south of Proposed Development (Cairn Water/River Nith and Water of Ken catchments)
High Park Farm	Existing	9.2 km north-north-west of Proposed Development (River Nith catchment)
Benbrack	Consented	9.5 km west of Proposed Development (Water of Deugh and River Doon catchments)
Twentyshilling Hill	Existing	9.9 km east-north-east of Proposed Development (River Nith catchment)

13.9.3 It is reasonable to assume that good practice mitigation of the type outlined in this EIA Report would also be applied to the other wind farms in the same catchments (Afton, Sanquhar II, Windy Rig, Cornharrow, Pencloe, Shepherd's Rig, Hare Hill and Troston Loch Wind Farms), ensuring no cumulative effects downstream. Nevertheless, as the construction phase for certain of these wind farms could overlap with that of the Proposed Development, a sensible precautionary measure would be to condition an extended WQMP to identify any construction phase changes in water quality from any site in the same surface water catchments and to apply appropriate mitigation measures quickly to prevent any effects.

13.9.4 The other wind farms are located within separate surface water catchments from the Proposed Development, such that no other cumulative effects are possible.

13.10 Conclusions of significance evaluation

13.10.1 The summary of the significance of predicted hydrological and hydrogeological effects presented in **Section 13.7** indicates that, based on the environmental baseline and embedded mitigation described in **Sections 13.4** and **13.6** respectively, there are some 'probably significant' adverse effects related to the Proposed Development, related to the presence of activities within the catchments of public water supplies.

13.10.2 Additional mitigation over that embedded in the design therefore has merit. That presented in **Section 13.8**, namely the optimisation of the borrow pit location within the borrow pit search area to minimise risk, the consideration of HDD to form the watercourse crossing WC01, the implementation of an early warning water quality monitoring system and the formulation of a WQMP is suitably precautionary. The extension of the WQMP to confirm the absence of cumulative effects resulting from multiple wind farms described in **Section 13.9** is also precautionary.

13.10.3 On this basis, with both embedded and additional mitigation in place, standalone and cumulative effects of the Proposed Development on all water receptors are not significant.

13.11 Implementation of environmental measures

13.11.1 **Table 13.16** describes the environmental measures embedded within the Proposed Development and the means by which they will be implemented i.e. they would have been secured through the CAR authorisation process and planning conditions.

Table 13.16 Summary of environmental measures to be implemented relating to Hydrology and Hydrogeology

Environmental measure	Responsibility for implementation	Compliance mechanism	EIA Report section reference
Pre-construction works: detailed design of watercourse crossings and cable trenching	Geotechnical and design teams	Approval of watercourse crossing design through CAR authorisation process.	13.6
Construction and maintenance of bunding and other works	Site management	Agreed construction method statements followed on site, secured by planning condition.	13.6
Construction and maintenance of watercourse crossings	Site management	Agreed construction method statements followed on site, secured by planning condition.	13.6
Micro-siting of tracks, turbines and other infrastructure during construction	ECoW	Agreed construction method statements followed on site, secured by planning condition.	13.6
Implementation of best practice in construction in relation to drainage, soil handling and other potential sources of pollution (e.g. oil)	Site management	Agreed construction method statements and best practice guidance followed on site, secured by planning condition and CAR authorisation process.	13.6

Environmental measure	Responsibility for implementation	Compliance mechanism	EIA Report section reference
Implementation of best practice in operation, including preventing spills and maintenance of infrastructure	Site management	Ongoing monitoring.	13.6, 13.8
Design and implementation of water quality monitoring in surface watercourses- baseline and construction phases. Targeted monitoring to continue through operational phase	ECoW	Secured by planning condition.	13.6

13.12 References

British Geological Survey, (1988). Hydrogeological Map of Scotland 1:625,000.

British Standards Institution, (2009). BS6031: 2009 Code of Practice for Earth Works.

Construction Industry Research and Information Association, (2019). Report C786: Culvert, Screen and Outfall Manual.

Dumfries and Galloway Council, (2019). Local Development Plan 2.

East Ayrshire Council (2017) Local Development Plan.

Forestry Commission Scotland (FCS) and Scottish Natural Heritage (SNH), (2010). Floating Roads on Peat: A report into good practice in design, construction and use of floating roads on peat, with particular reference to wind farm developments in Scotland.

Scottish Environment Protection Agency (SEPA) (2011). The Water Environment (Controlled Activities) (Scotland) Regulations 2011, as amended.

SEPA (2022). The Water Environment (Controlled Activities) (Scotland) Regulations 2011, as amended: A Practical Guide.

SEPA (2017). GPP 8 Safe Storage and Disposal of Used Oils.

SEPA (2021). GPP 21 Pollution Incident Response Planning.

SEPA (2018b). Land Use Planning System Guidance Note 24: Flood Risk and Land Use Vulnerability Guidance, Version 4.

SEPA (2017). Land Use Planning System Guidance Note 31: Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, Version 3.

SEPA (2010). WAT-SG-25 Engineering in the water environment: good practice guide, River Crossings, Second Edition.

SEPA (2009). WAT-SG-29 Engineering in the Water Environment, Good Practice Guide, Temporary Construction Methods, Version 1.

SEPA (2018a). WAT-SG-75 Sector Specific Guidance: Construction Sites, Version 1

Scottish Government, (2000). River Crossings and Migratory Fish: Design Guidance.

Scottish Renewables, SNH, SEPA, FCS, Historic Environment Scotland, Marine Scotland Science and Association of Environmental and Ecological Clerks of Works (2019), Good Practice During Wind Farm Construction, Fourth edition.

14. Traffic and Transport

14.1 Introduction

14.1.1 This chapter of the EIA Report assesses the likely significant effects of the Proposed Development with respect to Traffic and Transport. The chapter should be read in conjunction with the development description provided in **Chapter 3: Description of the Proposed Development** and relevant parts of **Chapter 7: Noise**, where common receptors have been considered and where there is an overlap or relationship between the assessment of effects.

14.1.2 An Abnormal Indivisible Loads (AIL) access study and Swept Path Analysis (SPA) have been prepared to support this chapter. The AIL access swept path is presented in **Appendix 14A**.

14.1.3 This chapter also outlines a draft Construction Traffic Management Plan (CTMP).

14.1.4 This chapter describes:

- Limitation of the assessment (**Section 14.2**);
- the legislation, policy and technical guidance that has informed the assessment (**Section 14.3**);
- the methods used for baseline data gathering (**Section 14.4**);
- current and Future Baseline Conditions (**Section 14.5**);
- consultation and engagement that has been undertaken and how comments from consultees relating to Traffic and Transport have been addressed (**Section 14.6**);
- the scope of the assessment for Traffic and Transport (**Section 14.7**);
- embedded measures relevant to Traffic and Transport (**Section 14.8**);
- the methods used for the assessment (**Section 14.9**);
- the assessment of Traffic and Transport effects (**Section 14.10**);
- the assessment of effects: Receptors on Tincornhill Quarry Route (**Section 14.11**);
- the assessment of effects: Receptors on Tongland Quarry Route (S**ection 14.12);**
- the assessment of cumulative effects (**Section 14.13**);
- a summary of the significance conclusions (**Section 14.14**) and
- a summary of the implementation of the environmental measures (**Section 14.15).**

14.2 Limitations of this assessment

14.2.1 There are no limitations relating to Traffic and Transport that affect the robustness of the assessment of the likely significant effects of the Proposed Development.

14.3 Relevant legislation, planning policy, technical guidance

14.3.1 This section identifies the planning policy and technical guidance that has informed the assessment of effects with respect to Traffic and Transport. Further information on policies relevant to the Proposed Development is provided in **Chapter 5: Planning Policy**.

Legislation

14.3.2 There is no specific legislation that needs to be considered when determining the scope of this assessment.

Planning policy context

14.3.3 **Table 14.1** provides a summary of the relevant national and local planning policies, regarding the Site and proposed access routes and traffic and transport.

Table 14.1 Planning policy issues relevant to traffic and transport

Policy reference	Policy issue	Considered in Section
National planning policies		
Scottish Planning Policy (2014) [1]	1) Wind farm development proposals should consider impact on road traffic and on trunk roads, where relevant. 2) Development proposals should account for the impact of the proposal on traffic, travel patterns, road and access safety and accessibility to appropriate sustainable transport options.	14.8, 14.10, 14.11 and 14.12
Planning Advice Note 75 – Planning for Transport	Provides advice on transport planning in Scotland, including the need for transport development management, as part of planning policy, including environmental assessment when required.	14.8, 14.10, 14.11 and 14.12
Planning Specific Advice Sheet for Onshore Wind Turbines[2]	Provides planning advice. It details typical planning considerations, including that for onshore wind farm developments pre-application discussions with Transport Scotland are advisable particularly due to the need for abnormal load traffic.	14.8, 14.10, 14.11 and 14.12
Local plan policies		

[1] The Scottish Government (2014) Scottish Planning Policy. (online) Available at: https://www.gov.scot/publications/scottish-planning-policy/documents/ (Accessed September 2022)
[2] Scottish Government (2014) Onshore wind turbines: planning advice. (online) Available at: https://www.gov.scot/publications/onshore-wind-turbines-planning-advice/ (Accessed: September 2022)

Policy reference	Policy issue	Considered in Section
Dumfries and Galloway Development Plan Scheme (2019)[3]	1) If there are adverse transport impacts, as part of a proposed development, developer contributions may be required for mitigation of the impact (OP3 Developer Contributions). 2) Accesses to development must not adversely impact on core paths, or any other access, unless appropriate mitigation is provided (CF4: Access Routes). 3) Developments related to renewable energy must provide environmental assessment of the impacts of construction and operation of the proposal (IN1 Renewable Energy) 4) The assessment of wind farm development proposals includes the need to consider impact on the highways network (IN2 Wind Energy). 5) Proposals that impact on the strategic transport network need to assess the level of impact (T1 Transport Infrastructure). 6) Development access should be safe, for multimodal users, mitigation measures may be required off site (on the access route) and consideration should be given to appropriate parking provision and the needs for Travel Plans/Transport Statements/Transport Assessments (T2 Location of Development/Accessibility). 7) Freight traffic should utilise rail, where appropriate, and road freight should be routed away from inner urban and residential areas (T4: Freight Transport)	14.8, 14.10, 14.11 and 14.12
Dumfries and Galloway Council Local Development Plan 2 Wind Energy Development: Development Management Considerations (2020)[4]	Wind farm development proposals should consider adverse impact on the highways network, including residents local to the transport routes. Consultation with the council (and policy) and a Traffic Management Plan are required for abnormal load movements.	14.8, 14.10, 14.11 and 14.12
East Ayrshire Local Development Plan Supplementary Guidance Planning for Wind Energy (2017)[5]	Impacts on key pedestrian/cycle routes and core paths and Public Rights of Way should be include in assessment of wind farm proposals. These assessments should also include highways impacts during construction (including abnormal load movements) in terms of network constraints, route suitability and ensuring impact on local communities is minimised. Consultation with the Ayrshire Roads Alliance for determining the scope of supporting transport documents, is advised to be early.	14.8, 14.10, 14.11 and 14.12

[3] Dumfries and Galloway Council (2019) Local Development Plan 2 [online] available at: https://dumgal.gov.uk/ldp2 [accessed: September 2022]
[4] Dumfries and Galloway Council (2020) Local Development Plan 2: Wind Energy Development: Development Management Considerations [online]. https://dumgal.gov.uk/article/17034/LDP2-Supplementary-Guidance [accessed: September 2022]
[5] East Ayrshire Council (2017) East Ayrshire Local Development Plan Supplimentary Guidance Planning for Wind Energy [online]. Available at https://www.east-ayrshire.gov.uk/Resources/PDF/P/Planning-SG-Planning-for-Wind-Energy.pdf [accessed: September 2022]

Policy reference	Policy issue	Considered in Section
East Ayrshire Local Development Plan (2017)[6]	1) Development should be accessible, should not incur unacceptable environmental impacts and should comply with Ayrshire Roads Alliance requirements (OP1 Overarching Policy). 2) Development should not be unacceptably detrimental to residential amenity, including in terms of disturbance and impact on key footpath links (Residential Amenity). 3) Development proposals (including construction and decommissioning) relating to renewable energy should not cause unacceptable impacts including: on communities, access route (including walking/cycling and leisure routes) and on the highways network (RE1 Wind Energy Proposals Over 50 m in Height). 4) Proposals should meet the requirements of the Ayrshire Roads Alliance and transport policy (T1 Transportation Requirements for New Development). 5) For developments generating high volumes of travel, provision of a Transport Assessment may be required to demonstrate compliance with the need for sustainable transport and safety on the highways network (T2: Transport Requirements for New Significant Traffic Generating Uses) 6) Freight transport should be by rail, where appropriate. Transport via roads should avoid routing through settlement areas (T3 Transportation of Freight). 7) Adverse impact on core paths and other Rights of Way will not be accepted unless it is essential, whereupon a diversion must be agreed along with other mitigation measures (T4 Development and Protection of Core Paths and Natural Routes).	14.8, 14.10, 14.11 and 14.12

Technical guidance

14.3.4 The assessment will be conducted with reference to the guidance contained in **Table 14.2**.

Table 14.2 Technical guidance relevant to the Traffic and Transport assessment

Technical guidance document	Context
Guidelines for the Environmental Assessment of Road Traffic (GEART)[7] (Institute of Environmental Assessment, 1993).	Provides the framework for assessment of road traffic on the environment
Design Manual for Roads and Bridges (DRMB)	The DMRB is a suite of technical documents that set out the design standards for roads.
Guide to Transport Assessment for Development Proposals in Scotland	This document provides advice and guidance, and in terms of environmental assessment refers

[6] East Ayrshire Council (2017) East Ayrshire Local Development Plan [online]. Available at: https://www.east-ayrshire.gov.uk/PlanningAndTheEnvironment/development-plans-and-policies/adopted-local-development-plans/ldp.aspx [accessed: September 2022]
[7] Institute of Environmental Assessment (IEA). (1993). Guidelines for the Environmental Assessment of Road Traffic (GEART). IEA; Lincoln, UK.

Technical guidance document	Context
	to PAN 58: Environmental Impact Assessment (Scottish Executive, 1999), which has been superseded by PAN 1/2013 Environmental Impact Assessment (Scottish Government, 2017). Both PAN 58 and PAN 1/2013 provide information and advice on the need for, and processes of, environmental assessment in general, but does not provide any detail on traffic and transport assessments.

14.4 Data gathering methodology

Study area

14.4.1 The study area that has been used for this assessment is the public road network to the Site which is anticipated would be used during the construction, operation and decommissioning of the Proposed Development. The following sections define the extent of the study area.

Site access

14.4.2 The primary Site access will be created off the track of the Afton Wind Farm to the north of the Proposed Development. Afton Wind Farm access track provides connection to Afton Road. All Abnormal Indivisible Loads (AIL) would access the Site via this route. For the purposes of this assessment, it is assumed that ~25% of the additional construction traffic would utilise this access and that the remaining ~75% would gain access from the public road to the South of the Site, via Lorg Road from the B729.

Route options for construction Heavy Goods Vehicles (HGV)

14.4.3 The majority of traffic will be generated during the construction stage, with relatively little traffic generation anticipated during operation. On the assumption that below ground infrastructure and access tracks will remain in situ, less traffic will be generated during decommissioning than during construction. Sources for the main construction materials have been identified through a desktop assessment of the area.

14.4.4 For the purposes of the assessment, it has been assumed that 100% of all road stone required for the construction of on-site access tracks will be imported, although it is highly likely that a significant proportion can be recovered using an on-site borrow pit. As such, the assessment presents a worst-case scenario.

14.4.5 For the purposes of this assessment, it is assumed that the bulk construction materials (stone aggregate and the materials required for the mixing of concrete) will be sourced from two candidate quarries: Tincornhill Quarry and Tongland Quarry.

14.4.6 Likely HGV routes are illustrated in **Figure 14.1** and are as follows:

- Tincornhill Quarry Route (north of the site): B743 (westbound) – B713 – B705 – B713 – A76 – B741 - Afton Road – Afton Wind Farm access track - Site; and
- Tongland Quarry Route (south of the site): A711 – A75 – A713 – B729 – Lorg Road - Site.

14.4.7 Tincornhill Quarry is located approximately 27km north-west of the Site, near the village of Sorn, within East Ayrshire, and is accessed via the B743. Tongland Quarry is located approximately 48km south of the Site, near Kirkcudbright, and is accessed via the A711.

14.4.8 For the purpose of this assessment, it is assumed that ~25% of the construction materials will be sourced from Tincornhill Quarry (north of the site), with the remaining ~75% sourced from Tongland Quarry (south of the site). These proportions are considered to be the likely volume which would travel along each route based on the current assumptions but are for illustrative purposes only, as the final materials source will depend on the outcome of commercial negotiations or other future changes to circumstances.

14.4.9 Whilst construction traffic vehicles may not necessarily come from either Tincornhill Quarry or Tongland Quarry, these routes are considered suitable proxies for vehicles approaching the Site from the north or from the south.

Route options for abnormal loads

14.4.10 It is anticipated that turbine components will be imported into Scotland via the Port of Ayr and delivered to the Site by road. A plan illustrating the proposed delivery route is provided within **Figure 14.2**.

14.4.11 Based on the AIL access study, the following is the preferred route for AIL deliveries:

- Port of Ayr Route: A79 – A719 – A77 (northbound) – A76 (southbound) – B741 – Afton Road – access track – site.

Desk study

14.4.12 The sources of information used for the Traffic and Transport assessment are listed below in **Table 14.3**.

Table 14.3 Data sources used to inform the Traffic and Transport assessment

Organisation	Data source	Data provided
Department for Transport (DfT)	Road traffic statistics[8]	Baseline traffic data of the roads within study area and transport statistics
Agilysis	CrashMap Pro[9]	Personal Injury Accident data
Department for Transport	TEMPro[10]	Derivation of growth factors
Google	Google Street View[11]	Desk study

[8] Department for Transport. (2022). Road Traffic Statistics. (Online) Available at: https://roadtraffic.dft.gov.uk/#10/51.1974/0.7423/basemap-localauthorities-countpoints (Accessed September 2022).
[9] Crashmap. (2022). Crash maps Department for Transport data published by www.crashmap.co.uk . (Online) Available at: https://www.crashmap.co.uk/ (Accessed September 2022).
[10] Department for Transport (2022) Trip End Model Presentation Program (Accessed September 2022)
[11] Google. (2022) Google Maps – Street View. (online) Available at: www.google.co.uk/maps (Accessed September 2022).

Survey work

14.4.13 Data to inform the assessment comprises automatic traffic counts (ATCs) on roads to be used by construction traffic generated by the Proposed Development, which has been derived from the DfT Road Traffic Statistics website[8] and from ATCs undertaken in 2015.

14.5 Overall baseline

14.5.1 The Site boundary is illustrated in **Figure 1.1**.

14.5.2 The Site lies mainly in Dumfries and Galloway, with a small proportion located in East Ayrshire, between Carsphairn (located approximately 11km south-west of the Site) and Sanquhar (located approximately 12.3km north-east of the Site). New Cumnock is located approximately 10.5km north of the Site. Afton Road to the north and the B729 to the south are the nearest public roads from where the Site can be accessed following provision of new access track.

Current baseline

14.5.3 The following sections provide an overview of the current baseline with regards to:

- The local road network;
- Current traffic flows; and
- Personal Injury Accident data (PIA).

Road network

Tincornhill Quarry Route

14.5.4 The proposed route from Tincornhill Quarry to the Site will be westbound on the B743; the B713, at Sorn village; then continuing through the village of Catrine (including along a short section of the A705); before joining the A76 southbound. The route, shown in **Figure 14.1**, will then pass through New Cumnock and join Afton Road, via a short section of the B741, which leads to the northern Site access via the Afton Wind Farm.

B743

14.5.5 The B743 is a single two-way carriageway road which provides access to the Tincornhill Quarry and routes through Sorn village. Along the proposed quarry route, the highway is predominantly subject to the National Speed Limit (NSL), rural in nature and passes through agricultural land, with a carriageway width of approximately 6m and is afforded grass verges on either side for the most part, with the exception of Sorn village. Through Sorn, the B473 is subject to a 30mph speed limit and has speed management measures in place. The carriageway is flanked by residential properties on approach to Sorn.

B713

14.5.6 The B713 is a single two-way carriageway which passes through the villages of Sorn and Catrine enroute to the Site. The B713 is subject to a 30 mph speed limit through the village of Sorn, and 30 and 20 mph speed limits in Catrine. Upon leaving each settlement the road is subject to the NSL. The carriageway is flanked by grass verges and hedgerows on either side and is approximately 5.5m wide. The B713 is predominantly rural in nature and passes through mostly agricultural land, apart from when it passes through Sorn and Catrine. In Catrine village, the route passes Daldorch House School and Catrine Early Childhood Centre.

B705

14.5.7 A short section of the B705, in Catrine, is part of the route. It is a single two-way carriageway road, subject to a 30 mph speed limit. The highway width is approximately 7m with dwellings set back from it. There are pedestrian footpaths on either one or both sides of the carriageway within Catrine and street lighting is present.

A76

14.5.8 The A76 is a strategic highway connecting Kilmarnock, in the north, to Dumfries, in the south. Along the quarry route, this highway is a single two-way carriageway road. On this section of the A76, the road has a width of approximately 7m and is fronted predominantly by agricultural land uses and is subject to the NSL. As the A76 passes through New Cumnock it is subject to a 30 mph speed limit, has urban characteristics and passes the town's railway station. New Cumnock follows a linear settlement pattern along parts of the A76, B741 and part of Afton Road, with low density development reducing to interspersed development clusters as the route exits the town along Afton Road. On approach to Afton Road, the route passes New Cumnock Primary School located on the A76.

B471

14.5.9 Approximately 250m of the B741 connects the A76 to Afton Road. This is single carriageway, subject to a 30 mph speed limit and has footway and streetlighting.

Afton Road

14.5.10 Afton Road is a two-way single carriageway road located on the western edge of New Cumnock. For approximately 500m after the junction with the B471, Afton Road is flanked by residential dwellings to the east of the carriageway. Apart from these dwellings, Afton Road passes predominantly through agricultural land interspersed with the occasional agricultural holding and dwellings. It also passes New Cumnock Afton Cemetery. This section of the route terminates approximately 6.5 km from New Cumnock, where Afton Road bifurcates towards the access tracks of the Afton Wind Farm, from which the Proposed Development would be accessed.

Tongland Quarry Route

14.5.11 The proposed route from the Tongland Quarry will use the A711 (northbound), the A75 (eastbound), the A713 (northbound) towards Carsphairn, before which, vehicles will take the right turn onto the B729 which provides access to the Site (approximately 2.2km east of the B729/B700 junction).

A711

14.5.12 The A711 is a single carriageway road, subject to the NSL. The road has a typical carriageway width of, approximately, 8m and is afforded grass verges on either side. The highway is rural in nature and passes predominantly through agricultural land, with groups of dwellings and small industrial sites interspersed along its length.

A75

14.5.13 The A75 is a strategic highway with a single carriageway, which provides access between Stranraer, Dumfries and the A74 (M). The A75 primarily passes through agricultural land with the NSL or 40 mph speed limits applying along sections within the route.

A713

14.5.14 The A713 is a single carriageway road. The majority of the A713 that is on the quarry route is subject to the NSL and is of rural nature primarily fronted by agricultural land. It passes through the settlements of Crossmichael, Parton and St John's Town of Dalry. The

speed limit reduces to 30mph on approach to the settlements, and through them is fronted primarily by residential properties. For a short distance, the A713 runs alongside a child's play area which is attached to Dalry Primary and Secondary School. The play area is located behind a stone wall set back from the carriageway with a wide footway and grass verge. On approach to and through the Townhead of Greenlaw, the A713 is subject to a 50 mph speed limit.

B729

14.5.15 The B729 is a single carriageway road which runs east from A713 along the eastern side of Kendoon Loch and provides access to the Site from the south. The B729 is subject to the NSL and is largely rural in nature, providing access to a few agricultural buildings and farmland.

Port Route

14.5.16 Turbine components are expected to be delivered by sea to the Port of Ayr. The route from the Port will follow Waggon Road, before turning onto the A79 Allison Street (southbound), and then onto the A719, the A77 (northbound), before turning onto the A76 (southbound), towards New Cumnock.

Waggon Road

14.5.17 Waggon Road is single carriageway road fronted by residential dwellings and light industry on either side of the carriageway. Waggon Road is subject to a 20 mph speed limit to its west and a 30 mph speed limit along its eastern section. The road is street lit, has footways on either side of the carriageway and has residential and non-residential properties adjacent to the carriageway.

A79

14.5.18 The A79 Allison Street is a dual carriageway with a central reservation and footways on either side. The A79 is street lit and fronted by residential properties which are set back from the carriageway.

A719

14.5.19 The A719 is a dual carriageway road with a central reservation and footways on either side. The A719 is lit and fronted by residential properties set back from the carriageway and also routes past schools. It has sections along the port route that are subject to 20 mph, 30 mph and, on approach to the A77, 50 mph.

A77

14.5.20 The A77 is a single carriageway road, which is lit and is subject to the NSL for most of the port route, on approach to the A719 it is subject to a 50 mph speed limit. The A77 is a strategic highway providing an outer ring road to Ayr, on the eastern edge of the settlement.

A76

14.5.21 The A76 section of the port route connects the A77 to New Cumnock, the southern section of this route, from Catrine southward, is as described in the Tincornhill Quarry route outline. The section north of Catrine to the A77 is similar in nature, as it is predominantly a single carriageway road, subject to the NSL and routing through areas agricultural areas. As it passes through Mauchline, the A76 is subject to a 30 mph speed limit and is fronted by residential and commercial properties.

B741 and Afton Road

14.5.22 B741 and Afton Road are as described above in the quarry route sections.

Traffic Flows

14.5.23 The assessment of likely significant effects requires a comparison to be made between the likely environmental conditions in the presence of the Proposed Development and in the baseline situation.

14.5.24 Only data for the quarry routes has been obtained, as turbine component deliveries will be relatively few in number compared to the construction traffic. The movement of Abnormal Loads is closely managed and all vehicles will be escorted by police, at set times which will be agreed with Transport Scotland and the Local Highway Authority prior to the transfer taking place. Furthermore, the impact of abnormal loads, is temporary and management measures that accord with national guidelines will be in place. It is therefore considered that all reasonable endeavours to mitigate the impact of deliveries will be made and no likely significant effects are predicted. No further detailed environmental assessment of the effects of the AIL deliveries is necessary.

14.5.25 Baseline traffic flow data has been established using publicly available traffic counts published by the DfT and, where no DfT data is available, traffic survey data of three locations undertaken in 2015. A factor has been applied to the DfT Annual Average Daily Flow (AADF) 24-hour flow to derive a 12-hour traffic flow to coincide with the typical 12-hour working day. It is proposed that construction will take place between 07:00 to 19:00 hours on weekdays and 07:00 to 13:00 on Saturdays. The factors, 0.80719 for all vehicles and 0.749958 for HGVs, have been derived from Table TRA0307 '*Motor Vehicle Traffic Distribution by time of day and day of the week on all roads, Great Britain: 2019*' and Table TRA0308 '*Traffic Distribution on all roads by time of day and day of the week, for selected vehicle types, Great Britain: 2019*'[12].

14.5.26 The locations of the DfT count points and ATC surveys are shown in **Figure 14.3** and the traffic flow data is summarised in **Table 14.4**.

Table 14.4 Baseline traffic flow (two-way)

Road Name	Source of data	Date of data	AADT[13] (24hr)		12hr (adjusted from AADT)	
			Total Vehicles	HGVs	Total Vehicles	HGVs
Tincornhill Quarry Route (north of the site)						
B743	ATC	2015	-	-	998	74
B705	ATC	2015	-	-	3,312	68
A76 (north-west of New Cumnock, DfT ID: 80520)	DfT	2019	6,135	892	4,952	720
Afton Road (near Glenafton)	ATC	2015	*n/a	-	182	49
Tongland Quarry Route (south of the site)						

[12] Department for Transport. (2019). Road Traffic Statistics (TRA). (online) Available at: https://www.gov.uk/government/statistical-data-sets/road-traffic-statistics-tra. (Accessed September 2022).
[13] Annual Average Daily Traffic

Road Name	Source of data	Date of data	AADT[13] (24hr)		12hr (adjusted from AADT)	
			Total Vehicles	HGVs	Total Vehicles	HGVs
A711 (north of Quarry, DfT ID: 1072)	DfT	2019	3,711	335	2,995	251
A75 (Bridge of Dee, DfT ID: 80294)	DfT	2019	9,192	1,008	7,420	756
A75 (north of Carlingware Lane Canal, DfT ID: 80293)	DfT	2019	6,258	923	5,051	692
A713 (Townhead of Greenlaw, DfT ID: 80301)	DfT	2019	3,677	193	2,968	156
A713 (Fauld-o'-wheat, DfT ID: 30886)	DfT	2019	1,796	176	1,450	142
A713 (New Galloway, DfT ID: 10884)	DfT	2019	2,661	227	2,148	183
A713 (Grennan Bank, DfT ID: 40886)	DfT	2019	2,171	186	1,752	150
A713 (Allangibbon Bridge, DfT ID: 20885)	DfT	2019	1,315	111	1,061	90
A713 (Earlstoun Loch, DfT ID: 50995)	DfT	2019	1,254	143	1,012	115
B729 (north-west of Craigdarroch, DfT ID: 990182)	DfT	2019	127	1	103	1

Source: Department for Transport (https://roadtraffic.dft.gov.uk/#6/55.254/-6.053/basemap-regions-countpoints); *see table 14.4 (surveyed, 2015)

14.5.27 Baseline traffic flows for 2022 have been calculated by applying growth factors from the DfT Trip End Model Presentation Program (TEMPro), which determines growth factors based upon the National Trip End Model (NTEM) forecasts. A growth factor of 1.021675 was applied to the 2019 base flows to forecast the current baseline year of 2022. This factor was determined using the average weekday growth factors of Dumfries and Galloway and East Ayrshire regions geographical areas, to encompass all study area roads. To forecast 2022 traffic from the 2015 survey data, a factor of 1.0424 was applied. This was determined using the East Ayrshire geographic area, within which all ATCs were located.

14.5.28 **Table 14.5** summarises the 2022 baseline traffic flows (two-way) calculated.

Table 14.5 2022 baseline traffic flow (two-way)

Road Name	2019/*2015 Baseline (12hr)		2022 Baseline (12hr)**	
	Total Vehicles	HGVs	Total Vehicles	HGVs
Tincornhill Quarry Route (north of the site)				
B743	*998	*74	1,041	78
B705	*3,312	*68	3,453	71
A76 (north-west of New Cumnock, DfT ID: 80520)	4,952	720	5,060	736
Afton Road (near Glenafton)	*182	*49	190	52
Tongland Quarry Route (south of the site)				
A711 (north of Quarry, DfT ID: 1072)	2,995	251	3,061	257
A75 (Bridge of Dee, DfT ID: 80294)	7,420	756	7,581	773
A75 (north of Carlingware Lane Canal, DfT ID: 80293)	5,051	692	5,161	708
A713 (Townhead of Greenlaw, DfT ID: 80301)	2,968	156	3,033	160
A713 (Fauld-o'-wheat, DfT ID: 30886)	1,450	142	1,482	146
A713 (New Galloway, DfT ID: 10884)	2,148	183	2,195	188
A713 (Grennan Bank, DfT ID: 40886)	1,752	150	1,791	154
A713 (Allangibbon Bridge, DfT ID: 20885)	1,061	90	1,085	92
A713 (Earlstoun Loch, DfT ID: 50995)	1,012	115	1,035	118
B729 (north-west of Craigdarroch, DfT ID: 990182)	103	1	105	1

** Note: Values rounded up.

Personal injury accident

14.5.29 Records of PIAs have been obtained from the CrashMap Pro database (DfT data published by https://www.crashmap.co.uk).

14.5.30 Records have been obtained over the most recently available and verified five-year period, which is between 2016 and 2020.

14.5.31 The impact of casualties differs according to the severity of the injuries sustained. Three groups are usually differentiated as follows:

- Fatal: any death that occurs within 30 days from causes arising out of an accident;
- Serious: casualties who require hospital treatment and have lasting injuries, but who do not die within 30 days of an accident; and
- Slight: where casualties have injuries that do not require hospital treatment, or, if they do, the effects of the injuries quickly subside.

14.5.32 **Table 14.6** summarises the PIA records for the accident assessment area in the vicinity of the Site:

- Afton Road - between the Site access and the A76; and
- B729 - between junction with the Site access and the A713.

Table 14.6 Summary of recorded PIAs in the accident assessment area (2016-2020)

Junction/Link	Slight	Serious	Fatal	Total	Accident Rate Per Annum
Afton Road (between the Site access and B741)	No accidents recorded				
B729 (between the junction with the Site access and the A713)	0	1	0	1	0.2
Total	0	1	0	1	-

Base Data Source: Department for Transport data published by www.crashmap.co.uk

14.5.33 **Table 14.6** shows there was only one accident within the specified area in the vicinity of the Site. It was serious in terms of injury severity but did not involve vulnerable road user casualties (pedestrians and cyclists). The Crashmap accident record summary for this accident is presented in **Appendix 14B**.

14.5.34 Clusters or links which exhibit an average accident rate of greater than one per annum are considered to be significant. Neither road section has an average accident rate greater than one per annum.

Future baseline

14.5.35 Background traffic growth will occur on the local road network irrespective of whether or not the Proposed Development proceeds. Projected baseline traffic growth flows for the expected year of construction peak (anticipated to be 2025) have been calculated, using TEMPro, by applying growth factors from the National Trip End Model (NTEM) forecasts.

14.5.36 A growth factor of 1.039575 was applied to the 2019 baseline flows to forecast traffic for the year 2025, assumed to be the year of construction peak phase (the average growth factor for the regions East Ayrshire and Dumfries and Galloway). A growth factor of 1.0651 was applied to the 2015 data to forecast traffic in 2025 (the average growth factor of East Ayrshire for this period).

14.5.37 **Table 14.7** summarises future 2025 Future Baseline traffic (two-way).

Table 14.7 2025 Future Baseline traffic flow (two-way) – 12hr

Road Name	Total Vehicles*	HGVs*
Tincornhill Quarry (north of the site)		
B743	1,063	79
B705	3,528	73
A76 (north-west of New Cumnock, DfT ID: 80520)	5,149	749
Afton Road (near Glenafton)	194	53
Tongland Quarry Route (south of the site)		
A711 (north of Quarry, DfT ID: 1072)	3,115	262
A75 (Bridge of Dee, DfT ID: 80294)	7,714	786
A75 (north of Carlingware Lane Canal, DfT ID: 80293)	5,252	720
A713 (Townhead of Greenlaw, DfT ID: 80301)	3,086	162
A713 (Fauld-o'-wheat, DfT ID: 30886)	1,508	148
A713 (New Galloway, DfT ID: 10884)	2,233	191
A713 (Grennan Bank, DfT ID: 40886)	1,822	157
A713 (Allangibbon Bridge, DfT ID: 20885)	1,104	94
A713 (Earlstoun Loch, DfT ID: 50995)	1,053	120
B729 (north-west of Craigdarroch, DfT ID: 990182)	107	1

*Values rounded up

14.6 Consultation

14.6.1 **Table 14.8** provides a summary of the issues about the Proposed Development that have been raised by consultees and how these have been accounted for.

Table 14.8 Summary of issues raised during consultation regarding Traffic and Transport

Issue raised	Consultee(s)	Response and how considered in this chapter	Section Ref
Evidence required that the size of proposed turbine can navigate the route and will not have detrimental impact on structures on the trunk road route. A full abnormal loads assessment is required identifying trunk road network pinch points. Swept Path Analysis required along with details of required street furniture/structure changes along the route.	Transport Scotland	Abnormal Indivisible Loads (AIL) access study including Swept Path Analysis (SPA) are provided in the **Appendix 14A** to support this Chapter.	Appendix 14A
An expectation that developers work with representative of the local horse riding community regarding road safety and equestrian access concerns.	British Horse Society	Information will be provided by the construction contractor to the local communities.	14.8

14.7 Scope of the assessment

14.7.1 The scope of the traffic and transport assessment as set out in the following sections has been based on the proposed construction and operation of a wind farm of up to 15 turbines and associated infrastructure including access tracks, hard standing areas, borrow pit (s), temporary works and on-site electrical infrastructure including underground cabling.

Spatial scope

14.7.2 The spatial scope of the assessment of Traffic and Transport covers the area of the Proposed Development Site, together with the roads that have formed the basis of the study area described in **Sections 14.4** and **14.5** and shown in **Figure 14.1**. Beyond these roads, traffic from the Proposed Development would access the wider road network where its effect would be diluted by existing traffic on these routes or would distribute to a point where the effects from traffic would be minimal.

14.7.3 The roads within the Study Area form the two proposed quarry traffic routes and potential receptors along these form the basis of the scope of the traffic related assessment.

14.7.4 As discussed in **Section 14.5.25** the abnormal load deliveries along the port route will be relatively few in number compared to the construction traffic, closely managed (including escort), and done under consultation. This route is therefore not included in relation to potential traffic related effects.

Temporal scope

14.7.5 The temporal scope of the assessment of Traffic and Transport is consistent with the anticipated period over which the construction of Project would be carried out, covering the period from March 2025 to February 2027.

14.7.6 As discussed in **Section 14.4**, the majority of traffic will be generated during the construction stage, with relatively little traffic generation anticipated during operation. On the assumption that below ground infrastructure and access tracks will remain in situ, less traffic will be generated during decommissioning than during construction.

Potential receptors

14.7.7 Receptors are the users or beneficiaries of the road network such as pedestrians, cyclists, equestrians, and drivers who travel within the vicinity of the Proposed Development.

14.7.8 The scope of the assessment provides comprehensive coverage of the routes surrounding the Proposed Development and it will consider of the implications of construction and operational traffic.

14.7.9 GEART[7] identifies the following groups and special interest groups that may be affected:

- *"people at home;*
- *people at work;*
- *sensitive groups including children, elderly and disabled;*
- *sensitive locations such as hospitals, churches, schools and historical buildings;*
- *people walking;*

- *people cycling;*
- *open spaces, recreational areas, and shopping areas;*
- *sites of ecological and nature conservation value; and*
- *sites of tourist/visitor attractions.*"

14.7.10 Potential receptors along the proposed quarry routes are identified in **Table 14.9**. These receptors will form the basis of the assessment in the following sections of this chapter

Table 14.9 Potential Receptors

Highway Link	Identified Potential Receptors
Tincornhill Quarry Route (north of the site)	
B743 (between Tincornhill Quarry and the B713)	Sorn Village (residential properties) and a small number of agricultural properties
B713 (between the B743 and B705 and the B705 and A76)	Sorn Village (residential properties), Catrine Village (including Daldorch House School, Catrine Early Childhood Centre and residential properties) and some residential and/or agricultural properties
B705 (between B713 (n) and B713 (s))	Catrine Village (including residential properties)
A76 (between B713 and B741)	New Cumnock and Pathhead (including New Cumnock Primary School, New Cumnock railway station, retail frontage and leisure land uses e.g. New Cumnock Golf Club and New Cumnock Swimming Pool) and a small number of residential and/or agricultural properties
B741 (between Afton Road and the A76)	New Cumnock (including a small number of adjacent properties)
Afton Road	New Cumnock (including New Cumnock Afton Cemetery, approximately 400m of residential properties on the east side of the carriageway and a small number of other property accesses along its length)
Tongland Quarry Route (south of the site)	
A711 (between Tongland Quarry and the A75)	A small number of residential and/or agricultural properties
A75 (between the A711 and A713)	Bridge of Dee settlement and a small number of residential and/or agricultural properties
A713 (between the A75 and B729)	Employment and community land north of Castle Douglas, the settlements of Townhead of Greenlaw, Crossmichael, Parton, St John's Town of Dalry (including Primary & Secondary schools and playground) and a small number of residential/leisure/hospitality/agricultural properties along the more rural sections of the road

Highway Link	Identified Potential Receptors
B729 (between the A713 and Lorg Road access track)	Properties near the junction with the A713 and a small number of agricultural and hospitality properties along its length and leisure land-uses (including Kendoon Loch and Carsphairn Community Woodland)

Likely significant effects

14.7.11 The effects on Traffic and Transport receptors which have the potential to be significant and have been taken forward for detailed assessment are summarised in **Table 14.10**.

Table 14.10 Likely significant effects

Activity	Effect	Receptor
Additional road traffic on local routes generated by the construction of the Proposed Development.	Potential increase in traffic flows on the local road network and impact on: ● severance; ● driver delay; ● pedestrian delay; ● pedestrian amenity; ● fear and intimidation; and ● accident and safety.	Occupants (residents, workers, schools, shopping areas, etc – groups identified in GEART[7]) alongside the roads used by construction traffic and users of the roads such as drivers, pedestrians and cyclists.

Effects scoped out

14.7.12 The following potential effects have been scoped out of further assessment because the potential effects are not considered to be significant.

- Potential effects on users of the road network as a result of operational traffic from the Proposed Development:
  - The Proposed Development would operate autonomously and would only be visited for inspection on a monthly basis or should a fault occur. As a result, it is unlikely that receptors would be significantly affected during the operational period and this phase of the Proposed Development is therefore scoped out of further assessment.
- Potential effects on users of the road network as a result of decommissioning traffic from the Proposed Development:
  - Far fewer traffic movements would be generated during decommissioning than during construction as below ground infrastructure and access tracks will remain in situ and therefore the magnitude of any change would be less than during construction. Coupled with uncertainty in relation to the conditions of the highway following the 35-year life cycle of the Proposed Development and the assumed general continued growth in baseline traffic levels (which would further dilute effects), the effects during the decommissioning phase have therefore been scoped out of further assessment.
- Hazardous loads – No hazardous loads are anticipated in relation to the Proposed Development.

14.8 Environmental measures embedded into the development proposals

14.8.1 A range of environmental measures have been embedded into the development proposals. **Table 14.11** outlines those embedded measures relevant to the Traffic and Transport assessment.

Table 14.11 Summary of the embedded environmental measures and how these influence the Traffic and Transport assessment

Receptor	Changes and effects	Embedded measures and influence on assessment
All	Vehicles could carry mud and debris onto the carriageway	Wheel washing facilities will be installed on site. Sheeting installed prior to leaving site.
All	Changed traffic flows on local roads	Specific travel routes to and from site will be defined for delivery vehicles.
All	Possible impact on Road Safety due to increased traffic flows on highway network	HGVs to use identified routes. No existing accident problems identified within the vicinity of the Site and appropriate signage will be posted on the approach to the Site access points where HGVs would slow and turn off the highway.

Draft Construction Traffic Management Plan (CTMP)

14.8.2 Following planning approval of the Proposed Development, further detailed discussions would be carried out with the Road Authorities by the appointed construction contractor to agree any variations or additions to the draft CTMP proposed hereunder:

- Further detailed discussions will be held with the Road Authorities by the appointed construction contractor to agree the traffic control requirements during the construction phase.
- Police presence and assistance with traffic control will be arrange from the port of entry and along the route, as the long low-loader vehicle's manoeuvring speeds will be slow at junctions and it would encroach onto the opposing lane on tight bends and around some roundabouts.
- Abnormal load deliveries would be planned to leave the port mid-morning and arrive on the Development Site mid-afternoon – prior to nightfall.
- During times of abnormal load deliveries and peak construction traffic activity, trained monitors with two-way radios will be stationed at key pointed to control the flow of traffic to the Development Site to allow free-flow two-way traffic.
- The road haulier will obtain the required permits for abnormal loads from Transport Scotland, who liaise with the relevant affected councils and other interested organisations, for the total route from the port of entry to the Development Site.

- Construction traffic movements (equipment and materials will, where possible, be scheduled to avoid the peak traffic periods at the beginning and end of each day and other sensitive periods (including school drop off and pick up times), in order to minimise any potential disturbance to local traffic.
- Information will be provided by the construction contractor to the Road Authorities, affected councils, and community leaders to facilitate the distribution of information relating to the construction period, including construction traffic flows. Residents on the local roads will also be kept informed by the contractor on a regular basis during the construction works, to follow good practice.
- Signage would be erected on the main routes advising of the frequency and overall period of abnormal load vehicle convoy movements to allow motorists advance warnings.
- Signage will be erected on the A76, A713 and B741 to identify Development site access routes and to inform motorists that the local roads are accommodating construction traffic. These signs would, also, be positioned at access points approaching the route.
- Wheel washing and road sweeping will be carried out where required to ensure that local highways are kept clear of mud and debris.
- All HGVs transferring loose material will be covered to mitigate against any spillage onto the highway or adjacent footways.

14.9 Assessment methodology

14.9.1 The generic project-wide approach to the assessment methodology is set out in **Chapter 4: Approach to Preparing the EIA Report**. However, whilst this has informed the approach that has been used in this Traffic and Transport assessment, it is necessary to set out how this methodology has been applied, and adapted as appropriate, to address the specific needs of this assessment.

14.9.2 The assessment compares the traffic flows for the 2025 Future Baseline with those for the 2025 Future Baseline plus the Proposed Development construction traffic.

General approach

14.9.3 The guidance followed when assessing the potential significance of road traffic effects is summarised in GEART[7], which states the following:

> "*At an early stage, it is useful to identify particular groups or locations which may be sensitive to changes in traffic conditions.*" (Paragraph 2.5).
>
> "*The detailed assessment of impacts is…likely to concentrate on the period during which the absolute level of an impact is at its peak, as well as the hour at which the greatest level of change is likely to occur*." (Paragraph 3.10).

14.9.4 To assess the transport impact, the percentage increase in traffic will be determined by comparing the Proposed Development traffic flows with the baseline traffic flows on the highway links identified in **Table 14.10**.

14.9.5 GEART[7] provides two rules that are used to establish whether an environmental assessment of traffic effects should be carried out on receptors:

- **"*Rule 1**: Include highway 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%)*
- ***Rule 2**: Include any other specifically sensitive areas where traffic flows are predicted to increase by 10% or more..*"

14.9.6 It should be noted that, according to GEART[7], predicted traffic flow increases as a result of the Proposed Development below 10% are generally not considered to be significant as daily variations in background traffic flow may fluctuate by this amount. Changes in traffic flows below this level are, therefore, assumed not to result in significant environmental effects and have therefore not been assessed further as part of this chapter.

Receptor sensitivity

14.9.7 As set out in GEART[7], the impact of traffic is dependent upon a wide range of factors which include the volume of traffic, traffic speeds and operational characteristics and traffic composition (such percentage of HGVs). The perception of changes in traffic varies according to factors such as:

- "*existing traffic levels;*
- *the location of traffic movements;*
- *the time of day;*
- *temporal and seasonal variation of traffic;*
- *design and layout of the road;*
- *land-use activities adjacent to the route*
- *ambient conditions of adjacent land-uses.*"

14.9.8 Each highway link included in the assessment has been assigned a sensitivity in accordance with GEART[7] based on the groups identified under 'Potential Receptors' in Section 14.7 (Scope of the assessment).

14.9.9 This is based on the proximity of receptors to the highway link, and the sensitivity of these receptors, and the highway environment. **Table 14.12** summarises the rationale used to determine highway sensitivity against the corresponding receptors as part of the assessment as contained in GEART[7]. Professional judgement is also used to determine the sensitivity of the receptor.

Table 14.12 Receptor sensitivity

Sensitivity	Description / Reason	Receptor
High	Highway links with a high sensitivity to changes in traffic flows include routes with sensitive receptors alongside them such as schools and colleges, and/or where there are land-uses which result in high volumes of pedestrian/cycle users and the road is narrow and/or footway provision is poor, existing traffic volumes are high for the type of road resulting in congestion and road safety issues.	Occupants of land-uses alongside the highway link and users of the highway link

Sensitivity	Description / Reason	Receptor
Medium	Highway links with a medium sensitivity to changes in traffic flows include routes with some sensitive receptors alongside them, and/or where there are land-uses which result in some pedestrian/cyclist users, road design and footway provision is adequate/appropriate, existing traffic volumes can be accommodated for the type of road but approaching capacity.	Occupants of land-uses alongside the highway link and users of the highway link
Low	Highway links with low sensitivity to changes in traffic flows include routes with no sensitive receptors and some land uses alongside and no/very limited pedestrian/cyclist users, road design and footway provision is appropriate, existing traffic volumes can be accommodated for the type of road.	Occupants of land-uses alongside the highway link and users of the highway link
Negligible	Highway links with negligible sensitivity to changes in traffic flows include routes with no sensitive receptors and very few land uses alongside them, which have no direct access and no/very limited pedestrian/cyclist users and existing traffic volumes can be accommodated for the type of road.	Users of the highway link

14.9.10 Sensitivity judged as 'High' or 'Medium' results in Rule 2 (sensitive areas where traffic flows are predicted to increase by 10% or more) being considered for that link. Sensitivity judged as 'Low' or 'Negligible' results in Rule 1 being considered for that link where traffic flows are predicted to increase by more than 30% or where the number of HGVs is predicted to increase by more than 30%.

Environmental effects assessed

14.9.11 GEART[7] sets out the following environmental effects that should be considered, relating to traffic and transport.

Severance

14.9.12 There are no predictive formulas which give simple relationships between traffic factors and levels of severance. GEART[7] states that changes in traffic flow of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' changes in severance (equating to low, medium and high magnitude of change respectively for the purpose of this assessment). In general, marginal (slight) changes in traffic flow are, by themselves, unlikely to create or remove severance.

Driver delay

14.9.13 GEART[7] states that delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system. The capacity of a road or a particular junction can be determined by establishing the ratio of flow to capacity (RFC) or judged by traffic increase levels.

Pedestrian delay

14.9.14 Given the range of local factors and conditions which can influence pedestrian delay, GEART[7] does not recommend that thresholds be used as a means to establish the significance of pedestrian delay but recommend that reasoned judgements be made instead.

Pedestrian amenity

14.9.15 GEART[7] notes that changes in pedestrian amenity may be considered significant where the traffic flow is halved or doubled, with the former leading to a positive effect and the latter a negative effect.

Fear and intimidation

14.9.16 There are no commonly agreed thresholds by which to determine the significance of this effect. GEART[7] notes that special consideration should be given to areas where there are likely to be particular problems, such as high-speed sections of road, locations of turning points and accesses. Consideration should also be given to areas frequented by school children, the elderly and other vulnerable groups.

Accidents and safety

14.9.17 This is informed by a review of existing collision patterns and trends based upon the existing personal injury collision records and the forecast increase in traffic.

Magnitude of change

14.9.18 GEART[7] recognises that professional judgement should be used as part of the assessment and states the following:

"For many effects there are no simple rules or formulae which define thresholds of significance and there is, therefore, a need for interpretation and judgement on the part of the assessor, backed-up by data or quantified information wherever possible. Such judgements will include the assessment of the numbers of people experiencing a change in environmental impact as well as the assessment of the damage to various natural resources." (Paragraph 4.5).

14.9.19 Based on the Rule 1 and Rule 2 and the sensitivity of the receptors, **Table 14.13** shows the magnitude of change applied to the environmental effects to help identify levels of significance. The indicators to assess the magnitude of change are based on advice included within GEART[7] and professional judgement.

Table 14.13 Magnitude of change

	Magnitude of change			
Transport effect	High	Medium	Low	Negligible
Severance	Change in total traffic or HGV flows over 91%.	Change in total traffic or HGV flow of 61-90%.	Change in total traffic or HGV flows of 31-60%.	Change in total traffic or HGV flows of less than 30%.
Driver delay	High increase in queuing at junctions and/or congestion on road links.	Medium increase in queuing at junctions and/or congestion on road links.	Low increase in queueing at junctions and/or congestion on road links.	Low or no increase in queuing at junctions and/or congestion on road links.
Pedestrian amenity and delay and fear and intimidation	Based on general level of pedestrian activity, visibility, and physical conditions such as traffic flow, traffic composition, crossing points and pavement width/separation from traffic.			
Accident and safety	Informed by a review of existing collision patterns and trends based upon the existing personal injury accident records and the forecast increase in traffic.			

Significance criteria

14.9.20 The classification of a significant or not significant traffic and transport effect is based on the sensitivity of the receptor (**Table 14.12**) and the magnitude of change (**Table 14.13**) as defined in **Table 14.14**. The shading indicates effects deemed to be 'significant' or 'not significant'.

Table 14.14 Significance evaluation matrix

		Magnitude of change			
		High	**Medium**	**Low**	**Negligible**
Receptor sensitivity	**High**	Major (Significant)	Major (Significant)	Moderate (Significant)	Negligible (Not significant)
	Medium	Major (Significant)	Moderate (Significant)	Minor (Not significant)	Negligible (Not significant)
	Low	Moderate (Significant)	Minor (Not significant)	Minor (Not significant)	Negligible (Not significant)
	Negligible	Negligible (Not significant)	Negligible (Not significant)	Negligible (Not significant)	Negligible (Not significant)

14.9.21 Major and Moderate effects are considered significant in EIA terms, whilst Minor and Negligible effects are not significant.

14.10 Assessment of Traffic and Transport effects

14.10.1 This section provides an assessment of the likely significant environmental effects arising from the traffic predicted to be generated by the Proposed Development during the construction period.

Sensitivity of highway links

14.10.2 **Table 14.16** identifies the sensitivity of the study area roads (in vicinity of the count point and general nature of highway link as a whole) and the GEART[7] rule that applies.

Table 14.15 Sensitivity of roads (based on receptors and road characteristics)

Highway link	Rationale	Receptor sensitivity	Assessment (Rule 1 or 2)
Tincornhill Quarry Route (north of the site)			
B743 (between Tincornhill Quarry and the B713)	Sorn village has adequate footway provision where pedestrian movements would be most anticipated (including sections of bollards and railing) and/or properties sufficiently set back from the carriageway.	Low	Rule 1
B713 (between the B743 and B705 and the B705 and A76)	Catrine has pedestrian footway and properties which are set back from the carriageway. The B713 routes past an early years centre. It also routes past the private road access to Daldorch House School, though the school is located far from the B713. Residential properties in Sorn village are set back from the carriageway and there is pedestrian provision. Other properties are set back from the carriageway. Given the nature of the road, adjacent land uses and prevalence of pedestrian crossing points, considered to be Medium sensitivity.	Medium	Rule 2
B705 (between B713 (n) and B713 (s))	Adjacent properties are sufficiently set back from the carriageway, pedestrian footway is adequate, and sections of bollards are provided.	Low	Rule 1
A76 (between B713 and B741)	The majority of the road has no sensitive receptors; however, the settlements of New Cumnock and Pathhead are sensitive. New Cumnock has appropriate footway, including sections of railing but the route passes a primary school and other sensitive receptors including community facilities. School children are a highly sensitive receptor group and significant pedestrian flows would be expected along the A76 within New Cumnock and Pathhead.	High	Rule 2

Highway link	Rationale	Receptor sensitivity	Assessment (Rule 1 or 2)
***B741** (between A76 and Afton Road)	Short section (approx. 70m) connects the A76 to Afton Road. The route passes a few residential properties which are set back from the carriageway with footways on both sides.	Negligible	Rule 1
Afton Road	Residential properties and a cemetery are the main adjacent land-use receptors. The residential properties are small in number, are set back from the carriageway and, along with the route to the cemetery) have appropriate pedestrian footway.	Low	Rule 1
Tongland Quarry Route (south of the site)			
A711 (between Tongland Quarry and the A75)	Very limited number of residential and agricultural properties which are sufficiently set back from the carriageway. A very limited number of pedestrian and cycle road users would be anticipated on a road section of this character.	Negligible	Rule 1
A75 (between the A711 and A713)	Properties adjacent to the carriageway are sufficiently set back from the carriageway. A very limited number of pedestrian and cycle road users would be anticipated on a road section of this character.	Negligible	Rule 1
A713 (between the A75 and B729)	The majority of this link has no sensitive receptors. However, it passes through the settlements of St John's Town of Dalry, Parton, Crossmichael and Townhead of Greenlaw which have varying level of pedestrian provision and pedestrian separation from traffic flows. St John's Town of Dalry has particularly high sensitivity with a school with playground adjacent to the A713, with only a narrow verge and pavement and low wall as separation between the playground and carriageway. Additionally there are sections of narrow or no footway.	High	Rule 2
B729 (between the A713 and access track)	There are a small number of properties that are set back from the carriageway, however there is no footway provision. Some pedestrian and cycle movements may be expected given the leisure land-uses adjacent to this road section.	Low	Rule 1

*Very short section, therefore not assessed further.

Predicted effects and their significance

Construction traffic

14.10.3 Where possible, construction operations would be carried out concurrently, thus minimising the overall length of the construction programme. A 24-month construction programme (commencing in 2025) has been assumed for the purposes of this assessment.

14.10.4 Construction traffic will consist of:

- flatbed trucks and HGVs delivering plant and equipment (e.g. excavators, bull dozers and cranes; and
- vans and cars (Light Vehicles, LVs) associated with construction staff movement.

14.10.5 To estimate the generated traffic flows over the construction period, an assessment of a likely construction programme was undertaken to establish concurrent activities and the vehicle movement requirements of each activity. It should be noted that the traffic movements are estimates based on the potential spread of construction activities over the anticipated 24-month programme. While these may differ, for example if weather delays progress, assumptions made allow a robust assessment to be undertaken.

14.10.6 As a worst-case scenario, it is assumed that 100% of all aggregate would be sourced from off-site sources via road. **Table 14.16** shows the predicted traffic generation during the construction phase.

Table 14.16 Predicted traffic generation during total 24-month construction phase

Activity	Total loads	Total trips (two-way)
Delivery of Plant and Equipment	30	60
Delivery of Stone for Construction Compound	225	450
Delivery of Compound General Equipment	24	48
Delivery of Stone for Access Tracks	5,135	10,270
Delivery of Geogrid	28	56
Delivery of Culvert Materials	150	300
Delivery of Stone for Areas of Crane Operation	338	676
Delivery of Backfill Stone for Turbines	945	1,890
Delivery of Concrete for Turbines	1,407	2,814
Concrete for transformer foundations	47	94
Delivery of Base Rings	8	16
Delivery of Shuttering	15	30

Activity	Total loads	Total trips (two-way)
Delivery of Form work and reinforcing steel	5	10
Delivery of Stone for substation	248	496
Delivery of Fibre Optic Cabling	8	16
Delivery of Sand for cable trench	1,740	3,480
Delivery of Cabling	19	38
Delivery and Removal of Mobile Crane	24	48
Delivery of Turbines (AIL)	150	300
Delivery of Concrete for Control Building Base	36	72
Delivery of Electrical Equipment	60	120
Delivery of External Transformers	5	10
Delivery of HV Plinth Concrete	17	34
Delivery of Met Mast	6	12
Removal of Plant and Equipment	30	60
Total	10,700	21,400
Total Assessed (*excluding 150 AIL deliveries)	**10,550**	**21,100**

*The movement of Abnormal Loads is closely managed and all vehicles will be escorted by police at set times.

Construction traffic distribution

14.10.7 As mentioned, this assessment is based on the scenario whereby all road stone is imported to the Development Site by road to create a worst-case assessment. Based on this scenario, it has been proposed that ~25% of the total construction materials will be sourced from Tincornhill Quarry (north of the site) and the remaining ~75% will be sourced from Tongland Quarry (south of the site).

14.10.8 **Table 14.17** shows the worst-case distribution of the construction traffic on the local road network.

Table 14.17 Distribution of construction traffic (HGVs) – peak period

Route	Highway links	Construction traffic %	Construction traffic per day (two-way)
Tincornhill Quarry	B743 – B713 – B705 – B713 – A76 – B741 – Afton Road	25%	22
Tongland Quarry	A711 – A75 – A713 - B729	75%	62

14.10.9 These HGV construction traffic movements are anticipated to occur over a 24-month period.

14.10.10 **Table 14.18** summaries the construction traffic movements across the 24-month period.

Table 14.18 Construction traffic movements across the 24-month construction period

Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
Site mobilisation	60																								**60**
Construction of construction compound	249	249																							**498**
Track and hardstanding	1,256	1,256	1,256	1,256	1,256	1,256	1,256	1,256	1,256																**11,302**
Construction of turbine foundations					607	607	607	607	607				607	607	607										**4,854**
Substation construction and energy storage compound				122	122	122	122	122	122																**732**
Trenches and cabling													589	589	589	589	589	589							**3,534**
Delivery of mobile crane, turbine fit and commission and Site restoration															33	9	9	9	9	9	9	33			**120**
Winter shutdown																									**-**
Total movements per month (excluding AIL deliveries)	1,565	1,505	1,256	1,378	1,985	1,985	1,985	1,985	1,985	-	-	-	1,196	1,196	1,229	598	598	598	9	9	9	33	-	-	**21,100**
Total trips (excluding AIL deliveries) per 12-hour day, based on 5.5 days per week (24 days per month)	66	63	52	57	83	83	83	83	83	-	-	-	50	50	51	25	25	25	1*	1*	1*	2	-	-	

*Note: <0.5 movements rounded to 1.Note: grey shading denotes the months each activity is anticipated to be active.

14.10.11 Based on the construction program, the construction traffic results in an approximate peak of 84 (rounded up) HGV movements per day two-way (approx. 42 arrivals plus 42 departures per day). This peak is predicted to occur during month 5-9 (July-November 2025) of the total 24-month construction programme because during these months there is anticipated to be some overlap of deliveries related to the different construction activities.

Construction effects

14.10.12 **Table 14.19** shows the worst-case percentage change in traffic flows in 2025, with construction traffic on the local road network. The GEART[7] screening exercise is also presented within this table. Percentage increases that exceed the relevant GEART[7] threshold of assessment rule would be subject to further assessment. Any increase that is below the GEART[7] threshold would not be taken forward for further assessment.

Table 14.19 Percentage impact during peak construction traffic

Highway link	Sensitivity	2025 Base*		Construction traffic		2025 + construction traffic		% Change		GEART[7] screening rule	Further assessment required
		Total	HGVs	Total	HGVs	Total	HGVs	Total	HGVs		
Tincornhill Quarry Route (north of the site)											
B743 (between Tincornhill Quarry and the B713)	Low	1,063	79	22	22	1,085	101	2%	28%	Rule 1	Below 30% - no assessment required
B713 (between the B743 and B705 and the B705 and A76)	Medium	3,528	73	22	22	3,550	95	1%	30%	Rule 2	Exceeds 10% in HGV traffic only - assessment required
B705 (between B713 (n) and B713 (s))	Low	3,528	73	22	22	3,550	95	1%	30%	Rule 1	Does not exceed30% - assessment not required
A76 (between B713 and B741)	High	5,149	749	22	22	5,171	771	0%	3%	Rule 2	Below 10% - no assessment required
Afton Road	Low	194	53	22	22	216	75	11%	41%	Rule 1	Exceeds 30% in HGV traffic only - assessment required
Tongland Quarry Route (south of the site)											
A711 (between Tongland Quarry and the A75)	Negligible	3,115	262	62	62	3,177	324	2%	24%	Rule 1	Below 30% - no assessment required
A75 (between the A711 and A713)	Negligible	7,714	786	62	62	7776	848	1%	8%	Rule 1	Below 30% - no assessment required

Highway link	Sensitivity	2025 Base*		Construction traffic		2025 + construction traffic		% Change		GEART[7] screening rule	Further assessment required
		Total	HGVs	Total	HGVs	Total	HGVs	Total	HGVs		
Bridge of Dee											
North of Carlingwark Lane Canal		5,252	720	62	62	5314	782	1%	9%	Rule 1	Below 30% - no assessment required
A713 (between the A75 and B729) Townhead of Greenlaw	High	3,086	162	62	62	3,148	224	2%	38%	Rule 2	Exceeds 10% HGV – further assessment required
Fauld-o'wheat		1,508	148	62	62	1,570	210	4%	42%	Rule 2	Exceeds 10% HGV – further assessment required
New Galloway		2,233	191	62	62	2,295	253	3%	33%	Rule 2	Exceeds 10% HGV – further assessment required
Grennan Bank		1,822	157	62	62	1,884	219	3%	40%	Rule 2	Exceeds 10% HGV – further assessment required
Allangibbon Bridge		1,104	94	62	62	1,166	156	6%	66%	Rule 2	Exceeds 10% HGV – further assessment required
Earlstoun Loch		1,053	120	62	62	1,115	182	6%	52%	Rule 2	Exceeds 10% HGV – further assessment required

Highway link	Sensitivity	2025 Base*		Construction traffic		2025 + construction traffic		% Change		GEART[7] screening rule	Further assessment required
		Total	HGVs	Total	HGVs	Total	HGVs	Total	HGVs		
B729 (between the A713 and access track)	Low	107	1	62	62	169	63	58%	6225%	Rule 1	Exceeds 30% in HGV traffic only - assessment required

Note: Values rounded up

14.10.13 Given the potential receptors described in **Table 14.15**, **Table 14.19** identifies the highway links that are taken forward for further assessment based on the percentage impacts on these links exceeding the 10% threshold (Rule 2) or 30% HGV threshold (Rule 1) when considering the worst-case scenario whereby all aggregate is imported to site.

14.10.14 A further assessment of environmental effects on the following links will be undertaken:

- Tincornhill Quarry Route:
  - B713 (between the B743 and B705 and the B705 and A76); and
  - Afton Road.
- Tongland Quarry Route:
  - A713(between the A75 and B729); and
  - B729 (between the A713 and access track).

14.10.15 This assessment is within Section 14.11, with a summary of the results provided in **Table 14.20**.

14.11 Assessment of effects: Receptors on Tincornhill Quarry Route

B713 (between the B743 and B705 and the B705 and A76)

14.11.1 The B713 is assessed as being of medium sensitivity.

14.11.2 The GEART[7] threshold is exceeded due to the 30% increase in HGVs movements when compared to baseline HGV traffic on this highway link. The threshold is not exceeded considering the increase in total traffic. For the purpose of the assessment, the links have been combined as one.

Severance

14.11.3 Majority of the sections of this road are rural in nature and short sections of the road have residential properties. Therefore, there are minimal pedestrian desire lines across the B713.

14.11.4 The increase in traffic flows is of negligible magnitude of change (less than 31%), equating to 22 vehicles in 12 hours (an average of one vehicle every 33 minutes), which will not result in severance. The level of the effect on this medium sensitivity receptor is therefore considered negligible overall and not significant.

Driver delay

14.11.5 This section of the B713 is a high standard road with appropriate markings. The increases in traffic of one vehicle in every 33 minutes would not affect a junctions' capacity. The magnitude of change is, therefore, considered to be negligible. The level of the effect on this medium sensitivity receptor is therefore considered negligible overall and not significant.

Pedestrian delay and amenity

14.11.6 A proportion of the B713 within the study route is rural, which would be anticipated to have low pedestrian flows due to a lack of destinations and thus pedestrian desire lines. Traffic increases along these sections would, therefore, have minimal impact on pedestrians. There are crossing points for pedestrians, including a zebra crossing and build outs with raised surfaces.

14.11.7 The increases in traffic of one vehicle in every 33 minutes is considered to be a negligible magnitude of change that would not affect pedestrian delay and amenity. The level of the effect on this medium sensitivity receptor is therefore considered negligible overall and not significant.

Fear and intimidation

14.11.8 The assessment of effects with regard to pedestrian amenity above is also applicable here. Near the early years centre there are sufficient pedestrian provisions, for example. The magnitude of change is considered to be negligible and the level of the effect is therefore considered negligible overall and not significant.

Accident and safety

14.11.9 The increase of one vehicle every 33 minutes represents a negligible magnitude of change and is unlikely to increase the likelihood of accidents occurring. The level of the effect is therefore considered negligible overall and not significant.

Afton Road

14.11.10 Afton Road is assessed as being of low sensitivity.

14.11.11 The GEART[7] threshold is exceeded due to the ~41% increase in HGVs movements when compared to baseline traffic on this highway link. The percentage increase in traffic should be treated with caution however given the low volume of existing baseline traffic (without development) as this method of comparison therefore results in a disproportionate impact.

Severance

14.11.12 Afton Road is low in sensitivity, with minimal destinations along its length and residential properties along only one side of the carriageway for approximately 500m. Given Afton Road is on the western edge of New Cumnock and the properties are on the eastern side of the carriageway there is typically considered to be no need to cross the highway.

14.11.13 The increase in traffic flows is up to 22 in 12 hours, which equates to an average of one vehicle in every 33 minutes, will result in a low magnitude of change (change in HGV traffic between 31-60%). The effect with respect to severance is therefore considered minor overall and not significant.

Driver delay

14.11.14 Afton road is a rural road with minimal destination and low traffic flow. The increases in traffic of one vehicle in every 33 minutes would not affect a junctions' capacity and, therefore, would result in a negligible magnitude of change in respect of driver delay. The level of the effect is therefore considered negligible overall and not significant.

Pedestrian amenity and delay

14.11.15 Afton Road would not be expected to have high levels of pedestrian movements and minimal need for pedestrians to cross it. The increases in traffic of one vehicle in every 33 minutes would result in a negligible magnitude of change and unlikely to affect pedestrian delay and amenity. The traffic flow increase is less than doubling so not significant based on GEART[7] guidance. The level of the effect is therefore considered negligible overall and not significant.

Fear and intimidation

14.11.16 The assessment of the effects on pedestrian amenity above is also applicable here. The magnitude of change is considered to be negligible and the level of the effect is negligible overall and not significant.

Accidents and safety

14.11.17 As outlined in **Table 14.6**, Afton Road does not exhibit severe accident hot spots which need to be targeted with specific casualty reduction measures. The magnitude of change as a result of the increase in traffic is therefore considered to be negligible. The level of the effect is therefore considered negligible overall and not significant.

14.12 Assessment of effects: Receptors on Tongland Quarry Route

A713 (between the A75 and B729)

14.12.1 The A713 is assessed as being of high sensitivity.

14.12.2 There are several receptors along this section of the A713 within the assessment area. The GEART[7] threshold is exceeded due to increase in HGV percentage over 10% at all the receptors. The threshold is not exceeded considering the increase in total traffic.

Severance

14.12.3 Change in the total traffic is minimal. The magnitude of change of HGV traffic varies between low (31-60% change) and medium (61-90% change). The high sensitive receptors of the school and playground near St John's Town of Dalry are on the east side of the carriageway with no desire lines across the A713 and footway, with a verge provided near these receptors. As such, these receptors are unlikely to be affected in terms of severance. Additionally, an average of one vehicle every 33 minutes would be the peak traffic generation during construction.

14.12.4 Based solely on the GEART[7] thresholds, the magnitude of change with respect to the most sensitive parts of the A713 is up to medium (61-90% change in HGV flow) and on a high sensitivity receptor, this would result in a major and significant effect. However, as outlined, the high sensitive receptors noted are of low sensitivity with regards to severance because there is no need to cross the A713. Furthermore, the passage of an average of one vehicle every 33 minutes is unlikely to result in severance. As such, it is concluded that effects with regards to severance are unlikely to be significant.

Driver Delay

14.12.5 The A713 is a high standard road. The increase in traffic flows is up to 62 in 12 hours which equates to an average of one vehicle in every 12 minutes, which would not affect a junctions' capacity and, therefore, is considered to be a negligible magnitude of change in respect of driver delay. The level of the effect is therefore considered negligible overall and not significant.

Pedestrian amenity and delay

14.12.6 The sections of the A713 in the residential areas have adequate pedestrian crossing facilities. The increases in traffic of one vehicle in every 12 minutes would not affect pedestrian delay and amenity and is considered to be a negligible magnitude of change. The level of the effect is therefore considered negligible overall and not significant.

Fear and intimidation

14.12.7 The assessment of the effects on pedestrian amenity is also applicable here and the magnitude of change is considered to be negligible in respect of fear and intimidation also. The level of the effect is therefore considered negligible overall and not significant.

Accidents and safety

14.12.8 The increase of one vehicle every 12 minutes represents a negligible magnitude of change and is unlikely to increase the likelihood of accidents occurring. The level of the effect is therefore considered negligible overall and not significant.

B729

14.12.9 The B729 is assessed as being of low sensitivity.

14.12.10 The GEART[7] threshold is exceeded due to the increase in HGVs movements when compared to baseline HGV traffic on this highway link from 1 to 62 (~6225%) and the increase of ~58% of in total traffic.

14.12.11 The percentage increase in traffic should be treated with caution given the low volume of existing baseline traffic (without development) as this method of comparison results in a disproportionate impact.

Severance

14.12.12 As mentioned in previous sections, the section of the B729 on the Tongland Quarry route is low in sensitivity, with minimal destinations on each side of the carriageway along its length. Therefore, it is anticipated that desire lines across the highway are few in number.

14.12.13 The increase in traffic flows is up to 62 in 12 hours which equates to an average of one vehicle in every 12 minutes which will not impact on severance. Given the frequency of HGV journeys it is considered that the magnitude of change is low and the effect is therefore considered minor overall and not significant.

Driver Delay

14.12.14 The B729 is a rural road which provides access to very limited properties. The increase in traffic flows is up to 62 in 12 hours which equates to an average of one vehicle every 12 minutes. This would not affect a junctions' capacity and the magnitude of change is

therefore considered to be negligible, on which basis the level of the effect is negligible overall and not significant.

Pedestrian amenity and delay

14.12.15 There are minimal destinations on either side of the carriageway and due to the rural location, minimal pedestrian activities are expected. Based on anticipated pedestrian levels and desire lines on this section of road, the increases in traffic of one vehicle in every 12 minutes would not affect pedestrian delay and amenity. The magnitude of change is therefore considered to be negligible. On this basis, the level of the effect is therefore considered negligible overall and not significant.

Fear and intimidation

14.12.16 The assessment of the effects on pedestrian amenity is also applicable here and the magnitude of change is likewise considered to be negligible. The level of the effect is therefore considered negligible overall and not significant.

Accidents and safety

14.12.17 As outlined in **Table 14.6**, the B729 within the study area, does not exhibit severe accident hot spots which need to be targeted with specific casualty reduction measures. The increase of one vehicle every 12 minutes represents a negligible magnitude of change and is unlikely to increase the likelihood of accidents occurring. The level of the effect is therefore considered negligible overall and not significant.

Table 14.20 Summary of significance of adverse effects

Receptor and summary of predicted effects	Sensitivity receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Tincornhill Quarry Route				
B713 (between the B743 and B705 and the B705 and A76)				
Severance	Medium	Negligible	Negligible – Not significant	The increase in traffic of one vehicle in every 33 minutes. The level of effect is negligible (does not exceed 30% traffic increase) and therefore is insignificant.
Driver delay	Medium	Negligible	Negligible – Not significant	Section of the road is standard carriageway. Increase in due to the Proposed Development is negligible.
Pedestrian amenity and delay	Medium	Negligible	Negligible – Not significant	Rural location with minimal pedestrian activity. Increase in traffic due to the Proposed Development is less than doubled and therefore is negligible.

Receptor and summary of predicted effects	Sensitivity receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Fear and intimidation	Medium	Negligible	Negligible – Not significant	The assessment of the pedestrian amenity environmental effect mentioned above is also applicable here.
Accident and safety	Medium	Negligible	Negligible – Not significant	An increase of one vehicle in every 33 minutes would have a negligible impact on accidents and safety.
Afton Road				
Severance	Low	Low	Minor – Not significant	Desire lines across the highway are few in number. Severance will not occur, as the sensitivity of the receptor and the magnitude of change both are low.
Driver delay	Low	Negligible	Negligible – Not significant	Afton road is a rural road with minimal destinations and low traffic flow. The increase in traffic of one vehicle in every 33 minutes would not affect driver delay.
Pedestrian amenity and delay	Low	Negligible	Negligible – Not significant	Afton Road would not be expected to have high levels of pedestrian movements and minimal need for pedestrians to cross it. The increase in traffic levels of one vehicle every 33 minutes does not double traffic flow. The magnitude of change is therefore considered to be negligible.
Fear and intimidation	Low	Negligible	Negligible – Not significant	The assessment of the pedestrian amenity environmental effect mentioned above is also applicable here.
Accident and safety	Low	Negligible	Negligible – Not significant	This link does not exhibit severe accident hot spots which need to be targeted with specific casualty reduction measures. The magnitude of change is considered to be low and therefore not significant.
Tongland Quarry Route				
A713 (between the A75 and B729);				

Receptor and summary of predicted effects	Sensitivity receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Severance	High (Highest sensitivity receptor are low sensitivity to severance)	Medium	Minor - Not significant	The increase in traffic is one vehicle in every 12 minutes. While the receptor has a maximum sensitivity of high to traffic and transport effects the highly sensitive receptors are not highly sensitive to severity, The magnitude of change is considered to be medium and therefore the overall effect is minor and therefore not significant.
Driver delay	High	Negligible	Negligible – Not significant	The A713 is a high standard road. The increase in traffic one vehicle in every 12 minutes. The magnitude of change is considered to be negligible and therefore not significant.
Pedestrian amenity and delay	High	Negligible	Negligible – Not significant	The sections of the A713 in the residential areas have adequate pedestrian crossing facilities where required. Also the change in traffic is negligible and traffic levels do not double.
Fear and intimidation	High	Negligible	Negligible – Not significant	The assessment of the pedestrian amenity environmental effect mentioned above is also applicable here.
Accident and safety	High	Negligible	Negligible – Not significant	An increase of one vehicle in every 12 minutes would have a negligible impact on accidents and safety.
B729 (between the A713 and access track)				
Severance	Low	Low	Minor – Not significant	Minimal destinations on each side of the carriageway along its length. Due to the low background traffic, percentage increase is high and it's disproportionate. The level of effects is considered minor overall and therefore not significant.
Driver delay	Low	Negligible	Negligible – Not significant	The B729 is a rural road which provides access to very limited properties. The increases in traffic of one vehicle in every 12

Receptor and summary of predicted effects	Sensitivity receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
				minutes would not affect driver delay.
Pedestrian amenity and delay	Low	Negligible	Negligible – Not significant	Despite the level of HGVs greatly increasing, total traffic levels do not double. Due to the rural location minimal pedestrian activities are expected.
Fear and intimidation	Low	Negligible	Negligible – Not significant	The assessment of the pedestrian amenity environmental effect mentioned above is also applicable here.
Accident and safety	Low	Negligible	Negligible – Not significant	This link does not exhibit severe accident hot spots which need to be targeted with specific casualty reduction measures. The magnitude of change is considered to be low and therefore not significant.

1. The sensitivity/importance/value of a receptor is defined using the criteria set out in Section 14.9 above and is defined as negligible, low, medium and high.
2. The magnitude of change on a receptor resulting from activities relating to the development is defined using the criteria set out in Section 14.9 above and is defined as negligible, low, medium and high.
3. The significance of the environmental effects is based on the combination of the sensitivity/importance/value of a receptor and the magnitude of change and is expressed as major (significant), moderate (probably significant) or minor/negligible (not significant), subject to the evaluation methodology outlined in Section 14.9.

14.13 Assessment of cumulative effects

14.13.1 Consideration has been given as to whether any of the Traffic and Transport receptors that have been taken forward for assessment in this chapter are likely to be subject to cumulative transport effects because of those generated by other developments.

14.13.2 **Table 9.4** outlines existing, committed and application stage wind farms in the vicinity of the Site. Only the committed developments, within **Table 9.4**, have been assessed in terms of cumulative impact as existing developments are included in the baseline counts and growthing and application developments are not certain.

14.13.3 **Table 14.21** outlines the consented developments, listed in **Table 9.4**, which are relevant to the Site's cumulative transport effect. This is defined as consented developments where the construction route overlaps with the Site's construction route. **Table 14.21** provides a summary of details available from the applications regarding each of the developments on their relevant planning portal or other publicly available source. Where the construction traffic route is unknown or does not overlap it is assumed there is no cumulative traffic and transport impact. AIL delivery routes have been excluding from this assessment as AIL delivery is closely managed and all vehicles will be escorted by police at set times.

Table 14.21 Outline of Cumulative Effects: Traffic and Transport

Consented Development	Number of Turbines	Section of Construction Route Overlap	Anticipated Impact
Polquhairn	9	A76	The peak HGV traffic is given as 104 daily movements. The peak month is unknown as the future baseline year is 2016. It is assumed peak traffic and transport months construction will not overlap.
Over Hill	10	A76 and B741	The peak HGV traffic is given as 48 daily movements with traffic impacts compared to 2018 baseline. The peak month of construction traffic generation is therefore unknown and it is assumed that it will not overlap with the Proposed Development's.
Glenmuckloch	8	A76	The peak HGV traffic is given as 29 daily movements with traffic impacts compared to 2014 baseline. The peak month of construction traffic generation is therefore unknown and it is assumed that it will not overlap with the Proposed Development's.
Glenshimmeroch	10	A713	The peak monthly HGV traffic generation is given at 39 daily movements, and is assessed against 2018 traffic flow. The programme is 12 months long. It is assumed that the traffic generation periods will not overlap.
Margree	9	A713	The assessed future year is given as 2021 with 31 daily peak monthly traffic generation, across a 12 month programme. Therefore, it is assumed that traffic generation periods will not overlap.
Benbrack	18	A75 and A713	The peak HGV traffic is given as 206 daily movements with based on 2018 construction over a 12 month programme. Construction has commenced on this project and therefore, it is unlikely to coincide with the Proposed Development's peak monthly traffic generation
Windy Standard Phase III	20	A713	The peak HGV traffic is given as 40 daily movements. Assessment has been taken against 2013 data. The 15 month construction period is unknown, therefore it is assumed that construction periods will not overlap.
Enoch Hill	16	Tincorn Hill Quarry Route	The peak HGV traffic is given as 204 daily HGV movements in month 3 of a 12 month construction programme. The CTMP submitted for this application in 2022 anticipated construction would be complete in 2024. Therefore, it has been assumed that the construction periods do not overlap, due to the Proposed Development's anticipated construction peak period is in 2025.

Consented Development	Number of Turbines	Section of Construction Route Overlap	Anticipated Impact
Troston Loch	14	B729	The peak HGV traffic is given as 205 daily movements with 2022 construction. It is unlikely to coincide with the Proposed Development's peak monthly traffic generation
Cornharrow	8	A713 and B729	The peak month for construction traffic generation is given as 41 movements, four months into a 12 month construction programme. Traffic impact has been assessed against 2022 data. Therefore, it has been assumed that the construction periods do not overlap, due to the Proposed Development's anticipated construction period peak is in 2025.
Lethans	22	A76 and B441	The peak month for construction traffic is given as 87 HGV daily movements during month 19 in a 30 month construction programme. Traffic impact has been assessed against a 2019 baseline year. A potential construction commencement is given as during 2022. Therefore, it is unlikely that the peak construction periods do not overlap, due to the Proposed Development's anticipated construction period peak is in 2025.
North Kyle	54	A76 and B741	The peak month for traffic construction traffic is given occurring in 2023 including 864 daily HGV movements. The Proposed Development's peak construction is anticipated in 2025 therefore the programme do not overlap and there would not be anticipated to be any cumulative impact on the highways network.
Fell	9	A713	The peak month for construction traffic is given as month 5 of the 12 month programme including 62 daily HGV movements Traffic impact has been assessed against a 2021 baseline year. Therefore, it has been assumed that the construction periods do not overlap, due to the Site's anticipated construction period peak is in 2025.
Pencloe	19	A76, B741, Afton Road	Based on a 19 month construction programme the anticipated worst case daily movements of HGVs is 36. There is no available information regarding the anticipated construction date of Pencloe. The Proposed Development's peak construction is anticipated in 2025. and therefore it has been assumed that the programmes do not overlap and there would not be anticipated to be any cumulative impact on the highways network.

14.13.4 In general, the overlap of HGV construction traffic routes between the consented wind farm developments and the Site are for short sections only, excluding Enoch Hill and Pencloe. It is not possible to determine, with the information available and the potential for variation in construction programmes whether the construction traffic period will overlap and if peak construction traffic generation months would overlap. It is, however, unlikely to be the case with the Site's peak month in 2025 and therefore, given the low likelihood of temporal overlap and minimal spatial overlap the cumulative traffic and transport impact is considered to be not significant.

14.13.5 Additionally, the traffic assessment presented in this chapter provides a worst-case scenario in terms of percentage change in traffic flows. This is because 2025 Baseline Future year flows are lower without the addition of committed development traffic, resulting in, potentially, higher proportional impact of the development traffic.

14.14 Conclusions of significance evaluation

14.14.1 As summarised in **Table 14.20**, it is assessed that construction traffic associated with the Proposed Development would result in no significant effects in terms of severance, driver delay, pedestrian delay and amenity, fear and intimidation, and accidents and safety.

14.15 Implementation of environmental measures

14.15.1 **Table 14.22** describes the environmental measures embedded within the Proposed Development and the means by which they will be implemented, i.e. they will have been secured through the CTMP. The draft CTMP is outlined in **Section 14.8**, this will be developed into a CTMP post discussions between the relevant local highway authorities and construction contractor to agree any variations or additions to the draft CTMP.

Table 14.22 Summary of environmental measures to be implemented – relating to Traffic and Transport

Environmental measure	Responsibility for implementation	Compliance mechanism	EIA Report section reference
HGV traffic management (delivery timings, routes, signage and information provision)	Developer/Contractor	*CTMP*	*14.8*
Dust and debris minimisation techniques (e.g. sheeting of HGVs and wheel washing)	Developer/Contractor	*CTMP*	*14.8*
AIL permits, escort, signage, traffic control and management	Developer/Contractor	CTMP	*14.8*

14.16 References

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15. Socio-economics, Tourism and Recreation

15.1 Introduction

15.1.1 This Chapter of the EIA Report examines the implications of the Proposed Development on socio-economic, tourism and recreation receptors.

15.1.2 The key revisions to the Proposed Development since the 2017 FEI which assessed the Consented Development are described in **Chapter 3: Description of the Proposed Development** and include an increase in the maximum number of turbines (and associated infrastructure such as crane pads) from 9 to 15, a corresponding increase in the length of access track, an increase in the operational period from 25 to 35 years and an increase in the turbine height to 200m and a commensurate increase in rotor diameter.

15.1.3 The estimated electrical power output per turbine (subject to final turbine selection) has increased from 3.3 megawatt (MW) as originally proposed to 6.6MW, giving a revised proposed installed generating capacity of 99MW (previously 32.4MW). For the purpose of calculations within this Chapter a proposed installed generating capacity of 96MW has been used[1].

15.1.4 The assessments provided in Chapters 15 - Socio-economics, Tourism and Recreation of the 2015 ES and 2017 FEI concluded that residual economic effects during construction, operation and decommissioning of the Consented Development would be beneficial, but 'not significant' in EIA terms. Also, the residual effects once the Consented Development is operational would be beneficial, but not significant in respect of public access. All other construction and operational effects on recreation and tourism receptors during construction, operation and decommissioning were concluded as not being significant in EIA terms. The effects of the Proposed Development are not anticipated to alter these conclusions and as there are no likely significant effects, Socio-economics has been scoped out of the EIA. The Energy Consents Unit has however requested that socio-economic aspects are discussed and in particular any economic/employment benefits should be detailed, so these are provided in this Chapter. The Proposed Development would provide increased net economic benefits compared to the Consented Development.

15.2 Consultation

15.2.1 Throughout the scoping process, and subsequently during the ongoing EIA process, relevant organisations were contacted with regards to the Proposed Development. **Table 15.1** outlines the consultation responses received in relation to socio-economics, tourism and recreation, and also provides the Applicant's response.

[1] The specific choice of wind turbine to be installed is dependent on the final commercial and technical choice by the Applicant. The anticipated power rating of 1 turbine is in the range 6.2 MW to 6.6 MW. 6.4 MW has been used for a conservative calculation of potential electricity generation and CO_2 savings, so the same figure has been used in this chapter for consistency.

Table 15.1 Relevant Consultation Responses

Consultee	Summary of Consultation Response	How it has been addressed
Scottish Government Energy Consents Unit (ECU) (October 2021)	States that the EIA Report should include: • Consideration of any strategies for long-term public access to the site for recreational uses. • Details regarding the management of public access to the site during the construction period. • Consideration of recreational or tourist receptors which may face significant impacts as a result of landscape and visual impacts • Details of any proposed community benefits or shared ownership proposals. The ECU notes that the Applicant seeks to scope out socio-economic, tourism and recreation out of the EIA Report, however it is still expected that any such matters be discussed and in particular any economic/employment benefits be detailed.	As per the Scoping Opinion received from ECU, this chapter discusses the socio-economic, tourism and recreation impacts, with potential employment and economic benefits and how these have changed in relation to the Consented Development being detailed. Details regarding management of public access to the site during the construction period is discussed in **Chapter 3: Description of the Proposed Development.** Assessment of selected recreational/tourist receptors is included within **Chapter 9: LVIA**.
Tynron Community Council (July 2021)	Objection. Extracts included from an objection to the previous planning application submission. "Lorg wind farm would be within the UNESCO internationally designated Galloway and Southern Ayrshire Biosphere; the D&G Local Development Plan (October 2019) states that this requires developments to 'not adversely impact on unique tourism assets'. Outdoor recreation and landscapes underpin much of the local tourism industry, including B&B, holiday lets, and walking and other outdoor activities. Lorg wind farm is situated in an area bounded by several designated Main Tourist Routes (Map 15, D&G Local Development Plan2). It will have unacceptable impacts (from turbine proximity, operational noise, visual impact, operational and constructional disturbance, access limitations during construction and maintenance) on local tourism attractions including the Southern Upland Way, local Heritage Paths (the Old Road from New Cumnock to Dalquhairn and the Sanquhar to Stroanpatrick Path), Polskeoch/Chalk Memorial Bothy, the network of core	A response from the Galloway and Southern Ayrshire Biosphere is included within **Table 15.1**. The potential impacts upon tourism and recreations assets is detailed within this **Chapter,** and **Chapter 9: LVIA**.

Consultee	Summary of Consultation Response	How it has been addressed
	paths, and the Striding Arches. This is against the D&G Policy IN1."	
Scottish Wild Land Group (July 2021)	SWLG stated that they had no comments to provide for the Scoping Opinion.	Comment is noted.
Scottish Rights of Way and Access Society (Scotways) (July 2021)	Provided information on rights of ways (DS13/SCD101, DS14, DS15 and DN159), Heritage Paths projects (HP368 and HP366), Scottish Hill Tracks, access to land, public access, recreational amenity and cumulative impact.	Recreational receptors have been assessed in **Chapter 9 : LVIA**.
British Horse Society (July 2021)	States that a project like the one proposed is an excellent opportunity to improve connections in a community and resolve any problems in terms of countryside access, transport and travel.	Comment is noted.
Member of Public	Provided commentary on potential local views of impacts upon tourism and recreation. Requested that the socio-economic assessment is not scoped out of the EIA Report.	Recreational receptors have been assessed in **Chapter 9: LVIA**. This chapter discusses the socio-economic, tourism and recreation impacts, with potential employment and economic benefits and how these have changed in relation to the Consented Development being detailed.
Galloway & Southern Ayrshire Biosphere	Confirmed that the site is outwith the Core and Buffer of the Biosphere. Unable to respond to proposals within the transition area due to limited capacity.	Comment is noted.

15.3 Economic and Employment Impacts

Economic and Employment Effects

15.3.1 Based on the methodology set out in 2015 ES Chapter 15 (**Appendix 15A**), the construction phase of the Proposed Development (including turbine manufacture) could result in construction expenditure of up to £126.72m (£159.92m adjusted for inflation to October 2022 values[2]). based on the weighted average construction cost being £1.32m per MW and an installed capacity assumed to be 96MW (BiGGAR Report, 2015). This compares to £42.77m (£53.98m adjusted for inflation). for the Consented Development

[2] Calculated using the Bank of England Inflation Calculator available at https://www.bankofengland.co.uk/monetary-policy/inflation/inflation-calculator. All other inflation adjusted costs in this chapter have been calculated on the same basis.

(32.4MW). Applying figures (between £1.17m and £1.80m per MW installed) from DECC (2011), the capital cost of the Proposed Development is estimated to be between £112.32m (£141.75m adjusted for inflation) and £172.8m (£218.07m adjusted for inflation and based on assumed installation of 96MW). The equivalent figures for the Consented Development were £37.91m and £58.32m (£47.84m and £73.60m adjusted for inflation and based on assumed installation of 32.4MW). As per 2015 ES and 2017 FEI Chapters 15, this range of figures underpins the calculations detailed below regarding predicted economic and employment effects from the construction of the Proposed Development.

15.3.2 A report published by BiGGAR, Onshore Wind: Direct and Wider Economic Benefits (2015) states that 12% of the total capital costs of an onshore wind farm (i.e. including turbine manufacturing, balance of plant and grid connection) are typically spent locally (in this case, Dumfries and Galloway and East Ayrshire), 36% are typically spent in the Region/Nation (Scotland) and 47% are typically spent within the UK. For the Proposed Development this results in a range of between £13.48m (12% of £112.32m and £17.01m adjusted for inflation) and £20.69m (12% of £172.4m and £26.11m adjusted for inflation) being spent locally (between £4.55m (£5.74m adjusted for inflation) and £7m £8.83m adjusted for inflation for the Consented Development) and a range of between £40.42m (36% of £112.32m and £51.01m adjusted for inflation) and £62.1m (36% of £172.4m and £78.37m adjusted for inflation) spent within Scotland (between £13.65m and £21m for the Consented Development, £17.23m and £26.50m adjusted for inflation).

15.3.3 Based on the BiGGAR report (2015), with the total capital expenditure of £126.72m the manufacturing of the turbines could result in capital expenditure of up to approximately £81.61m (64.4% of £126.72m and £103m adjusted for inflation), (£27.54m for the Consented Development and £34.76 m adjusted for inflation), the balance of plant construction phase could result in capital expenditure of up to approximately £36.24m (28.6% of £126.72m and £159.92m adjusted for inflation) (£12.23m for the Consented Development and £15.43m adjusted for inflation) and grid connection work could result in capital expenditure of up to approximately £9.00m (7.1% of £126.72m and £11.38m adjusted for inflation). The equivalent figure was £3.04m for the Consented Development.

15.3.4 The BiGGAR (2015) report estimates that average total turnover per employee during the construction phase of a wind farm is £137,942. (£174,081 adjusted for inflation) If replicated during the construction of the Proposed Development, this would result in local employment across East Ayrshire and Dumfries and Galloway ranging from up to 97.71FTE (£17.01m/£174,081) up to 149.10 Full time Equivalent (FTE) jobs (£26.11m/£174,081), (between 32.99 FTE to up to 50.75 FTE for the Consented Development) and Scottish level employment ranging between 293.02 FTE (£51.01m/£174,081) up to 450.19FTE (£78.37m/£174,081) throughout the construction period (between 98.96 FTE to up to 152.24 FTE for the Consented Development).

15.3.5 Operational investment for a wind farm of greater than 5MW is predicted to be between £23,000 and £130,000 per year per MW installed and the weighted average cost was £59,867 per MW installed per annum (BiGGAR 2015). The equivalent figures adjusted for inflation to £2022 costs are between £29,025 and £164,058 with a weighted average of £75,551. On this basis, the Proposed Development has the potential to generate up to between £2.79m (96MW x £29,025) and £15.75m (96MW x £164,058) each year during its operational life (between £745,200 and £4.21m for the Consented Development). Using the weighted average operations and maintenance cost of £75,551 per MW installed per annum, this would generate approximately £7.25m of operations and maintenance expenditure per annum throughout the Proposed Development's operational life. Therefore, over the 35 year period of operation, the Proposed Development is predicted to generate total operations and maintenance expenditure of up to between £97.65m and £551.25m (and £253.85m based on the weighted average cost of £75,551

per MW). This was between £18.63m and £105.25m and £45.8m based on the weighted average cost for the Consented Development.

15.3.6 The Review of Renewable Electricity Generation Cost and Technical Assumptions Study Report (ARUP, 2016) estimates the operating costs of a wind farm would be around £93,000 per year, per MW installed for a scheme >50MW scheme. Adjusted for inflation to £2022 costs this would give a figure of £116,595 per year per MW. On the basis of 15 turbines with a power output of 96MW, these figures would provide an annual operating cost for the proposed development of around £11.19m, and a lifetime operating cost of around £392m over the 35 year period of operation. In terms of the geographical distribution of operations and maintenance expenditure, 42% of expenditure occurs locally and 58% is within the region/nation (BiGGAR, 2015). It is therefore predicted that based on the figures above, the Proposed Development may deliver between £1.17m (42% of £2.79m) and £6.61m (42% of £15.75m) of local annual operations and maintenance expenditure (between £313,200 and £1.77m for the Consented Development) and up to between £1.62m (58% of £2.79m) and £9.13m (58% of £15.75m) of annual operations and maintenance expenditure within Scotland (between £432,200 and £2.44m for the Consented Development).

15.3.7 In regards to operational employment effects, it is estimated that the average total turnover per employee during the operational phase of a wind farm is £121,935 (BiGGAR, 2015), £153,880 adjusted for inflation which based on the Proposed Development equals total employment ranging from up to 18.13 FTE (£2.79m/£153,880) to 102.35 FTE (£15.75m/£153,880) per annum (between 6.11 FTE to 34.53 FTE for the Consented Development). Based on a 42% spend locally, this equates to between 7.69 and 42.99 FTE jobs across Dumfries and Galloway and East Ayrshire (between 2.57 FTE to 14.5 FTE for the Consented Development).

15.3.8 The 2015 ES and 2017 FEI Chapters 15 concluded that the economic and employment benefits would be beneficial but not significant in EIA terms, while there has been a large increase in the magnitude of economic benefits ,it is considered based on the above figures that the conclusions of the previous assessment is still applicable.

Recreation and Tourism

Direct Effects

15.3.9 All designated walking routes within the vicinity of the Development Site are illustrated on **Figure 9.11** (**Chapter 9: LVIA**) and as shown, the following public rights of way are located within the boundary:

- Core Path 215;
- Scottish Hill Track 84: New Cumnock to St John's Town of Dalry by Glen Afton;
- Heritage Path: Old Road from New Cumnock to Dalquhairn; and
- Heritage Path: Sanquhar to Stroanpatrick Path (follows same route as Core Path 215).

15.3.10 In terms of mitigation, this remains the same as stated in the 2015 ES chapter, i.e. to ensure safe construction of the proposed bridge over the Water of Ken, and in accordance with the CDM Regulations 2015 and the Land Reform (Scotland) Act 2003 (as amended), it may be necessary to divert a localised section of Core Path 215 (and the Heritage Path: Sanquhar to Stroanpatrick Path which follows the same route) for the duration of the construction of the watercourse crossing and associated access track. It is proposed to leave access tracks located within Dumfries and Galloway in-situ after the end of the consented operating period of the Proposed Development, so whilst site traffic would

utilise the watercourse crossing and access track during decommissioning works it would not be necessary to divert Core Path 215 during the decommissioning phase.

15.3.11 It is envisaged that any required localised diversion would be formed within the immediate vicinity of Core Path 215 at the outset of the bridge construction works programme by stripping vegetation to create a passable surface. Signage and way markers would be deployed to assist walkers using this localised diversion, which would likely only extend to a few hundred metres in length and would remain on similar topography to the existing route.

15.3.12 To ensure safe construction and subsequent decommissioning of the section of proposed access track which intersects with Scottish Hill Track 84 and the overlapping Old Road from New Cumnock to Dalquhairn Heritage Path (which follow the same route), it may be necessary to temporarily restrict but not prevent public access to a localised section of this route. It is anticipated that such restrictions would include a reduced path width, fencing around construction areas immediately adjacent to or on part of the route, and the potential need to escort walkers along this section of route when construction activities are taking place. However, only a very small extent of land would be directly affected over the anticipated short duration of construction and decommissioning works necessary to construct and later remove this specific intersection and it is anticipated that this Scottish Hill Track and Heritage Path would remain open continuously.

15.3.13 With the above mitigation measures in place, it is considered that the conclusions remain the same as in the 2015 ES and 2017 FEI – i.e. no significant effects.

Indirect Effects

15.3.14 Based on the assessment undertaken in **Chapter 9: LVIA**, there would be significant effects on the views from parts of the following nine local recreational routes:

- DGC Core Path No. 51 Benbuie to Troston Hill;
- DGC Core Path No. 188: Corlae;
- DGC Core Path No. 215 (Lorg Trail) / Heritage Path 2: Sanquhar to Stroanpatrick / Core Path No. 443 (Bank Hill to Graystone Hill)/ Right of Way DS15;
- DGC Core Path No. 446: Benbrack;
- EAC Core Path No. C10: Coalfield Cycle Route;
- Heritage Path 1: Old Road from New Cumnock to Dalquhairn / Scottish Hill Track 84: New Cumnock to St John's Town of Dalry; and
- Rights of Way: DS14, DS13 and DS15.

15.3.15 Significant visual effects would also be experienced by users of the Southern Upland Way (also overlapped with DGC Core Path No. 504: Southern Upland Way, Scottish Hill Track 83: St John's Town of Dalry to Sanquhar and Other Pedestrian Route': DN159) in three areas (up to around 6.5-7km of the 151km route within the 45km study area) as follows:

- Area to the north / northeast, between Dalgonar and Wether Hill via Polskoech at the low watershed between the Polskoech Burn and the Water of Ken valley, as the SUW approaches from the north / northeast, through forestry, revealing partial views of the Eastern group;
- Area closest to the Proposed Development, between Wether Hill and Cairn Hill, as the SUW approaches and skirts the east and southern boundary of the Eastern group Site with open views of the proposed turbines; and

- Area to the south, between Cairn Hill and Benbrack, as the SUW approaches the Eastern group from the south near one of the Striding Arches sculptures, revealing full and partial views of the Proposed Development (Eastern and Western groups).

15.3.16 None of the remaining recreational routes would be significantly affected by the Proposed Development.

15.3.17 There are four sculptures (the 'Striding Arches' by the artist Andy Goldsworthy) located on hill summits above, or within the Dalwhat Water valley to the southeast of the Proposed Development. Although certain views from three of these locations, back towards the Proposed Development, would be significantly affected, the wider 360° views, sculpture setting and visitor experience would not be significantly affected due to the way in which these features would be accessed and experienced and their wider landscape context.

15.3.18 The remaining recreational and tourist destinations would also not be significantly affected by the Proposed Development.

15.3.19 Significant visual and cumulative visual effects would be experienced by walkers from three hill summits within 10km including Windy Standard, Blackcraig Hill and Cairnsmore of Carsphairn.

15.3.20 There have been a number of studies undertaken over the years to assess public attitudes to wind farms in relation to tourism and recreation. A selection of the studies undertaken are outlined below with some commentary provided on their key findings.

Moffat Centre Research

15.3.21 In 2007, the Moffat Centrei undertook a study of the economic impact of wind farms on the Scottish economy, the objective being to provide guidance on assessing the economic impact of wind farm developments and related infrastructure on tourism. Scottish tourism depends heavily on the country's landscape, with 92% of visitors stating that scenery was important in their choice of Scotland as a holiday destination. As man-made structures such as pylons and wind turbines may affect the attractiveness of a landscape this could result in a reduction in prices for tourism services or reduced numbers of tourists, leading to a loss of income and jobs.

15.3.22 Part of the research involved interviewing 380 tourists at locations that maximised the likelihood that respondents would have seen a wind farm during their visit. This found that 39% of respondents were positive about wind farms, 36% had no opinion either way, and 25% were negative. Importantly, respondents that had seen a wind farm were less hostile than those who had not. The results confirm that a minority (20% to 30%) of tourists preferred landscapes without wind farms. However, of these, only a very small group were so negative that it would affect their intentions about revisiting Scotland.

15.3.23 In general, the research found that the negative impact of wind farms on tourism at a national level (Scotland) was small, and it was concluded that even large sites such as the Dalswinton Wind Farm in Dumfries and Galloway have minimal impact on tourism.

BiGGAR Economics (2007) Review of Evidence on the Impact of Wind Farms on Tourism and Recreation

15.3.24 This report found that the key drivers of tourism were either major geopolitical events or more regional/local factors, with wind farms not considered to have an impact on tourism trends.

15.3.25 The report stated that "There is no case study evidence that wind farm developments have a negative impact on tourism".

BiGGAR Economics Wind Farms and Tourism Trends in Scotland: Evidence from 44 Wind Farms

15.3.26 This research has analysed trends in tourism related employment within the localities of 44 recently developed wind farms. '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.'

15.3.27 This research has also found that 'in the majority of cases, tourism-related employment in the vicinity of wind farms had outperformed the trend for Scotland as a whole and for the local authority area in which the wind farm was based.'

Survation Energy Poll 27/10/2013 Prepared on Behalf of The Mail on Sunday

15.3.28 An opinion poll commissioned by the Mail on Sunday found that 70.1% of people surveyed would be happy to have a wind farm built in their local area, with 68.1% stating they would prefer to live near a wind development than a fracking plant. This increased when looking at the regional view of Scotland with 70.6% of people surveyed in favour of wind development.

15.3.29 Taking the above studies into account, it is not considered that the visitor attractiveness and tourism potential of the identified recreation and tourism receptors would be substantially reduced by these significant effects and it is therefore considered that there would be no significant effects in relation to socio economics.

15.4 References

Bank of England Inflation Calculator available at https://www.bankofengland.co.uk/monetary-policy/inflation/inflation-calculator

BiGGAR Economics Review of Evidence on the Impact of Wind Farms on Tourism and Recreation (2007).

BiGGAR Economics Wind Farms and Tourism Trends in Scotland: Evidence from 44 Wind Farms.

BiGGAR Economics. (2012) Economic Impact of Onshore Wind: Direct & Wider Economic Impacts Report. London: Renewable UK.

BiGGAR Economics. (2015) Onshore Wind: Direct and Wider Economic Benefits.

O'Herlihy and Co Ltd (2006). Windfarm Construction: Economic Impact Appraisal. Glasgow: Scottish Enterprise.

Mail on Sunday Survation Energy Poll (27/10/2013).

Moffat Centre Research (2007).

Scottish Natural Heritage. (2013) A handbook on Environmental Impact Assessment: Guidance for Competent Authorities, Consultees and others involved in the Environmental Impact Assessment Process in Scotland.

16. Infrastructure and Other Issues

16.1 Introduction

16.1.1 This Environmental Impact Assessment Report (EIAR) chapter has been prepared on behalf of RWE Renewables UK Onshore Wind Limited (the "Applicant") in respect of a proposal for the development, 35 year operation and subsequent decommissioning of a wind farm comprising of up to 15 wind turbines and associated infrastructure ("the Proposed Development") located between the settlements of Sanquhar and Carsphairn in Dumfries and Galloway and East Ayrshire ("the Development Site").

16.1.2 This chapter of the EIAR assesses the likely significant effects of the Proposed Development with respect to existing infrastructure such as Overhead Lines (OHL) and cables, telecommunications and 'other issues' comprising: health and safety, population and human health and major accidents and disasters.

16.1.3 Prior to assessing the likely significant effects, this chapter summarises the relevant legislative and policy background, the methods used to determine likely significant environmental effects and the baseline conditions currently present on the Development Site. The likely significant effects associated with the Proposed Development are then established by comparison to the baseline conditions, along with proposed mitigation measures and the subsequent anticipated residual effects.

16.1.4 This chapter is not intended to be read as a standalone assessment and should be read in conjunction with the complete EIAR, particularly **Chapters 1 – 5**.

16.2 Limitations of this assessment

16.2.1 Some service providers have not responded to the consultation requests issued. Where consultees do not respond, it is presumed their services would be unaffected by the Proposed Development.

16.2.2 Given the above, there is the possibility that the consultation process has not picked up some services. However, the process has been as inclusive as possible.

16.3 Relevant legislation, planning policy, technical guidance

16.3.1 Planning policy at the national and local level and its relevance to environmental design and assessment is discussed in **Chapter 5: Planning Policy**, which includes a summary of the principal planning policies and guidance relevant to this chapter as listed below:

- The National Planning Framework 3 2014 (NPF3);
- The National Planning Framework 4 2022 (NPF4);
- Scottish Planning Policy 2014 (SPP);
- Scottish Government Online Renewables Planning Advice: Onshore Wind Turbines (2014);
- Scottish Government, Onshore Wind: Policy Statement Refresh 2021: Consultative Draft;
- Dumfries and Galloway Council Local Development Plan 2 (LDP2) (2019);

- Dumfries and Galloway Council LDP2 Wind Energy Development: Development Management Considerations (2020);
- East Ayrshire Local Development Plan (EALDP) 2017;
- Easy Ayrshire Council Local Development Plan 2 – Proposed Plan (2022); and
- East Ayrshire Supplementary Guidance Planning for Wind Energy (2017).

Telecommunications

16.3.2 Paragraph 169 of the SPP notes that considerations in the determination of applications for energy infrastructure developments are likely to include impacts on telecommunications and broadcasting installations, particularly ensuring that transmission links are not compromised.

16.3.3 Further advice is provided in the Scottish Government's Online Renewables Planning Advice: Onshore Wind Turbines (2014), which states that wind turbines produce electro-magnetic radiation which can interfere with broadcast communications and signals, and advises that applicants should make direct contact with any authorities or bodies likely to have an interest, in particular, the local emergency services, local authority services departments, gas and electricity companies.

16.3.4 Policy IN2 of the Dumfries and Galloway LDP2 requires renewable energy proposals to be assessed against the extent to which any detrimental impact on telecommunications has been addressed, particularly ensuring transmission links are not compromised. The Dumfries and Galloway Wind Energy Development Management Considerations identifies that wind turbines can impact on broadcasting installations. It advises that applicants should consult with Ofcom and network owners to ensure that they are satisfied with the proposal, that no material impact will occur or that a technical solution will be used to mitigate any issue of broadcast interference, that is deemed satisfactory to all interested parties.

16.3.5 Section 3.3 of the East Ayrshire Planning for Wind Energy Supplementary Guidance requires that applicants consult with appropriate network operators, and where any interference is likely the applicant should put forward a technical solution.

Health and Safety

16.3.6 The Scottish Government's Online Renewables Planning Advice: Onshore Wind Turbines, advises that companies supplying products and services to the wind energy industry operate to a series of international, European and British standards. It identifies that danger to human or animal life from falling parts or ice or lightning is rare, due to the protection and control measures that can be put in place. Such measures include vibration sensors on turbines which can detect any imbalance caused by ice and inhibit the operation of the machines; as well as rigorous and computer-aided maintenance regimes and control rooms which can detect icing of blades.

16.3.7 Other advice and guidance are provided in the following documents:

- British Standard BS 61400-1:2004;
- Energy Review: HSE Expert Report (2006), Health and Safety Executive;
- Wind Turbines and Horses – Guidance for Planners and Developers (2014), British Horse Society;
- The Construction (Design and Management) Regulations 2015;

- The Health and Safety and Work Act 1974;
- The Management of Health and Safety at Work Regulations 1999;
- Provision and Use of Work Equipment Regulations 1998;
- The Work at Heights Regulations 2005; and
- Control of Substances Hazardous to Health Regulations 2002.

16.4 Stakeholder Consultation

16.4.1 In accordance with policy guidance the organisations listed in **Table 16.1** have been consulted in August 2022 to establish the relevant baseline conditions.

Table 16.1 Summary of Relevant Consultation Undertaken to Date

Consultee	Response
Infrastructure and telecommunications	
Arqiva / National Grid Wireless	Stated – "We have considered whether this development is likely to have an adverse effect on our operations and have concluded that in their current location we have no objection to this development."
BT	Stated – "We have studied this Wind Farm proposal with respect to EMC and related problems to BT point-to-point microwave radio links. The conclusion is that the grid references provided for the 15 proposed Turbine locations should not cause interference to BT's current and presently planned radio network."
City Fibre	The online enquiry service confirmed no known assets fell within the vicinity of the proposed Lorg Wind Farm.
Colt Technology	Stated – "We can confirm that Colt Technology Services do not have apparatus near the above location as presented on your submitted plan, if any development or scheme amendments fall outside the 50 metre perimeter new plans must be submitted for review"
ENGIE	Stated – "We can confirm that, based on the details provided to us, we have no buried plant or equipment in the identified area."
Equans	Stated "We can confirm that, based on the details provided to us, we have no buried plant or equipment in the identified area"

Consultee	Response
GTC	Stated – "GTC can confirm that we have no apparatus in the vicinity but please note that other asset owners may have and ensure all utility owners have been consulted"
Joint Radio Company (JRC)	Stated – "This proposal is *cleared* with respect to radio link infrastructure operated by: The local electricity utility and Scotia Gas Networks. In the case of this proposed wind energy development, JRC does not foresee any potential problems based on known interference scenarios and the data you have provided."
Lumen Technologies	Stated "We can confirm that Lumen Technologies (formerly CenturyLink Communications UK Limited, Level 3, Global Crossing (UK) Ltd, Global Crossing PEC, Fibernet UK Ltd and Fibrespan Ltd) do not have any apparatus within the indicated works area."
MBNL	Stated – "There are no infringement issues with the EE/3UK mobile microwave network from the proposed turbine cluster at the coordinates you have supplied."
MLL	Stated – "There are no existing links within a 10km radius of your proposed wind turbines, so we therefore have no objection regarding the proposal."
National Grid	Stated – "In order to ascertain whether we have assets in the vicinity of your works, please process an enquiry through the Linesearch website (Link Below) Home - LinesearchbeforeUdig (lsbud.co.uk)"
Scottish Power Energy Networks (SPEN)	Provided mapping of transmission cabling in proximity to the Proposed Development. SPEN may have assets in the wider vicinity, there are no records of any owned apparatus within the specific search area of the enquiry detailed in the location provided.
Sky UK Ltd	Stated – "Please be advised that Sky Telecommunications Services Ltd will not be affected by your proposal."
Utility Assets Ltd	Stated – "We will check whether we have any plant present at your site and contact you within 5 - 7 working days ONLY if we own any plant in the vicinity. If we do not reply, we do not have any apparatus in the area of your works." No further response was received from Utility Assets Ltd
Verizon Business	Stated – "Verizon is a licensed Statutory Undertaker. We have reviewed your plans and have determined that Verizon (Formally known as MCI WorldCom, MFS) has no apparatus in the areas concerned."

Consultee	Response
Vodafone	Stated – "I have plotted the co-ordinates provided for the proposed wind farm and can find no links that will be impacted by your development at present"

16.5 Assessment Methodology and Significance Criteria

16.5.1 In order to predict and quantify the effects that would result from the Proposed Development, this assessment has considered:

- Baseline Conditions – a review of existing information in relation to existing public rights of way, telecommunication links, television reception, residential receptors and existing infrastructure on the Development Site and local area.
- Significance of Effects – an assessment of the effects of the Proposed Development against the baseline conditions and assessment of the cumulative effects of the Proposed Development with any other existing, consented or proposed development in the area. Likely significant effects are based upon professional judgement.
- Mitigation Measures – details of the proposed mitigation measures to be incorporated into the Proposed Development, that would be implemented to avoid any significant impacts.
- Residual Effects – an assessment of residual effects following the implementation of mitigation measures.

16.6 Baseline Conditions and Identification and Evaluation of any Significant Effects

Infrastructure

16.6.1 Scottish Power Energy Networks (SPEN) provided mapping of transmission cabling in proximity to the Proposed Development. It was confirmed that whilst SPEN may have assets in the wider vicinity, there are no records of any owned apparatus within the vicinity of the Proposed Development. No significant effects are anticipated.

16.6.2 In the 2015 ES BT responded to consultation showing that they have an overhead telephone line to the unoccupied Lorg Farmhouse. This runs alongside the minor road which runs up the valley of the Water of Ken and enters the centre of the Development Site from the south and in places it moves away from the road by 100m or so; As stated in the 2015 ES, if this apparatus is found to be still in situ, if required, it would be undergrounded where necessary. No significant effects are anticipated.

16.6.3 All authorised work in the vicinity of cables will comply with HS (G) 47, the Health and Safety Executive guidelines for avoiding danger when working near underground electric cables.

16.6.4 There are no other known apparatus located in proximity to the Proposed Development. No significant effects are anticipated.

Telecommunications

16.6.5 The moving rotors of wind turbines have the potential to interfere with telecommunication and television signals by causing Electromagnetic Interference (EMI). Wind turbines cause EMI by reflection of signals from rotor blades so that a nearby receiver picks up both a direct and reflected signal.

16.6.6 As part of the scoping process and subsequent consultation, consultees have confirmed that the Proposed Development should not cause any interference to their equipment. No significant adverse effects on telecommunication links are therefore anticipated.

16.6.7 The potential for negative impacts on domestic television reception are greatly diminished post digital switchover, which is understood to have taken place across the local area in 2009. As such no significant effects are anticipated. In the unlikely event that television signals are affected by the Proposed Development, appropriate mitigation measures would be considered by the Applicant.

Health and Safety

16.6.8 The potential health and safety impacts are identified in this section. Other potential impacts on health and safety are also addressed in the Major Accidents and Disasters section below.

Construction

16.6.9 During construction, safety precautions for workers and the general public would be ensured by following all relevant legislation and best practice. A Construction Health and Safety Plan would be developed to manage safety during construction.

General Turbine Safety

16.6.10 Wind turbines have a proven track record for safety. A very small number of wind turbines have been known to lose parts of the rotor assembly through accidental damage due to lightning or mechanical failure, however, such incidents occur infrequently. No member of the public has ever been injured during the normal operation of a wind turbine (Renewable UK Health and Safety Guidelines, 2015).

16.6.11 The safe operation of the turbines is ensured through a combination of design, quality control and manufacture to high safety standards. The Applicant would require that the selected wind turbine model has certification from an internationally recognised authority and has a proven track record of safe operation. The wind turbines installed at the Development Site would comply with BS EN 61400-1 ‘Wind turbines: Design requirements’.

16.6.12 Once the proposed wind turbines are installed and operational, there would be very little on-site activity. The primary safety systems at the Development Site would include a computerised central control system housed within the electrical control housing. This system would continually monitor the operational status and safe working of key components for the turbines and would allow the operator to remotely monitor the turbines. Any problems which the internal computer cannot resolve would be referred to the operator via the computer’s link.

Public Access and Rights of Way

16.6.13 The recreational routes within the LVIA Study Area are illustrated in **Figures 9.10-11**. The recreational routes include Core Paths, Heritage Paths, Scottish Hill Tracks and recorded

Rights of Way which have been assessed within 10km of the proposed Development and Sustrans Cycle routes and national level long distance routes such as Scotland's Great Trails, which are assessed within the wider 45km Study Area.

16.6.14 There are no known promoted horse-riding routes within 10km of the Proposed Development.

16.6.15 With regard to recreational paths, the Land Reform (Scotland) Act (2016) establishes statutory rights of responsible access on and over most land. The legislation offers a general framework of responsible conduct for both those exercising rights of access and for landowners.

16.6.16 During the construction period, site security and public access would be governed under the Health and Safety at Work Act 1974 and associated legislation. Right of Way access will be managed throughout the construction phase. Appropriate signage and protection measures will be provided ensuring adequate separation between construction traffic and recreational users. The Rights of Way will be fenced / gated where necessary. Users of the paths will be given right of way at all times. Warning signs will be erected along the routes and at crossing points to warn both the public and construction workers of potential risks during construction. Restrictions will be minimised as far as possible. Mitigation measures will be provided in a CEMP or as otherwise required.

16.6.17 During operation, appropriate warning signs would be installed concerning restricted areas such as transformers, switchgear and metering systems. All on-site electrical cables would be buried underground with relevant signage. Appropriate signage and protection measures will be provided ensuring adequate separation between operational traffic and recreational users.

16.6.18 With the implementation of the mitigation measures, no significant effects in relation to population and human health are anticipated.

Population and Human Health

16.6.19 As well as safety being considered in this chapter of the EIA Report, the potential for significant effects in relation to population and human health has been considered in those technical chapters where changes may affect people (**Chapter 7: Noise**, **Chapter 8: Shadow Flicker** and **Chapter 9: Landscape and Visual** (which includes consideration of residential amenity). The conclusions relating to these technical chapters of the EIA Report are summarised in **Table 16.2**, with no significant effects in relation to population and human health being predicted.

Table 16.2 Population and Human Health Effects

Technical Assessment	Effects	Effect on Population and Human Health	Rationale
Noise - Chapter 7	Not Significant	Not Significant	Construction noise is predicted to meet noise limits set out in BS 5228-1:2009 + A1:2014. The Proposed Development alone and cumulative noise of the Proposed Development, including contributions from neighbouring wind farms, is predicted to meet noise limits derived in accordance with Institute of Acoustics 'A Good Practice Guide to the Application of ETSU-R-97. It is,

Technical Assessment	Effects	Effect on Population and Human Health	Rationale
			therefore, considered that there would be no significant effects in relation to noise on residential receptors.
Shadow Flicker - Chapter 8	Not Significant	Not Significant	There is the potential for one property (Polskeoch) to be affected by shadow flicker using worst-case modelling and not including a correct for sunshine hours. Mitigation could be put in place if required.
Residential Visual Amenity Assessment (RVAA) – Appendix 9C	There would be a significant visual effect from parts of seven individual / groups of properties (Polskeoch, Nether Holm of Dalquhaim, Craigythorn Croft, Corlae Byre 1 and 2, Dalgonar, Polcheskie Brae, Strahanna Farm), as a result of the Proposed Development. The effect of aviation warning lights, although potentially visible would however not result in a significant effect due to the lighting mitigation which controls the intensity and luminance of the lights during operation.	Not Significant	Of the eleven individual / groups of properties included in the assessment none would be affected by the Proposed Development in terms of their residential visual amenity. This is due largely to the intervening distance, partial screening and use / orientation of the property, such that the living standards would not be affected, and the property would not be adversely affected by 'visual dominance' to the extent that it would become an unattractive place to live when judged objectively and in the public interest, on an individual basis or cumulatively.

Major Accidents and Disasters

16.6.20 The potential for significant effects as a result of the vulnerability of the Proposed Development to major accidents and disasters has been considered for a range of topics.

16.6.21 As shown in **Table 16.3**, the Proposed Development would not be susceptible to major accidents and disasters and there would be no significant effects due to major accidents or disasters as a result of the Proposed Development.

Table 16.3 Major Accident or Disaster Effects

Major Accident or Disaster	Risk due to location	Risk due to project	Significant Effect	Rationale
Biological hazards: epidemics / Covid 19 pandemic	Low	Low	No	The probability of epidemics / the Covid 19 pandemic affecting the construction or operation of the

Major Accident or Disaster	Risk due to location	Risk due to project	Significant Effect	Rationale
				Proposed Development is considered to be low. If still necessary, government guidance in relation to social distancing and other relevant precautions, would be followed to enable safe construction and operation of the Proposed Development.
Landslide / subsidence	Low	Low	No	Steep slopes, along with other areas identified as having historic peat slides, have largely been avoided for construction of turbines, borrow pits, access tracks and other infrastructure.
Severe weather: storms	Medium	No	No	Turbines are equipped with lightning conductors and automatically shut down when wind speeds are at a level which could damage internal components.
Severe weather: droughts	Very Low	No	No	The probability of severe drought occurring in the vicinity of the Proposed Development is considered to be very low. Furthermore, turbines would be unaffected by drought conditions.
Severe weather: extreme temperatures	Low	Very low	No	In cold weather, ice can build up on blade surfaces when operating. The turbine can continue to operate with a very thin accumulation of snow or ice but would shut down automatically as soon as there is a sufficient build up to cause aerodynamic or physical imbalance of the rotor assembly. Once the ice has thawed and the turbine re-starts in circumstances such as this, there is a slight possibility that fragments of ice or snow would be released from the rotor and drop within close vicinity of the turbine. The risk to public safety is considered to be very low due to the initial slow rotational speed of the rotor and because such fragments are sufficiently small and lightweight

Major Accident or Disaster	Risk due to location	Risk due to project	Significant Effect	Rationale
				to allow the rotor assembly to be back in balance before restarting.
Floods	Low	Very low	No	**Chapter 13: Geology, Hydrology & Hydrogeology** of the EIAR confirms that there would be no likely significant effects.
Transport accidents	No	Yes	No	**Chapter 14: Traffic & Transport** of the EIAR suggests that the construction of the Proposed Development would not increase the likelihood of accidents or reduce safety. No significant effects in respect of accidents and safety are therefore anticipated.
Industrial accidents	No	Low	No	Relevant UK health and safety legislation would be adhered to; site construction management practices would include temporary diversions of public rights of way, relevant signage and fencing as potential hazardous construction areas where appropriate.
Electricity, gas, water supply or sewerage system failures	No	Low	No	The Proposed Development has taken existing utilities into account. All relevant health and safety legislation would be followed, and industry best practice guidance adhered to.

Future baseline

16.6.22 On the basis of the information currently available, no changes to the baseline conditions are anticipated in the event that the Proposed Development does not proceed.

16.7 Cumulative Effects

16.7.1 As the Proposed Development is expected to have no significant effect on infrastructure and telecommunications and 'other issues', the Proposed Development would not contribute to any cumulative effects when considered along with other projects in the local area. Therefore, no cumulative effects are expected Mitigation Measures

16.7.2 Mitigation has been incorporated through design to appropriately site the Proposed Development away from constraints that may be adversely impacted. Good Practice

measures would be employed including a Construction and Environmental Management Plan (CEMP).

16.8 Residual Effects

16.8.1 Following implementation of mitigation through design and best practice and the mitigation measures identified above, it is considered that there would be no significant effects on infrastructure, telecommunications, health and safety, population and human health or major accidents and disasters.

16.9 Summary

16.9.1 This chapter has considered the potential for likely significant environmental effects on infrastructure, telecommunications, health and safety, population and human health and the susceptibility of the Proposed Development to major accidents and disasters. The design evolution process has taken into account the potential effects and has sought to minimise these as much as possible.

16.9.2 Overall therefore, no significant effects are predicted.

16.10 References

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17. Aviation

17.1 Introduction

17.1.1 This Environmental Impact Assessment Report (EIAR) chapter has been prepared on behalf of RWE Renewables UK Onshore Wind Limited (the "Applicant") in respect of a proposal for the development, 35 year operation and subsequent decommissioning of a wind farm comprising of up to 15 wind turbines and associated infrastructure ("the Proposed Development") located between the settlements of Sanquhar and Carsphairn in Dumfries and Galloway and East Ayrshire ("the Development Site").

17.1.2 This chapter of the EIAR assesses the likely significant effects of the Proposed Development with respect to Aviation.

17.1.3 Prior to assessing the likely significant effects this chapter summarises the relevant legislative and policy background, the methods used to determine likely significant environmental effects and the baseline conditions currently present on the Development Site. The likely significant effects associated with the Proposed Development are then established by comparison to the baseline conditions, along with proposed mitigation measures and the subsequent anticipated residual effects.

17.1.4 This chapter is not intended to be read as a standalone assessment and should be read in conjunction with the complete EIAR, particularly the initial **Chapters 1 – 5**.

17.2 Limitations of this assessment

17.2.1 There are considered to be no limitations relating to aviation that affect the robustness of the assessment of the likely significant effects of the Proposed Development.

17.3 Relevant legislation, planning policy, technical guidance

17.3.1 Planning policy at the national and local level and its relevance to environmental design and assessment is discussed in Chapter 5: Planning Policy, which includes a summary of the principal planning policies relevant to this chapter as listed below:

- The National Planning Framework 3 2014 (NPF3);
- The Draft National Planning Framework 4 2022 (NPF4);
- Scottish Planning Policy 2014 (SPP);
- Scottish Government Online Renewables Planning Advice: Onshore Wind Turbines (2014);
- Dumfries and Galloway Council Local Development Plan 2 (LDP2) (2019);
- Dumfries and Galloway Council LDP2 Wind Energy Development: Development Management Considerations (2020); and,
- East Ayrshire Council Local Development Plan (2017);
- East Ayrshire Council Local Development Plan 2 – Proposed Plan (2022).

17.3.2 Paragraph 169 of the SPP requires renewable energy developments to consider a variety of matters that may be impacted by a proposal, including potential impacts on aviation and

defence interests. The Scottish Government's Online Renewables Planning Advice: Onshore Wind Turbines advises that civilian and military aviation interests should be taken into account, and consultation with relevant aviation interests is encouraged.

17.3.3 Policy IN2 of the Dumfries and Galloway LDP2 requires renewable energy proposals to be assessed against the extent of impact on aviation and defence constraints.

17.3.4 The Dumfries and Galloway Wind Energy Development Management Considerations highlights that the main aviation constraints in the region includes potential radar interference associated with Prestwick Airport and West Freugh Ministry of Defence (MoD) range, the Civil Aviation Authority (CAA) consultation zone around Carlisle Airport, areas subject to low flying airport and the Eskdalemuir Seismological Monitoring Station.

17.3.5 Other advice and guidance are given in the following documents:

- Civil Aviation Publication (CAP) CAP 168 Licensing of Aerodromes, Ed 12 January 2022;
- CAP 764 Civil Aviation Authority (CAA) Policy and Guidance on Wind Turbines, February 2016;
- CAP 670 ATS Safety Requirements, May 2019;
- CAP 774 UK Flight Information Services Version 4, Dec 2021;
- CAP 738 Safeguarding of Aerodromes Version 3 October 2020;
- CAP 793 Safe Operating Practices at Unlicensed Aerodromes, July 2010;
- CAP 493 Manual of Air Traffic Services Part 1, Feb 2022;
- CAP 660 Parachuting Version 5, March 2020;
- Military Aviation Authority Regulatory Article (RA) 2330: Low Flying, November 2014;
- Low Flying Operations Squadron Wind Farm Assessment Criteria (Briefing Document
- 20071128 U TTA WF 2009/2011/2013);
- UK Military Aeronautical Information Publication (MIL AIP);
- UK Aeronautical Information Publications (AIP);
- CAA 1:250,000 and 1:500,000 VFR Charts; and,

17.3.6 Policy RE1: Renewable Energy of the East Ayrshire Local Development Plan requires that impacts on aviation and defence interests and seismological recording are assessed.

17.4 Stakeholder Consultation

17.4.1 In accordance with policy guidance the organisations listed in **Table 17.1** have been consulted to establish the relevant baseline conditions.

Table 17.1 Summary of Relevant Consultation Undertaken to Date

Consultee	Summary of Consultation Response	How it has been addressed
Energy Consents Unit (ECU), July 2021	Within the Scoping report provided by the ECU the following is noted regarding the aviation assessment: • The Planning Authority will require a detailed assessment of aviation impacts. • Aviation stakeholders may have changed their technical criteria since the 2015 ES. • The Applicant should consult with Glasgow Prestwick Airport (GPA). • Aviation lighting applies. Night time visualisations should be included within the LVIA and RVA as necessary.	An assessment of aviation impacts is included within this **Chapter 17 – Aviation**. Updated consultation has taken place within aviation consultees. Consultation responses are detailed in **Table 17.1**, with further detail provided within this **Chapter 17 – Aviation**. An aviation lighting scheme is discussed as **Section 17.8 - Mitigation**. Night time visualisations are included in **Volume 2**, with assessment commentary provided in **Chapter 9 Landscape and Visual.**
Ministry of Defence (MOD), August 2021	Subject to the provision of appropriate lighting, the MOD has no concerns in relation to this application.	Further details are provided in **Section 17.6 – Baseline Conditions and Identification and Evaluation of Key Impacts**. An aviation lighting scheme is discussed as **Section 17.8 - Mitigation**.
MOD, September 2022	The MoD may have concerns about the proposal. The turbines will be 94.5km from and detectable by the ATC radar at Spadeadam Deadwater Fell The turbines will be 123.7km from and detectable by the ATC radar at Great Dunfell, which provides a data feed for Warton Aerodrome. The proposal may have an impact upon low flying operations. It is probable that the MOD will request the turbines be fitted with MOD accredited visible or infrared aviation safety lighting/	Further details are provided in **Section 17.6 – Baseline Conditions and Identification and Evaluation of Key Impacts**. An aviation lighting scheme is discussed as **Section 17.8 - Mitigation**
Glasgow Airport, July 2021	State the site is located out-with the obstacle limitation surfaces for Glasgow Airport; It is out-with the radar consultation area for Glasgow Airport; It is within the Instrument Flight Procedure area for Glasgow Airport and may impact upon procedures. Request Developer engages with Glasgow Airport.	Further details on consultation is provided in **Section 17.6 – Baseline Conditions and Identification and Evaluation of Key Impacts**.
Glasgow Prestwick Airport		
Glasgow Prestwick Airport	Confirm the proposed scope of the EIA seems appropriate.	Further details on consultation is provided in **Section 17.6 – Baseline Conditions**

Consultee	Summary of Consultation Response	How it has been addressed
(GPA), July 2021	Interested in how the Developer proposes to address the aviation warning obstruction lighting scheme as required by UK CAA for obstacles greater than 150m in height above local ground level. Request to be consulted regarding the proposed aviation lighting scheme. State that it will be necessary that further detailed radar modelling assessments/flight trials are undertaken to confirm the exact number of turbines visible to GPA primary radars. Engagement with GPA to establish if there is likely to be any impact on Instrument Flight Procedures (IFP). State that this is an area of airspace where GPA provide an air traffic service, and as such if some of the turbines are visible to GPA primary radar then mitigation will be required. Requests consultation if the Proposed Development is submitted as a Section 36 application. Based on information at the time of the Scoping Response it is likely that GPA would object to the development until the aviation safety matters detailed are appropriately addressed.	**and Identification and Evaluation of Key Impacts**.
Glasgow Prestwick Airport, August 2022	Further consultation held between GPA and Wind Power Aviation Consultants (WPAC)	Further details on consultation is provided in **Section 17.6 – Baseline Conditions and Identification and Evaluation of Key Impacts**.
NATS, July 2021	The Scoping Response states that NATS objects to the proposal as a technical impact is anticipated.	Further details on consultation is provided in **Section 17.6 – Baseline Conditions and Identification and Evaluation of Key Impacts**. Details on a proposed mitigation scheme is included at Section **17.8 – Mitigation**.
NATS, August 2022	The Proposed Development may degrade the performance of Great Dun fell and Lowther radar.	Further details on consultation is provided in **Section 17.6 – Baseline Conditions and Identification and Evaluation of Key Impacts**. Details on a proposed mitigation scheme is included at Section **17.8 – Mitigation**

17.5 Assessment Methodology and Significance Criteria

17.5.1 In order to predict and quantify the effects that would result from the Proposed Development, this assessment has considered:

- Baseline Conditions – a review of existing information in relation to existing aviation interests on the Site and local area.
- Significance of Effects – an assessment of the effects of the Proposed Development against the baseline conditions and assessment of the cumulative effects of the Proposed Development with any other existing, consented or proposed wind turbine development in the area.
- Mitigation Measures – details of the proposed mitigation measures to be incorporated into the Proposed Development that would be implemented to avoid any significant impacts.
- Residual Effects – an assessment of residual effects following the implementation of mitigation measures.

17.6 Baseline Conditions and Identification and Evaluation of Key Impacts

17.6.1 Wind turbines have the ability to reflect radio waves and, therefore, have the potential to interfere with radar systems. Reflections from the rotating wind turbine blades may show up on radar as 'clutter'. Such effects could have an adverse impact on aircraft safety.

17.6.2 Consultation undertaken through the Scoping exercise identified that the aviation and defence infrastructure interests relevant to the Proposed Development are as follows:

- Potential effects on Ministry of Defence (MOD) radar operations;
- Potential effects on Ministry of Defence (MOD) Low Flying activities;
- Conflicts with safeguarding criteria due to the potential impact on Great Dun Fell and Lowther Radar identified by NATS;
- Potential effects on Glasgow Prestwick Airport Primary Surveillance Radar; and,
- Within the Instrument Flight Procedure area of Glasgow Prestwick Airport.

MOD

17.6.3 The Defence Infrastructure Organisation (DIO) stated at Scoping that subject to the provision of appropriate lighting the MOD has no concerns in relation to the scheme. It is noted that the Scoping layout was for an earlier iteration of the site layout which was a 12 turbine development.

17.6.4 The MOD were reconsulted in September 2022 on the Proposed Development. The response received indicated that the MOD may have concerns regarding the development. The response states that the Proposed Development:

- Is 94.5km from, and detectable by, the ATC radar at Spadeadam;
- Is 123.7km from, and detectable by, the ATC radar at Great Dun Fell which provides a data feed to Warton Aerodrome;
- May impact upon low flying; and
- Will likely require aviation lighting.

17.6.5 The MOD will undertake a full operational impact assessment upon submission of the planning application.

17.6.6 The Radar Line of Sight (LoS) analysis undertaken for the RAF Spadeadam Deadwater Fell radar results are in **Table 17.2** below. The results show that the turbines will all be screened by terrain from the radar. It is anticipated that the MOD will confirm these results through the planning determination process. It is also the case that the location of the Proposed Development is not in an area where RAF Spadeadam would routinely provide ATC services. It is considered to be likely that the MOD will confirm that there would be no technical or operational effect.

Table 17.2 RAF Spadeadam Radar Results

Turbine	RLOS (m AGL)	Turbine	RLOS (m AGL)
1	297.7	9	328.9
2	347.3	10	470.7
3	427.4	11	348
4	356.7	12	224.8
5	378.4	13	359.3
6	328.2	14	204.7
7	438.6	15	259.3
8	327.4		

17.6.7 The Applicant has proposed an aviation lighting strategy which has been approved by the CAA, see **Section 17.8.2** and **Appendix 17A**.

NATS

17.6.8 NATs have identified conflicts with safeguarding criteria due to the potential impacts on Great Dun Fell and Lowther Hill Radars. Modelling has indicated that the terrain screening available will not adequately attenuate the signal and the Proposed Development may cause false primary plots to be generated for Great Dun Fell and Lowther Radar. A reduction in the Radar's probability of detection may also occur.

17.6.9 The LoS analysis undertaken by WPAC confirms that all the turbines will be visible to both radars. Discussions with NERL regarding mitigation options have taken place and the Applicant will be contracting NERL to provide a technical mitigation solution.

Glasgow Prestwick Airport

17.6.10 Glasgow Prestwick Airport (GPA) made the following comments regarding the Proposed Development:

- GPA remain interested in how the Developer proposes to address the aviation warning obstruction lighting scheme, and request that they are consulted on the proposed aviation lighting scheme;
- Preliminary Line of Sight (LoS) analysis indicates that a number of the turbines may be visible to the GPA primary radars. GPA requests that they are consulted on this matter to allow a more detailed radar LoS modelling assessment/flight trials to be undertaken;
- Request that the Developer engages with GPA to establish fully if the Proposed Development is likely to have any impact upon the Published Instrument Flight Procedures (IFP);
- State that this in an area in which GPA provide an air traffic service, and as such if turbines are visible to the Primary radar then mitigation will be required;
- Request to be consulted with at Section 36 planning application submission stage to allow a full ATC operational impact assessment to be undertaken together with a technical assessment against all Communications, Navigation and Surveillance (CNS) equipment(s); and,
- It is likely that GPA would object to the Proposed Development until such time as the aviation safety matters identified have been addressed.

17.6.11 In relation to GPA, the Applicant has continued to liaise with the airport, providing the finalised turbine details in August 2022. In order to determine what mitigation is likely to be required, GPA were provided details of radar modelling in relation to both the Primary Surveillance Radar and the new Terma Scanter 4002 radar being installed as a wind farm mitigation scheme. The results for the PSR are shown in **Table 17.3** below.

Table 17.3 GPA Primary Surveillance Radar Results

Turbine	RLOS (m AGL)	Turbine	RLOS (m AGL)
1	229.2	9	212.9
2	191	10	245.6
3	213.8	11	90.3
4	252.8	12	26.8
5	269.4	13	121.7
6	229.6	14	32.3
7	239.7	15	40.7
8	206.5		

17.6.12 These results show that six out of fifteen turbines will be visible to the radar (T2, T11, TT12, T13, T14 and T15) and require mitigation by utilising the capabilities of the Terma radar. Discussions are ongoing with GPA to agree a mitigation strategy to enable a planning condition to be agreed.

17.6.13 GPA also requested to be consulted at the application stage in order to undertake a technical assessment against all Communication, Navigation and Surveillance equipment. Discussions are taking place to determine precisely what additional checks will be required.

17.6.14 GPA have also requested that an Instrument Flight Procedure check be undertaken to ensure the published procedures will not be affected by the Proposed Development. The Applicant is in discussions with GPA to enable the check to be undertaken by a CAA licensed procedure design company.

Glasgow Airport

17.6.15 Glasgow Airport made the following comments regarding the Proposed Development:

- The site is located outwith the obstacle limitation surfaces for Glasgow Airport;
- It is outwith the radar consultation area for Glasgow Area; and,
- It is within the IFP area for Glasgow Airport. Early engagement is recommended.

17.6.16 Glasgow Airport confirmed that they would carry out a full safeguarding impact assessment upon the submission of the planning application for the Proposed Development.

17.7 Cumulative Effects and Interaction of Effects

17.7.1 Cumulative impacts have not been raised by aviation and defence consultees. It is considered that post-mitigation that there will be no significant cumulative effects.

17.8 Mitigation Measures

17.8.1 An aviation lighting strategy has been prepared by WPAC and is included in Appendix 17A. The lighting arrangement combines CAA approved (ANO) visible lighting and MOD infra-red (IR) lighting. The resulting lighting strategy would therefore involve visible Air Navigation Order (ANO) lighting on turbines 1, 2, 8, 9, 10, 11, 12, 13 and 15 and IR lights on all turbines except turbine 4. Mid-height tower lights are not required in this case, but a second ANO light on the nacelles of Turbines 1, 2, 8, 9, 10, 11, 12, 13 and 15, would be provided to act as an alternative in the event of failure of the main light. The lighting strategy was approved by the CAA on 9 September 2022.

17.8.2 In relation to the potential mitigation of impacts upon NATS Lowther Hill and Great Dun Fell radars, an agreement was signed on the 14th December 2015 between NATS Services Limited (NSL) and the Applicant. This was in relation to the implementation of a Primary Radar Mitigation Scheme (PRMS) for the previously consented Lorg wind farm scheme. It is anticipated that mitigation would similarly be available to mitigate the Proposed Development and discussions with NATS in relation to this are underway.

17.8.3 Discussions are ongoing with GPA to agree a mitigation strategy to enable a planning condition to be agreed.

17.8.4 With these measures in place, it is anticipated that any potential effects on aviation would be satisfactorily mitigated.

17.9 Residual Effects

17.9.1 Following implementation of mitigation through design and best practice and the mitigation measures identified above, it is considered that there would be no significant effects on aviation interests.

17.10 Summary

17.10.1 This chapter has considered the potential for likely significant environmental effects on aviation. The design evolution process has taken into account the potential effects and has sought to minimise these as much as possible.

17.10.2 An aviation lighting scheme that conforms with the most recent CAA requirements and MOD guidelines has been prepared to address the requirements of the CAA for aviation lighting and the MOD with regard to low flying.

17.10.3 A mitigation scheme is proposed and discussions are progressing to address NATS' safeguarding impacts.

17.10.4 A mitigation scheme in relation to the effect of the proposed development on GPA radar and operations will be agreed.

17.10.5 Overall, therefore, no significant effects are predicted.

17.11 References

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18. Summary of Mitigation and Residual Effects for the Proposed Development

18.1.1 **Table 18.1** details the mitigation and enhancement measures that the Applicant has committed to implement during the construction, operation and decommissioning of the Proposed Development. These measures are set out by technical topic, along with details of responsibility for implementation and the compliance mechanism, and are presented as a table that could form a base component of a Construction Environmental Management Plan (CEMP) that will provide visibility into the strategy to be employed to ensure that mitigation measures set out in this EIA Report are implemented.

18.1.2 It is assumed that the CEMP will be produced by the Applicant post-consent and it is assumed this will be undertaken as a requirement to discharge the appropriate planning condition. Contractors will be required to adhere to the measures set out in the CEMP; and with any conditions specified in the planning permission. However, it is the Applicant who retains ultimate responsibility for ensuring that the Contractors comply with the CEMP and planning conditions.

18.1.3 The significance of effects following implementation of mitigation measures is also noted within **Table 18.1**. The definition of significance, particularly in respect of how this relates to and relates to “significant effects” in terms of the EIA Regulations, is described within **Chapter 4: Approach to Preparing the EIA Report**. A definition of how significant effects are derived for each topic is set out in the corresponding technical chapter along with the relevant explanation and descriptions of receptor sensitivity, magnitude of change and levels of effect that are considered significant in terms of the EIA Regulations.

Table 18.1 Summary of Mitigation and Enhancement Measures

EIA Report Chapter / Section	Project Stage	Topic / Receptor / Effect	Outline Mitigation/Enhancement Measure	Significance of Residual Effect Following Implementation	Responsibility	Compliance Mechanism	Summary Rationale
Contents							
Chapter 3 Description of the Proposed Development Section 3.4.19	Construction	Air Quality	The main measures for managing dust that will be used where necessary are: ● Adequate dust suppression facilities will be used on-site. This will include the provision of on-site water bowsers with sufficient capacity and range to dampen down all areas that may lead to dust escape; ● Any on-site storage of aggregate or fine materials prone to dust generation will be managed using enclosures and screening if required so that dust escape from the site is avoided. Sheeting can also be provided for the finer materials that are prone to 'wind whipping'; ● HGVs entering and exiting the Development Site will be fitted with adequate sheeting to totally cover any load carried that	Not significant.	The Contractor.	Environmental controls specified in contracts. CMS and CEMP.	There is the potential for an increase in dust during construction. However, as well established and effective dust control measures are used during the construction of wind farms, it is not expected that air quality will be affected.

EIA Report Chapter / Section	Project Stage	Topic / Receptor / Effect	Outline Mitigation/Enhancement Measure	Significance of Residual Effect Following Implementation	Responsibility	Compliance Mechanism	Summary Rationale
			has the potential to be 'wind whipped' from the vehicle; ● Vehicles used on-site will be regularly inspected and maintained, to minimise vehicle emissions and the risk of leaking diesel or hydraulic fluids; ● Good housekeeping or 'clean up' arrangements will be employed so that the Development Site is kept as clean as possible. There will be regular inspections of the working areas and immediate surrounding areas to ensure that any dust accumulation, litter or spillages are removed/cleaned up as soon as possible; and ● A site liaison person will investigate and take appropriate action where complaints or queries about construction arise. These measures would be included in the Construction Environmental Management Plan (CEMP).				

EIA Report Chapter / Section	Project Stage	Topic / Receptor / Effect	Outline Mitigation/Enhancement Measure	Significance of Residual Effect Following Implementation	Responsibility	Compliance Mechanism	Summary Rationale
Chapter 3 Description of the Proposed Development 3.4.5	Construction	Hours of working	For the purposes of this EIA Report, construction activities have been assumed to take place between 07:00 to 19:00 hours on week days (Monday to Friday) and 07:00 to 13:00 hours on Saturdays. Quiet on-site working activities such as electrical commissioning have been assumed to extend outside the core working times noted (where required). Working hours may be reduced at times due to seasonal or weather restrictions. Some works such as delivery of the components of turbines may take place outside the core working hours to reduce disturbance to other users of the road network.	Not significant	Contractor	By planning condition following consent. CMS and CEMP.	There is a potential for some construction activities to cause disturbance to local receptors. Construction activities will be mindful of this and will not occur during unsocial hours.
Chapter 3 Description of the Proposed Development 3.4.21	Construction	Site waste management	• The stockpiling of materials would be minimised and any essential stockpiles would be located as far away as possible from watercourses • Steps will be taken to minimise the extraction of peat as per the Peat Management Plan (PMP) described in Chapter 6 - Renewable	Not significant	Contractor	By planning condition following consent. CMS, CEMP and PMP.	The deliberate minimisation of waste stockpiling and the siting of any unavoidable stockpiles away from watercourses will ensure no significant effects with regard to waste management.

EIA Report Chapter / Section	Project Stage	Topic / Receptor / Effect	Outline Mitigation/Enhancement Measure	Significance of Residual Effect Following Implementation	Responsibility	Compliance Mechanism	Summary Rationale
			Energy Policy, Carbon Balance and Peat Management. The PMP would ensure that peat excavated during construction is safely and suitably re-used within the extent of the Development Site wherever possible.				The minimisation of peat extraction and the onsite re-use of all excavated peat will mean waste management effects are not significant.
Chapter 3 Description of the Proposed Development 3.5.1	Construction	On-site Access tracks	The final design of any Development Site access track will depend on local geological, topographical and drainage conditions. In terms of design, the primary objectives that have informed the access tracks are: ● Requirements to maintain water flows across tracks and minimise disruption to the current hydrology; ● Minimisation of peat spoil by routing tracks through areas of shallow or no peat where possible; ● Mitigate and manage silt run off and surface water; ● Serviceability requirements for construction and wind turbine delivery vehicles; and	Not significant	Contractor	By planning condition following consent. CMS, CEMP and PMP	The construction and use of access tracks on the development site creates a risk to maintaining existing hydrological conditions. However, the commitment to minimising disruption and silt run off means that impacts on water quality are not expected.

EIA Report Chapter / Section	Project Stage	Topic / Receptor / Effect	Outline Mitigation/Enhancement Measure	Significance of Residual Effect Following Implementation	Responsibility	Compliance Mechanism	Summary Rationale
			Constructability considerations				
Chapter 3 Description of the Proposed Development 3.5.1	Construction	Culverts	To prevent silt entering watercourses, an ongoing scheme of silt mitigation will be carried out, which will include use of: silt traps; silt fences; silt mats etc, all installed to suit the local conditions. The silt mitigation measures will be monitored throughout the construction period by the Contractor and ECoW Bridges are the preferred solution for larger watercourse crossings due to their lesser hydrological and ecological effects and are particularly suited to higher flow watercourses. Bridge construction is unlikely to interfere with the watercourse to the same extent as culvert construction and can be built over the existing alignment of the river without the need for diversion	Not significant	Contractor	By planning condition following consent. CMS, CEMP and PMP	Risk of hampering water quality through silt run off is managed by ensuring compliance to silt management conditions through the presence of an ECoW. The use of bridges are intended to reduce the level of impact on water crossings and are expected to render no significant effects.
Chapter 3 Description of the Proposed Development 3.5.20	Construction	Temporary Works: Construction Compound and Lay Down Area	Foul drainage will either be collected in a holding tank for regular collection and disposal off-site or by using an on-site septic tank. Areas of the compound	Not significant	Contractor	By planning condition following consent. CMS, CEMP and PMP	There is potential for the contamination of land as a result of foul drainage from construction

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			which represent an increased pollution risk, e.g. oil or fuel storage and vehicle refuelling would be self double bunded or bunded and drained into an isolated holding tank for treatment and disposal. The bund would ensure that a protected volume of 110% of the stored capacity is provided. Drainage would be directed to an oil interceptor to prevent pollution if any spillage occurred.				workers' accommodation and fuel or oil spills. It is not expected that these effects will be significant due to the implementation of robust measures including holding tanks and double bunding.
Chapter 3 Description of the Proposed Development Section 3.5.46	Construction	Peat management during construction.	A draft Peat Management Plan (PMP) has been prepared (Appendix 6B) and it will be finalised prior to construction and following completion of detailed ground investigations and micro-siting. The PMP will be further refined and detailed methods and specifications agreed with the Council in consultation with Scottish Environment Protection Agency (SEPA) and NatureScot. This will address methods in respect of peat excavation, haulage, storage, re-use and degraded habitat restoration. The PMP will	Not significant.	Contractor.	By planning condition following consent. CMS, CEMP and PMP.	A draft PMP has been produced (**Appendix 6B, Peat Management Plan**) which outlines the estimated volumes of excavated peat associated with the Proposed Development. It also includes control measures to protect peat, including temporary storage and restoration, which are designed to

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			ensure that peat excavated during construction is safely and suitably re-used within the extent of the Development Site wherever possible. Details of the draft PMP and peat slide risk assessment are provided in Chapter 6.				minimise potential peat waste. This will form the basis of the final PMP.
Chapter 3 Description of the Proposed Development Section 3.5.48	Construction	Cross drainage	Where tracks are to be placed on slopes, lateral drainage will be required on the upslope side of the road. The length of drains should be minimised, to prevent either pooling on the upslope side or, at the other extreme, creating long flow paths along which rapid runoff could occur. The spacing of cross drains will depend on the area draining to the cross drain, gradient, choice of material for the drain and design objective. Where cross drains are required, depending on-site conditions, the aim will be for subsequent re-infiltration on the downslope side rather than direct discharge to the drainage network. Cross-drainage may be achieved using culverts or pipes beneath the track,	Not significant.	Contractor.	Environmental controls specified in contracts. CMS, CEMP.	The need for drainage on the access track network will be considered for all parts of the track network separately, since slope and wetness vary considerably across the Development Site. In flat areas, drainage of floating tracks are not required as it can be assumed that rainfall onto the road will infiltrate to the ground beneath the tracks or along the verges. Track-side drainage will be avoided where

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			again in line with the Forestry Commission Scotland (FCS) and SNH (2013) guidance. Drainage will be installed before or during track construction, rather than afterwards, to ensure that the track design is not compromised. The cross drainage will flow out in to shallow drainage, which will allow diffuse re-infiltration to the peat on the downslope side. The cross drains will flow out at ground level and will not be hanging culverts: the avoidance of steep gradients for the tracks will also reduce the risk of erosion occurring at cross-drain outflows. No water from a drainage ditch will be discharged directly to a watercourse. Instead it will pass through silt fences, silt traps or other best practice pollution control features. Drains will not be discharged directly into natural channels, ephemeral streams or old ditches. If required, any discharge, once sediment has been removed as described above, would occur under				possible, in order to prevent any local reductions in the water table or influences on the track structure and compression (the latter can occur where a lower water table reduces the ability of the peat to bear weight, increasing compression).

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			the appropriate SEPA consent. The ditch design will be considered in line with the recommendations of the FCS and SNH (now NatureScot) guidance (2013), including the use of flat-bottomed ditches to reduce the depth of disturbance. In instances of drainage close to surface watercourses, discharge from the drainage may be to surface water rather than re-infiltration. In these situations, best practice control measures including sediment settlement will be undertaken before the water is discharged into surface water systems. The discharges will be small and collect from only a limited area, rather than draining a large area to the same location. Check dams (small dams built across channels or ditches) may be required at regular intervals in the drainage ditches alongside an excavated track and these will be installed as necessary. Regular maintenance and clearing of the check dams				

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			is imperative to ensure their effectiveness is maintained.				
Chapter 3 Description of the Proposed Development Section 3.5.61	Construction	On-site Rock Areas and Borrow Pits	Once detailed intrusive investigations have been completed a detailed plan for the proposed borrow pit will be developed and agreed with Dumfries and Galloway Council (DGC), in consultation with SEPA and NatureScot. The plan would address establishment, extraction and restoration phases with the management protocols for the borrow pit(s) included in the Construction Method Statement (CMS), which is envisaged to be subject to an appropriate planning condition. Any quarrying activities will also follow the Approved Code of Practice, Health and Safety at Quarries Regulations 1999. Nonetheless the likely effects and proposed mitigation that would be anticipated to address effects is likely to include: ● Traffic – the majority of traffic moving stone will use on-site access tracks. Any requirement to access highways will be	Not significant.	Contractor.	By planning condition following consent. CMS, CEMP, SWMP, PPIP.	The CMS and supporting documents will be submitted for agreement with DGC following consultation with bodies such as SEPA prior to construction and development. It is assumed that the production and content of these documents would be required by planning conditions. In order to ensure that the specified measures are adhered to by the appointed contractors, an independent and suitably qualified Engineer, who will also liaise with the various environmental advisers (for example the Environmental Clerk of Works (ECoW) employed

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			addressed through a Traffic Management Plan (TMP); ● Blasting – effects from blasting will be controlled through use of relevant protocols, blast mats and through appropriate communication and publicity about blasting occurrence. Blasts at the borrow pits can be expected to be infrequent, being approximately 2km from residential receptors and are therefore not anticipated to be of any substantive concern, nor likely to give rise to significant effects; ● Noise / vibration – potential effects arise from blasting itself, as well as the use of excavation and stone crushing equipment. Use of appropriately silenced equipment, publicity over blasting, adherence to operational hours (10.00 to 16.00 on Monday to Friday and 10.00 to 12.00 on Saturdays for the				during the construction phase, will be appointed to monitor implementation and provide specialist advice.

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			borrow pits as per the anticipated planning conditions) and the distance to residential receptors (~2km) provide the main mitigation for such effects which are anticipated to be well within limits of acceptability established by guidance; ● Dust – residential receptors are at a considerable distance from the potential borrow pit areas (closest at ~2km) and thus no dust effects on them are expected. Some potential for dust to be deposited on adjacent vegetation exists, though with damping down of surfaces or use of mist sprays as appropriate, this should avoid any significant effects (and this would be assessed by the appointed ECoW); ● Visual intrusion – construction effects will be discernible through the presence of construction machinery.				

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			Long term, an appropriate restoration plan for the borrow pits will be developed in agreement with consultees (SEPA, NatureScot, DGC. EAC as applicable) which is expected to include some re-grading of the final profile and measures to encourage re-vegetation and potentially peat habitat restoration; ● Water - the potential for sediment laden water to be released will be controlled through appropriate design and treatment facilities at the borrow pits. Design will be specific to the location and where possible will encourage natural infiltration. Furthermore, the potential for ingress of water to excavations will be controlled by gravity drainage to settlement lagoons, and encouraging natural infiltration. Where dewatering is required, giving rise to additional potential effects of excavations on the				

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			surrounding groundwater levels, the re-use of filtrated water from the settlement ponds may be used to provide a compensatory water source for any groundwater-dependent features by discharging to a vegetated surface just upgradient of their location; and ● Wastes – Any waste arisings will be handled as per other construction wastes.				
Chapter 3 Description of the Proposed Development 3.5.68	Operation	Post-Construction Development, Site Restoration and Commissioning	● The temporary construction compounds and associated facilities be re-instated as appropriate. This may be with vegetation/peat displaced from elsewhere on the Development Site and landscaped having regard to the local topography	Not significant	The Applicant	Adherence to planning conditions.	The commitment to establishing a Planning Monitoring Officer ensures that planning conditions will be adhered to.
Chapter 3 Description of the Proposed Development 6.6.2	Operation	Land management	● On-site access tracks have been located where possible to minimise effects on	Not significant	The Applicant	N/A	The restoration of the landscape post construction and limited disturbance

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			continued agricultural management				during operation means that no significant effects on agricultural land management are anticipated.
Chapter 3 Description of the Proposed Development 3.6.3	Operation	Meteorological effects and turbine control	While ice-throw is unlikely notices would be installed at access points to the Proposed Development to warn visitors and members of the public of the possible risk of ice throw in colder weather	Not significant	The Applicant	N/A	ice throw is extremely unlikely from the development. Warning signage will be sufficient to contribute to no significant effects.
Chapter 3 Description of the Proposed Development Section 3.7.8	Decommissioning	Decommissioning	A Restoration and Decommissioning Plan (RDP) would be submitted and agreed with the relevant authorities close to the Proposed Development's end-of-life. Any applicable new legislation or guidelines published prior to decommissioning would be considered and taken into account in relation to any design of mitigation prior to decommissioning taking place.	Not significant.	The Applicant and Contractor.	By planning condition following consent. RDP.	The RDP will be agreed with the Councils and relevant stakeholders and followed robustly to ensure all relevant restoration work is carried through. The measures will mean no significant effects are caused.
Chapter 7 Noise	Operation Construction Decommissioning	Residential receptors	Wind farm noise assessment is part of an iterative design process, the aim of which is to achieve a design from	Not significant	N/A	N/A	N/A

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			which noise emissions meet limits derived following the approach given in ETSU-R-975. Consequently, the design of the scheme is such that relevant operational noise limits are met and no environmental mitigation measures are necessary. By way of separation between receptors and turbines resulting from this process, construction noise is also limited, thus only general good-practice noise control measures are required, and no specific mitigation is necessary.				
Chapter 8 Shadow Flicker 8.6.1	Operation	Occurrence of shadow flickering	• Mitigation has been incorporated through design, to appropriately site the Proposed Development away from constraints that may be adversely impacted. • In the event that complaints of shadow flicker are received by the Applicant, Dumfries and Galloway Council and/or East Ayrshire Council, an appropriate investigation would be undertaken to confirm the occurrence,	Not significant	The Applicant	By planning condition following consent. CMS, CEMP and PMP	If shadow flicker does occur sufficient screening and other mitigation measures as described could be implemented, as appropriate, to minimise the impact. Together, these measures ensure no significant impact.

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			following which mitigation measures would be used to mitigate the re-occurrence if required. This could involve the provision of screening planting, the installation of blinds within the affected property, or the programming of the wind turbines to automatically shut down at times when shadow flicker effects could occur. This could be secured through a planning condition.				
Chapter 9 LVIA Section 9.7.5	Pre-construction	Visual Impact	The Proposed Development has been designed to balance technical and project requirements with a need to safeguard the environment and satisfactorily accommodate the Proposed Development within its landscape setting. The design evolution has aimed to reduce landscape, visual and cumulative effects and to respect the landscape characteristics identified in the in the DGWLCS and EALWCS	Significant	The Applicant	Planning Condition	N/A

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			The design and appearance of the new Lorg Bridge water crossing would be agreed with DGC prior to construction to ensure that the local landscape character of the Lorg Glen (Narrow Wooded River Valley LCT) is preserved. This measure should be implemented via a planning condition Turbine locations have avoided the immediate 'front' facing hill slopes of the Narrow Wooded Valley (4) and Upland Glen (14). The hill tops which are set back from the valley and the visually less sensitive interior hills would be preferable in order to maintain a sense of separation between the lower lying areas and the more elevated Southern Uplands / Southern Uplands with Forest which are most capable of accommodating wind farm development. As a consequence, a turbine 'exclusion area' was applied to the interior part of the Development Site, ensuring that turbines would not be positioned on				

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			the 'front' valley facing hill slopes and hill summits where turbines would otherwise appear to 'overlook' the valley. This constraint also had the benefit of minimising potential visual effects on the views from the closest receptors, including residential properties located within the Water of Ken valley Within the lower areas of the Development Site, 'valley' landscape character has been maintained by siting ground based infrastructure in the least visible locations when viewed from the valley floor, walkers on the Southern Upland Way (SUW) and sensitive residential receptors				
Chapter 9 LVIA Section 9.7.16	Construction	Visual Impact	The development of the wind farm would draw upon the guidance set out in SNH guidance 'Good Practice during Wind farm Construction', Scottish Renewables, SNH, SEPA, and the Forestry Commission Scotland;	Significant	Contractor	By planning condition following consent. CMS, CEMP, PPIP, SWMP.	The CMS and supporting documents will be submitted for agreement with DGC, EAC following consultation with bodies such as SEPA prior to

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			Version 3, September 2015. The key measures that would be implemented, as part of the Construction Method Statement (CMS) and the supporting Construction Environmental Management Plan (CEMP) in order to avoid or reduce potential construction effects include: ● The selective and sensitive location of temporary storage areas for materials, plant, and security fencing; ● Using designated routes around the Development Site for construction vehicles and operation of construction plant such as cranes. Avoiding the creation of any wheel ruts and subsequent clear up of any that are created. ● Implementation and monitoring of site management procedures, such as regular litter sweeps of the immediate environs to ensure the removal of all litter arising from the construction activities.				construction and development. In order to ensure that they are being suitably adhered to by the appointed contractors, an independent and suitably qualified Engineer, who will also liaise with the various environmental advisers employed during the construction phase, will be appointed to monitor implementation and provide specialist advice.

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			• Removal, reinstatement, and clear up of the temporary construction compounds and any related construction arisings.				
Chapter 9 LVIA 9.7.38	Decommissioning	Reversibility of visual effects	All visible, above ground structures (turbines, met masts and substation) would be removed upon decommissioning, thereby rendering the vast majority of the landscape and visual effects as reversible. The Site entrance and internal access tracks would remain as permanent features and would gradually re-vegetate in accordance with the level of use and or maintenance by the landowner.	Not significant	The Applicant	By planning condition following consent.	No significant lasting effects will remain once decommissioning of the Proposed Development has taken place, as intrusive structures will be removed and any remaining development will revegetate.
Chapter 10 Historic Environment	Construction Operation Decommissioning	Change to character and setting	The proposed turbines would be screened in views of the hillfort from the valley floor by forestry planation and the underlying topography, particularly in the key view along the ridgeline from the east end of Smitten's Bridge identified by Historic Environment Scotland (HES).	Not significant	N/A	N/A	Screening through design will allay any significant effects on views towards and from the hillfort as existing topography and forestry have been utilised in the Proposed Development's design.

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Chapter 10 Historic Environment Section 10.13.1	Construction Operation Decommissioning	Direct effects on unrecorded heritage assets within the site.	Potential direct effects would be effectively mitigated by an agreed programme of archaeological work to be overseen by an Archaeological or Environmental Clerk of Works (ACoW/ECoW). The details of this work will be contained within a Written Scheme of Investigation including a Post-Excavation and Research Design (PERD) to be agreed with the Dumfries and Galloway Archaeologist and West of Scotland Archaeology Service (WoSAS) (in respect of works within East Ayrshire), but in principle it will comprise the following elements: ● Micro-siting of access tracks to avoid/minimise direct effects; ● Monitoring of intrusive groundworks within areas of archaeological interest, including deep peat; ● Archaeological Recording: any archaeological features or deposits of archaeological or palaeoenvironmental	Not significant.	Archaeological or Environmental Clerk of Works (ACoW/ECoW).	By planning condition following consent. CMS, CEMP and PMP.	Known features have been avoided where possible. Significant effects will be mitigated by recording. Disturbance of previously unrecorded heritage features anticipated to be of lesser to regional importance and sparsely distributed. These are expected to predominantly relate to peat deposits and watercourses within the Development Site. Effect can be mitigated by recording.

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			importance which cannot be preserved in situ will be excavated to standards agreed with the Dumfries and Galloway Archaeologist and WoSAS (in respect of works within East Ayrshire); and ● Analysis, archival, reporting and dissemination: standards for analysis and archival of archaeological and palaeoenvironmental material with subsequent reporting to WoSAS, and the Dumfries and Galloway Archaeologist.				
Chapter 10 Historic Environment Section 10.13.2	Construction Operation Decommissioning	Mitigation for indirect effects on heritage assets	Mitigation by design which reduced the visibility of the Proposed Development and maximise the separation distance through a combination of site selection and iterative design which takes the setting of heritage assets into account. the Development Site is located over 5km from the closest designated heritage asset and in terrain where the majority of heritage assets are screened by the	Not significant	N/A	N/A	Screening through design will allay any significant effects on views towards and from the heritage assets as existing topography and forestry have been utilised in the Proposed Development's design.

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			underlying topography and planting. This screening has been maximised by the location of proposed turbines within the Development Site.				
Chapter 11 Ecology 11.7.2	Construction Operation Decommissioning	Land take and design optimisation	Ecological features have been considered at all stages of the design, from early feasibility to final layout. This has helped to avoid or greatly reduce impacts on Important Ecological Features (IEFs) and other ecological features. Site infrastructure has been designed as far as reasonably practicable to use the minimum land take. For instance, all access track has been designed to be linear, without loops, to avoid creating islands of habitat fragmentation. The layout of the Proposed Development within the Afton Uplands proposed Local Wildlife Site (pLWS) has avoided important vegetation communities for which the site has been notified, including upland mire, montane heath and species-rich grassland communities. The layout of the Proposed Development	Not significant	N/A	N/A	The efforts made to avoid the most valuable areas of habitat on the Proposed Development site, while minimising the scale of associated infrastructure ensures that no significant ecological effects will be incurred.

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			across the rest of the Development Site has also wherever possible, avoided peatland habitat, and where avoidance has not been possible, has been designed to avoid habitats of highest ecological importance and highest sensitivity to effects. Preference for development avoided blanket bog or in areas broadly categorised as modified/drained or actively eroding, and upon areas of shallower peat. The proposed borrow pit search areas, the substations, temporary construction compounds and storage/laydown areas have been sited to avoid sensitive vegetation communities. The avoidance of habitats with potential groundwater dependency, which has been largely achieved by siting the majority of the Proposed Development outwith habitats with potential dependency on groundwater (GWDTEs) and making use of existing tracks. Access to the Proposed Development will utilise the existing access track to the consented				

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			Afton Wind Farm to the north of the Proposed Development and also the Lorg Road from the B729 entering the Development Site from the public road from the south of the Development Site. The sensitive designs (e.g. of watercourse crossing and culverts) have been developed to safeguard the water environment and will help effectively mitigate construction-related direct and indirect impacts to fish and other aquatic features. The Proposed Development has been designed to minimise watercourse crossings				
Chapter 11 Ecology 11.7.8	Construction Operation Decommissioning	Watercourse buffers	The layout of the Proposed Development has also been designed with a buffer of 50m around watercourses and waterbodies, where possible, excluding watercourse crossings in order to minimise construction risks on the aquatic environment.	Not significant	The Applicant	Planning condition	Watercourse buffers make an effort to nullify the pathway between the source and the receptor thereby creating an environment where no significant effect on the existing aquatic conditions is expected.

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Chapter 11 Ecology 11.7.9	Construction operation decommissioning	Bat habitat features	Turbines will be positioned at least 50m (measured from blade-tip) from any features (i.e. key watercourses and woodland edge) likely to be used by commuting and foraging bats to reduce collision risk. Buffer distances have been applied during the design phase in order to avoid areas of habitat with potential to be utilised by commuting and foraging bats.	Not significant	The Applicant	By planning condition following consent.	Buffer zones make an effort to nullify the risk of collision between bats and turbine blades, thereby creating an environment where no significant effect bats is expected.
Chapter 11 Ecology Construction Section 11.11	Construction	Temporary habitat loss / degradation. Running Water (habitat loss / degradation/pollution). Protected and/or Notable Species (disturbance, killing, injury, habitat loss / degradation / fragmentation).	• Preparation and implementation of a final Peat Management Plan and Construction Environmental Management Plan (CEMP). • Protected species pre-construction surveys including otter and badger. • Preparation and implementation of Otter Species Protection Plan. • Preparation of reinstatement and restoration plan. • Adherence to pollution prevention guidelines etc. as fully detailed in	Not significant	Applicant, Construction Manager and ECoW.	By planning condition following consent. CMS, CEMP.	No additional mitigation measures are proposed to further reduce the Proposed Development effects that are identified in this EIA Report. This is because all relevant and implementable measures have been embedded into the development proposals and are assessed above in the Ecology chapter. These

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			Chapter 13: Geology, Hydrology and Hydrogeology. ● Watercourse exclusion zones (50m buffers) and restrictions on timing of works within these zones implemented through the CEMP. ● Culvert designs and construction in accordance with SEPA good practice. Construction/installation and monitoring requirements implemented via the CEMP.				measures are considered to be likely to be effective and deliverable, and address the likely significant effects of the Proposed Development.
Chapter 11 Ecology Section 11.11	Operation	Protected and/or Notable Habitats (habitat loss / degradation). Protected and/or Notable Species (disturbance, killing, injury, habitat loss / degradation / fragmentation).	Monitoring of effects on freshwater ecology through an Environmental Monitoring Plan (fish, freshwater invertebrates and water quality).	Not significant.	The Applicant and ECoW.	By planning condition following consent.	Commitment to measures required by planning condition will ensure no significant effect.
Chapter 11 Ecology Decommissioning Section 11.10	Decommissioning	Protected and/or Notable Habitats (habitat loss / degradation). Protected and/or Notable Species (disturbance, killing,	Preparation of a Restoration and Decommissioning Plan.	Not significant.	The Applicant	By planning condition following consent. RDP.	Commitment to measures included in the restoration and decommissioning plan will ensure

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		injury, habitat loss / degradation / fragmentation).					no significant effect.
Chapter 12 Ornithology Section 12.9	Construction and Decommissioning	Breeding bird species	As part of an overarching Construction Environmental Management Plan (CEMP), a Breeding Bird Protection Plan (BBPP) would be developed in consultation with the relevant consultees in advance of construction works commencing. Construction Method Statements (CMSs) would be developed to detail the mitigation approach for all bird receptors. These would cover the Proposed Development and receptor-specific requirements of the embedded mitigation. Site supervision would be provided by a suitably experienced Environmental Clerk of Works (ECoW), who would be responsible for ensuring the successful implementation of embedded measures, including pollution prevention, monitoring of buffers around construction areas and reference to areas of high ecological sensitivity, and adherence to current construction best practice.	Not significant	The Applicant, Contractor and ECoW.	By planning condition following consent. CMS, CEMP and PMP	Commitment to measures included in CEMP, CMSs and BBPP will ensure no significant effect.

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			Pre-construction verification check surveys would be undertaken for all protected bird species where potential significant effects or legal breaches could occur otherwise. Maintain species-specific buffers detailed in the BBPP from nests during the breeding or roosting season until young fledge, or develop method statements outlining methods to allow works to continue safely within buffer areas where appropriate. For example, in some cases, there may be a requirement to install suitable screening around working areas to allow it to continue within a buffer area. An ornithologist may be required to monitor the nesting birds during the working phase in certain areas and halt any significantly disturbing activities in consultation with the ECoW. An emergency procedure would be implemented by site workers if a nest of a breeding bird is encountered. The ECoW would inspect the site and define appropriate measures (if required)				

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			When construction activities are taking place at more than one location at any one time, this would be subject to ECoW approval, to avoid any cumulative impact on breeding bird activity. By excluding construction activities from the relevant buffer zone when the species taken forward for assessment are breeding, this eliminates the majority of potential impacts on these species.				
Chapter 12 Ornithology 12.9	Operation	Breeding bird species	Mitigation is proposed to be of a similar nature to construction where impacts (and consequent effects) occur, but proportionally reduced in scale.	Not significant	The Applicant	By planning condition following consent. CMS, CEMP and PMP	Commitment to measures included in CEMP, CMSs and BBPP will ensure no significant effect.
Chapter 12 Ornithology 12.9	Construction	Waterbirds	A construction area stand-off of at least 50 m has been applied to all watercourses and water bodies (except for watercourse crossings). All watercourse crossings would be designed in accordance with the SEPA (2010) Good Practice Guide for the Construction of River Crossings and, where culverts are required,	Not significant	The Contractor	By planning condition following consent. CMS, CEMP and PMP	A buffer of at least 50m between construction activity and watercourses and the commitment to the SEPA (2010) Good Practice Guide for the Construction of River Crossings will minimise any incidental impacts

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			have been designed in accordance with the CIRIA (2010) Culvert Design and Operation Guide.				on waterbirds to a negligible level meaning there will be no significant effect.
Chapter 12 Ornithology 12.9	Construction	All bird species	A Pollution Prevention Plan (PPP) and Pollution Incident Response Plan (PIRP) will be prepared, subject to consultation with SEPA and NatureScot, in advance of any construction activities. It will then be implemented as part of the overall CEMP. This will set out site management and working practices and draw heavily upon SEPA's Pollution Prevention and Control Guidelines (PPGs) or Guidance for Pollution Prevention (GPPs), whichever are operative at the time.	Not significant	The Contractor	By planning condition following consent. CMS, CEMP, PIRP and PPP	Commitments to measures outlined in the PPP, PIRP, PPGs, GPPs and CEMP will minimise any pollution impacts on bird species to negligible levels meaning there will be no significant effect.
Chapter 12 Ornithology 12.9	Construction Decommissioning	Peregrine	A 500 m turbine exclusion buffer has been designed into the Proposed Development to reduce effects on breeding peregrines. The observation of this buffer will be secured by appropriate marking-out and information measures	Not significant	The Contractor	By planning condition following consent. CMS and CEMP	The commitment to measures outlined in the CEMP and the 500m buffer will ensure no significant effect on Peregrine populations as a result of the

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			in the proposed CEMP. Owing to the sensitivity of this information, the CEMP must be marked as confidential.				Proposed Development.
Chapter 12 Ornithology 12.9	Operation	Peregrine	Adherence to the specified buffer will also reduce operational disturbance impacts. This requirement will be communicated to relevant site personnel in a suitable manner (to be specified by the proposed BBPP).	Not significant	The Applicant	By planning condition following consent. CMS, CEMP and BBPP	The commitment to measures outlined in the CEMP, BBPP and the 500m buffer will ensure no significant effect on Peregrine populations as a result of the Proposed Development.
Chapter 12 Ornithology Section 12.12	Construction Operation Decommissioning	Disturbance of black grouse.	Works will commence no earlier than 07:00 each day, limiting the potential overlap with lekking (an early-morning activity).	Not significant.	the Applicant and contractor	By planning condition following consent.	No significant impacts on black grouse have been identified. However, adopting a conservative approach mitigation measures have been identified would result in further reduction for potential of disturbance of black grouse, and these will be implemented

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							through the CEMP.
Chapter 12 Ornithology Section 12.12	Construction	Disturbance of breeding birds.	A breeding birds protection plan will be produced and submitted to the planning authorities for approval ahead of the commencement of construction works. This will specify any survey requirements and mitigation measures required in relation to construction works or vegetation clearance to be undertaken between 1st March and 31st August, to ensure compliance with the legislation protecting breeding birds. The specification and mitigation measures shall be implemented as approved under the supervision of a qualified ornithologist. An Ecological Clerk of Works (ECoW) will be employed for the duration of construction to ensure compliance with ecological mitigation and implementation of good practice methods, including the protection of breeding birds.	Not significant.	The Applicant	By planning condition following consent.	No significant impacts on breeding birds have been identified. However, adopting a conservative approach, mitigation measures have been identified which would result in further reduction of potential for disturbance of breeding birds, and these will be implemented through the CEMP.

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Chapter 13 Geology, Hydrology and Hydrogeology 13.6	Construction Operation Decommissioning	Avoidance of flood risk zones	No part of the Proposed Development is proposed on the areas with a high-medium likelihood of flooding within the Water of Ken. In any case, this flood risk area falls entirely within the 50 m buffer for this watercourse which has been avoided	Not significant	The Applicant	N/A	The location of the Proposed Development as well as the implementation of a 50m buffer between works and any water courses means no significant effects will be incurred.
Chapter 13 Geology, Hydrology and Hydrogeology 13.13	Construction	Watercourses and associated WFD surface water bodies Aquifers and associated WFD groundwater bodies CAR licenced abstraction (surface water) Water conditions supporting GWDTEs (surface water) Water conditions supporting conservation sites and GWDTEs (groundwater)	- Avoidance of steep gradients - Avoidance of deep peat deposits - Avoidance of flood zones - Watercourse buffer zones - Minimising areas of hardstanding - Drainage design - Cable trench design - Watercourse crossings design - Best Practice guidelines e.g. WAT-SG-29 - Dewatering and associated drainage consistent with requirements of GBRs 3 and 15 PIRP in accordance with GPP 21 - Fuel storage in accordance with Water Environment (Oil Storage) (Scotland) Regulations 2006 and GBR9	Not significant	Contractor; ECoW; and Site Environmental Manager.	CEMP; CMS; WMP SEPA PPG notes; and Controlled Activities Regulations (CAR) licensing.	There is a risk that construction related activity could cause issues that would otherwise not arise if the site remained un developed. These are detailed in Table 13.13 of Chapter 6. However, the implementation of the measures outlined in this table and the commitment to the CEMP, WEMP, SEPA and CAR Regulations ensure that no significant effects are expected to arise from construction activity on site.

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			- Hydrocarbon interceptors - Regular vehicle maintenance in designated hardstanding areas - Oil storage in accordance with GPP 8 - CEMP - Minimising areas of hardstanding - Dewatering and associated drainage consistent with requirements of GBRs 3 and 15.				
Chapter 13 Geology, Hydrology and Hydrogeology 13.6.14	Construction Operation Decommissioning		● Track layout has been designed to minimise the total track length, and to avoid, where possible, intersecting catchment areas in a manner that could significantly interrupt flow paths. Cross-drainage would be provided in areas where access tracks unavoidably intersect dominant flow pathways.	Not significant	The Applicant	By planning condition following consent. CMS, CEMP and PMP	
Chapter Geology, Hydrology and Hydrogeology 13.6.21	Construction	Drainage Design	● Best Practice control measures including sediment settlement would be undertaken before the water is discharged into surface water systems. The	Not significant	The Applicant and Contractor	By planning condition following consent. CMS, CEMP and PMP	Close commitment to SEPS best practice principles and the measures outlined in the CEMP, CMS and

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			discharges would be small and collected from only a limited area, rather than draining a large area to the same location. Sufficient attenuation storage would also be incorporated into site drainage systems to ensure that discharge rates to watercourses do not exceed pre-development rates and taking into account potential increases in peak rainfall intensity due to climate change. ● Although drainage would be provided in areas of disturbance as required, areas of hardstanding would be minimised so that this need is reduced. This includes careful design of construction compounds and minimising the size of crane pads at each turbine location. ● The detailed drainage design would be developed following consent being granted, but for the purpose of this EIA Report, the basic principles are that				PMP allay the risk of polluting watercourses therefore it is not expected that significant effects will arise.

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			the drainage system would be developed: ● Based on SUDS principles; and ● In accordance with CAR. ● Measures based on Best Practice guidelines from SEPA would be adopted during construction to prevent pollution, with all contractors aware of a pre-planned pollution incident response procedure (PIRP), as detailed in GPP 21. The turbine foundation design minimises excavation requirements in accordance with BS6031: 2009 Code of Practice for Earth Works.				
Chapter 14 Transport 14.11	Construction	*HGV traffic management (delivery timings, routes, signage and information provision)* Dust and debris minimisation techniques (e.g. sheeting of HGVs and wheel washing)	Following planning approval of the Proposed Development, detailed discussions would be carried out with the Road Road Authorities to agree any variations or additions to the draft Construction Traffic Management Plan (CTMP) proposed hereunder:	Not significant.	the Applicant and Contractor.	By planning condition relating to the production of CTMP following consent.	Further detailed discussions would be carried out with the highways authorities by the appointed construction contractor post consent to agree any variations or additions to the proposed CTMP.

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		AIL permits, escort, signage, traffic control and management	Detailed discussions will be held with the Road Authorities by the appointed construction contractor to agree the traffic control requirements during the construction phase. Police presence and assistance with traffic control will be arrange from the port of entry and along the route, as the long low-loader vehicle's manoeuvring speeds will be slow at junctions and it would encroach onto the opposing lane on tight bends and around some roundabouts. Abnormal load deliveries would be planned to leave the port mid-morning and arrive on the Development Site mid-afternoon – prior to nightfall. During times of abnormal load deliveries and peak construction traffic activity, trained monitors with two-way radios will be stationed at key pointed to control the flow of traffic to the Development Site to allow free-flow two-way traffic. The road haulier will obtain the required permits for abnormal loads from Transport Scotland, who				

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			liaise with the relevant affected councils and other interested organisations, for the total route from the port of entry to the Development Site. Construction traffic movements (equipment and materials will, where possible, be scheduled to avoid the peak traffic periods at the beginning and end of each day and other sensitive periods (including school drop off and pick up times), in order to minimise any potential disturbance to local traffic. Information will be provided by the construction contractor to the Highway Road Authorities, affected councils, and community leaders to facilitate the distribution of information relating to the construction period, including construction traffic flows. Residents on the local roads will also be kept informed by the contractor on a regular basis during the construction works, to follow good practice. Signage would be erected on the main routes advising of the frequency and overall period of abnormal load				

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			vehicle convoy movements to allow motorists advance warnings. Signage will be erected on the A76, A713 and B741 to identify Development site access routes and to inform motorists that the local roads are accommodating construction traffic. These signs would, also, be positioned at access points approaching the route. Wheel washing and road sweeping will be carried out where required to ensure that local highways are kept clear of mud and debris. All HGVs transferring loose material will be covered to mitigate against any spillage onto the highway or adjacent footways.				
Chapter 15 – Socio economics Section 15.3	Constriction / Decommissioning	Recreational Receptors	May be necessary to divert a localised section of Core Path 215 (and the Heritage Path: Sanquhar to Stroanpatrick Path which follows the same route) for the duration of the construction of the watercourse crossing and associated access track. It is proposed to leave access tracks in-situ after the end of the consented operating period of the Proposed	Not Significant	Applicant / Contractor	Planning Condition	With diversions of public rights of way in place it is not envisaged that there would be any significant effects on Recreational Receptors

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			Development, so whilst site traffic would utilise the watercourse crossing and access track during decommissioning works it would not be necessary to divert Core Path 215 during the decommissioning phase. It is envisaged that any required localised diversion would be formed within the immediate vicinity of Core Path 215 at the outset of the bridge construction works programme by stripping vegetation to create a passable surface. Signage and way markers would be deployed to assist walkers using this localised diversion, which would likely only extend to a few hundred metres in length and would remain on similar topography to the existing route. To ensure safe construction and subsequent decommissioning of the section of proposed access track which intersects with Scottish Hill Track 84 and the overlapping Old Road from New Cumnock to Dalquhairn Heritage Path (which follow the same route), it may be necessary				

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			to temporarily restrict but not prevent public access to a localised section of this route. It is anticipated that such restrictions would include a reduced path width, fencing around construction areas immediately adjacent to or on part of the route, and the potential need to escort walkers along this section of route when construction activities are taking place. However, only a very small extent of land would be directly affected over the anticipated short duration of construction and decommissioning works necessary to construct and later remove this specific intersection and it is anticipated that this Scottish Hill Track and Heritage Path would remain open continuously.				
Chapter 16 - Other Issues Section 16.8		Construction Safety.	During the construction period, site security and public access would be governed under the Health and Safety at Work Act 1974 and associated legislation. Right of Way access will be managed throughout the construction	Not significant.	Contractor.	Standard Site Management practices incorporated into construction contracts. Planning Condition	Health Safety Security Environment (HSSE) guidance and best practice will be followed at all times. It is expected that an Access Management Plan

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			phase. Appropriate signage and protection measures will be provided ensuring adequate separation between construction traffic and recreational users. The Rights of Way will be fenced / gated where necessary. Users of the paths will be given right of way at all times. Warning signs will be erected along the routes and at crossing points to warn both the public and construction workers of potential risks during construction. Restrictions will be minimised as far as possible. Detailed mitigation measures will be provided with a Construction Access Management Plan. During operation, appropriate warning signs would be installed concerning restricted areas such as transformers, switchgear and metering systems. All on-site electrical cables would be buried underground with relevant signage. Appropriate signage and protection measures will be provided ensuring adequate separation between				would by required by planning condition. With these mitigation measures in place, no significant infrastructure effects are predicted

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			operational traffic and recreational users. All authorised work in the vicinity of cables will comply with HS (G) 47, the Health and Safety Executive guidelines for avoiding danger when working near underground electric cables.				
Chapter 17 – Aviation Section 17.8	Construction Operation Decommissioning	Aviation receptors	Potential mitigation of impacts upon NATS Lowther Hill and Great Dun Fell radars, an agreement was signed on the 14th December 2015 between NATS Services Limited (NSL) and the Applicant. This was in relation to the implementation of a Primary Radar Mitigation Scheme (PRMS) for the previously consented Lorg wind farm scheme. It is anticipated that mitigation would similarly be available to mitigate the Proposed Development and discussions with NATS in relation to this are underway.	Not Significant	Applicant	Planning Condition	Planning Condition would ensure the agreements for mitigation schemes to be implemented would be in place before construction commences.
Chapter 17 – Aviation Section 17.8	Operation	Aviation receptors	A reduced lighting strategy would involve visible Air Navigation Order (ANO)	Not Significant	Applicant	Planning Condition	Planning Condition would ensure the lighting

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			lighting on turbines 1, 2, 8, 9, 10, 11, 12, 13 and 15 and IR lights on all turbines except turbine 4. Mid-height tower lights are not required in this case, but a second ANO light on the nacelles of Turbines 1, 2, 8, 9, 10, 11, 12, 13 and 15, would be provided to act as an alternative in the event of failure of the main light. The lighting strategy was approved by the CAA on 9 September 2022.				strategy is implemented as agreed.