



Naturalis Energy Development Limited

Earlsburn Wind Farm Extension

EIA Scoping Report

663544

MAY 2022

RSK



RSK GENERAL NOTES

Project No.: G/P/6635344/09/04/01 Rev00

Title: Earlsburn Wind Farm Extension: EIA Scoping Report

Client: Naturalis Energy Development Limited

Date: 30 May 2022

Office: Glasgow

Status: Final

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ABBREVIATIONS

AA	Appropriate Assessment
AGL	above ground level
ALMP	Aviation Lighting Mitigation Plan
AIL	abnormal indivisible load
AM	amplitude modulation
ANSP	Air Navigation Service Providers
ATC	Automatic Traffic Count
BGS	British Geological Survey
BS	British Standard
BST	British Standard Time
CAA	Civil Aviation Authority
CAR	Controlled Activities Regulations
CCC	Committee on Climate Change
CEMP	construction (or contract) environmental management plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CNS	communications, navigation and surveillance
COP	Conference of Parties
CRTN	Calculation of Road Traffic Noise
CTA	Glasgow Control Area
CTMP	Construction Traffic Management Plan
CTZ	Edinburgh Control Zones
dB(A)	decibel (A-weighted), a unit of noise measurement
DPSG	Designation Policy and Selection Guidance
DECC	Department of Environment and Climate Change
DMRB	Design Manual for Roads and Bridges
EC	European Commission
ECU	Energy Consents Unit of the Scottish Government
EIA	environmental impact assessment
EIAR	environmental impact assessment report
FWPM	Freshwater pearl mussel
FRT	Firth Rivers Trust
GCR	Geological Conservation Review
GDL	garden and designed landscapes
GHG	greenhouse gas

GPG	Good practice guidance
GPP	Guidance for Pollution Prevention
GPS	global positioning system
GWDTE	groundwater dependent terrestrial ecosystem
HEPS	Historic Environment Policy Scotland
HER	historic environment record
HES	Historic Environment Scotland
IEMA	Institute of Environmental Management and Assessment
IFP	Instrument Flight Procedures
IOA	Institute of Acoustics
JNCC	Joint Nature Conservation Committee
km	kilometre
LCT	landscape character types
LDP	local development plan
LiDAR	Light detection and ranging
LLA	Local Landscape Area
LNCS	Local Nature Conservation Site
LSE	likely significant effects
LVIA	landscape and visual impact assessment
m	metre
MBEC	The appointed ecological and ornithological consultants
MOC	minimum obstacle clearance
MOD	Ministry of Defence
MW	megawatt
NCN	National Cycle Network
NCV	Nature Conservation Value
NEDL	Naturalis Energy Development Limited
NERL	National Air Traffic Services En Route Ltd
NGR	National Grid Reference
NHZ	nature heritage zone
NPF	National Planning Framework
NRHE	National Record of the Historic Environment
NVC	national vegetation classification
OS	ordnance survey
OSA	outer study area
PAN	planning advice note
PMP	Peat Management Plan

PSR	primary surveillance radar
PSRA	Peat Slide Risk Assessment
PWS	private water supply
REG	Earlsburn Wind Farm Extension project partner
RMS	root mean squares
RSK	The EIA consultants representing NEDL
RSPB	Royal Society for the Protection of Birds
RVAA	residential visual amenity assessment
SC	Stirling Council
SEPA	Scottish Environment Protection Agency
SG	Supplementary Guidance
SNH	Scottish Natural Heritage (now NatureScot)
SPA	special protection area
SPP	Scottish Planning Policy
SRTM	Shuttle Radar Topography Mission
SSSI	site of special scientific interest
TS	Transport Scotland
UK	United Kingdom
UN	United Nations
VP	vantage point
WCA	Wildlife and Countryside Act
WLA	Wild Land Area
WPAC	The appointed aviation consultants
ZPSF	Zone of Potential Shadow Flicker
ZTV	zone of theoretical visibility

1 INTRODUCTION

1.1 Background

- 1.1.1 Naturalis Energy Development Limited (NEDL) ('the applicant') is proposing to submit an application for consent under Section 36 of the Electricity Act 1989 for a wind farm development of up to 15 turbines of up to 180 m to tip (the "Proposed Development") located directly adjacent (north-east) to the operational Earlsburn Windfarm, c.4 km due south of the village of Gargunock, in the Stirling Council (SC) local authority area.
- 1.1.2 NEDL is a joint venture company created by project partners REG Power Management Limited and Falck Renewables. Falck Renewables are the owners of the adjacent existing Earlsburn and Kingsburn wind farms.
- 1.1.3 Each turbine is likely to generate approximately 5-6 Megawatts (MW) of electricity. The total installed capacity of the Proposed Development is therefore expected to be greater than 50 MW.
- 1.1.4 The applicant has appointed RSK Environment Ltd (RSK), an experienced environmental consultancy, as lead consultant to carry out an Environmental Impact Assessment (EIA) and related assessments to accompany a Section 36 Application to the Scottish Ministers.
- 1.1.5 RSK is a fully integrated, environmental, health, safety and engineering consultancy with extensive experience of providing environmental, health, safety and engineering services to the renewable energy onshore wind sector.

1.2 Requirements of the Legislation

- 1.2.1 Any proposal to construct or operate a power generation scheme with a capacity in excess of 50 MW requires Scottish Ministers' consent under Section 36 of the Electricity Act 1989.
- 1.2.2 Under the *Electricity Works (Environmental Impact Assessment) (Scotland) (EIA) Regulations 2017* (as amended) (the "EIA regulations"), the Scottish Ministers are required to consider whether any proposal for a wind farm is likely to have a significant effect on the environment.
- 1.2.3 While not a statutory requirement, as part of the EIA process, the applicant wishes to seek a formal scoping opinion from the Scottish Government Energy Consents Unit (ECU) on behalf of the Scottish Ministers under the EIA regulations.

1.3 The Scoping Process

- 1.3.1 Scoping is undertaken to refine the scope of the assessment of environmental impacts and ensure that it is robust but focused in its approach on potentially significant effects. This will be achieved by inviting the Scottish Ministers and consultees to:
- Specify aspects of the environment and issues relating to these that should be considered and addressed in the EIA (with an emphasis on any issues local to the Site);
 - Comment on the proposed approach to the EIA;

- Comment on or recommend, where appropriate, assessment methodologies; and
- Highlight other relevant bodies or organisations that may have a vested interest in the scheme or be able to provide relevant information.

1.3.2 Once the scoping opinion has been issued and adopted by the ECU, the responses will be analysed and used to inform the assessment process.

1.3.3 The project team benefits from significant experience and technical expertise in environmental assessment and development of such projects and will ensure that the EIA will be carried out in accordance with the EIA scoping opinion. The potential environmental impacts during construction, operation and decommissioning will be identified and assessed in the EIAR, based upon the recommendations of the technical EIA team, consultation with statutory consultees, other interested parties and local communities. Topic assessments will be undertaken using best practice methodology, following industry guidelines whenever appropriate and carried out by specialists with relevant professional experience. A summary table of personnel involved in the EIA is provided in Table 1.1 below.

Table 1.1 EIA Team Competencies

Discipline	Specialist	Qualifications
EIA Project Manager	Joe Somerville, RSK	MA(Hons) MSc MCIfA FSA Scot PIEMA
EIA Project Support	Adam Paterson, RSK	BSc, MSc
Planning policy	Simon Herriot, Savills	BSc (Hons) MRTPI
Landscape and Visual Impact Assessment	Mark Evans, Stephenson Halliday	BSc, PGDip, CMLI
Ecology	Kay Marriott, MBEC	BSc (Hons) CIEEM
Ornithology	Paul Bradshaw, MBEC	BSc (Hons) MSc MRes
Hydrology, Geology, and Hydrogeology	Catherine Isherwood, RSK	MA, MSci, MSc, PhD, ProfGradIMMM, CGeol, FGS
Archaeology and Cultural Heritage	Owen Raybould, Headland Archaeology	BSc (Hons) Archaeological Science MCIfA, MIHBC
Traffic and Transport	Jon Hassel, RSK	BEng (Hons), MCIHT
Noise and Vibration	Matthew Cand, Hoare Lea	Dipl Eng, PhD
Aviation and Radar	John Taylor, WPAC	Commander, Royal Navy (ret) and former Air Traffic Controller and Fighter Controller

1.4 Document Structure

1.4.1 This document constitutes the Scoping Report and contains the necessary information as required under Part 4 Section 12 of the EIA Regulations. (**Table 1.2**).

Table 1.2: Requirements of Part 4, Section 12(2) of the EIA Regulations

Requirement	Section of Scoping Report
<i>“(a) a description of the location of the development, including a plan sufficient to identify the land;</i>	Section Error! Reference source not found.
<i>“(b) a brief description of the nature and purpose of the development and of its likely significant effects on the environment; and</i>	Section Error! Reference source not found. Section Error! Reference source not found.
<i>“(c) such other information or representations as the developer may wish to provide or make.”</i>	Section Error! Reference source not found. Section Error! Reference source not found.

1.4.2 **Section Error! Reference source not found.** of the Report details the proposed approach to consultation for the Proposed Development, including the procedure for those wishing to make comments in relation to this scoping exercise. The consultee list containing the statutory and non-statutory stakeholders will be agreed with the ECU during the scoping process and later as part of the application for consent. **Appendix 1** contains the relevant maps and figures referred to in this Scoping Report.

2 PROJECT DESCRIPTION

2.1 Introduction

2.1.1 This section describes the Proposed Development. A brief description of the Site and surroundings is given followed by a description of the components of the scheme. **Figure 2.1** shows the location and boundary of the area under consideration. It should be noted however, that beyond scoping, the design of the development is iterative and will evolve to take account of constraints and issues raised during scoping, through baseline studies both completed and currently in progress, and through the subsequent assessment of impacts. The boundary for the application for consent will also incorporate land required to access the Proposed Development from the public road.

2.2 Site Description

2.2.1 The Site (i.e., the area within the red line boundary as shown on **Figure 2.1**) sits within an upland plateau of rounded hills and comprises rough grazing moorland, blocks of plantation forestry, watercourses and mosaics of blanket bog.

2.2.2 The Site varies in height above Ordnance Datum (AOD) between 485 m at the summit of Carleatheran, to 370m AOD at the edge of Earlsburn Reservoir 1. The Site is 562 Ha in size. Of this, around 108 Ha comprises establishing commercial coniferous plantation, with the remainder comprising upland moorland.

2.2.3 Various farming and sporting activities/interests (activities that take place on site may include grouse shooting, deer stalking and cattle and sheep grazing/roaming) and forestry operations are carried out on site. There are access tracks which connect to the adjacent Earlsburn Windfarm that are used recreationally. There appear to be a number of informal paths across the Site. No buildings are located within the Site.

2.2.4 The Site lies directly northeast of Earlsburn reservoirs No 1 & No 2, and approximately 0.5 km east of the operational Earlsburn Wind Farm at its closest point. The Site is located in a relatively remote location with a small number of dispersed residential properties to the east and south of the Site.

2.3 Project Components

2.3.1 The Applicant anticipates the Proposed Development to have a maximum of 15 wind turbines, each of a maximum blade tip height of 180 m. The preliminary turbine layout for the Proposed Development is shown in **Figure 2.2**. The design of the Proposed Development will be informed by the EIA process, and as such is subject to change. Similarly, the design of the associated infrastructure will depend on the turbine layout design, and will also be informed by the EIA process and ongoing studies.

Summary of Key Components

2.3.2 The Proposed Development infrastructure will likely include:

- Wind turbines and associated infrastructure (including crane pads and temporary laydown areas);
- Internal access tracks;

- Borrow pits;
- Transformers and underground cables;
- Onsite sub-station / control building;
- Energy storage equipment; and
- One or more temporary construction compounds.
- Forestry felling (either clear-felling or key hole)

2.3.3 It is anticipated that the turbines proposed for the Site would have the following physical characteristics (to be confirmed through EIA):

- Number of turbines: 15;
- Height to blade tip: up to 180 m;
- Individual turbine generating capacity: likely to be 5-6 MW; and
- Total generating capacity: to be in excess of 50 MW.

Wind Turbines

2.3.4 Based upon current site information, it is considered that the Site can accommodate up to 15 turbines. The final number will be determined by environmental, technical, and commercial constraints identified during the EIA and iterative design process. A maximum blade tip height of 180 m is being considered; however, the final dimensions of each turbine will also be determined as the design progresses.

2.3.5 The detailed design specification for each foundation would depend on the type of turbine procured, and the specific ground conditions at the location of each turbine.

Access to Site and Internal Tracks

2.3.6 A new access to the Site for vehicles delivering both construction materials and the turbine components would be required. Technical feasibility studies are ongoing to identify potential access options that are commercially and technically viable. These options will then be subject to an environmental appraisal before selecting a proposed site access option. The proposed site access option will be included in the iterative design process.

2.3.7 Tracks used by construction vehicles would be retained throughout the lifetime of the wind farm for use by maintenance vehicles. The width of the tracks would be approximately 6 m, although there may be some localised widening and a requirement for passing places and laydown areas. The surface of the tracks will have a cross fall in order to drain run-off into ditches on the downhill side of the track where necessary, and lateral and cross drains will also be installed where required. Drain outlets would be suitably located with erosion protection as required.

Watercourse Crossings

2.3.8 The Water Environment (Miscellaneous) (Scotland) Regulations 2017 came into force from the 1 January 2018. This new legislation will impact the construction industry by requiring a formal Controlled Activities Regulations (CAR) licence to discharge water to the environment for construction sites (such as wind farms) larger than 4 hectares.

- 2.3.9 The number of water crossings required for the Proposed Development would be kept to a minimum. Any new crossings would be designed in accordance with Scottish Government best practice and taking due regard of SEPA guidelines to enable the passage of fish and other wildlife. Any upgrades to existing water crossings that are required would also comply with Scottish Government and SEPA best practice.

Grid Connection, Energy Storage and Operations Control Building

- 2.3.10 Cables from the Proposed Development would be connected to the substation building, which would incorporate the switchgear and metering equipment. In addition to the grid connection equipment, a control and metering room, telecommunications equipment, an office, and welfare facilities for visiting staff would be housed.
- 2.3.11 The cable connection of the substation to the wider grid network would fall under a separate consenting process and would be subject to a separate application for consent. Therefore, this will not be considered as part of the EIA for the Proposed Development.
- 2.3.12 In addition to wind farm operation control and connection for export to the grid network, the potential use of equipment and facilities for the storage of electricity Battery Storage Unit will be considered during the design process which will be informed by the EIA. Storage may take the form either of housed or containerised arrays of lithium or other batteries, or potentially other non-battery forms of energy storage technology. The power and energy capacity of such storage would be subject to the final installed capacity of the wind farm element of the Proposed Development and depending on the nature of grid connection secured may be additional to the total generation capacity of the Proposed Development.
- 2.3.13 All power and cabling on site from and between the wind turbines would be buried in trenches located directly adjacent to the internal tracks where possible.

Stone and Aggregate

- 2.3.14 The Proposed Development would require crushed stone to construct new tracks, create hard standing areas for the cranes and lay the turbine foundations. Whether the stone and aggregate would be sourced from on-site borrow pits or delivered to site from external sources will be confirmed during the design process and EIA phase.

Construction Compounds and Work Areas

- 2.3.15 During the construction period, one or more construction compounds would be required that would include laydown areas. The main construction site office and compound would likely comprise temporary cabins to be used for the site offices, the monitoring of incoming vehicles and welfare facilities for site staff including toilets; parking for construction staff, visitors, and construction vehicles; secure storage for tools and small parts; a receiving area for incoming vehicles; and security fencing around the compound.
- 2.3.16 The compounds would be used as a storage area for the various components, fuels and materials required for construction. The major structural components of the turbines would be delivered directly to site. It is anticipated that temporary lay-down areas would be provided for parking and unloading delivery vehicles and abnormal loads.

Construction Phase

2.3.17 It is estimated that it would take approximately 12-18 months to construct the Proposed Development.

2.3.18 Construction works would include:

- Temporary and permanent highway modifications to enable vehicles to access the Site from the local and strategic highway network;
- Construction of permanent new site tracks required to access the wind turbine positions. These would be used by civil engineering plant and construction equipment;
- Construction of a secure site compound / storage area for site office facilities and storage of materials and components;
- Installation of hardstandings and outrigger pads for the support of the cranes that would be used for the erection of the turbines;
- Construction of foundations for the support of the turbine structures;
- Wind turbine delivery and erection;
- Installation of transformers in separate housings alongside each wind turbine (if required);
- Installation of on-site High Voltage cabling, communication cabling and earthing;
- Installation of Supervisory Control and Data Acquisition system;
- Construction of site substation and compound;
- Commissioning of site mechanical and electrical equipment; and
- Reinstatement and landscaping, removal of temporary site offices, reseeding verges and areas around turbine base

Decommissioning Phase

2.3.19 At the end of the operational period the wind farm would be decommissioned. This would involve the complete removal of the wind turbines, transformers, substation, switchgear and other equipment over a period of up to 12 months. The removal of the wind farm components would essentially be the reverse of the construction process.

2.3.20 The removal of the wind turbines at the end of the operational life of the wind farm would be the reverse of the erection process, involving similar cranes and procedures. The components would be removed off-site to be re-used elsewhere, dismantled and recycled or disposed of as appropriate.

2.3.21 The decommissioning of the turbine foundations would involve removing the upper part of the reinforced concrete foundation. This could be achieved by conventional construction equipment (e.g., excavator mounted pneumatic hammers etc.). In order to achieve the removal of the upper section, which is approximately 1m deep, a 600mm wide trench would need to be excavated around the approximately 4m diameter upstand to facilitate access for removal of the concrete. All other parts of the foundation would remain in place and no other disturbance of the ground around the turbine would be required.

2.3.22 Once the upstand has been removed, the disturbed area would be reinstated by backfilling with site-derived materials to an agreed method statement, leaving the remaining portion of the foundation approximately 1m below ground level. Access tracks would either be removed or left in-situ with the agreement of the local planning authority.

3 PLANNING & ENERGY POLICY CONTEXT

3.1 Introduction

3.1.1 The application will be submitted under Section 36 of the Electricity Act 1989 (Section 36 application). The EIA Report's Planning & Energy Policy Chapter will provide the legislative and policy context relevant to the Proposed Development. A separate Planning Statement will consider the Proposed Development in the context of planning and other policy objectives, concluding with comments about the extent to which the Proposed Development complies with the aims and objectives of relevant plans and policies.

3.2 National Planning Policy and Guidance

3.2.1 The EIA Report will refer to various national planning policy and guidance documents including:

- National Planning Policy Framework 3 (NPF3) and the Draft National Planning Policy Framework 4 (Draft NPF4);
- Scottish Planning Policy (SPP), noting that NPF4 will, in effect, replace NPF3 and SPP once approved;
- Scottish Government web-based renewables guidance;
- Scottish Government Planning Advice Notes; and
- Scottish Government policy and good practice guidance on community benefit funding and community shared ownership.

3.2.2 At the time of writing, NPF3 remains the approved national planning policy document, setting out the spatial framework priorities for development in Scotland as well as identifying National Developments. Draft National Planning Framework 4 (NPF4) was published for consultation in November 2021. The separate Planning Statement will identify those elements of NPF3 and Draft NPF4 considered relevant to determination of the Proposed Development reflective of their position at the time of submission.

3.2.3 Draft NPF4 renews the positive context for the continued roll out of renewable energy development within the context of the 2045 net zero target and the associated interim targets, including the aim of achieving a 75% reduction in greenhouse gas emissions by 2030 compared to 1990 levels. Part 2 relates to National Developments including 'Strategic Renewable Electricity Generation and Transmission Infrastructure'. Electricity generation, including electricity storage, from renewables with a capacity of 50 MW or more would benefit from national status meaning that the principle of such development does not need to be agreed later in the consenting process. Part 3 sets out a raft of national planning policies, including Policy 19 Green Energy which states that outwith National Parks and National Scenic Areas "*development proposals for new wind farms should be supported unless the impacts identified (including cumulative effects) are unacceptable*". Proposals to repower, extend or expand existing wind farms should also be supported in principle.

3.2.4 SPP emphasises the importance of tackling climate change and, in particular, the need to reduce greenhouse gas emissions. It is a material consideration of relevance to the Proposed Development. As with NPF3, the policies and commentary within the 'Low Carbon Place' section are likely to be of most relevance to the Proposed Development,

as this section contains policy commentary relating to renewable energy matters generally and in relation to onshore wind in particular. Table 1 of SPP 'Spatial Frameworks' sets out the approach that Planning Authorities should follow to identify areas where wind farms will not be acceptable (Group 1), areas of significant protection (Group 2) and areas with potential for wind farm development (Group 3). The spatial framework map within the Local Development Plan indicates this site to be within Group 2. The separate Planning Statement will discuss the Site's status within the context of the Spatial Framework.

3.3 Local Planning Policy and Guidance

- 3.3.1 The planning policy context applicable to the Site will be taken into account in the iterative EIA design process. The relevant planning policy framework will also be described in the EIA Report.
- 3.3.2 The statutory Development Plan for the Site comprises the following:
- Adopted Stirling Local Development Plan (LDP) (October 2018); and
 - Adopted Supplementary Guidance (SG), especially Wind Energy Developments (February 2019)
- 3.3.3 Also of relevance is the Council's suite of non-statutory Supplementary Planning Guidance (SG) and its updated Stirling Landscape Sensitivity and Capacity Study for Wind Energy Development (January 2015).
- 3.3.4 While the policies within the LDP require to be considered 'in the round', Primary Policy 12 Renewable Energy and related Policy 12.1 Wind Energy Developments are likely to be of most relevance to the assessment of the Proposed Development. In this respect, Section (b) of Policy 12.1 states that "*developments will be permitted if they are of a scale, layout and nature such that adverse environmental impacts, including cumulative impacts, are avoided or minimised...*".
- 3.3.5 Section (c) of Policy 12.1 states that wind energy proposals will be assessed against the following criteria:
- *"Contribution to renewable energy generation targets and effect on greenhouse gas emissions;*
 - *Landscape and visual impacts;*
 - *Effects on natural heritage including wild land areas, the quality of the water environment and carbon rich soils;*
 - *Historic environment;*
 - *Aviation and telecommunication interests;*
 - *Residential and community amenity;*
 - *Net economic impact, including local and community socioeconomic benefits such as employment, associated business and supply chain opportunities;*
 - *Public access, including impact on long distance walking and cycling routes and scenic routes identified in NPF;*
 - *Road traffic and adjacent trunk roads;*
 - *Hydrology and flood risk;*
 - *Cumulative Impacts, arising from the above considerations;*

- *The need for planning conditions relating to decommissioning and site restoration;*
- *Tourism and recreation interests.”*

3.3.6 SG Wind Energy Developments supports this policy by providing detailed advice and guidance on the planning and environmental considerations set out in Section (c) above.

3.4 Climate Change and Energy Policy

3.4.1 The EIA Report will summarise the renewable energy policy framework and associated needs case for renewables, identified as a matter of both law and policy, at international, European and domestic levels.

3.4.2 Energy policy documents are published and updated on a regular basis and the documents noted in this section are the current versions of the main documents likely to be of most relevance to the Proposed Development. Any revisions to these documents, or new policy documents, published by the time the application is submitted will be referenced in the EIA Report.

3.4.3 The Proposed Development relates to the generation of electricity from renewable energy sources and comes as a direct response to the climate emergency and energy policy objectives. The EIA Report will discuss the binding commitments set out in the COP26 ‘Glasgow Climate Pact’ which reaffirms the COP UN Paris Agreement 2015 (the Paris Agreement) temperature goal of holding back the increase in the global average temperature to well below 2 °C above pre-industrial levels.

3.4.4 Reference will also be made to the UN Emissions Gap Reports, which are published on an annual basis. The latest 2021 report shows that the most recent national climate assurances combined with other measures project a global temperature rise of 2.7°C by the end of the century. To tackle this matter and to achieve the aims of the Paris Agreement, it states that the world needs to cut greenhouse gas emissions in half within the next eight years.

3.4.5 The clear objectives of the UK and Scottish Governments will be summarised, in relation to encouraging increased deployment and application of renewable energy technologies, consistent with sustainable development policy principles and national and international obligations on climate change. In addition to various Committee on Climate Change (CCC) publications, reference will also be made to the recently published British Energy Security Strategy.

3.4.6 The Proposed Development would clearly make a contribution to the attainment of renewable energy generation and greenhouse gas reduction targets at both the Scottish and UK levels and the quantification of this contribution would be described. The description of the renewable energy policy framework will also refer to the Scottish Government’s Climate Change Plan and associated Update; its Energy Strategy and Position Statement; and its Onshore Wind Policy Statement and Policy Statement Refresh.

3.4.7 The Proposed Development will also be considered in terms of the Scottish Government’s declared ‘climate emergency’, the 75% reduction in greenhouse gas emissions by 2030 and the legally binding 2045 net zero reduction target.

3.5 Questions for Consultees

3.5.1 The following questions are directed to consultees:

- Do consultees agree with the extent of the planning policy and energy documents described above?
- Are there any additional planning and energy documents that consultees wish to be considered?

4 EIA PROCESS AND METHODOLOGY

4.1 Overall Approach

4.1.1 The EIA will be conducted in accordance with the requirements of the EIA regulations. Regulation 4 (1) states that EIA process consists of:

- the preparation of an Environmental Impact Assessment Report (EIAR) by the developer;
- the carrying out of consultation, publication and notification of the EIAR
- the examination of the EIAR and any other environmental information by the Scottish ministers;
- the reasoned conclusion by the Scottish Ministers on the significant effects of the development on the environment; and
- the integration of the Scottish Ministers' reasoned conclusions into the planning decision notice.

4.1.2 Regulation 4(2) of the EIA Regulations states:

“the EIA must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development on the following factors:

- a) Population and human health;
- b) Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC(a) and Directive 2009/147/EC(B);
- c) Material assets, cultural heritage and the landscape;
- d) The interaction between the factors referred to in sub-paragraph (a) to (d)…”

4.1.3 Regulation 4(3) requires that these factors must include the operational effects of the proposed development where the proposed development will have operational effects’

4.1.4 The following key stages will form the basis of the preparation of the EIAR:

- Consultation - with statutory and non–statutory bodies and relevant stakeholders;
- Baseline - establishing a robust baseline of the existing environment on and around the Site;
- Assessment of Environmental Impacts and their Significance - assessment of the environmental impacts and establishing their significance (primarily the assessment of residual effects once mitigation has been adopted); and
- Development of Mitigation Measures - formulation of mitigation measures to ameliorate the potential impacts of the Proposed Development that cannot practically be avoided through site design.

4.1.5 Where, in the professional opinion of the environmental specialists, particular impacts are not predicted to be significant, it is proposed they are scoped out of further assessment. The environmental aspects proposed to be scoped out of the EIA process are outlined in Section 4.3.

4.1.6 Following established best practice, it is intended that the design of the Proposed Development will evolve in an iterative manner with the assessment process, led mainly by the consideration of constraints that exist within and around the Site (environmental,

technical, and economic). Once the preferred design is selected, this will form the basis of the impact assessment.

COVID-19

- 4.1.7 The applicant acknowledges that there is uncertainty regarding the evolving COVID-19 situation and the impact that it might have on this project. The applicant and its supply chain will regularly review their processes and make adjustments to reflect the latest advice from the UK and Scottish Governments. Whenever it is not possible to proceed with the normal approach then the applicant will consult with the relevant stakeholder(s) or consenting authority to find a solution that all parties find agreeable. The applicant takes its commitments under statutory provisions very seriously and will aim to comply with standard practice and guidance where practicable.

4.2 Consultation

- 4.2.1 Consultations with relevant authorities, organisations and stakeholders will be undertaken throughout the EIA and site design process, commencing with scoping. The consultations will serve three main purposes:

- to establish a sufficiently robust environmental baseline of the Site and its surroundings;
- to identify, early in the process, specific concerns and issues relating to the Site and Proposed Development in order that they can be discussed and accounted for appropriately in the design and assessment; and
- to ensure appropriate involvement of the public and authorities in the assessment and design process.

- 4.2.2 To fulfil the applicant's obligations under EIA Regulations and S36 of the Electricity Act 1989, the applicant's preferred approach to community consultation is to hold exhibitions and distribute circulars, in addition to the development of a project website in accordance with COVID-19 guidelines. With regards to consultation with other stakeholders and the consenting authority, the applicant will make every effort to accommodate the needs of the stakeholder and comply with current government advice. The distribution of circulars would still be completed by the standard means of post and email. The community consultation approach will be reviewed regularly, and this has been factored into the project programme.

- 4.2.3 While not a requirement of the applicable legislation and guidance, the Applicant will prepare a Pre-Application Consultant (PAC) or Statement of Community Consultation (SoCC) report to accompany the application for consent, in line with good practice.

4.3 Baseline

- 4.3.1 For each environmental aspect under consideration for the EIA, the environmental baseline of the Site and its surroundings will be established as well as the relevant study or survey area for any particular topic. This will be achieved through consultation with relevant authorities and organisations, a desktop review of available data including that generated from consultation, and completion of specialist field surveys where required. Relevant information and data already held by the applicant gathered during the pre-application feasibility/screening stage will also be used in the EIA process.

4.4 Assessment of Environmental Impacts and their Significance

4.4.1 The baseline assessments provide the foundation for predicting and assessing effects that may result from the Proposed Development. In accordance with the EIA Regulations, potential environmental effects will be evaluated over the whole lifecycle of the Proposed Development including construction, operation and decommissioning, and their significance determined. Evaluation of significance will use specific criteria for each assessment topic. These will follow best practice guidance where available and will consider the following:

- Compatibility with planning policy and environmental standards;
- Impact extent and magnitude;
- Impact nature (whether beneficial or adverse, direct, or indirect, primary, or secondary, permanent, or temporary);
- Importance and sensitivity of the environmental receptor;
- The number of receptors that are impacted;
- Impact duration (whether short, medium, long term and reversible); and
- Whether it is a standalone or cumulative impact

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

4.4.3 For all environmental aspects, the significance of residual impacts i.e., those predicted once mitigation is taken into account, will form the basis of the assessment. An outline of the proposed methods of assessment for each environmental topic is provided in Section 5.1 onwards.

Development of Mitigation Measures

4.4.4 Due to the 'constraints-led' iterative design process for the Proposed Development, most mitigation measures are considered likely to be embedded rather than 'add-on' measures to ameliorate significant environmental effects. The evolution of the design, therefore, will be reported clearly in the EIAR, including the rationale behind the preferred choice of development design and proposal layout.

4.4.5 All other measures proposed as mitigation for the Proposed Development will be reported within the relevant section of the EIAR. The mechanism by which these measures will be carried through to implementation on site will also be made clear.

5 EIA SCOPE

- 5.1.1 This section identifies the environmental aspects that the applicant proposes to address within the EIA for the Proposed Development. It discusses each aspect in terms of a brief summary of the environmental baseline for each (where practical), the relevant potential impacts and an overview of the proposed method of assessment for each. Where relevant, the technical areas will be assessed in the context of a defined study area that is informed by industry guidance, best practice, and likely design of the Proposed Development.

5.2 Landscape and Visual Impact Assessment

Introduction

- 5.2.1 The Landscape and Visual Impact Assessment (LVIA) will consider direct and indirect effects on landscape resources, landscape character, designated landscapes and wild land. It will examine the nature and extent of effects on existing views and visual amenity. The effects of the Proposed Development, as well as the ancillary infrastructure (access track, masts, transformers etc.), will be assessed during the construction and operational phases. The LVIA will also consider cumulative effects i.e., the incremental effects of the Proposed Development in combination with other renewable energy developments.
- 5.2.2 The LVIA will inform modifications and refinements to the layout design and will be undertaken following the approach set out in Guidelines for Landscape and Visual Impact Assessment: Third Edition (GLVIA3). The assessment will also draw upon current good practice guidance issued by SNH.

Legislation, Policy and Guidance

- 5.2.3 An overview of national and local planning policy is provided within **Section 3** of this report. The LVIA will include a review of policies of relevance to the LVIA and will be informed by current guidance including:
- Landscape Institute (LI) and the Institute for Environmental Management and Assessment (IEMA) (2013) Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA 3);
 - Landscape Institute (2019) Technical Guidance Note 6/19 Visual Representation of Development Proposals;
 - Natural England (2014) An Approach to Landscape Character Assessment;
 - Natural England (2019) An Approach to Landscape Sensitivity Assessment;
 - NatureScot (July 2020) Landscape Sensitivity Assessment – Guidance for Scotland Consultation draft;
 - Landscape Institute (2019) Technical Guidance Note 2/19 Residential Visual Amenity Assessment;
 - Landscape Institute (2021) Technical Guidance Note 02/21 Assessing landscape value outside national designations;
 - NatureScot (2020) General pre-application and scoping advice for onshore wind farms;
 - Scottish Natural Heritage (2017) Visual Representation of Wind Farms (Version 2.2);

- NatureScot (2021) Assessing the Cumulative Impact of Onshore Wind turbine developments;
- Spatial Planning for Onshore Wind Turbines – Natural Heritage Considerations. Scottish Natural Heritage 2015
- Scottish Natural Heritage (2017) Siting and Designing Wind Farms in the Landscape (Version 3);
- NatureScot (2020) Assessing impacts on Wild Land Areas - technical guidance;
- Landscape character studies and local planning policy and guidance documents including:
 - Stirling Council (July 2019) Supplementary Guidance: Wind Energy Developments;
 - Stirling Council (October 2014) Supplementary Guidance SG28: Landscape Character Assessments;
 - Stirling Council (April 2019) Draft Supplementary Guidance: Biodiversity & Landscape;
 - Similar guidance and baseline studies within neighbouring authority areas will also be used to inform the LVIA.

Baseline

Site Location and Context

- 5.2.4 The Site is located immediately east of the operational Earlsburn and Kingsburn wind farms in the Touch Hills, around 2.2 km south of Gargunnock, 3.8 km southeast of Kippen and 7 km to the west of Stirling (excluding the Site Access corridor which passes around 1 km east of Cambusbarron).
- 5.2.5 The Site sits within an upland plateau of rounded hills with surrounding land uses including existing wind farms, commercial forestry and reservoirs set within surrounding moorland used for a variety of farming and sporting activities. The wider surrounding landscape is varied with the settled Forth valley located to the north and east, commercial forestry within the Carron Valley to the south and more open, elevated moorland within the Fintry Hills and Campsie Fells to the southwest.

Landscape Character

- 5.2.6 Local landscape character is described in the SNH Landscape Character Assessment in Scotland digital map based character assessment (2019). The Proposed Development lies within Landscape Character Type (LCT) 149 Lowland Hills - Central.
- 5.2.7 This LCT is split into five units, of which the Proposed Development is located within the northernmost of a group of three extending across the hills to the southwest of Stirling. It is broadly described as an area of large scale character, gently rounded upper slopes and hill summits, with rolling expanses of peatland, rough grass and heather moorland. The northern edge of the Touch Hills is noted as being dramatically defined by steep slopes topped by exposed rock. Settlement within the LCT is largely limited to dispersed individual properties and farmsteads although existing modern influences close to the Site include operational wind farms Earlsburn, Kingsburn, and Craigengelt.

Visual Amenity

- 5.2.8 As shown on **Figure 5.2.2**, the Proposed Development is located on undulating hills to the northeast of the Earlsburn reservoirs, adjacent to the existing Earlsburn and Kingsburn wind farms and around 2 km north of Craigengelt Wind Farm. The hills and upland areas immediately surrounding the Site and extending away to the south and west, including the Carron Valley, are sparsely settled with the primary access to this area provided by the B818 which runs along the Carron Valley and passes within approximately 4.1 km of the Site. There are a number of other minor roads within this upland area that link together dispersed houses, farms and occasional small groups of houses.
- 5.2.9 There are no promoted long distance walking or cycle routes in the vicinity of the Site. The closest are the John Muir Way and National Cycle Network (NCN) Route 754 which follow the Forth and Clyde Canal around 11.5 km to the south. Walking and mountain bike trails within Carron Valley Forest, located to the south of the reservoir, draw a variety of recreational users to this area.
- 5.2.10 The escarpment of the Touch and Gargunnock Hills lies immediately to the north of the Site, beyond which the broad expanse of the low lying upper Forth Valley and Flanders Moss extends northwards. This area encompasses a number of villages, including Gargunnock and Kippen, along with dispersed rural settlement and farms. These are linked by a number of main roads, including the A811 (c. 3.3 km north), A84 (c. 6.7 km northeast) and A873 (c. 6.7 km north). The M9 is located around 7 km east of the Site, immediately beyond this lies the city of Stirling and the smaller towns of Bridge of Allan and Dunblane to the north.
- 5.2.11 Beyond Stirling to the east and southeast, the landscape becomes increasingly urbanised within the lower Forth Valley, extending out into the Firth of Forth. South of the Carron Valley, Kilsyth Hills and Campsie Fells lies the wider extent of the settled central belt.

Landscape Designations

- 5.2.12 As illustrated by **Figure 5.2.1**, the Site is not covered by any nationally protected landscape-based planning designations. The closest national landscape designation is the Loch Lomond and the Trossachs National Park which is located approximately 12.6 km northwest of the Site. The Trossachs and Loch Lomond National Scenic Areas (NSAs) are also located within the boundary of the National Park. These are located around 16.7 km northwest and 21.5 km west respectively.
- 5.2.13 The Site is located within the locally designated Southern Hills Local Landscape Area (LLA), as illustrated by **Figure 5.2.2**. This forms part of an extensive cluster of locally designated landscapes that extend over 30 km southwest of Stirling to the northern suburbs of greater Glasgow, encompassing the hills and upland areas between the two cities.

Assessment of Environmental Impacts and their Significance

Zone of Theoretical Visibility

- 5.2.14 Zone of Theoretical Visibility (ZTV) studies have been undertaken for the preliminary scoping layout of the Proposed Development. **Figure 5.2.1** illustrates theoretical visibility based on a 'bare earth' model and illustrates the maximum potential visibility of the turbines while **Figure 5.2.2** incorporates above ground screening features (including woodlands, forestry and buildings) and provides a more realistic impression of likely visibility.
- 5.2.15 The ZTVs illustrate that there would be fairly widespread visibility on the open hills within the site and in the immediate vicinity although within 5 km the undulating terrain and nearby forestry would start to break this up. Beyond 10 km to the south and southwest there would be extremely limited visibility. Potential visibility is more widespread in northern and eastern directions with fairly extensive areas of potential visibility occurring throughout the upper Forth valley, north of the Site, and extending east through areas of more widespread settlement towards the Firth of Forth. Beyond 15 km, landform begins to break up potential visibility and beyond 20 km this is largely confined to more open, elevated locations and hilltops.

Study Area

- 5.2.16 With reference to the Representation of Wind Farms, Version 2.2 (Scottish Natural Heritage, 2017), based on the preliminary turbine height of over 150 m to blade tip, an initial study area of up to 45 km should be considered for the purposes of establishing a preliminary evaluation of the likely receptors. However, the preliminary ZTV studies (**Figures 5.2.1** and **5.2.2**) which accompany this Scoping Report illustrates that visibility would be limited at distances greater than 20 km, as described above, and unlikely to give rise to significant effects (in part due to proximity of operational and consented wind farms) and a 20 km detailed study area is proposed. This is considered sufficient to identify all potentially significant landscape and visual effects that may result from the Proposed Development.

Landscape Assessment

- 5.2.17 The landscape assessment will use the latest NatureScot online National Landscape Character Assessment (published in 2019) as an up to date and consistent baseline assessment of landscape character across the study area. This will be supplemented by information contained within the Stirling Council Supplementary Guidance SG28: Landscape Character Assessments (2014), Supplementary Guidance: Wind Energy Developments (2019), Draft Supplementary Guidance: Biodiversity & Landscape and other similar local baseline studies for other local authority areas within the detailed study area.

Visual Assessment

- 5.2.18 The assessment will be a receptor-based assessment. The assessment will include potential effects on settlement areas, people visiting attractions and routes, including roads, railway lines, walking and cycle routes, within the detailed study area, where

potential visibility is indicated by the ZTVs. The assessment will focus on those receptors where there may be the potential for significant effects, within the 20 km detailed study area.

Designated Landscapes

- 5.2.19 The assessment of effects on designated landscapes will be based on the potential impact on their defined special qualities or purposes for designation. Effects on nationally and locally designated landscapes within the detailed study area, where potential visibility is indicated by the ZTVs, will be considered within the assessment.
- 5.2.20 There are a number of designated Gardens and Designed Landscapes (GDLs) within 20 km of the Site. These are designated for their cultural heritage importance rather than just their scenic quality. In respect of the LVIA these areas will be considered as indicators of increased landscape value while effects on the setting and cultural heritage value of these will be considered within the Cultural Heritage chapter of the EIAR (refer to **Section 5.6**). For those GDLs which are publicly accessible, effects on recreational visual receptors will be considered within the LVIA.

Viewpoints

- 5.2.21 The assessment will be supported by a number of representative viewpoints. The list of viewpoint locations proposed to be included are detailed in **Table 5.1** below and illustrated on **Figures 5.2.1** and **5.2.2**. Viewpoints have not been 'ground truthed' at this stage, so grid references are approximate, and locations may be micro sited to obtain the most representative view or greatest extent of views.

Table 5.1: Proposed Viewpoints

VP	Location	Grid Ref	Distance / Direction ¹	Reason for Inclusion
1	Easter Cringate	271226, 687177	1.7 km, S	Road users, dispersed rural settlement, LLA
2	Gargunnock	270645, 694638	3.5 km, N	Settlement, LLA
3	Kippen	265373, 694518	5.2 km, NW	Settlement, LLA
4	Todholes Car Park	267229, 685869	4.8 km, SW	Road users, dispersed rural settlement, recreational visitors, LLA
5	B822, Campsie Muir	264144, 682635	9.2 km, SW	Road users, recreational visitors, LLA
6	Tomtain	272133, 681429	7.4 km, S	Recreational visitors, LLA
7	B818, Carron Valley	276001, 684259	6.4 km, SE	Road users, dispersed settlement, LLA

¹ From nearest proposed turbine.

VP	Location	Grid Ref	Distance / Direction ¹	Reason for Inclusion
8	Bannockburn Memorial	279500, 690677	7.8 km, E	Settlement, recreational visitors
9	Stirling Castle	278973, 694027	8.4 km, NE	Recreational visitors
10	Wallace Monument	280907, 695652	10.9 km, NE	Recreational visitors, LLA
11	Bridge of Allan	278808, 698187	11.1 km, NE	Settlement, NCN users, LLA
12	A84, Buchany	271283, 702714	11.6 km, N	Main road users, settlement
13	Thornhill	266882, 699986	9.3 km, N	Main road users, settlement
14	A873, Port of Mentieth	257763, 701455	15.5 km, NW	Main road users, dispersed rural settlement, National Park
15	North of Callander	263921, 708581	18.3 km, N	Road users, recreational visitors, National Park
16	Falkirk Wheel	285260, 679946	16.4 km, SE	Settlement, recreational visitors
17	Clackmannan	291180, 691594	19.5 km, E	Settlement, NCN users

Visualisations

5.2.22 The viewpoint visualisations will incorporate wireframes and photomontages and will be used to consider and illustrate changes to existing views. They will be prepared in accordance with the 2017 SNH Guidance Visual Representation of Wind Farms, Version 2.2. Photographs will be taken using a 50mm lens recommended as best practice by the Landscape Institute and NatureScot. Night-time photomontages (see below) will be based on photography taken approximately 30 minutes after sunset, which is the point at which any aviation lighting is required to switch on.

Night-time Assessment

5.2.23 This is an emerging area of assessment, but at present turbines of 150 m or greater tip height would require visible aviation lighting. There is currently no definitive guidance on assessing the night-time landscape and visual effects of aviation lighting although some general advice is provided in Annex 2 of General pre-application and scoping advice for onshore wind farms (NatureScot, September 2020).

5.2.24 A lighting strategy will be developed for the Proposed Development in conjunction with an aviation specialist. The agreed lighting strategy will form the basis of the assessment and visual material presented. An assessment of night-time impacts on landscape and visual receptors will be carried out and included within the LVIA. In line with the NatureScot guidance above, night-time photomontages will be prepared from a small number of viewpoints which are chosen to represent a range of receptors and locations

where proposed aviation lighting may more typically be seen. It is proposed that these would be:

- VP7 – B818, Carron Valley
- VP8 – Bannockburn Memorial
- VP13 – Thornhill

5.2.25 In addition to the night-time photomontages, wireline visualisations will illustrate the position of all visible turbine lights and tables illustrating which lights are visible at which viewpoint will also be included.

Wild Land Assessment

5.2.26 The closest Wild Land Area (WLA) to the Site is WLA 07: Ben More – Ben Ledi, as illustrated by **Figure 5.2.1**, which is over 20 km from the Site and outside of the proposed detailed study area. The ZTV indicates very limited potential visibility from the area, confined to a small number of hill summits. It is not anticipated that the key attributes or wildness qualities of the WLA would be notably affected and therefore it is proposed that a Wild Land assessment is scoped out of the EIA.

Cumulative Assessment

5.2.27 As noted above, the Site is located immediately east of the operational Earlsburn and Kingsburn wind farms. The operational Craigengelt Wind Farm is located approximately 2 km south of the Site and the consented Shelloch Wind Farm approximately 3.2 km to the southwest. More distantly, there are further operational wind farms at Todhill and Rosehill to the northeast of Denny, around 13-15 km from the Site, and the operational Braes of Doune Wind Farm is situated on the open hills around 17.5 km to the north. Just over 20 km to the southeast there is a cluster of operational, consented and proposed wind farms located to the northeast of Airdrie. There are also a small number of single turbines scattered throughout the landscape within 20 km of the Site, including the nearby Craiggannet Hill turbine located approximately 3 km to the south.

5.2.28 The cumulative landscape and visual assessment will be carried out in accordance with the principles contained in *Assessing the Cumulative Impact of Onshore Wind Energy Developments* (SNH, 2012). Cumulative relationships will be assessed with a series of scenarios. Existing wind farms will be included within the main LVIA. Consented wind farms will also be included within the main LVIA unless there is reason to believe they may not be constructed as consented, in which case they will be considered as part of the cumulative scenarios.

5.2.29 Cumulative visual effects will be assessed through analysis of combined ZTVs, views from individual viewpoints and sequential views from routes. In each scenario considered, the magnitude of cumulative change to landscape character and views is the additional influence the Proposed Development has on the characteristics and character of the landscape type assuming the other wind farm schemes are already present.

5.2.30 Cumulative wind farm information will be gathered for all wind farms within the 20 km detailed study area and the cumulative LVIA will focus on wind farms with which there will be cumulative relationships which may give rise to significant effects. Considering the Site is adjacent to an existing cluster of operational and consented development and the

wider context of operational development, significant cumulative effects with other consented or proposed schemes beyond the 20 km detailed study area are unlikely.

- 5.2.31 Schemes in scoping will only be included by exception, at the reasonable request of consultees or where there is specific justification for doing so, and if sufficient information is available to make an informed assessment. Single turbines and those below 50 m to blade tip height will not be included in the assessment.
- 5.2.32 The final list of wind farms for inclusion in the cumulative assessment will be drawn up during the assessment process, so as to be as up-to-date as possible at the time of submission.

Residential Visual Amenity

- 5.2.33 A separate assessment of the effects on residential visual amenity will be undertaken as a standalone appendix/document. This will be undertaken in line with Landscape Institute Technical Guidance Note (TGN) 2/19: Residential Visual Amenity Assessment (RVAA) and will also consider the effects of any proposed visible aviation lighting. We propose a 2 km study area from the outermost turbines for the purposes of the RVAA, in line with the advice set out in the TGN.

Questions for Consultees

- Can it be confirmed that a 20 km detailed study area for the LVIA is considered to be appropriate?
- Are the proposed viewpoint locations considered to be suitable for the LVIA?
- Are the viewpoints proposed for night-time photomontages considered appropriate?
- Can it be confirmed that a Wild Land Assessment is not required?
- Can it be confirmed that the study area and outline parameters for the cumulative assessment are appropriate? Can it be confirmed that a 2 km study area is appropriate for the RVAA?

5.3 Ecology

Introduction

- 5.3.1 This section sets out the proposed approach to the assessment of potentially significant effects on ecology and biodiversity during construction and operation of the Proposed Development. This section focuses on the likely impacts of the Proposed Development on important ecological features or 'IEFs' (e.g., species and habitats of conservation concern and vulnerability to the range of potential effects of the Proposed Development). Potential effects on birds and their supporting habitats are considered in section 5.4 of this Scoping Report.
- 5.3.2 Some ecological desk study and survey work of the Site has been completed including a habitat survey completed in 2015 (based on a slightly different Site boundary to the current one), a bat activity survey (completed during 2021 and fish survey completed in October 2021). This information, along with publicly available information on species and habitats present / likely to be present and potentially impacted by the Proposed

Development, has been collated and reviewed to inform the proposed approach to the EIA process as set out in this report.

- 5.3.3 This section of the Scoping Report also considers the potential for statutory designated sites, of national and/or international importance for nature conservation, to be directly or indirectly affected by the Proposed Development. In relation to the legislation protecting Special Areas of Conservation (SACs), this is intended to inform the initial screening process by the competent authority for 'Likely Significant Effects' (LSE), alone and in combination with other plans or projects. This screening process will allow the competent authority to determine whether an Appropriate Assessment (AA) will be required.

Legislation, Policy and Guidance

- 5.3.4 The approach taken to this study (i.e., the scope and methods of ongoing/proposed surveys and the impacts assessment methods) draws on a range of guidance from a number of sources including guidance produced by government, statutory nature conservation organisations and available published scientific literature.
- 5.3.5 In addition to the relevant EIA regulations, consideration will also be given to the requirements of all other relevant legislation, directives and conventions.

Legislation

- 5.3.6 The following legislation will be taken into account in the proposed baseline survey and impact assessment.
- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the EC Habitats Directive);
 - Environmental Impact Assessment Directive 85/337/EEC (the EIA Directive);
 - The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (the EIA Regulations);
 - The Conservation of Habitats and Species Regulations 2010 (the Habitats Regulations), which transpose the Habitats Directive into UK law;
 - The Conservation (Natural Habitats, &c.) (Amendment) Regulations 2007;
 - The Conservation of Habitats and Species (Amendment) Regulations 2012, relating to reserved matters in Scotland;
 - Wildlife and Countryside Act (WCA) 1981 (as amended);
 - The Nature Conservation (Scotland) Act 2004;
 - The Wildlife and Natural Environment (Scotland) Act 2011; and
 - Protection of Badgers Act 1992 (as amended).

Policy

- 5.3.7 Relevant national and local authority planning policy (e.g., in relation to development and natural heritage, relevant Local and National Biodiversity policy) will also be taken into full consideration within the assessment, including the following:
- Scottish Executive (2006) Planning Advice Note 51: Planning, Environmental Protection and Regulation;
 - Scottish Executive (2006) Planning Advice Note 60: Planning for Natural Heritage;

- Scottish Executive (2000) Nature Conservation: Implementation in Scotland of the Habitats and Birds Directives: Scottish Executive Circular 6/1995 as amended (June 2000);
- Scottish Government (2014) Scottish Planning Policy;
- Scottish Government (2004) Scotland's Biodiversity: It's in Your Hands;
- Scottish Government (2013) 2020 Challenge for Scotland's Biodiversity;
- Edinburgh Declaration on post-2020 global biodiversity framework (August 2021); and
- Stirling Council (2018) Stirling Local Development Plan and supporting supplementary guidance SG: Wind Energy Developments (February 2019).

Guidance

5.3.8 Relevant guidance in relation to the implementation of the legislation and policy listed above will be taken into consideration along with best practice guidance for the EIA process. The following is a list of the key guidance documents, additional reference materials are cited in the survey methods section:

- Scottish Executive (2001, updated 2006) European protected species, development sites and the planning system: Interim guidance for local authorities on licensing arrangements. Scottish Executive, Edinburgh.
- CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester.
- Scottish Natural Heritage (2018) Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland (Version 5, April 2018).
- Scottish Environment Protection Agency (2014) Land Use Planning System Guidance Note 4: Planning guidance on windfarm developments (Version 7, 14 May 2014).
- Scottish Environment Protection Agency (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, 11 September 2017).
- Scottish Renewables, SNH, SEPA, Forestry Commission Scotland (2019) Good practice during windfarm construction (4th Edition).
- Scottish Natural Heritage (2019) Bats and onshore wind turbines: survey, assessment and mitigation.

Baseline

Study Area

5.3.9 The Site is located within the Gargunnoch Hills, which lie to the west of Stirling, on an elevated moorland plateau that ranges in altitude from c. 370 m to 485 m above sea level. There are two Scottish Water reservoirs (Earlsburn Reservoirs 1 and 2), which are adjacent to the southwestern boundary of the Site. The existing Earlsburn wind farm development is located to the south and west of the Site. There are several minor watercourses that drain the Site, most of which flow into the Earlsburn reservoirs. The

primary land uses, and management focus, within the Site are red grouse (*Lagopus lagopus scotica*) driven shooting and commercial conifer plantation forestry.

Designated Sites

- 5.3.10 The Site is not located within or adjacent to any statutory site designated for its ecological interest, for example any Special Area of Conservation or Site of Special Scientific Interest (see **Figure 5.3.2**).
- 5.3.11 The nearest Site of Special Scientific Interest (SSSI) designated for biological and geological interest is located c. 5km to the east of the Site. The Sauchie Craig Wood SSSI is designated for supporting one of the largest areas of mixed ash woodland in the Stirling area. This SSSI is situated on a limestone scarp beside Bannock Burn and includes several uncommon plant species within the ground flora.
- 5.3.12 Approximately 6 km to the southwest of the Site is the Endrick Water SSSI. The Endrick Water is of national and international importance for the populations of river lamprey (*Lampetra fluviatilis*) and brook lamprey (*L. planeri*) that the river supports. The Proposed Development would be located outside of the Endrick Water catchment.
- 5.3.13 There are no non-statutory designations within the Proposed Development area (i.e., where the wind turbines are likely to be located). Black Craig East Local Nature Conservation Site (LNCS) and Touch Hills LNCS (Stirling Council designated sites) are located partly within the Site boundary (see **Figure 5.3.2**).

Existing Baseline Conditions

- 5.3.14 The following is a brief summary of the habitats within the Site and information about key protected species based on surveys completed in the vicinity of the Site in 2015 (NB the survey was confined to the Touch Estate landholding) and 2021 by MBEC ecologists.

Broad Habitats

- 5.3.15 The proposed wind farm is largely situated within an extensive area of heath (*Calluna vulgaris*) blanket bog (primarily the National Vegetation Classification community M19 *Calluna vulgaris* – *Eriophorum vaginatum* blanket mire) with a mosaic of wet dwarf shrub heath communities. The southern end of the Site is within the Touchadam Muir conifer plantation, dominated by even-aged late thicket stage Sitka spruce (*Picea sitchensis*), which extends for several kilometres to the east of the Site. Some of the slopes within the Site support small patches of acid grassland and marshy grassland vegetation communities. There are also acid flush features within the Site. Some of these flushes and marshy grassland areas may also be Groundwater Dependent Terrestrial Ecosystems (GWDTEs).
- 5.3.16 There are several minor watercourses that arise within the broad ridge line within the Site and which flow south-west into the two Earlsburn reservoirs. Brown trout (*Salmo trutta*) are present in relatively low numbers within some of the watercourses within the Site and within the reservoirs (it is unknown if they are stocked).

Badger (*Meles meles*)

- 5.3.17 To date, no signs of badger have been found within the Site and habitat quality is relatively poor within the Site. The ground throughout the plantation area was on the whole very waterlogged and as such this area was assessed as unsuitable for the species, as there were very few areas where sett excavation would have been possible. Although drier areas of ground were present, they were found to be small and isolated.

Bats

- 5.3.18 The proposed wind farm site itself may be used for foraging although it is considered too elevated and exposed to attract high levels of bat activity. The coniferous plantation area may offer some roosting opportunities for bats, although most of the trees are at late thicket stage and lack suitable roost features, as well as foraging around the margins. The large waterbodies to the south and west of the Site are also likely to provide foraging opportunities for bats. There is a boat house near the southwestern shore of the northern Earlsburn reservoir, but it was considered to provide low potential as a bat roost site, along with the nearby mature trees. There is a private residential property on the southern shore of the southern Earlsburn reservoir, this building has not been assessed for its potential to support roosting bats. It is located over 1 km from the nearest proposed wind turbine and is therefore unlikely to be adversely affected by the Proposed Development should it be used by bats as a roost site.

Otter (*Lutra lutra*)

- 5.3.19 The minor watercourses within the survey area, as well as the two reservoirs, provide potentially suitable foraging habitat for otter and otters have been seen in along the shore of the Earlsburn Reservoirs. No confirmed otter holts, couches or lie-ups have been recorded within the Site.

Water vole (*Arvicola amphibius*)

- 5.3.20 There is suitable habitat for water vole within the Site. The majority of the minor watercourses are well vegetated, typically with rush and sedge species which provide some foraging habitat and cover. The bank substrate is predominantly peaty and suitable for water vole burrowing. No water vole burrows, or other evidence of the species, has been found within the Site to date.

Red Squirrel (*Sciurus vulgaris*)

- 5.3.21 There is the potential for red squirrel to be present within the area of coniferous plantation to the south-east of the Site. However, there was no evidence of the presence of squirrels recorded during the field surveys completed in woodland areas within the Site to date. The trees within the plantation are young, even-aged and dominated by Sitka spruce which provides poor foraging habitat for red squirrels.

Amphibians

- 5.3.22 There are no suitable breeding habitats for great crested newt (*Triturus cristatus*) within or adjacent to the Site. The reservoirs to the west of the Site are unsuitable for great crested newt, given their size and the presence of predators such as fish and wildfowl. It

is likely that common amphibian species, such as common frog (*Rana temporaria*) and toad (*Bufo bufo*) are present within suitable habitats across the Site.

Reptiles

- 5.3.23 The moorland area within the Site, in particular areas of dry heath and south-facing well-drained slopes, were considered to provide suitable basking habitat for reptiles, such as adder (*Vipera berus*) and common lizard (*Zootoca vivipara*). There are also a small number of rocky areas that could provide suitable refugia and hibernacula.

Freshwater Pearl Mussel (*Margaritifera margaritifera*)

- 5.3.24 No surveys for freshwater pearl mussel (FWPM) have been completed within the Site to date. No evidence of the presence of FWPM was noted during the electrofishing surveys completed during October 2021. There is a lack of suitable substrate within the small watercourses draining the Site and these watercourses are not physically accessible to migratory salmonids, such as salmon (*S. salar*) and sea trout, which reduces the availability of fry and parr². There is the potential for FWPM colonies to be present in the wider catchment downstream of the reservoirs.

Key Species & Habitats

- 5.3.25 Based on the preliminary desk study and surveys completed to date, the key species and sensitive habitats have been provisionally identified as follows:
- Blanket bog, dwarf shrub-heath and associated plant communities;
 - Waterbodies, in relation to otter and fish populations;
 - The woodland edge, watercourses and the two waterbodies as bat foraging habitat / commuting routes; and
 - Potential GWDTEs, possibly some areas of marshy grassland and spring/flush habitats.

Desk Study & Baseline Survey Methodologies

Introduction

- 5.3.26 The following provides a summary of the proposed desk study, baseline surveys, and methods that would be followed, to inform the design process of the Proposed Development and the EIA.
- 5.3.27 The survey methods will follow current best practice and are intended to be flexible with respect to emerging findings (e.g., allowing for more detailed surveys where initial work identifies the need).
- 5.3.28 The various areas referred to in this report are defined as follows:
- The 'wider study area' refers to the local surrounding area up to a maximum of 10 km from the 'red line boundary'.
 - The 'core study area' is defined as the red line boundary plus a 500 m wide buffer (see **Figure 5.3.1**).

² FWPM larvae (glochidia) can only complete their development on salmonid fry and parr.

- 5.3.29 Sensitive ecological features and all other protected species of conservation concern are considered within the core study area. Baseline habitat and protected species surveys will be completed within this area. Habitat and protected species survey will focus on the Proposed Development areas (shown indicatively on Figure 5.3.1) and include appropriate buffer zones up to 250 m wide, depending on the type of survey / focal species.

Desk Study

- 5.3.30 A full desk study will be undertaken to collate existing available information about habitats and protected species of conservation interest that may be present in the area. Requests for records of notable and protected species within and adjacent to the Site will be made to a range of organisations and individuals including the following:

- Forth Rivers Trust;
- Botanical Society of the British Isles vice county recorder;
- Butterfly Conservation;
- Forestry & Land Scotland;
- Biological Records Centre;
- Scottish Badgers; and
- Scottish Wildlife Trust.

- 5.3.31 The collated information from the desk study will be used to help inform, in combination with data from the baseline surveys, the windfarm design process as well as the assessment of effects of the Proposed Development

Habitats and GWDTE Surveys

- 5.3.32 All habitats within c. 250 m of the Proposed Development will be surveyed, described and categorised according to the Phase 1 habitat survey method set out by the Joint Nature Conservation Committee (JNCC 2010). A National Vegetation Classification (NVC) survey will be undertaken for habitats that are potential GWDTEs.

- 5.3.33 All habitat and botanical surveys would be completed by suitably experienced ecologists who have been trained in the fieldwork techniques and recording methods of each of the surveys they are undertaking. The key guidance and reference materials for these surveys are as follows:

- Atherton I., Bosanquet, S.D.S. & Lawley, M. (eds) (2010) Mosses and Liverworts of Britain and Ireland: A Field Guide. British Bryological Society, Plymouth.
- Averis, A., Averis, B., Birks, J., Horsfield, D., Thompson, D., & Yeo, M. (2004) An Illustrated Guide to British Upland Vegetation. Joint Nature Conservation Committee, Peterborough.
- JNCC (2010). Handbook for Phase 1 habitat survey - a technique for environmental audit. First published 1990; reprinted in 1993; reprinted in 2003 with limited revisions & additions; reprinted in 2004; reprinted in 2007 with minor additions; reprinted in 2010.
- Paton, J.A. (1999) The Liverwort Flora of the British Isles. Harley Books, Colchester, UK. Smith, A.J.E. (2004). The Moss Flora of Britain and Ireland, 2nd Edition. Cambridge University Press, Cambridge, UK.

- Rodwell, J.S. (ed.) (1991 - 2000) British Plant Communities. Volumes 1 - 5. Cambridge University Press, Cambridge, UK.
- Smith, A.J.E. (2004) The Moss Flora of Britain and Ireland, 2nd Edition. Cambridge University Press, Cambridge.
- Stace, C.A. (2019) New Flora of the British Isles, 4th Edition. Cambridge University Press, Cambridge, UK.

- 5.3.34 Target notes will be made during the Phase 1 habitat survey to provide further detail on factors such as habitat condition, vegetation composition and diversity, management effects, and the location of notable habitats and plant species stands too small to map.
- 5.3.35 The presence of any potentially important assemblages of non-vascular plants and lichens will also be noted. A full list of plant species recorded during the survey will also be produced. Scientific names used for vascular plants will follow those given in Stace (2019) and for non-vascular plants (mosses and liverworts) Atherton *et al.* (2010), Smith (2004) and Paton (1999).
- 5.3.36 Baseline survey methods will also enable the identification of any habitats considered to be GWDTEs which could be affected by the Proposed Development. GWDTEs are wetlands which critically depend on groundwater flows and/or chemistries that are considered sensitive to changes in groundwater flow and quality, particularly in response to earthworks associated with construction sites. GWDTEs are protected under the provisions of the Water Framework Directive (Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy). Habitats considered to be, or potentially to be, GWDTEs are listed in guidance produced by SEPA (2017).
- 5.3.37 NVC survey will be undertaken for all Phase 1 habitats that are potential GWDTEs and this information will be used to inform the design and assessment of the Proposed Development. Using field notes and quadrat data, the closest matching NVC community will be assigned using professional judgement, with reference to the descriptions in Rodwell (ed. 1991-2000) and keys in Averis *et al.* (2004). The NVC survey will provide more detail on the type and distribution of semi-natural vegetation communities that might be affected by the development and will identify sensitive habitats of conservation interest, including those considered to be moderately or highly groundwater dependant. In accordance with SEPA guidance (SEPA 2017) the mapped results of the NVC survey will be provided for all areas with 250 m of excavations over 1 m in depth and within 100 m of excavations less than 1 m in depth.
- 5.3.38 The potential ecological effects on such habitats (and relevant species of conservation concern supported by these habitats) from any appreciable perturbation to groundwater hydrology will be considered within the ecology chapter, with this assessment informed by the findings of the hydrology assessment.

Protected Species

- 5.3.39 Various surveys will be undertaken to systematically assess habitat suitability and presence or likely absence of a range of species which have enhanced legal protection in the UK. Surveys will be undertaken for badger, bat species, otter, red squirrel and water vole, and will follow current best practice guidance on relevant survey methods described in the following key literature:

- Badger - Neal, E. and Cheeseman, C. (1996) Badgers. T & A D Poyser Ltd, London; Andrews (2013) Badger sett classification method (In Practice, CIEEM);
- Bats - Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition), Bat Conservation Trust;
- Otter - Strachan, R. (2007). National survey of otter *Lutra lutra* distribution in Scotland 2003-04. Scottish Natural Heritage Commissioned Report No. 211;
- Red squirrel - Gurnell, J., Lurz, P., McDonald, R. and Pepper, H. (2009) Practical techniques for surveying and monitoring squirrels, Forestry Commission Technical Note, FCPN011; and
- Water vole - Strachan R., Moorhouse, T. and Gelling, M. (2011). Water Vole Conservation Handbook. Wildlife Conservation Research Unit.

- 5.3.40 A handheld Global Positioning System (GPS) would be used to record important features and any field signs to within approximately +/-6 m accuracy (although this could be greatly increased under a closed plantation canopy).
- 5.3.41 All surveys would be completed by suitably experienced ecologists who have been trained in fieldwork techniques and recording methods of each of the surveys they are undertaking.
- 5.3.42 A handheld GPS is used to record to within approximately ± 5 m accuracy (NB accuracy can much lower under forest canopy) any important features and field signs.

Badger

- 5.3.43 A walkover survey will be undertaken to search for and record any signs of badger or the presence of setts within the survey area as shown on Figure 5.3.1, focusing on habitats that are likely to support badger and which could be affected by the Proposed Development. Badger signs include paths, latrines, snuffle holes, guard hairs and footprints, which are described in Neal and Cheeseman (1996), Bang and Dahlström (2001) and SNH (2001). Setts are assessed for the current level of use and the number of entrance holes. Where possible, each sett is classified into one of four types: main, annexe, subsidiary and outlier, following approach set out by Andrews (2013).

Bats

- 5.3.44 Habitat suitability and an assessment of bat roost potential will be undertaken within the survey area (see Figure 5.3.1). The survey will consider all trees and buildings within at least 500 m of the Proposed Development. Potential bat roost features will be described and categorised following the methods set out in Collins (2016). Potential roost features on trees include large holes, splits and fissures in the trunk or main branches, standing deadwood, branch scars, bark slabs, and ivy cover. Consideration will be given in the assessment to the potential impacts on bats, including the risk of bat mortality from the wind turbines, from the proposed tree felling required to accommodate the construction and operation of the Proposed Development.
- 5.3.45 Bat activity surveys were undertaken in 2021 across the proposed Development Area following the approach recommended in SNH (2019). This survey involved the deployment of automated bat detectors at 15 locations across the Site (potential wind turbine locations based on an indicative layout) between April and August 2021, see Table 5.3.1 (the locations are shown on **Figure 5.3.1**). Data was collected for a minimum of 10 consecutive nights in each of three 'seasons' (spring, summer, late summer).

Table 5.3.1: Bat Activity Survey 2021 – Static Detector Locations

Location Ref.	Grid Reference	Broad Habitats
1	NS 69202 90914	Grass knoll in dense heather
3	NS 69970 91092	Open grass and heather
4	NS 69471 90395	Grass knoll in dense heather
5	NS 69895 90695	Open grass and heather
7	NS 69931 90336	Open calluna mire
8	NS 70352 90901	Near access track, edge of open calluna mire
9	NS 69988 90041	Open calluna mire
11	NS 70217 89733	Open calluna mire
13	NS 70823 90449	Open calluna mire
16	NS 70519 89392	Open calluna more, c. 30m west of minor watercourse
15	NS 70616 90036	Open calluna mire
17	NS 70829 89733	On fence line, edge of conifer plantation and open mire
20	NS 71196 89992	On fence line, edge of mire and young conifer plantation
21	NS 71301 89245	In small clearing within conifer plantation
24	NS 71870 89783	Edge of conifer plantation and open mire/heath

5.3.46 The results of the 2021 bat activity survey, following manual review of the automated bat pass species identification, will be processed using the Ecobat online tool (www.ecobat.org.uk), which was developed by the University of Exeter (Lintott *et al.* 2019) and is managed by the Mammal Society. This gives access to comparative database of bat activity survey results collected from similar areas (within 100 km of the Site) and at the same time of year (within 30 days) and in comparable weather conditions. Ecobat generates a percentile rank (and associated confidence limits) for each night where bat activity was recorded against a reference range and is used to inform an assessment of risk to bats from the Proposed Development (i.e., wind turbine mortality) and appropriate mitigation strategies.

Otter

5.3.47 Surveys will be undertaken along the watercourses and waterbodies that have the potential to be affected by the Proposed Development. Any signs of otter and potential / confirmed resting sites (holts, lie-ups) will be searched for described and recorded. Otter field signs including spraints, prints, feeding remains, as described in Bang and Dahlstrøm (2001) and Sargent and Morris (2003) will be recorded.

Red Squirrel

5.3.48 Signs of squirrel presence will be searched for along walked transects within areas of woodland within the survey area. This survey would follow the method outlined in Gurnell

et al. (2009). Hair tube surveys would not be undertaken unless evidence of squirrels is found and there is then a need to identify which species are present.

Water Vole

- 5.3.49 Within the survey area, all suitable watercourses, including ditches and other features with the potential to support water vole and which could be affected by the Proposed Development, will be surveyed following the method detailed in Strachan *et al.* (2011). All signs of the presence of water vole, e.g., latrines, burrows, feeding stations, nests and footprints will be seared for and recorded.

Reptiles & Amphibians

- 5.3.50 No formal survey for reptiles and amphibians is proposed. However, any sightings or signs during other walkover surveys will be recorded. There is no suitable breeding habitat for great crested newt within the Site.

Fish & Aquatic Habitats

- 5.3.51 Some fish population and habitat surveys were completed on three watercourses by Firth Rivers Trust (FRT) in October 2021 (the survey locations are shown on **Figure 5.3.1**). This survey recorded the presence of brown trout on two of the watercourses. Habitats in these watercourses were assessed to be of excellent quality and likely to support healthy fish communities. Other species of conservation interest were not found during the survey i.e., European eel (*Anguilla anguilla*), lamprey species or freshwater pearl mussel. Further fish population surveys are therefore not considered to be necessary to inform the EIA for the Proposed Development.
- 5.3.52 The presence of spawning and juvenile brown trout within these watercourses will be considered a constraint in the design of the Proposed Development. All watercourses will be protected with a minimum 50 m wide buffer zone and the number of new crossing points required will be kept to the minimum necessary. Appropriate, best practice measures will be proposed to ensure that potential construction and tree felling related adverse effects on fish and the aquatic environmental are avoided and otherwise minimised and mitigated. These measures will be discussed with FRT, the Forth District Salmon Fishery Board, SEPA and Marine Scotland.

Other Protected / Notable Species

- 5.3.53 A detailed desk study will be completed to determine if there are any existing records of specially protected and/or notable species (e.g., national or regional rarities or other species of high conservation concern) within or near to the Site. In addition to FRT, the Forth District Salmon Fishery Board, SEPA and Marine Scotland, other organisations such as Scottish Wildlife Trust, Scottish Badgers and The Wildlife Information Centre will be contacted as part of this process.

Assessment of Environmental Impacts and their Significance

Potential Impacts

- 5.3.54 The potential significant effects on ecological features arising from a wind farm development can be broadly summarised as follows:
- Loss and degradation of sensitive habitats of biodiversity/nature conservation importance as a result of construction/decommissioning the temporary and permanent structures, access tracks and borrow pits;
 - Risk of pollution to the aquatic environment, particularly during tree felling and construction works, associated potential effects on fish populations and their habitats;
 - Effects on sensitive fauna arising from disturbance to and displacement from supporting habitats, during construction/ site decommissioning works and wind farm operation; and
 - Mortality from operating wind turbines for bat species, potentially adversely affecting population conservation status.
- 5.3.55 The potential for cumulative impacts with other projects will also be assessed where relevant. For (non-avian) ecological features, cumulative impacts are only likely to be important within the same hydrological catchment(s) or within the regular range of more mobile species, e.g., bats. The cumulative assessment will include consideration of operational projects; projects under construction; consented projects which are not yet under construction; and projects for which planning applications have been submitted and for which ecological impact assessment information is available.

Design Considerations

- 5.3.56 As well as helping to inform the EIA process the results of the proposed baseline surveys and desk study will also be used to determine key constraints for the windfarm design process. For example, the vegetation surveys will provide data to identify sensitive habitats, including GWDTEs, that should be avoided where possible. Buffer zone sizes, required to protect the local hydrological regime supporting the habitat, will vary depending on a range of factors including the extent and depth of proposed excavation. Recommended buffer zones will be determined in alongside the hydrology and hydrogeology constraints and included as part of any necessary mitigation.
- 5.3.57 Protected species resting sites (e.g., badger setts, otter holts, bat roosts) will be avoided with appropriate buffer zones. Where this is not achievable, appropriate best practice mitigation measures will be proposed and the potential effects of the loss or disturbance to such sites fully considered in the EIA and in accordance with the legislation protecting the species.
- 5.3.58 In relation to reducing bat mortality risk from the operational wind farm, minimum buffer zones around existing or proposed woodland edges and waterbodies will be proposed and will comply with current best practice guidance.

Important Ecological Features

- 5.3.59 Focus will be given in the impact assessment to potential effects on IOFs, i.e., sensitive habitats and protected species that are of relatively high conservation importance and/or

subject to special legal protection that are known to the present, or potentially present, in the region. These include:

- Habitats listed on Annex I of Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora and those identified within the local Biodiversity Action Plan, the Scottish Biodiversity Strategy;
- Non-avian fauna with special legal protection, for example, through their inclusion on Schedule 2 of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) or Schedule 5 of the Wildlife & Countryside Act 1981 (as amended); and
- Non-avian fauna which are identified within the local Biodiversity Action Plan or Scottish Biodiversity Strategy as requiring special conservation measures and which are also considered to be vulnerable to impacts from the Proposed Development.

5.3.60 Any wetland habitats considered to be moderately or highly groundwater dependant (GWDTEs) will be identified through the NVC survey and potential impacts on these habitats from changes to local hydrology, because of the construction of the wind farm, will be reported in the Hydrology chapter of the EIAR and considered in the Ecology assessment.

5.3.61 Based on the desk study and ecology surveys completed to date the habitats that would be IEFs for the assessment, and also constraints to be considered during the design process, have been identified as follows:

- Areas of blanket bog;
- Soligenous mires springs and flushes;
- Swamps and fens;
- Localised areas of species-rich unimproved grassland;
- All watercourses and natural lochans/pools;
- Broadleaved woodland and scattered broadleaved trees (also as potential bat roost habitats);
- Woodland edges and watercourses as bat commuting routes; and
- Any moderate to highly groundwater dependent habitats (GWDTEs).

5.3.62 Based on the desk study and surveys completed to date, the non-avian species that will be a focus for the assessment are as follows:

- Badger;
- Bats;
- Fish and aquatic habitats;
- Otter; and
- Red squirrel.

Assessment Methods

5.3.63 A summary description of the existing baseline ecological interest of the study area will be included in the ecology chapter of the EIAR, along with the assessment of the potential effects of the Proposed Development on the identified ecological features. Detailed technical description and discussion of the baseline data will be provided in separate technical appendices to the EIAR. Any survey limitations and data gaps or uncertainties will be discussed and appropriately addressed in the EIA following current best practice.

- 5.3.64 The nature conservation value / sensitivity of the features will be assessed using current best practice EIA methodology (e.g., in agreement with relevant and current CIEEM guidance). The evaluations and effect assessments will be undertaken based on the field survey information collated, augmented with information available from the desk study.
- 5.3.65 The EIA will be carried out using a set of standardised 'effect categories' that describe the scales at which an effect can occur and its subsequent effect(s) and significance. These effect categories have been developed following best practice guidance, professional judgement and practitioner experience of the EIA process. The likely effects that the Proposed Development (construction and operation) would have on the IOFs will be assessed for their potential to be significant and all relevant limitations and uncertainties discussed and accounted for in the assessment (e.g., assuming realistic worst case where there is uncertainty about the potential magnitude of an effect or efficacy of a proposed mitigation measure).
- 5.3.66 Any mitigation measures required to offset or reduce identified effects will be described and assessed along with any recommendations for ecological enhancement (e.g., habitat enhancement / creation proposals to help offset any potentially significant effects on sensitive habitats and species).
- 5.3.67 Any sensitive data (e.g., badger sett locations) will be included in a confidential annex to the EIAR which will be issued to Stirling Council, NatureScot and the ECU only and will not be made publicly available.

Approach to Mitigation

- 5.3.68 Where the potential for significant adverse effects is identified then mitigation measures will be considered and developed, where feasible, to reduce effect severity. Mitigation measures are actions to prevent, reduce or compensate for adverse effects on ecological features. This might include alternative construction methods, the timing of works, habitat enhancement or creation. In some cases, mitigation measures may also be specified where effects are not considered to be significant as part of a best practice approach to development.
- 5.3.69 In relation to wind farm development, appreciable reduction or avoidance in potential impacts can often be achieved by taking into consideration data on ecological constraints from Site surveys and other sources through the design process (this may also include the detailed design stage prior to construction). Where it is not possible to avoid effects on sensitive features through design, alternative suitable mitigation measures will be proposed where possible. The appropriate measures will vary depending on the focal habitat or species. In general terms, options that can be considered include changes to the operation of the development to reduce adverse effects or the creation or enhancement of habitats outside of the zone of effect of the proposed wind farm (where this land is under the control of the Applicant) to compensate for losses or reduction in habitat quality because of the construction and/or operation of the windfarm. In relation to construction, it may also be appropriate to commit to undertaking certain works outside of sensitive periods to avoid (or greatly reduce) the potential adverse effects on sensitive species.

Matters Scoped Out

- 5.3.70 Given the Site location, physical separation from, and lack of connectivity to, any SACs in the wider surrounding area, there is considered to be no potential for LSE in relation to any SACs. Therefore, no further consideration in the EIAR, for example special studies to help inform Appropriate Assessments by the Competent Authority under the relevant provisions of the Habitats Regulations (1994, as amended), are deemed necessary in this case.
- 5.3.71 No adverse effects from the Proposed Development are possible for the Sauchie Craig Wood SSSI or the Endrick Water SSSI. These designations and their qualifying features will not be considered in the EIAR.
- 5.3.72 Based on desk study and survey findings to date, the assessment will not consider in detail potential effects on terrestrial invertebrates or amphibian species including great crested newt.

Questions for Consultees

- Are the proposed survey methods and survey effort, taking into consideration the location and extents of the Proposed Development, considered to be sufficient to inform the EIAR?
- Is the consultee aware of any habitats or species of conservation concern that have not been mentioned and may require consideration in the EIAR?
- Any other information requirements, potential effects or assessments not mentioned in the Scoping Report?
- Are there any other organisations that should be contacted in addition to the list at 5.3.30?

5.4 Ornithology

Introduction

- 5.4.1 This section sets out the proposed approach to the assessment of potentially significant effects on ornithological interests during construction and operation of the Proposed Development. This section focuses on the likely impacts of the Proposed Development on Important Ornithological Features or 'IOFs' (e.g., populations of bird species of conservation concern, and their supporting habitats, and vulnerability to the range of potential effects of the Proposed Development). Potential effects on non-avian fauna are considered in section 5.3 of this Scoping Report.
- 5.4.2 Some ornithological desk study and survey work has been completed, including breeding bird surveys and flight activity surveys completed in 2014-15 for an earlier proposal that was confined to the Touch Estate. More recently, breeding bird surveys based on the Site of the current Proposed Development were completed in 2021 and will be repeated in 2022. Also, bird flight activity surveys commenced in September 2020 and are on-going, due to be completed in August 2022). This information, along with publicly available information on species and habitats present / likely to be present and potentially impacted by the Proposed Development, has been collated and reviewed to inform the proposed approach to the EIA process as set out in this report.

5.4.3 This section of the Scoping Report also considers the potential for statutory designated sites, of national and/or international importance for birds, to be directly or indirectly affected by the Proposed Development. In relation to the legislation protecting Special Protection Areas (SPAs), this is intended to inform the initial screening process by the competent authority for LSE, alone and in combination with other plans or projects. This screening process will allow the competent authority to determine whether an Appropriate AA will be required.

Legislation, Policy and Guidance

5.4.4 The approach taken to this study (i.e., the scope and methods of ongoing/proposed surveys and the impacts assessment methods) draws on a range of guidance from a number of sources including guidance produced by government, statutory nature conservation organisations and available published scientific literature.

5.4.5 In addition to the relevant EIA regulations, consideration will also be given to the requirements of all other relevant legislation, directives and conventions. The following will be taken into account in the proposed baseline survey and impact assessment.

Legislation

- The Convention for the Conservation of European Wildlife and Natural Habitat (The Bern Convention) 1979;
- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the EC Habitats Directive);
- Council Directive 2009/147/EC on the conservation of wild birds (codified version of the 'Birds Directive');
- Environmental Impact Assessment Directive 85/337/EEC (the EIA Directive);
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (the EIA Regulations);
- The Conservation of Habitats and Species Regulations 2010 (the Habitats Regulations), which transpose the Habitats Directive into UK law;
- The Conservation (Natural Habitats, &c.) (Amendment) Regulations 2007;
- The Conservation of Habitats and Species (Amendment) Regulations 2012, relating to reserved matters in Scotland;
- Wildlife and Countryside Act (WCA) 1981 (as amended);
- The Nature Conservation (Scotland) Act 2004;
- The Wildlife and Natural Environment (Scotland) Act 2011.

Policy

5.4.6 Relevant national and local authority planning policy (e.g., in relation to development and natural heritage, relevant Local and National Biodiversity policy) will also be taken into full consideration within the assessment, including the following:

- Scottish Executive (2006) Planning Advice Note 51: Planning, Environmental Protection and Regulation;
- Scottish Executive (2006) Planning Advice Note 60: Planning for Natural Heritage;

- Scottish Executive (2000) Nature Conservation: Implementation in Scotland of the Habitats and Birds Directives: Scottish Executive Circular 6/1995 as amended (June 2000);
- Scottish Government (2014) Scottish Planning Policy;
- Scottish Government (2004) Scotland's Biodiversity: It's in Your Hands;
- Scottish Government (2013) 2020 Challenge for Scotland's Biodiversity;
- Edinburgh Declaration on post-2020 global biodiversity framework (August 2021); and
- Stirling Council (2018) Stirling Local Development Plan and supporting supplementary guidance SG: Wind Energy Developments (February 2019).

Guidance

5.4.7 Relevant guidance in relation to the implementation of the legislation and policy listed above will be taken into consideration along with best practice guidance for the EIA process. The following is a list of the key guidance documents, any additional reference materials are cited in the survey methods section:

- CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester.
- Scottish Natural Heritage (2018) Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland (Version 5, April 2018).
- SNH (2018) Assessing Significance of Impacts from Onshore Wind Farms Outwith Designated Areas;
- SNH (2016) Guidance on Assessing Connectivity with Special Protection Areas;
- SNH (2018) Assessing the cumulative impacts of onshore wind farms on birds;
- Natural Heritage Zones Bird Population Estimates. SWBSG Commissioned Report Number: 1504 (British Trust for Ornithology 2015);
- SNH (2000) Wind farm impacts on birds - calculating a theoretical collision risk assuming no avoiding action;
- SNH (2018) Avoidance rates for the onshore windfarm collision risk model;
- SNH (2014) Wind farm impacts on birds - flight speeds and biometrics for collision risk modelling;
- SNH (2007) A review of disturbance distances in selected bird species;
- SNH (2016) Environmental statements and annexes of environmentally sensitive bird information;
- SNH (2020) Information note - the effect of aviation obstruction lighting on birds at wind turbines, communication towers and other structures; and
- SNH (2016) Dealing with construction and birds.

5.4.8 Consideration will also be given to the potential implications of the Proposed Development for all relevant national and local nature conservation policies and for key species highlighted for conservation action in national and local biodiversity action plans.

Baseline

Study Area

- 5.4.9 The Site (i.e., the red line boundary as shown on **Figure 5.3.2**) is located within the Gargunnock Hills, which lie to the west of Stirling, on an elevated moorland plateau that ranges in altitude from c. 370m to 485m above sea level. There are two Scottish Water reservoirs (Earlsburn Reservoirs 1 and 2), which are adjacent to the southwestern boundary of the Site. The existing Earlsburn wind farm development is located to the south and west of the Site. There are several minor watercourses that drain the Site, most of which flow into the Earlsburn reservoirs. The primary land uses, and management focus, within the Site are red grouse (*Lagopus lagopus scotica*) driven shooting and commercial conifer plantation forestry.

Designated Sites

- 5.4.10 The Site is not located within or adjacent to any statutory site designated solely, or in part, for its ornithological interest, for example any Special Protection Area or Site of Special Scientific Interest (see **Figure 5.3.2**).
- 5.4.11 The nearest statutory designated site for ornithological interest is Firth of Forth SPA and Ramsar Site, located c. 15km to the east of the Site. The Firth of Forth SPA is designated for a wide range of bird species listed on Annex I of the EC Birds Directive whose wintering populations associated with the Firth of Forth exceed national and international levels of importance. Additionally, the Firth of Forth is also designated for the importance of the populations of migratory and wintering wildfowl that the area supports.
- 5.4.12 There are no non-statutory designations within the Proposed Development area (i.e., where the wind turbines are likely to be located). Black Craig East LNCS and Touch Hills LNCS (Stirling Council designated sites) are located partly within the Site boundary (see **Figure 5.3.2**).

Existing Baseline Conditions

- 5.4.13 The following is a summary of the bird species of conservation concern recorded within or near to the Site based on surveys completed by MBEC in 2014-15 and 2020-21. Bird surveys are currently on-going and are due to be completed in August 2022, which will provide 2 years of current baseline data to inform the design of the Proposed Development and the EIA process. The breeding bird survey areas and vantage point locations (for the flight activity survey) are shown on **Figures 5.4.1** and **5.4.2**.

Nearby wind farms

- 5.4.14 The Site is located near to several operational wind farms, the closest being Earlsburn wind farm (15 turbines), and the Earlsburn (North) Extension (9 turbines), which is located to the immediate west and southwest and Craigengelt wind farm (8 turbines), which is c. 2km to the south of the Site.
- 5.4.15 The Environmental Statement (ES) for Earlsburn North provided a summary of the results of baseline ornithological surveys carried out on this wind farm site, to the west of the Proposed Development, during 2006-07. The results of the breeding bird survey

confirmed breeding pairs of short-eared owl (*Asio flammeus*), curlew (*Numenius arquata*), common sandpiper (*Actitis hypoleucos*) and common snipe (*Gallinago gallinago*).

- 5.4.16 Black grouse (*Lyrurus tetrix*) surveys revealed three lek sites, one of which had a peak count of 13 males. The location of the black grouse activity was not given in the ES but based on information from the landowner it is thought to be outside of the area of interest for the Earlsburn Extension proposal. Surveys completed by MBEC in 2014-15 and 2021-22 have not found any evidence of the presence of lekking black grouse within the survey area for the Proposed Development (see Figure 5.4.1).
- 5.4.17 During the surveys for Earlsburn wind farm, flight activity by several scarce raptor species was recorded including red kite (*Milvus milvus*), hen harrier (*Circus cyaneus*), osprey (*Pandion haliaetus*) and peregrine falcon (*Falco peregrinus*). The species assessed as being at the highest risk of collision for the wind farm were red kite and osprey.

Bird Flight Activity

- 5.4.18 The flight activity surveys completed to date (autumn 2020 to spring 2022) indicate use of the Site by various species of conservation concern and vulnerability to the impacts of onshore wind farm development including red kite, hen harrier and osprey. The open moorland areas within the area where wind turbines area proposed has been used by hen harrier for hunting and there have been occasional commuting flights by osprey across to and from the upper Earlsburn Reservoir (which is a foraging loch by ospreys breeding in the wider surrounding area). Red kite is regularly recorded hunting within the Site and surrounding area.
- 5.4.19 To date there has been no evidence of regular flight activity across the Site by migratory or wintering geese and swans. Small numbers of greylag geese (*Anser anser*) have been recorded using the Earlsburn reservoirs. These birds are thought to be a semi-resident flock (c. 20-30 birds) and not part of the migratory Icelandic population.

Breeding Birds

- 5.4.20 The Site supports relatively few breeding moorland bird species of conservation interest. In terms of breeding moorland waders, a single curlew territory was recorded within the northern part of the Site in 2014. Common snipe regularly breeds within the Site and common sandpiper along the shoreline of the adjacent reservoirs. Otherwise, the Site supports a typical suite of common moorland and woodland passerines.
- 5.4.21 Despite the presence of suitable habitats, to date, there has been no evidence of a population of breeding black grouse within the Site or surrounding survey area.
- 5.4.22 During the 2014-15 or 2021 surveys there was no evidence of breeding attempts by any Schedule 1/Annex I raptor species (e.g., hen harrier, merlin, red kite, peregrine, short-eared owl) in the core or wider survey areas. During the flight activity surveys, completed to date, hen harrier has been mostly recorded using the Site outside of the main breeding period. There was some evidence of breeding activity by short-eared owl during 2020 but a full survey was not completed in 2020 due to the Covid-19 pandemic restrictions. Breeding activity by this species tends to be rather sporadic and nomadic, being strongly influenced by the natural population cycles in their preferred small mammal prey.

Goshawk, a species that is occasionally seen within the survey area, is suspected to breed in the wider surrounding area.

- 5.4.23 Another raptor species of conservation concern that have been recorded using the Site regularly is common kestrel (*Falco tinnunculus*). Breeding is suspected to occur the wider area rather than within the Site. There is also some evidence of a pair of long-eared owl (*Asio otus*) breeding within the area.

Wildfowl

- 5.4.24 No significant numbers of any passage or wintering wild geese or swan species such as pink-footed goose (*Anser brachyrhynchus*) or whooper swan (*Cygnus cygnus*) have been recorded passing over the Site or using the nearby reservoirs during the autumn, winter or spring. There is a small population of resident greylag geese present in the area that use the Earlsburn Reservoirs. Small numbers of mallard (*Anas platyrhynchos*) use the upper and lower reservoirs. Widgeon (*Anas penelope*), teal (*Anas crecca*), goosander (*Mergus merganser*) and Canada goose (*Branta canadensis*) have also been recorded, either singly or in small groups.

Key Species of Interest

- 5.4.25 Based on the desk study and surveys completed to date, the key species of interest for the ornithological impact assessment have been provisionally identified as follows:
- Osprey - flight activity with respect to collision risk for birds commuting to and from the upper Earlsburn reservoir and the potential for displacement / barrier effects restricting access to this foraging site;
 - Hen harrier - with respect to collision risk and potential displacement from foraging habitats; and
 - Red kite - activity near to the proposed wind farm with respect to collision risk.

Survey Methodology

Desk Study and Consultations

- 5.4.26 A desk study will be undertaken to collate available ornithological data for the study area from a range of sources. In addition to this, several organisations will be contacted with requests for ornithological data relevant to the proposed wind farm site and the surrounding study area including:
- The Royal Society for the Protection of Birds (RSPB);
 - Central Scotland Raptor Study Group;
 - British Trust for Ornithology;
 - Wildfowl & Wetlands Trust; and
 - Scottish Ornithologists' Club local recorder.
- 5.4.27 The information collated from the desk study will be used to help inform, in combination with data from the baseline surveys, the wind farm design process as well as the assessment of effects of the Proposed Development.
- 5.4.28 Where available, the results of bird surveys completed for other proposed wind farms in the area will be reviewed and referred to, where relevant, during the EIA process.

5.4.29 The 2020-22 survey results (see below) will be the primary baseline dataset for the EIA but surveys completed during 2014-15 by MBEC for an earlier iteration of the Proposed Development which did not progress to planning applications stage will also be taken into consideration.

Baseline Survey Methods

5.4.30 Baseline ornithological surveys are being carried out to assess the use of all habitats within the Proposed Development area and surrounding survey area by breeding and non-breeding birds with a particular focus on species that are potentially sensitive to wind farm development and are also of conservation concern (i.e., species listed on Annex I of the EC Birds Directives, Schedule 1 of the Wildlife and Countryside Act 1981, species on the UK Red List of birds of conservation concern).

5.4.31 All surveys will be undertaken by suitably experienced ornithological surveyors trained in the detailed field and recording methods of each of the surveys undertaken. All surveys will follow methods set out in current NatureScot guidance (i.e., 'Recommended bird survey methods to inform impact assessment of onshore wind farms, March 2017'). Other key references for survey methods include the following:

- Brown, A.F. and Shepherd, K.B. (1993) A method for censusing upland breeding waders. *Bird Study*. 40: 189-195.
- Gilbert, G., Gibbons, D.W. and Evans, J. (1998) *Bird Monitoring Methods*. Royal Society for the Protection of Birds, Sandy, Bedfordshire.
- Hardey, J., Crick, H.Q.P., Wernham, C.V., Riley, H.T., Etheridge, B. and Thompson, D.B.A. (2013). *Raptors: a Field Guide to Survey and Monitoring* (3rd Edition). The Stationary Office, Edinburgh.
- Marchant, J.H. (1983). *Common Birds Census Instructions*. British Trust for Ornithology, Tring.

5.4.32 The survey areas referred to within this report are illustrated on **Figure 5.4.1** and are based on the indicative Proposed Development area (i.e., where the wind turbines are likely to be located).

5.4.33 A suite of ornithological surveys will be completed to inform the design and assessment of the Proposed Development. In summary, the following surveys have been completed or are ongoing:

- Bird Flight Activity Surveys, 36 hours of observation per season from each VP (see Figure 5.4.2), to systematically quantify the use of the Site by key species between September 2020 and August 2022;
- Breeding Bird Surveys: a range of surveys completed to determine the presence and approximate location of breeding territories/sites within the core and wider survey areas, including the following:
 - Moorland and woodland breeding bird surveys of the core survey area during April to July of 2021 and 2022;
 - Breeding raptor surveys, focusing on species listed on Schedule 1 of the Wildlife & Countryside Act 1981, within suitable habitats in the raptor survey area during 2021 and 2022; and
 - Black grouse reconnaissance and lek surveys in spring of 2021 and 2022 within the black grouse survey area.

- 5.4.34 Winter waterfowl surveys to assess the use of the Site by passage and wintering swans and geese through regular counts of waterbodies and the use of any fields in the survey area for grazing. These surveys commenced in September 2020 and are ongoing.

Flight Activity Surveys

- 5.4.35 The aim of the flight activity surveys is to record the use of the development site by all birds of conservation concern (breeding and non-breeding). Use by key sensitive species of different parts of the study area and the proportion of time that they spend flying at different elevations relative to the potential turbine blade swept height is the primary focus of the survey. The data is used to determine any apparent flight corridors and areas of relatively high activity, in order to inform an estimate of potential collision risk, displacement and disturbance impacts and to inform the wind farm design process.
- 5.4.36 During flight activity surveys, surveyors preferentially monitor activity by more sensitive species/groups, with species divided into three groups in descending order of sensitivity, as follows:
- Target Species / Groups: All wildfowl (e.g., whooper swan, greylag goose, pink-footed goose), hen harrier, osprey, red kite, merlin, peregrine, short-eared owl, curlew, golden plover, black grouse; and
 - Secondary Species / Groups: All other raptor and wader species apart from common buzzard.
- 5.4.37 Time budget information on bird flight activity is collected during watches from two fixed, strategically located vantage points (VP). The VP locations were carefully selected to ensure good visual coverage of the proposed wind turbine area (see Figure 5.4.2).
- 5.4.38 A total of 144 hours of observation is intended to be completed from each VP for the 24-month survey period, at c. 6-9 hours per month. Based on an initial desk study and the findings from surveys completed during autumn/spring (2014, 2020-21) the need for additional survey effort during the autumn and spring passage periods is not considered to be necessary to inform a future impact assessment for this proposal.
- 5.4.39 VP watches will continue to be undertaken between sunrise and sunset (with watches timed to achieve an even spread throughout the hours of daylight) by a single observer in conditions of good ground visibility (> 2 km) and when the cloud base is at least 500m higher than the most elevated ground observed.

Moorland Breeding Bird Survey

- 5.4.40 All the open moorland habitats within the survey area will be subjected to a moorland breeding bird survey, following a method derived from the Brown & Shepherd (1993) constant search method for surveying upland waders. Four visits are undertaken (April to mid-July) about one month apart. A defined route is walked around the survey area, ensuring that all open areas are approached to within 100 m.
- 5.4.41 Surveys are not undertaken in unsuitable weather conditions (that is, cold, wet and/or wind speed greater than Beaufort force 3) and are completed between 0600 and 1730 BST. Observations of waders (and all other birds apart from common moorland songbirds) are recorded on a 1:10,000 scale map using standard Common Birds Census recording codes and symbols (Marchant 1983).

5.4.42 Emphasis is placed on mapping the locations of birds exhibiting breeding behaviour, such as:

- Birds observed displaying or singing;
- Nests, eggs or young are located;
- Adults repeatedly alarm call;
- Birds are seen carrying food to nest or young;
- Distraction displays are seen; and
- Territorial disputes are seen.

5.4.43 Distance to the registration, the location of birds exhibiting any of these behaviours, or the location of any nests or eggs encountered, is estimated and marked on a 1:10,000 scale maps of the survey area. Following completion of the surveys, the breeding registrations are collated and a final map showing the location of breeding territories or nests. Various standardised criteria are used to assign observations recorded on different visits to the same or different pair/territory.

Woodland Breeding Birds

5.4.44 The woodland edge on the southern side of the survey area was surveyed as part of the moorland bird survey (see above).

5.4.45 A survey for breeding tawny owl (*Strix aluco*) and long-eared owl will be completed following the methods detailed in Gilbert *et al.* (1998) and Hardey *et al.* (2013). The Site and immediate surrounding area are considered sub-optimal for barn owl (*Tyto alba*).

Breeding Raptor Surveys

5.4.46 Surveys to determine the presence and status of raptor species will be carried out (focusing on Schedule 1 species) over, up to, four visits between March and July 2021 and 2022. Survey methods follow the relevant species-specific approaches detailed Hardey *et al.* (2013). The raptor survey effort is concentrated in areas of suitable breeding habitat and may extend up to 2 km from the Proposed Development for some species.

5.4.47 At the end of the survey all breeding records are collated and assigned an appropriate category (e.g., possible, probable, confirmed) and as accurately mapped as possible following the species-specific approaches detailed in Hardey *et al.* (2013).

Black Grouse Survey

5.4.48 Surveys to determine the presence and use of the study area by black grouse have been (during 2021) and will continue to be carried out during spring 2022 following the methodology detailed in Gilbert *et al.* (1998). This survey initially involves a daytime reconnaissance visit to the survey area to identify any potentially suitable habitats, focusing on potential lek sites. Following this, two repeat visits are completed, timed for one hour before to one hour after sunrise, to listen for / observe and count peak numbers of birds attending leks.

Waterbody Survey

5.4.49 Waterbody counts, following the Wetland Bird Survey methodology set out in Gilbert *et al.* (1998) have been completed approximately twice per month for the upper and lower

Earlsburn Reservoirs, to the west of the proposed wind farm site between September 2020 and will continue until August 2022.

Assessment of Environmental Impacts and their Significance

Potential Impacts

- 5.4.50 The potential effects on ornithological receptors arising from a wind farm development can be broadly summarised as follows:
- Construction
 - Short-term disturbance and displacement
 - Indirect effects e.g., disruption to habitat function, effects on prey
 - Operation
 - Collision with the turbines
 - Disturbance and displacement
 - Barrier effects causing disruption of flight routes
 - Indirect effects e.g., disruption to habitat function, effects on prey
 - Decommissioning
 - Short-term disturbance and displacement.
- 5.4.51 Potential effects arising from tree felling to accommodate the wind farm and any proposed changes to existing forest felling plans and management (also consideration of any interactions from felling and forest management on other effects as listed above) will also be fully considered in the assessment.

Evaluation and Impact Assessment

Important Ornithological Features

- 5.4.52 Focus will be given in the assessment to bird species whose populations are of conservation concern (in a regional, national or international context), that are subject to specific legal protection, and that are considered to be particularly vulnerable to impacts from wind farm development, these include:
- Bird species of conservation concern listed on Annex I of European Council Directive 2009/147/EC on the Conservation of Wild Birds, in particular those that may be associated with populations of species that are qualifying interests of Special Protection Areas in the wider region;
 - Bird species listed in Schedule 1 to the Wildlife and Countryside Act 1981 (as amended); and
 - Bird species of national or regional conservation concern, not included within the above categories, but that are present within the study area in nationally or regionally important numbers and are sensitive to the potential impacts of the Proposed Development.
- 5.4.53 **Table 5.4.1** provides a list of the species that are likely to be the focus of the impact assessment (i.e., as important ornithological features). These species have been selected based on the results of surveys completed to date, their conservation status / relative rarity of their populations, potential vulnerability to the impacts of onshore wind farm development, the suitability of habitats within the study area and their breeding /

wintering ranges (i.e., the likelihood of the species being present in the study area). This table also includes a summary of the current conservation status, nature conservation policy and legal designations for each species.

Table 5.4.1: Key Bird Species their Conservation Status and other Relevant Designations

Common Name	Scientific Name	UK BoCC Status ⁱ	Taxon Designations
Greylag goose	<i>Anser anser</i>	Amber	CMS App. 2 ⁱⁱ
Pink-footed goose	<i>Anser brachyrhynchus</i>	Amber	CMS App. 2 ⁱⁱ
Whooper swan	<i>Cygnus cygnus</i>	Amber	Ann. I ⁱⁱⁱ , Sch. 1 ^{iv} , SBL ^v
Black grouse	<i>Lyrurus tetrix</i>	Red	SBL ^v , UK BAP ^{vi}
Osprey	<i>Pandion haliaetus</i>	Amber	Ann. I ⁱⁱⁱ , Sch. 1 ^{iv} , SBL ^v
Goshawk	<i>Accipiter gentilis</i>	Green	Sch. 1 ^{iv} , CMS App. 2 ⁱⁱ
Hen harrier	<i>Circus cyaneus</i>	Red	Ann. I ⁱⁱⁱ , Sch. 1 ^{iv} , SBL ^v
Red kite	<i>Milvus milvus</i>	Green	Ann. I ⁱⁱⁱ , Sch. 1 ^{iv} , SBL ^v
Curlew	<i>Numenius arquata</i>	Red	SBL ^v , UK BAP ^{vi}
Short-eared owl	<i>Asio flammeus</i>	Amber	Ann. I ⁱⁱⁱ , SBL ^v
Merlin	<i>Falco columbarius</i>	Red	Ann. I ⁱⁱⁱ , Sch. 1 ^{iv} , SBL ^v
Peregrine	<i>Falco peregrinus</i>	Green	Ann. I ⁱⁱⁱ , Sch. 1 ^{iv} , SBL ^v
Common kestrel	<i>Falco tinnunculus</i>	Amber	SBL ^v

i. Birds of Conservation Concern (BoCC) in the UK (Stanbury et al. 2021). The population status of birds regularly found in the UK is reviewed every five years to provide an up-to-date assessment of conservation priorities.

Quantitative criteria are used to assess the population status of each species and to place it on the Red, Amber or Green list. These are global conservation status, recent decline, historical decline, European conservation status, rare breeders, localised species and international importance.

ii. Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention or CMS) adopted in Bonn, Germany in 1979. Signatory parties work together to conserve migratory species and their habitats by providing strict protection for endangered migratory species (listed in Appendix 1 of the Convention), concluding multilateral Agreements for the conservation and management of migratory species which require or would benefit from international cooperation (listed in Appendix 2).

ii. Species listed on Annex I of the EC Birds Directive (Directive 2009/147/EC on the conservation of wild birds - the codified version). These species are the subject of special conservation measures concerning their habitat, to ensure their survival and reproduction within their area of distribution.

iii. Species listed on Schedule 1 to the Wildlife and Countryside Act 1981 (as amended). All wild birds their nests eggs and dependant young are protected under the Wildlife and Countryside Act. Schedule 1 species receive additional legal protection under the Act.

iv. Species included on the Scottish Biodiversity List (Scott Wilson 2005), which is part of the Scottish Biodiversity Strategy (published by the Scottish Government in May 2004).

v. Priority species in the 2007 UK Biodiversity Action Plan (UK). The UK BAP was superseded by the UK Post-2010 Biodiversity Framework (JNCC 2012).

5.4.54 Other species, not listed above, may be considered within the assessment depending on the outcome of the ongoing surveys and following consultation with organisations such as NatureScot and data holders such as Central Scotland Raptor Study Group, British Trust for Ornithology, and the Royal Society for the Protection of Birds.

Sensitivity of IOFs

5.4.55 A summary description of the existing baseline ornithological interest of the study area would be included in the EIAR chapter along with the assessment of the potential impact

of the wind farm proposal on the IOFs. Detailed technical description and discussion of the baseline data would be provided in separate technical appendices to the EIAR.

- 5.4.56 The nature conservation value / sensitivity of the receptors would be assessed using current best practice EIA methodology (e.g., in agreement with relevant and current NatureScot and CIEEM guidance). The evaluations and effect assessments would be undertaken on the basis of the field survey information collated and augmented with information available from the desk study.

Assessment of Effects

- 5.4.57 Bird flight activity data would be collated and analysed to assess the potential risk to individual species of conservation concern from collision mortality, following the method described by Band *et al.* (2007). A technical appendix would provide further detail on the source data and the collision risk model calculations. Current NatureScot guidance on bird collision avoidance rates would be followed in the analysis.
- 5.4.58 The EIA would be carried out using a set of standardised 'impact categories' that describe the scales at which an impact can occur and its subsequent effect(s) and significance. These impact categories have been developed following best practice guidance, informed professional judgement and practitioner experience of the EIA process. The likely effects that the development (construction and operation) would have on IOFs would be assessed for their potential to be significant. All relevant limitations and uncertainties discussed and accounted for in the assessment (e.g., assuming realistic worst case where there is uncertainty about the potential magnitude of an effect or efficacy of a proposed mitigation measure).
- 5.4.59 Potential cumulative effects will also be fully considered, following the approach set out in current NatureScot guidance, and will be assessed in the context of the West Central Belt Natural Heritage Zone (NHZ 17). All relevant projects that are operational, in construction or those for which applications for statutory consents have been submitted, will be considered in the cumulative assessment.
- 5.4.60 Any mitigation measures required to offset or reduce identified significant effects would be described and assessed along with any recommendations for habitat creation or enhancement (e.g., habitat management proposals to help offset any potentially significant effects on key species).

Approach to Mitigation

- 5.4.61 Where the potential for significant adverse effects is identified then mitigation measures will be considered and developed, where feasible, to reduce effect severity. Mitigation measures are actions to prevent, reduce or compensate for adverse effects on ornithological features. This might include the timing of works, habitat enhancement or creation. In some cases, mitigation measures may also be specified where effects are not considered to be significant as part of a best practice approach to development.
- 5.4.62 In relation to wind farm development, appreciable reduction or avoidance in potential impacts can often be achieved by taking into consideration data on ornithological constraints from Site surveys and other sources through the design process. Mapped data from the various ornithological surveys will be collated and 'sensitive areas' (e.g., nest sites of Schedule 1 and Annex I species, areas of critical supporting habitat, areas

or 'corridors' where there is a regular concentration of flight activity at wind turbine collision risk height) identified with appropriately sized set-back zones, for consideration in developing the wind farm layout. Historical breeding sites (i.e., Records of nest locations, territory centres) of Schedule 1 raptor species, for example, will also be identified as a design constraint where there is a reasonable expectation that breeding attempts may occur in the future (i.e., where there remains adequate supporting habitat and an extant population in the surrounding area).

- 5.4.63 Where it is not possible to avoid effects on sensitive features through design, alternative suitable mitigation measures will be proposed where possible. The appropriate measures will vary depending on the focal habitat or species. In general terms, options that can be considered include changes to the operation of the development to reduce adverse effects or the creation or enhancement of habitats outside of the zone of effect of the proposed wind farm to compensate for losses or displacement from habitats supporting key species resulting from the construction and/or operation of the windfarm.

Matters Scoped Out

- 5.4.64 The consideration of potential effects on SPA populations will be focused on the Firth of Forth SPA, specifically potential effects on species that are identified in NatureScot guidance as having potential connectivity to the Proposed Development based on their potential foraging ranges (e.g., pink-footed goose).
- 5.4.65 The EIA will not consider potential effects on common moorland songbird species such as skylark (*Alauda arvensis*) and meadow pipit (*Anthus pratensis*).

Questions for Consultees

- Is the proposed scope and extent of baseline data surveys, taking into consideration the Site location, survey results collated to date and relevant contextual data from other sources, considered to be sufficient to inform a reliable assessment of the potential effects of the Proposed Development considering the ornithological sensitivity of the Site and the information that is available from other sources?
- Does the consultee agree with the list of key species for consideration in the EIA, and are there other species that should also be considered?
- Does the consultee agree with the proposed scope of the assessment and the aspects that are proposed to be scoped out of the assessment?

5.5 Hydrology, Geology, and Hydrogeology

Introduction

- 5.5.1 This section considers the potential effects of the Proposed Development on the hydrology, geology and hydrogeology of the study area. It includes a baseline description of the existing conditions, followed by the proposed assessment method for determining the potential effects to be addressed in the Environmental Impact Assessment (EIA) chapter.

Legislation, Policy and Guidance

Legislation

- Water Environment and Water Services (Scotland) Act 2003;
- Water Environment (Controlled Activities) (Scotland) Regulations 2011, as amended;
- Water Environment (Miscellaneous) (Scotland) Regulations 2017, with particular reference to the amendments to the Water Environment (Controlled Activities) (Scotland) Regulations 2011;
- Environmental Protection Act 1990, as amended;
- Pollution Prevention and Control (Scotland) Regulations 2012;
- Water Environment (Oil Storage) (Scotland) Regulations 2006;
- Flood Risk Management (Scotland) Act 2009.

Policy

- Scottish Government (2014) Scottish Planning Policy;
- Scottish Government (2022) Draft Fourth National Planning Framework (NPF4)³;
- Scottish Government (2006) Planning Advice Note 51: planning, environmental protection and regulation;
- Stirling Council (2018) Local Development Plan (LDP2), with particular reference to:
 - Primary Policy 13: The Water Environment;
 - Policy 3.2: Site Drainage.

Guidance

- Stirling Council (2020) Supplementary Guidance: Flood Risk Management and the Water Environment;
- Stirling Council (2019) Supplementary Guidance: Wind Energy Developments;
- SEPA (2014) Position Statement WAT-PS-10-01: Assigning Groundwater Assessment Criteria for Pollutant Inputs;
- SEPA Guidance for Pollution Prevention with particular reference to:
 - GPP 1 (2020): Understanding your environmental responsibilities – good environmental practice;
 - GPP 5 (2018): Works and maintenance in or near water; and
 - PPG 6 (2012): Working at construction and demolition sites.

Baseline

Study Area

- 5.5.2 The area assessed will include the Site (the red-line application boundary), plus a buffer zone of 2 km around the application boundary. For hydrological receptors, impacts

³ The NPF4 is expected to be adopted in summer 2022.

downstream up to 5 km from the Site would be considered, as impacts such as pollution events can be transmitted downstream for greater distances.

Existing Baseline Conditions

Bedrock geology

- 5.5.3 The Site is underlain by bedrock from the Gargunnock Hills Lava Member of the Clyde Plateau Volcanic Formation. It consists predominantly of basalt and composite lavas and is Carboniferous in age (BGS GeoIndex onshore, 2022, available at: <http://mapapps2.bgs.ac.uk/geoindex/home.html>).
- 5.5.4 Minor dykes and sills from the Midland Valley Carboniferous to Early Permian Alkaline Basic Suite are also present within the study area.
- 5.5.5 There is some minor faulting present within the study area, principally trending east to west and north to south.

Superficial geology

- 5.5.6 BGS GeoIndex (2022) indicates that the Site is dominated by peat deposits, which are extensive in the middle and south of the Site and become slightly sparser towards the north.
- 5.5.7 Small pockets of Devensian diamicton till are present, particularly in the eastern part of the Site. A small area of alluvium is present along the channel of the Earl's Burn. No artificial ground is identified on the Site.

Mineral extraction

- 5.5.8 No areas of mineral extraction are identified within the Site; however, several have been identified within 5 km of the Site. BGS GeoIndex (2020) indicates the presence of Gargunnock Hills Quarry within the north-eastern part of the Site at National Grid Reference (NGR) NS 7047 9107, and Cringate Muir Gravel Pit to the south of Earlsburn Reservoir No. 2 at NGR NS 7080 8808.
- 5.5.9 A number of other small quarries and gravel pits are located within 1.5 km north of the Site and adjacent to the minor road south of Earlsburn Reservoirs approximately 2.5 km south of the Site.
- 5.5.10 Areas of former shallow coal mine workings are identified within Middlethird Wood, approximately 4.2 km east of the Site (Coal Authority Interactive Map, 2022, available at <https://mapapps2.bgs.ac.uk/coalauthority/home.html>). There are several mine entries associated with these former workings. In addition, the coal mining reporting area is located approximately 4 km east of the Site.

Soils

- 5.5.11 Scotland's Soils National Soil Map of Scotland (2022, available at <https://map.environment.gov.scot/>) indicates that soil coverage of the Site is predominantly dystrophic blanket peat. It is described as poorly drained, acidic and

nutrient poor upland blanket peat soil which contains no mineral layer within 0.5 m of the surface.

- 5.5.12 Parts of the northern and south-western site are covered by peaty gleyed podzols of the Darleith association. These are described as acid soils with a wet peaty surface layer overlying a wet, greyish subsoil which often have a thin iron-pan restricting the flow of water deeper into the soil.
- 5.5.13 The Carbon and Peat map (2016; available at <https://map.environment.gov.scot/>) indicates that the majority of the Site is Class 1 peatland, considered to be peatland of national importance.

Hydrogeology

- 5.5.14 The bedrock at the Site is classed as a low productivity aquifer with flow virtually all through fractures and discontinuities (Scotland's Environment, 2022, available at www.map.environment.gov.scot/sewebmap/).
- 5.5.15 There are two groundwater bodies associated with the Site. The Carron and Touch groundwater body, which lies beneath the majority of the Site, and the Campsie groundwater body, which lies beneath a small section in the north-east of the Site, are both considered to be in Good condition (SEPA Water Environment Hub, 2015, available at <https://www.sepa.org.uk/data-visualisation/water-environment-hub/>).

Hydrology

- 5.5.16 The Site lies within four main catchments. The majority of the Site lies within the River Forth catchment in the north and the River Carron catchment in the south. Smaller areas of the Site lie within the Endrick Water catchment in the south-west and the Bannock Burn catchment in the east.
- 5.5.17 There are a number of named watercourses within the Site:
- the Earl's Burn and its tributaries, which form part of the River Carron catchment;
 - the Bannock Burn and its tributaries within the Bannock Burn catchment;
 - the Touch Burn, Craigbrock Burn and Gargunnock burn and their tributaries, which form part of the River Forth catchment;
 - the Burnfoot Burn and Mary Glyn's Burn and their tributaries, which form part of the River Endrick catchment.

Groundwater-dependent terrestrial ecosystems

- 5.5.18 GWDTE are areas of wetland or marshy ground that are dependent on groundwater to maintain their function as a wetland or marsh area. Although vegetation mapping is not currently available for the project area, potential GWDTE were identified during a site visit. Due to the nature of the ground conditions within the Site, it is likely that some potential GWDTE areas may be present within the project area, this will be followed up in a further site walkover, as described in section 5.5.28.

Designated sites

- 5.5.19 NatureScot (2022) indicates that there is one designated site within 5 km of the Site boundary (Sauchie Craig Wood SSSI) that has been designated for reasons associated with geology, hydrogeology, hydrology or peat.
- 5.5.20 There are four additional sites listed as Geological Conservation Review (GCR) sites; this is not a statutory designation but identifies sites of national importance for geological features. Details are provided in **Error! Reference source not found.** below.

Table 6.10 Protected sites within 5 km and their qualifying interests

Name	Designation	Approximate Distance and Direction	Qualifying Interest
Sauchie Craig Wood	SSSI	4 km east	Stratigraphy: Lower Carboniferous; Igneous Petrology: Carboniferous-Permian Igneous Upland mixed ash woodland
Touch, Fintry and Gargunnock Hills	GCR	110 m north	Carboniferous-Permian Igneous strata
Touchadam	GCR	4 km east	Dinantian of Scotland (Lower Carboniferous) stratigraphy
Todholes	GCR	2.6 km south-east	Dinantian of Scotland (Lower Carboniferous) stratigraphy
Wallstale	GCR	4.2 km east	Carboniferous-Permian Igneous strata

- 5.5.21 A number of additional designated and GCR sites are present at distances greater than 5 km from the Site.

Public and private water supply

- 5.5.22 Earlsburn Reservoirs No. 1 and No. 2 are located immediately adjacent to the south-west site boundary. The Touch Reservoirs are located between 1.3 and 2.6 km east of the Site. All of these reservoirs are owned and operated by Scottish Water for public water supply purposes. The Site lies across the catchment areas that serve both sets of reservoirs, with much of the Site within the catchment for the Earlsburn Reservoirs. In addition, a Scottish Water service reservoir is present 1.8 km north of the northern site boundary and the Touch filter station is located 3.3 km east of the Site, just downslope of the Touch Reservoirs. These reservoirs will all have associated infrastructure.
- 5.5.23 Although there are no wells or springs indicated on Ordnance Survey (OS) mapping within the Site, a number of wells and springs are indicated within 3 km of the Site. The rural nature of much of the area makes it likely that some of the more isolated properties rely on private water supply (PWS) sources.
- 5.5.24 Public and private water supply assets will be further assessed as part of the site survey, and Stirling Council's Environmental Health Department, SEPA and Scottish Water will all be consulted as appropriate to identify any water supply assets that require detailed consideration, assessment and, where necessary, protection.

Flood risk

- 5.5.25 SEPA's Indicative Flood Map (2022, available at <https://map.sepa.org.uk/floodmaps/FloodRisk/PostCode>) was consulted to gain an

understanding of the main flood risk in the area. The overall flood risk for the Site and immediate surroundings is low. The Earlsburn Reservoirs, Touch Reservoirs and associated main watercourses are all indicated to have a high likelihood of river flooding. The majority of the minor watercourses are indicated to have a high likelihood of surface water flooding. In all cases, the flood risk areas are confined to the main channel or outline of the water body.

5.5.26 There are several isolated areas of high surface water flood risk scattered across the Site.

5.5.27 A high likelihood of flooding is defined as having a 10% chance of flooding each year.

Survey Methodology

5.5.28 To inform the assessment of the Proposed Development a detailed site visit and walkover survey will be undertaken to:

- verify the information collected during the baseline desk study;
- undertake a visual assessment of the main surface waters and verify public and private water supply infrastructure, including intakes that could be affected by the Proposed Development;
- identify drainage patterns, areas vulnerable to erosion or sediment deposition, and any pollution risks;
- visit any identified potential GWDTE (in consultation with the project ecology team);
- prepare a schedule of potential watercourse crossings and existing crossings that would require upgrading;
- inspect rock exposures that may be suitable for borrow pits and establish by probing an estimate of overburden thickness and confirmation of likely substrate; and
- allow appreciation of the project area including awareness of gradients, possible borrow pit sites, access route options and prevailing ground conditions, and to assess the relative location of all the components of the Proposed Development.

5.5.29 In parallel with the site visit and walkover survey, a peat probing exercise will be undertaken using a 100 m grid of this area.

5.5.30 Once a design is available, and if all areas of peat greater than 0.5m deep cannot be avoided by proposed infrastructure, a second peat probing survey will be undertaken to visit all the areas proposed for infrastructure. This will include peat probing at 50 m centres along all proposed new access tracks and 25 m crosshair probing at turbine locations. Additional probing will be undertaken as required in areas where existing tracks require widening or modification at corners or junctions, and at all other infrastructure locations, to ensure that there is sufficient soil and peat depth information to support related studies on peat instability and peat excavation and reuse.

Assessment of Environmental Impacts and their Significance

5.5.31 Potential impacts on geology, groundwater, surface water, soils, peatland, and public and private water supplies and assets will be assessed. Particular emphasis will be given to potential impacts on water supply assets, watercourses, peatland and on changes to groundwater quality or quantity with respect to GWDTE.

Construction

- 5.5.32 During the construction phase, potential impacts that will be considered include:
- Rock extraction for aggregate, including rock suitability, sediment release and blasting;
 - Changes to surface or groundwater quality and flow paths;
 - Changes to flood risk to, and arising from, the development;
 - Modifications to watercourses relating to watercourse crossings and associated engineering works;
 - Management of surface water runoff, suspended sediment and site drainage;
 - Pollution events relating to on-site materials such as fuel, oils and concrete;
 - Changes to water supply to GWDTE;
 - Changes to or pollution of public and private water supply sources, and damage to water supply assets;
 - Modifications to peatland including peat slide risk;
 - Damage to soil and peat from traffic movements and from handling, transport and storage of excavated material; and
 - Peat and soil erosion.

Operation

- 5.5.33 Operational impacts are anticipated to be considerably reduced from the construction phase. The main potential impact would be pollution events that may affect the quality of public and private water supply intakes, surface water, groundwater and soil/peat.

Decommissioning

- 5.5.34 During decommissioning, it is anticipated that buried infrastructure (such as turbine foundations) would remain buried to avoid the disruption required for removal, and that all above-ground infrastructure associated with the wind farm would be removed to a depth of 1 m below ground. All areas would be fully reinstated. Potential impacts on geology, hydrogeology and ground conditions would be expected to be similar to those during the construction phase, but less extensive.

Cumulative Impacts

- 5.5.35 An assessment of the impacts of the Proposed Development in combination with, and sequential to, other wind farms within 5 km of the Site will be undertaken. The assessment will include wind farms under construction, consented wind farms and wind farms at application stage. Wind farms at scoping stage will not be included. Wind farms that are already operational would be included as part of the baseline description.
- 5.5.36 Combined geological, hydrogeological, hydrological and soil effects of the Proposed Development with other wind farms will be assessed based on several factors. Due to the static nature of geology and soils, cumulative effects are likely to be negligible, although cumulative effects arising from peat loss or disturbance would be considered. Hydrogeological and hydrological effects will be assessed by the distance between the developments and flow directions/catchment areas. Designated sites will be assessed on their position in relation to all relevant developments.

Matters Scoped Out

- 5.5.37 Impacts arising from former mine workings are considered not to require assessment as a result of the distance from the Proposed Development to all areas of former mining activity.

Assessment Methodology

- 5.5.38 The assessment will involve a desk study, to gather available data concerning the existing geological, hydrogeological, hydrological and soil conditions in the project area.

- 5.5.39 Data will be collated from the following sources:

- Geological maps, including both bedrock and superficial geology;
- Hydrogeological maps, including productivity and groundwater vulnerability;
- Soil Survey of Scotland maps;
- High-resolution aerial or satellite imagery of the project area and its immediate surroundings;
- SEPA water quality and discharge records for the project area;
- Vegetation mapping and the Functional Wetland Typology for Scotland;
- Borehole records, where available. These will be sourced from records held by the BGS and other sources as available;
- Local authority private water supply records;
- Any available utilities and Scottish Water investigations and details of public water supplies and assets;
- Previous assessments carried out in relation to neighbouring wind farm projects and previous studies undertaken within the development area;
- Data gathered from site visits, including peat depth and vegetation surveys and any material arising from future surveys that may be relevant.

- 5.5.40 Consultations will be carried out with the following organisations and stakeholders:

- SEPA;
- The Scottish Government (Water Environment Unit, SEPA Sponsorship and Waste Unit and Energy Consents Unit);
- Scottish Water
- Stirling Council;
- Nature Scot; and
- Local landowners.

- 5.5.41 Following the desk study and data gathering exercise, a site reconnaissance and walkover survey will be undertaken. The reconnaissance and walkover will visit all areas identified as potentially at risk from the Proposed Development, such as GWDTE, public and private water supply assets, and areas identified for aggregate extraction. Any sites indicated to have a higher potential risk of peat instability will also be visited.

- 5.5.42 An early site-wide peat probing and peat condition survey will be undertaken to gain an understanding of the peat depth, variability and condition across the project area.

- 5.5.43 A constraints map will be produced to identify areas of higher sensitivity that should be avoided during the design process. This will include areas of deep peat, sensitive wetlands, steeper slopes, areas of dense forestry that would be difficult to survey and

other relevant constraints to development that are identified during the desk study, such as public and private water supply sources, infrastructure.

- 5.5.44 Once an infrastructure layout is available, a second peat probing survey will be undertaken. This will visit all areas proposed for infrastructure or development, including borrow pit locations and all turbine bases. Data from the peat probing surveys will be used to inform a peat management plan (PMP) and peat slide risk assessment (PSRA).
- 5.5.45 The PMP will provide estimated volumes of peat to be excavated, and options for reuse of peat within the Proposed Development. Reuse options will include consideration of peat for reinstatement and restoration purposes, as well as habitat enhancement opportunities where these may be suitable. The PMP will also provide outline methods for peat and soil handling and storage.
- 5.5.46 The PSRA will provide a formal assessment of the risk of natural or induced peat failure within and adjacent to the project area during the Proposed Development's lifespan. The PSRA will be undertaken in compliance with the Scottish Government's Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (2017) and will make use of best practice guidance in the joint Scottish Government, NatureScot and SEPA document Peatland Survey: Guidance on Developments in Peatland (2017). Other relevant guidance will be used where appropriate.
- 5.5.47 A drainage impact assessment and watercourse crossing inventory will be provided, to ensure that appropriate drainage is designed into the Proposed Development from the outset. This will consider suitable sustainable drainage systems to manage and treat runoff arising from the Proposed Development. Outline watercourse crossing designs will be prepared and included within the application, to ensure that suitable crossing structures are proposed for each location. As part of the impact assessment all relevant impacts that felling would have on the local ground conditions and hydrology will be considered.
- 5.5.48 An assessment will be made of the potential direct, indirect, cumulative and in-combination effects of the Proposed Development on geology, hydrogeology, hydrology and soils. Where relevant, mitigation and control measures will be put forward in order to manage or mitigate any potential impacts to sensitive receptors that may arise from the Proposed Development. A hierarchy of mitigation strategies will be devised and will follow best practice guidance including the GPP, the Water Environment (Controlled Activities) (Scotland) Regulations and relevant SEPA policies and guidance.

Sensitivity of Receptor

Table 5.2: Sensitivity of receptor criteria

Sensitivity of Receptor	Criteria
High	The receptor has very limited ability to absorb change without fundamentally altering its present character, is of very high environmental value and/or is of international importance.
Medium	The receptor has limited ability to absorb change without significantly altering its present character, is of high environmental value and/or is of national importance.
Low	The receptor has moderate capacity to absorb change without significantly altering its present character, has moderate environmental value and/or is of regional importance.
Negligible	The receptor is tolerant of change without detriment to its present character, is of low environmental value and/or of local importance.

Magnitude of Impact

Table 5.3: Magnitude of impact criteria

Magnitude	Criteria
High	Substantial changes, over a substantial area, to key characteristics or to the hydrological regime for more than 2 years.
Medium	Noticeable but not substantial changes for more than 2 years or substantial changes for more than 6 months but less than 2 years, over a substantial area, to key characteristics or to the hydrological regime.
Low	Noticeable changes for less than 2 years, substantial changes for less than 6 months, or barely discernible changes for any length of time.
Negligible	Any change would be negligible, unnoticeable or there are no predicted changes.

Significance of Effect

Table 5.4: Significance of effect matrix

Sensitivity of Receptor	Magnitude of Impact			
	High	Medium	Low	Negligible
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

Questions for Consultees

- Is the proposed peat assessment method acceptable?
- Are there any other relevant consultees which should be consulted about the geology, hydrogeology, hydrology and soils assessment?
- Are any records held for private water supplies within 5 km of the Site?

- Are there any known flooding problems downstream that could potentially be affected by the Proposed Development?

5.6 Archaeology and Cultural Heritage

Introduction

- 5.6.1 The cultural heritage section of the EIA Report will characterise the historic environment within the Site and in the wider study area. Consultation, desk-based research including LIDAR assessment and walkover surveys, a ZTV and setting visits will be used to define proportionate study areas for the assessment. A baseline of designated and non-designated heritage assets will be assembled to assess the potential direct, indirect, and setting effects of the Proposed Development. Where likely significant effects are identified, mitigation measures will be identified.
- 5.6.2 The cultural heritage of an area comprises archaeological sites, historic buildings, gardens and designed landscapes, historic battlefields and other sites, features or places in the landscape that have the capacity to provide information about past human activity, or which have cultural relevance due to associations with folklore or historic events. Sites of cultural heritage interest may also derive some, or all, of that interest from their setting within the wider landscape. The cultural heritage section of this EIA Scoping Report is thus intended to identify likely significant effects of the Proposed Development upon the physical fabric and settings of heritage assets within the Application Boundary, and likely significant effects on the cultural significance of assets within the wider landscape through development within their setting, which would need detailed consideration through EIA.
- 5.6.3 Direct physical effects involve physical alteration or destruction of heritage assets and could result from the construction of turbine and crane bases, new or upgraded access tracks, substations, transformers, cables etc.
- 5.6.4 Effects on the setting of heritage assets can arise due to the relative scale of turbines, their potential to detract from understanding of key views from/towards an asset, or a change resulting in an adverse experience of a heritage asset.
- 5.6.5 Cultural significance is a quality that applies to all heritage assets and as defined by Historic Environment Scotland (HES) (NatureScot & HES 2018, Appendix 1 page 175), relates to the ways in which a heritage asset is valued both by specialists and the general public; it may derive from factors including the asset's fabric, setting, context and associations. Following 'Scottish Planning Policy' paragraph 137, the analysis of a heritage asset's cultural significance aims to identify its 'special characteristics' which should be protected, conserved or enhanced. Such characteristics may include elements of the asset's setting, which is defined in Historic Environment Scotland's guidance as "the way in which the surroundings of a historic asset or place contribute to how it is experienced, understood and appreciated" (HES 2016, updated 2020, Section 1).
- 5.6.6 This use of the word cultural 'significance', referring to the range of cultural values or interest attached to an asset, should not be confused with the unrelated usage in EIA where the 'significance of an effect' reflects the weight that should be attached to it in a planning decision.
- 5.6.7 Historic landscape is not treated as a heritage asset for the purposes of this assessment except where a defined area of landscape has been designated for its cultural heritage

interest (including Conservation Areas and areas included in the Inventory of Gardens and Designed Landscapes). It is recognised that all landscapes have a historic dimension, and this will be considered as part of the assessment of Landscape Character (covered in the LVIA chapter of the EIA Report). Further, although any effects on the cultural significance and importance of heritage assets due to change in their setting are likely to be visual in nature, the assessment of these visual effects is distinct from the assessment of visual change in the LVIA. The assessment of effects on setting may be informed by visualisations prepared as part of the LVIA but the conclusions reached regarding visual change in the setting of a heritage asset are distinct.

Legislation, Policy and Guidance

5.6.8 It is proposed that the EIA will be carried out with reference to the following legislation, policy and guidance:

Legislation:

- The Ancient Monuments and Archaeological Areas Act 1979;
- The Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997;
- The Historic Environment Scotland Act 2014.

Policy:

- Scottish Planning Policy (SPP) 2014, and amendment 2020);
- Historic Environment Policy Scotland (HEPS) (HES, 2019);
- Policies in the Stirling Local Development Plan (2018): Primary Policy 7: Historic Environment;

Guidance:

- Historic Environment Scotland Circular (HES, 2019).
- Planning Advice Note (PAN) 2/2011: Planning and Archaeology;
- IEMA/CIfA/IHBC Principles of Cultural Heritage Impact Assessment in the UK (2021);
- Designation Policy and Selection Guidance (DPSG), (HES 2019)
- Standard and Guidance for Historic Environment Desk-Based Assessment (Chartered Institute for Archaeologists (CIfA 2020);
- Standard and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment (CIfA 2020);
- Managing Change in the Historic Environment: Setting (Historic Environment Scotland (HES) 2016, updated 2020);
- Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment Process in Scotland (NatureScot and HES, 2018).

Baseline

5.6.9 Overlapping study areas are proposed for the identification of heritage assets that may be affected by the Proposed Development: the Application Boundary, to identify potential direct (physical) impacts; and the Outer Study Area (OSA) based on a bare earth ZTV to

identify assets beyond the Site that may be affected through development within their setting.

- 5.6.10 Within the Application Boundary, all known and potential heritage assets will be assessed for potential direct, setting and indirect effects.
- 5.6.11 Within the OSA, assets will be included in the assessment based on the level of importance assigned to the asset so as to ensure that all likely significant effects are recognised:
- Up to 2 km from the proposed turbines: Category C Listed Buildings and all non-designated heritage assets.
 - Up to 10 km from the proposed turbines: Scheduled Monuments, Category A and B Listed Buildings, Conservation Areas, Inventory Gardens and Designed Landscapes, and Inventory Historic Battlefields.
 - Beyond 10 km from the proposed turbines: World Heritage Sites and any asset that is considered exceptionally important, and where long-distance views from or towards the asset are thought to be particularly sensitive, in the opinion of the assessor or relevant consultees.
- 5.6.12 The baseline will be screened (and agreed with relevant consultees) to identify any assets of particular sensitivity or importance. Criteria for the identification of assets of particular sensitivity or importance will be based on the approach set out in Managing Change in the Historic Environment: Setting (Historic Environment Scotland, 2016, updated 2020) that sets out a range of factors which might form part of the setting of a heritage asset as follows:
- *“Current landscape or townscape context;*
 - *Views to, from and across or beyond the historic asset or place;*
 - *Key vistas: for instance, a ‘frame’ of trees, buildings or natural features that give the historic asset or place a context, whether intentional or not);*
 - *The prominence of the historic asset or place in views throughout the surrounding area, bearing in mind that sites need not be visually prominent to have a setting;*
 - *Aesthetic qualities;*
 - *Character of the surrounding landscape;*
 - *General and specific views including foregrounds and backdrops;*
 - *Views from within an asset outwards over key elements in the surrounding landscape, such as the view from the principal room of a house, or from a roof terrace;*
 - *Relationships with other features, both built and natural;*
 - *Non-visual factors such as historical, artistic, literary, place name, or scenic associations, intellectual relationships (e.g., to a theory, plan, or design), or sensory factors; and*
 - *A ‘sense of place’: the overall experience of an asset which may combine some of the above factors.”*

Existing Baseline Conditions

- 5.6.13 The baseline information used for this EIA Scoping Report has been compiled using existing data on the historic environment:
- HES designations data available as Geographical Information Systems (GIS) datasets;

- Stirling Council Historic Environment Record (HER) data identified on the PastMap website. (At the time of writing, there is a problem with the Stirling Council Archaeology Service's system who are unable to provide data digitally);
- National Record of the Historic Environment (NRHE) comprising the Canmore database.

Application Boundary

- 5.6.14 There is one Scheduled Monument within the Application Boundary: SM7010 Carleatheran, cairn at summit, Gargunnock Hills. There are no further known heritage assets, designated or non-designated, within the Application Boundary.

Outer Study Area

- 5.6.15 Designated assets within 2 km of the Site comprise two scheduled monuments, a dun and a cairn. Of a further 11 non-designated assets within 2 km of the Site, one cairn is identified as having a wider landscape setting that potentially contributes to its cultural significance.
- 5.6.16 There are two Inventory Gardens and Designed Landscapes, three conservation areas, 17 scheduled monuments, and 40 Listed Buildings (six Category A & 34 Category B) located between 2 km – 5 km from the Site.
- 5.6.17 Between 5 km – 10 km from the Site there are six Inventory Gardens and Designed Landscapes, 53 scheduled monuments, four historic battlefields, 17 conservation areas, and 480 listed buildings (40 Category A & 440 Category B).
- 5.6.18 Beyond 10 km (within 20 km), the Antonine Wall World Heritage Site lies partially within the OSA, and there are 12 Inventory Gardens and Designed Landscapes and 68 Category A listed buildings.

Survey Methodology

- 5.6.19 A baseline Desk-based Assessment will be conducted to establish the baseline condition of the Site. The principal sources of information will be the Historic Environment Record (HER), supplemented by relevant published documentary and cartographic material as appropriate, including sources of aerial photography as appropriate. Various sources will be consulted for the collation of data, including but not limited to:
- Designation data downloaded from Historic Environment Scotland;
 - Historic Environment Record (HER) data, digital extract from Stirlingshire Council;
 - The National Record of the Historic Environment (NRHE), including the Canmore database and associated photographs, prints/drawings and manuscripts held by HES;
 - Conservation Area Character Appraisals
 - Historic Landscape Assessment data;
 - The National Collection of Aerial Photography (NCAP);
 - Geological data available online from the British Geological Survey;
 - Historic maps held by the National Library of Scotland;
 - Unpublished maps and plans held by the National Records of Scotland;

- Relevant internet resources, including Google Maps, Google Earth, Bing satellite imagery and PastMap;
- Readily available published sources and unpublished archaeological reports.
- LIDAR DTM data is available from the Scottish Remote Sensing Portal for the Site for the survey of potential hitherto unknown heritage assets within the Site;
- ZTV / cumulative ZTV; and
- Findings of other environmental topics (LVIA, peat depth, ground conditions, noise and vibration).

5.6.20 A site visit will be undertaken to ‘ground-truth’ the results of the LIDAR survey, as well as to record site characteristics, any visible archaeology and geographical/geological features which may have a bearing on previous land use and archaeological survival, as well as those which may constrain subsequent archaeological investigation.

Stage 1 Setting Assessment

5.6.21 Likely significant effects on the settings of heritage assets will be identified from an initial desk-based appraisal of data from HES, the HER and consideration of current maps and aerial images available via online sources. The methodology adopted for the identification and assessment of potential effects on setting follows the approach set out in Managing Change in the Historic Environment: Setting (Historic Environment Scotland, 2016, updated 2020) and the Environmental Impact Assessment Handbook (Ver 5, NatureScot & HES, 2018, Appendix 1). The guidance sets out three stages in assessing the impact of development on the setting of a heritage asset or place as follows:

- *“Stage 1: Identify the historic assets that might be affected by a development;*
- *Stage 2: define and analyse the setting by establishing how the surroundings contribute to the ways in which the historic asset or place is understood, appreciated and experienced; and*
- *Stage 3: evaluate the likely significant effect of the proposed changes on the setting, and the extent to which any negative impacts can be mitigated.”*

5.6.22 The Stage 1 Setting Assessment methodology considers each heritage asset in the OSA in turn to identify heritage assets in the ZTV that have a wider landscape setting that contributes to their cultural significance and whether it is likely that cultural significance would be harmed by the Proposed Development. Where heritage assets are located outwith the ZTV, third-party viewpoints within the ZTV which may provide a key view towards the heritage asset and the Site are considered.

Visualisations

5.6.23 Where this initial appraisal identifies the potential for a significant effect, the asset will be visited to define baseline conditions and identify key viewpoints.

5.6.24 Wireframe visualisations will be used in tandem with the ZTV to understand the likely nature of change in the setting of heritage assets. Visualisations will be prepared to illustrate changes to key views where potentially significant effects are identified.

5.6.25 Consultation with national and regional curators (HES and Stirling Council) will be undertaken to agree the viewpoints for the EIAR setting assessment.

Assessment of Environmental Impacts and their Significance

- 5.6.26 To assess the effect of the Proposed Development upon cultural heritage, the significance of any effect is calculated through comparison of the importance of each heritage asset against the potential magnitude of change upon it. Impacts from cumulative developments will also be considered.
- 5.6.27 Effects on cultural heritage can arise through direct physical effects, indirect effects, or effects on setting.
- Direct physical effects describe those development activities that directly cause damage to the fabric of a heritage asset. Typically, these activities are related to construction works and will only occur within the Application Boundary.
 - Indirect effects describe secondary processes, triggered by the Proposed Development, that lead to the degradation or preservation of heritage assets. For example, changes to hydrology may affect archaeological preservation; or changes to the setting of a building may affect the viability of its current use and thus lead to dereliction.
 - An effect on the setting of a heritage asset occurs when the presence of a development changes the surroundings of a heritage asset in such a way that it affects (positively or negatively) the cultural significance of that asset. Visual effects are most commonly encountered but other environmental factors such as noise, light or air quality can be relevant in some cases. Impacts may be encountered at all stages in the life cycle of a development from construction to decommissioning, but they are only likely to lead to significant effects during the prolonged operational phase of the Proposed Development.
- 5.6.28 Likely significant effects on unknown heritage assets will be discussed in terms of the risk that a significant effect could occur. The level of risk depends on the level of archaeological potential combined with the nature and scale of disturbance associated with construction activities and may vary between high and negligible for different elements or activities associated with a development, or for the Proposed Development as a whole.

Potential Impacts

Construction

- 5.6.29 Any infrastructure or access tracks associated with the Proposed Development will be designed to avoid the non-designated heritage assets within the Site. Should any previously unknown heritage assets be noted during the desk-based assessment or LIDAR/walkover survey, any infrastructure associated with the Proposed Development such as access tracks will take into account the presence of these heritage assets and avoid them through design.
- 5.6.30 Precautionary mitigation to avoid accidental direct impacts on heritage assets within the Site during construction may include demarcating their presence using physical barriers, if appropriate, with a suitable buffer off the asset established.
- 5.6.31 Where direct impacts are identified through EIA, evaluation methodologies may be employed (such as intrusive works) to better understand the extent and cultural significance of archaeological remains.

- 5.6.32 Where potentially significant impacts are identified, mitigation measures will be proposed. The preferred mitigation option is always to avoid or reduce impacts through design, or through precautionary measures such as fencing off heritage assets during construction works. Effects which cannot be eliminated in these ways will lead to residual effects.
- 5.6.33 Adverse effects may be mitigated by an appropriate level of survey, excavation, recording, analysis and publication of the results, in accordance with a written scheme of investigation (SPP paragraph 150 and PAN2/2011, sections 25-27). Archaeological investigation can have a beneficial effect of increasing knowledge and understanding of an asset, thereby enhancing its archaeological and historical interest and offsetting adverse effects.

Operation

- 5.6.34 Appraisal of heritage assets against the scoping ZTV has identified the following where wirelines or visualisations may be beneficial in understanding change in setting.
- SM7010 Carleatheran, cairn at summit, Gargunnock Hills
 - GDL377 Touch Inventory Garden and Designed Landscape
 - GDL188 Gargunnock House Inventory Garden and Designed Landscape
 - CA210 Gargunnock Conservation Area
 - LB10438 Gargunnock House Category A Listed Building
 - LB10445 Old Leckie Category A Listed Building
 - LB15295 Touch House Category A Listed Building
 - GDL60 Blair Drummond Inventory Garden and Designed Landscape
 - GDL86 Cardross House Inventory Garden and Designed Landscape
 - GDL231 Kier Inventory Garden and Designed Landscape
 - SM90291 Stirling Castle
 - CA218 Stirling Town & Royal Park Conservation Area
 - WH1 Antonine Wall World Heritage Site
 - GDL248 Kippenross Inventory Garden and Designed Landscape
 - LB41118 Wallace Monument Abbey Craig Category A Listed Building
- 5.6.35 Design will take into account any identified likely significant effects of the Proposed Development on the settings and cultural significance of any additional heritage assets identified during Stage 1 Setting Assessment in the OSA.
- 5.6.36 For example, design will seek to ensure that the Proposed Development will not dominate heritage assets that were intentionally constructed historically to be prominent landscape features, and will seek to maintain key intentional sightlines between, to, from or across associated and contemporary monuments, or designed vistas. The Proposed Development layout will not unacceptably impact upon any intact cultural landscapes. It is acknowledged that there are other factors which might form part of the setting of a heritage asset as outlined in Managing Change in the Historic Environment: Setting

(Historic Environment Scotland, 2016, updated 2020) summarised in this Scoping Report above.

- 5.6.37 Cumulative effects will be considered in cases where an effect of more than negligible significance would occur upon a heritage asset, as identified through EIA, as a result of the Proposed Development. Wind energy developments (operational, under construction, consented or at application stage) are included in the cumulative assessment where they also feature prominently within views of or towards heritage assets identified as affected by the Proposed Development, thus also have a potential to impact upon cultural their significance.

Matters Scoped Out

- 5.6.38 The extent of ground disturbance associated with decommissioning will not extend beyond the construction footprint and so decommissioning effects on heritage assets within the Site will not occur. Any residual operational phase setting effects will be reversed. Decommissioning effects are therefore proposed to be scoped out of the assessment.
- 5.6.39 Construction phase setting effects will be temporary and are not considered to be significant in EIA due to their very short duration. Construction phase setting effects are therefore proposed to be scoped out of the assessment.

Assessment Methodology

- 5.6.40 To assess the significance of the effect of the Proposed Development upon cultural heritage, the importance of each heritage asset is assessed against the potential magnitude of change upon it using a reasoned matrix-style approach.

Importance of Receptor

Table 5.5: Importance of receptor criteria

Importance of Receptor	Criteria
High	World Heritage Sites, Inventory Gardens and Designed Landscapes, Scheduled Monuments, Protected Wreck Sites, Inventory Historic Battlefields, Category A and B Listed Buildings, Historic Marine Protected Areas, and non-designated heritage assets of equivalent importance that contribute to national research objectives
Medium	Conservation Areas, Category C Listed Buildings, undesignated assets of regional importance except where their particular characteristics merit a higher level of importance, heritage assets on local lists and non-designated assets that contribute to regional research objectives
Low	Locally listed heritage assets, except where their particular characteristics merit a higher level of importance, undesignated heritage assets of Local importance, including assets that may already be partially damaged
Negligible	Identified historic remains of no importance in planning considerations, or heritage assets and findspots that have already been removed or destroyed (i.e., 'site of')

Magnitude of Impact

5.6.41 The magnitude of an effect is a measure of the degree to which the cultural significance of a heritage asset will potentially change as a result of the Proposed Development (NatureScot & HES 2018, Environmental Impact Assessment Handbook, v5 Appendix 1, para 42). This definition of magnitude applies to likely effects on the setting as well as likely physical effects on the fabric of an asset.

Table 5.6: Magnitude of impact criteria

Sensitivity of Receptor	Criteria
High	Alterations to an asset and/or its setting resulting in a considerable enhancement or loss of cultural significance. / Preservation of an asset and/or its setting where it would otherwise suffer considerable loss of cultural significance in the do-nothing scenario.
Medium	Alterations to an asset and/or its setting resulting in moderate enhancement or loss of cultural significance. / Preservation of an asset and/or its setting where it would otherwise suffer moderate loss of cultural significance in the do-nothing scenario.
Low	Alterations to an asset and/or its setting resulting in a slight enhancement or loss of cultural significance. / Preservation of an asset and/or its setting where it would otherwise suffer slight loss of cultural significance in the do-nothing scenario.
Negligible	Alterations to an asset and/or its setting resulting in a barely perceptible enhancement or loss of cultural significance. / Preservation of an asset and/or its setting where it would otherwise suffer barely perceptible loss of cultural significance in the do-nothing scenario.

Significance of Effect

5.6.42 The significance of an effect ('EIA significance') on the cultural significance of a heritage asset, resulting from a direct or indirect physical effect or an effect on its setting is assessed by combining the magnitude of the impact and the importance of the heritage asset.

Table 5.7: Significance of effect matrix

Sensitivity of Receptor	Magnitude of Impact			
	High	Medium	Low	Negligible
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

5.6.43 It is common practice to identify EIA effects as significant or not significant, and in this proposed EIAR, Major and Moderate effects will be regarded as 'significant' in EIA terms, while Minor and Negligible effects are 'not significant'.

5.6.44 Impact assessment conclusions upon scheduled monuments will also be presented in the terms of SPP paragraph 145 i.e. *"Where there is potential for a proposed development to have an adverse effect on a scheduled monument or on the integrity of its setting"*. SPP does not define 'integrity' in the context of paragraph 145, therefore for the purposes of the assessment, the integrity of a setting is considered to be maintained if the principal characteristics of the setting that contribute to the cultural significance of the asset are retained, and it would continue to be possible to appreciate and understand the scheduled monument in its setting.

Questions for Consultees

- Do consultees agree with the proposals for 'Matters Scoped Out' in this Scoping Report?
- Are consultees content with the proposed Outer Study Area buffers presented in this Scoping Report?
- Are there any other relevant consultees other than HES and the Council who should be contacted with respect to the Cultural Heritage and Archaeology assessment?
- Do consultees wish to request any specific heritage assets to be assessed in the EIAR?

5.7 Traffic and Transport

Introduction

5.7.1 This chapter sets out the proposed scope and approach to assessing potential direct and indirect impacts of the Proposed Development on access, traffic and transport during construction, operation and decommissioning phases. Within this chapter, preliminary baseline data will be presented and potential effects that may arise as a result of the Proposed Development will be outlined. Cumulative effects will also be assessed.

- 5.7.2 The methodology presented in this chapter builds upon the general assessment methodology summarised in Chapter 4 (EIA Process and Methodology) of this Scoping Report.

Legislation, Policy and Guidance

- 5.7.3 The Proposed Development has the potential to introduce impacts during construction, operation and decommissioning relating to traffic. The environmental effects of traffic will be assessed in accordance with the following principal sources:
- Institute of Environmental Management and Assessment (IEMA) (1993). Guidelines for the Environmental Assessment of Road Traffic;
 - LA104, Environmental assessment and monitoring, Design Manual for Roads and Bridges (DMRB) (Standards for Highways, 2020);
 - Transport Scotland (2012) Transport Assessment Guidance;
 - Scottish Government, Planning Advice Note (PAN) 75, Planning for Transport; and
 - Stirling Council (2021), Local Development Plan Supplementary Guidance: Transport and Access for New Development.

Baseline

Study Area

- 5.7.4 A Site location plan is presented in **Figure 2.1**.
- 5.7.5 The Proposed Development is located within the Stirling Council area, approximately 4 km south of Gargunnoch.
- 5.7.6 The location of the Site in proximity to the A811, a principal road connecting the City of Stirling at Raploch in the east to the Balloch in the west, a distance of some 30 miles (48km). It is a high-quality single carriageway road minimising the impact of construction traffic on the local road network by enabling vehicles to utilise the A811 for most of their journey as well as the M9.
- 5.7.7 The preliminary study area will therefore include and will extend no further than the following:
- A811 between Kersebonny Road and Kirk Lane;
 - Touch Road; and
 - Manse Brae.
- 5.7.8 Abnormal Load Route Assessment (ALA) has been undertaken and it is anticipated that Abnormal Indivisible Loads (AILs) are likely to be journeying north-west from the Port of Grangemouth. The ALA will be included as a Technical Appendix to the application. The proposed delivery route is detailed below:
- Loads would exit the port onto Central Dock Road before joining North Shore Road southbound;
 - Loads would take the third exit at the roundabout to join the A904 westbound;
 - Loads would take the fourth exit at Earl's Gate Roundabout to join the M9 northbound;

- Loads would exit the M9 at Junction 10 and take the third exit at the roundabout to join the A84 eastbound;
- Loads would take the third exit at the roundabout to continue on the A84 southbound;
- Loads would take the second exit at the roundabout to continue on the A84 southbound;
- Loads would take the second exit at the roundabout to join the B8051 southbound;
- Loads would take the second exit at the roundabout to join the A811 westbound;
- Loads would continue on the A811 to the junction with Touch Road;
- Loads would turn left to join the Touch Road southbound and proceed to the junction with the unclassified road north of Gartur Estate; and
- Loads would proceed westbound to the Site Access.

5.7.9 These roads are predominantly A classified roads and motorways, with the A roads operating at an urban speed limit of 30/40 mph and a rural speed limit of up to 60 mph.

Preliminary Baseline Conditions

5.7.10 The A811 is located approximately 4 km north of the Site, and forms part of the primary road network. It is designed as a long-distance road carrying a wide range of vehicle types, including goods vehicles. It provides connection between Stirling and Balloch and bypasses several urban areas, including Gargunnoch, Garden and Buchlyvie.

5.7.11 Touch Road provides connection between Stirling and the A811 passing through a number of residential areas as well as Cambusbarron. Manse Road provides connection between Gargunnoch and the A811.

5.7.12 It is possible that construction workers may reside in all these areas, providing an accessible connection for those that may journey to the Site.

Transport Network Users

5.7.13 A reasonable pedestrian network exists within the area of Cambusbarron and Gargunnoch. However, there are no pedestrian facilities along Touch Road in the vicinity of the Site, but there is little pedestrian activity in this area.

5.7.14 There are no special provisions for bicycle friendly roads/lanes along the Manse Road, Touch Road or A811 in close proximity to the Site. There are number of core paths in the vicinity of both Gargunnoch and Cambusbarron that are accessible off the A811 and Manse Road as well as Touch Road. None of these provide direct access onto the Site.

5.7.15 There are no public transport services close to the Site with the nearest bus stops are located in Cambusbarron and Gargunnoch providing access to Stirling and Glasgow, respectively.

Proposed Assessment Methodology

5.7.16 The study area for the assessment will focus on the routes used for access by construction vehicles and AILs.

5.7.17 Effects during the operation of the Proposed Development will be limited, with no more than occasional journeys by domestic scale vehicles during routine maintenance, and

therefore these effects are proposed to be scoped out of the access, traffic and transport assessment.

- 5.7.18 A desk-based review of the impacts arising from the construction of the Proposed Development will be undertaken, including the following:
- Collection and analysis of available road traffic accident data over the study area;
 - Determination of a construction phase programme and quantification of construction phase trips based on the quantity of material required for the Proposed Development (including generation as a result of forestry removal) and the duration of the construction phase;
 - Determination of a traffic baseline, taking account of measured existing traffic flow and other developments that have been identified for inclusion within the cumulative assessment; and
 - Quantification of material increases in traffic resulting from the construction phase of the Proposed Development.
- 5.7.19 A visual inspection of the study area will be carried out to ensure a full understanding of the local area and to identify all sensitive receptors. 24-hour Automatic Traffic Counts (ATCs) data will be obtained from the Department for Transport (DfT), Transport Scotland (TS) or Stirling Council (SC) and where not available, ATC surveys will be undertaken.
- 5.7.20 The most recent available five-year injury accident data will be obtained for the local and strategic road network in the study area from the DfT, SC and TS to identify any existing issues which may require to be addressed as part of the study.
- 5.7.21 Data gathered and processed for the access, traffic and transport assessment will be prepared in a suitable format to inform the Noise impacts which are considered separately in Chapter 5.8 of this Scoping Report.
- 5.7.22 An assessment of the Site will be undertaken to establish whether there are any suitable areas that can be used for borrow pits. If there are suitable areas then this will be factored in to transport movements associated with construction activities which would be reduced as a result of the use of onsite borrow pits.

Assessment of Environmental Impacts and their Significance

- 5.7.23 In accordance with the Institute of Environmental Management and Assessment (IEMA) Guidelines, the method used for assessing environmental effects of the increased traffic will be based on a comparison in percentage terms between predicted traffic flows on potentially affected roads with and without the Proposed Development traffic. The IEMA Guidelines express two ‘rules’ which should be followed when determining the scale and extent of the assessment, these are:
- “Rule 1: include highway links where traffic flows would increase by more than 30% (or the number of heavy goods vehicles would increase by more than 30%); and*
- Rule 2: include any other specifically sensitive areas where traffic flows have increased by 10% or more“.*
- 5.7.24 Rules 1 and 2 will be used as a screening tool to determine if a full assessment on routes within the study area is required due to the level of increase in traffic flows. In the case of construction traffic, where it is anticipated that traffic volumes do not increase by more than 30% (or 10% in sensitive locations) then a detailed assessment of the effects is not deemed necessary.

- 5.7.25 During construction, activities will generate traffic resulting in potential impacts on sensitive receptors.
- 5.7.26 Whilst the Site is in a rural location, there are several residential receptors located close to the potential construction access routes. There are a number of residential properties along Touch Road, with only a small number of these having direct frontage access i.e., located very close to the carriageway with no driveway/front garden separating them from the road.
- 5.7.27 Significance of effect will be determined using a matrix approach combining a function of the sensitivity of receptors and the magnitude of change. The assessment matrix incorporates information about the importance / sensitivity of the receptor, the magnitude of impact, the duration / persistence of the impact and the likelihood of the impact occurring. The criteria that will be used to categorise sensitivity of the receptor and magnitude impact characteristics will be set out in the Traffic and Transport Chapter of the EIAR.
- 5.7.28 Mitigation measures to reduce the level of any anticipated significant adverse impacts will be described, where necessary.

Potential Impacts

Construction

- 5.7.29 Where the IEMA thresholds are likely to be exceeded, consideration of the environmental effects of construction traffic would typically be undertaken in relation to the following transport effects:
- Severance;
 - Driver delay;
 - Pedestrian delay and amenity;
 - Accidents and safety; and
 - Hazardous/Abnormal loads.
- 5.7.30 In addition to this, the overall carrying capacity of the road in question will be considered in undertaking the assessment. A quantitative assessment of impact would be undertaken, based on the predicted rise in traffic flows against a measured baseline, considering the temporary nature of the works. The likely 'worst case' scenario will be described for the periods of peak traffic generation, with the daily numbers of vehicle movements predicted.
- 5.7.31 The assessment will identify the potential traffic and associated environmental effects on sensitive receptors and mitigation will be proposed where necessary. Traffic flows will increase on routes used for access to the Site and stretches of the local road network may need to be closed for a temporary period to facilitate the delivery of abnormal loads. The construction phasing and vehicle access would be managed to ensure that flows would be controlled during periods of more significant disruption, with mitigation likely to take the form of a Construction Traffic Management Plan (CTMP).

Operation

- 5.7.32 The Proposed Development will require a minimal number of trips with one or two small service vehicles carrying out routine maintenance. It is therefore proposed to scope out the assessment of the Proposed Development's operational impacts as part of the EIA.

Decommissioning

- 5.7.33 The levels of traffic associated with decommissioning are anticipated to be lower than those required during the construction phase, therefore will have a reduced impact compared to that assessed for construction phase. It is therefore proposed to scope out the assessment of the Proposed Development's decommissioning impacts as part of the EIA.

Cumulative Impacts

- 5.7.34 The anticipated cumulative effects of the potential for overlapping construction programmes for the Proposed Development in addition to other development proposals will be considered. The mechanism for mitigation of any cumulative effects is the implementation of a CTMP. It should be noted that a cumulative assessment in relation to transport and traffic is reliant on the prospect of more than one development being under construction (or operation, where this is applicable) at the same time as the Proposed Development.

Matters Scoped Out

- 5.7.35 It is proposed to scope out of the EIA Operational and Decommissioning Phase – potential impacts on:
- Severance;
 - Driver delay;
 - Pedestrian delay and amenity;
 - Accidents and safety; and
 - Hazardous/Abnormal loads.

Questions for Consultees

- Is the proposed methodology considered acceptable?

5.8 Noise and Vibration

Introduction

- 5.8.1 Noise can arise from both the construction, operation and the decommissioning of windfarms. The noise assessment will therefore evaluate the effects of the construction and decommission activities and operational noise of the Proposed Development on nearby noise sensitive receptors. This section of the Scoping Report has been prepared by Hoare Lea, who will also undertake the noise assessment for the EIA.

Legislation, Policy and Guidance

Legislation

- Control of Pollution Act 1974, Part III, HMSO (CoPA).

Policy

- Scottish Planning Policy (SPP), Scottish Government, 2014.
- Planning Advice Note PAN1/2011, Scottish Government, March 2011.
- Scottish Government, Online Renewables Planning Advice, Onshore Wind Turbines (<https://www.gov.scot/publications/onshore-wind-turbines-planning-advice>), May 2014.

Guidance

- The Assessment and Rating of Noise from Wind Farms, The Working Group on Noise from Wind Turbines, 1997 (ETSU-R-97);
- A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise, M. Cand, R. Davis, C. Jordan, M. Hayes, R. Perkins, Institute of Acoustics, May 2013 (IOA GPG);
- BS 5228, Code of practice for noise and vibration control on construction and open sites, Parts 1 & 2, British Standard Institute, 2014 (BS 5228);
- Calculation of Road Traffic Noise, Department of Transport (1988) (CRTN);
- Design Manual for Roads and Bridges, Transport Scotland, LA 111 Noise and vibration', revision 2 (2020) (DMRB).

- 5.8.2 Scottish Planning Policy requires consideration of potential noise impacts for developments such as this but provides no specific advice on noise. Planning Advice Note PAN1/2011 provides general advice on preventing and limiting the adverse effects of noise without prejudicing economic development. It makes reference to noise associated with both construction activities and operational windfarms.
- 5.8.3 The web-based planning advice note on 'Onshore wind turbines' provides further advice on noise and confirms that the recommendations of ETSU-R-97 "should be followed by applicants and consultees and used by planning authorities to assess and rate noise from wind energy developments".
- 5.8.4 Good practice in the application of the ETSU-R-97 methodology will be referenced, as set out in Institute of Acoustics Good Practice Guide to the Application of ETSU-R-97. This includes guidance on the assessment of cumulative operational noise impacts from wind farms, and on this point, further guidance set out in an article in the Institute of Acoustics Noise Bulletin will also be considered.
- 5.8.5 PAN1/2011 and the Technical Advice Note accompanying PAN1/2011 provide further advice on construction noise and make reference in particular to British Standard BS 5228. Furthermore, the Control of Pollution Act 1974 provides different means for local authorities of controlling construction noise and vibration. Potential impacts of construction traffic can be considered in line with the guidance of DMRB in addition to the advice of BS 5228.

Baseline

- 5.8.6 The assessment will consider noise sensitive residential locations in the vicinity of the Proposed Development. Specifically, ETSU-R-97 states that noise levels will be considered acceptable, even in the absence of measured baseline data, if predicted noise levels (including cumulative contributions from all wind farms) do not exceed 35 dB L_{A90}.
- 5.8.7 Therefore, the Study Area will encompass dwellings where predicted levels approach or are likely to approach this threshold, and also include properties located closer to the Site, provided the specific contribution of the Proposed Development is not negligible relative to that of the other schemes considered.
- 5.8.8 This will tend to include most dwellings potentially affected by noise or vibration effects from the construction of the Proposed Development infrastructure. In addition, dwellings located along the site access track or route will also be considered in relation to construction traffic.
- 5.8.9 The area surrounding the Site is generally of very low population density, with only a limited number of isolated properties located south of the Site. A lodge building has also been identified north of the Site but this is not understood to be residential in nature; however, this will be confirmed as part of further studies.

Existing Baseline Conditions

- 5.8.10 The site is rural in nature and the nearest properties are relatively isolated, therefore the background noise environment is likely to be characterised by 'natural' sources, such as wind-disturbed vegetation (including trees), birds, farm animals and water courses in some instances. Noise from existing turbines will also represent an influence in some conditions, but as explained below this must be considered carefully when undertaking an assessment under ETSU-R-97.
- 5.8.11 Consideration will be given to adjacent wind farms and whether sufficient and representative baseline background noise levels have already been obtained for these developments and which may appropriately define background noise levels for some of the relevant noise-sensitive receptor locations. It may be necessary to consider applying corrections for potential wind shear effects, where relevant.

Survey Methodology

- 5.8.12 ETSU-R-97 requires the baseline environment within the Study Area to be characterised by measuring background noise levels as a function of site wind speed at the nearest neighbours (or, at a representative sample of the nearest neighbours). ETSU-R-97 also requires that any such measurements are not significantly influenced by existing operational turbines, to prevent unreasonable cumulative increases.
- 5.8.13 The potential implication of wind shear effects due to the potential heights of the turbines considered for the Proposed Development would be taken into account in line with best practice. This would consist of referencing a sufficiently high wind speed reference for any new measurement and/or through the application of correction factors to any historical data used (if necessary).
- 5.8.14 The survey methods and selection of noise-sensitive receptors would be discussed in consultation with the Environmental Health Department of Stirling Council. The

assessment methodology, in particular with regards to cumulative impacts, will also be discussed with the Council. Representatives of the Council will be invited to attend during setup of the equipment for these surveys to agree measurement positions.

Assessment of Environmental Impacts and their Significance

Construction

- 5.8.15 Noise and vibration associated with the construction activities and associated traffic will be considered.

Operation

- 5.8.16 Operational noise from the Proposed Development will be assessed.

Cumulative Impacts

- 5.8.17 Cumulative operational noise from the Proposed Development in combination with neighbouring wind farms will be assessed unless it is considered that these effects are likely to be negligible. The IOA GPG suggests that cumulative noise effects need not be considered where differences between the noise level contribution of two wind farms are 10 dB or more. The assessment will consider the operational Earlsburn, Kingsburn and Craigenfelt Wind Farms as well as the proposed Shelloch Wind Farm.
- 5.8.18 If relevant, the implication of noise from cumulative construction traffic from different wind farms, should these overlap, will also be considered.

Matters Scoped Out

- 5.8.19 Construction activities (other than site traffic) from other sites considered in the cumulative analysis are unlikely to be undertaken simultaneously in sufficient proximity to lead to significant cumulative effects and this can be scoped out.
- 5.8.20 Similarly, decommissioning is likely to result in less noise than during construction of the Development and similar management measures can be employed and therefore this can be scoped out.
- 5.8.21 It is recognised that vibration resulting from the operation of wind farms is imperceptible at typical separation distances. It is therefore proposed to scope out the assessment of vibration produced during the operation of the Proposed Development.
- 5.8.22 With regard to infrasound and low frequency noise, the above-referenced online planning advice note, Onshore wind turbines, refers to a report for the UK Government which concluded that “there is no evidence of health effects arising from infrasound or low frequency noise generated by the wind turbines that were tested”. The current recommendation is that ETSU-R-97 should continue to be used for the assessment and rating of operational noise from wind farms. It is therefore not proposed to undertake specific assessments of infrasound and low frequency noise, but the noise chapter will consider the latest supporting information on these subjects and the topic of wind turbine blade swish or Amplitude Modulation (or AM).
- 5.8.23 Traffic during the operational phase of the Proposed Development is likely to be very low and is considered unlikely to have any noise effects.

Assessment Methodology

- 5.8.24 The methodology for the assessment of operational noise from wind farms in Scotland recommended in planning guidance is that documented in ETSU-R-97. In summary, the assessment shall:
- Identify the nearest noise sensitive receptors.
 - Determine the quiet day-time and night-time noise limits from the measured background noise levels at the nearest neighbours (see above).
 - Specify the type and noise emission characteristics of the wind turbines proposed for the Site.
 - Calculate noise emission levels which would be due to the operation of the wind turbines as a function of site wind speed at the nearest neighbours, including the cumulative effect of all turbines.
 - Compare the calculated wind farm noise emission levels with the derived noise limits.
 - The good practice guidance referenced above (IOA GPG) will be taken into account, including advice on baseline survey, wind shear assessment and noise prediction methodology.
- 5.8.25 When considering neighbouring cumulative wind farm noise, the potential noise emissions from the adjacent wind farm sites will be considered by examining the potential level of noise emission allowed under the respective consent for each of the sites, in line with current best practice (see guidance referenced above).
- 5.8.26 The calculated wind farm noise emission levels will be compared with the noise limits derived in accordance with ETSU-R-97. The noise limits derived according to ETSU-R-97 guidance, for each noise-sensitive receptor, apply to the total noise produced by all wind farms. Therefore, potential cumulative operational noise levels, including existing, consented and application wind turbines in the area, must be assessed relative to these limits.
- 5.8.27 In assessing the impact of noise and vibration from the construction activities, it is usual to accept that the associated works are of a temporary nature. The assessment of potential impacts due to noise emissions during construction will be undertaken in accordance with the BS 5228 British Standard guidance. Predictions of construction noise will be made referencing typical activity emission levels and likely variations in noise levels at surrounding receiver locations, using the methodology set out in BS 5228 Part 1. This standard can be used to predict noise levels associated with the different construction activities used throughout the construction programme.
- 5.8.28 Part 2 of the BS 5228 standard considers construction vibration and this will also be referenced. Any blasting if used for rock extraction at borrow pits may also create vibration and air overpressure which may require attention.
- 5.8.29 Consideration will also be given to the potential impact of construction traffic on sensitive receptors in the area. Depending upon the outcome of the assessment of traffic (see **Section 5.7: Traffic and Transport**), the impact of traffic along the Site access route will be assessed on the basis of the methodology within BS 5228-1, and the CRTN guidance, where appropriate.
- 5.8.30 The assessment of the temporary effects of construction noise is primarily aimed at understanding the need for dedicated management measures and, if so, the types of

measures that are required. In this respect, relevant working practices, traffic routes, and proposed working hours will be considered in the assessment.

- 5.8.31 The assessment of construction noise and vibration will identify if and when predicted noise levels may be above standard guideline limits, taking into account the rural character of the area. For construction traffic, the criteria set out in the DMRB are also likely to be referenced. Construction noise management procedures will also be determined.
- 5.8.32 Mitigation of operational noise will be achieved through the design of the Proposed Development, such that the relevant ETSU-R-97 noise limits can be achieved at the surrounding properties with commercially available wind turbines, taking into account the noise emissions from other wind farms in the area.
- 5.8.33 Regarding construction noise, relevant working practices, traffic routes, management procedures and proposed working hours will be set out within a Construction and Environmental Management Plan (CEMP).

Questions for Consultees

- Are the consultees happy with the suggested approach for the noise assessment, including elements scoped in and out?
- Are there any concerns regarding referencing baseline noise data previously measured in the assessment of neighbouring wind farm schemes?

5.9 Aviation and Radar

Introduction

- 5.9.1 Wind turbines have the potential to affect civil and military aviation. This section covers the methodology used to undertake the aviation safeguarding assessment, lists the aviation references used and describes the aviation baseline condition, consultation requirements and mitigation to be applied if required.

Guidance

- 5.9.2 There are a number of aviation publications relevant to the interaction of wind turbines and aviation containing guidance and legislation, which cover the complete spectrum of aviation activity in the UK as shown below.
 - Civil Aviation Publication (CAP) 764 Civil Aviation Authority (CAA) Policy and Guidance on Wind Turbines Version 6, Feb 2016
 - CAP 168 Licensing of Aerodromes, Version 11 March 2019
 - CAP 670 ATS Safety Requirements Version 3 June 2019
 - CAP 774 UK Flight Information Services, Ed 3 May 2017
 - CAP 738 Safeguarding of Aerodromes Version 2 Dec 2006
 - CAP 793 Safe Operating Practices at Unlicensed Aerodromes Ed 1 July 2010
 - CAP 493 Manual of Air Traffic Services Part 1 Ed 7.0 2017
 - CAP 660 Parachuting Ed 5 March 2020
 - Military Aviation Authority Regulatory Article 2330 (Low Flying)
 - UK Military Aeronautical Information Publication (MIL AIP)

- UK Aeronautical Information Publications (AIP)
- CAA 1:250,000 and 1:500,000 VFR Charts
- CAA Policy Statement: Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150m Above Ground Level dated 01/06/17.

Baseline

Study Area

- 5.9.3 The assessment of effects of the proposed turbines will be based upon the guidance laid down in CAA Publication CAP 764 Policy and Guidelines on Wind Turbines Version 6 Dated February 2016. Consultation criteria for aviation stakeholders is defined in Chapter 4. These distances inform the size of the study area and include:
- Airfield with a surveillance radar – 30 km
 - Non radar licensed aerodrome with a runway of more than 1,100 metres – 17 km
 - Non radar licensed aerodrome with a runway of less than 1,100 metres – 5 km
 - Licensed aerodromes where the turbines would lie within airspace coincidental with any published Instrument Flight Procedure (IFP)
 - Unlicensed aerodromes with runways of more than 800 metres – 4 km
 - Unlicensed aerodromes with runways of less than 800 metres – 3 km
 - Gliding sites – 10 km
 - Other aviation activity such as parachute sites and microlight sites within 3 km – in such instances developers are referred to appropriate organisations.
- 5.9.4 CAP 764 goes on to state that these distances are for guidance purposes only and do not represent ranges beyond which all wind turbine developments will be approved or within which they will always be objected to. These ranges are intended as a prompt for further discussion between developers and aviation stakeholders and will be reported upon in the EIA Report.
- 5.9.5 It is necessary to take into account the aviation and air defence activities of the Ministry of Defence (MOD) as safeguarded by the Defence Infrastructure Organisation (DIO). The types of issues that will be addressed in the EIA Report include:
- Ministry of Defence Airfields, both radar and non-radar equipped
 - Ministry of Defence Air Defence Radars
 - Ministry of Defence Meteorological Radars
 - Military Low Flying.
- 5.9.6 It is necessary to take into account the possible effects of wind turbines upon the National Air Traffic Services En Route Ltd (NERL) communications, navigation and surveillance (CNS) systems – a network of primary and secondary radars and navigation facilities around the country.
- 5.9.7 As well as examining the technical impact of wind turbines on Air Traffic Control (ATC) facilities, it is also necessary to consider the physical safeguarding of ATC operations using the criteria laid down in CAP 168 Licensing of Aerodromes to determine whether a Proposed Development will breach obstacle clearance criteria. This will also be reported

on in the EIA Report but initial surveys show there are no physical safeguarding issues associated with this proposal.

Existing Baseline Conditions

- 5.9.8 The Proposed Development is located in an area with significant aviation facilities. It is 31 km to the north-east of Glasgow Airport and 48 km to the north-west of Edinburgh Airport. It is also 12km to the north of Cumbernauld Aerodrome. **Figure 5.9.1** shows that the Proposed Development is under Class D regulated airspace designated as the Glasgow Control Area (CTA) with a base altitude of 3000 ft. The site is also at the northern end of a gap between the Glasgow and Edinburgh Control Zones (CTZ) used by light aircraft transiting north/south that are unable to enter the CTZs. It is, however, in a location that already has wind turbines marked on the aviation charts with a height of 377 and 410 ft above ground level.

Methodology

- 5.9.9 The general approach to windfarm development is to avoid adverse effects on aviation infrastructure where possible or, where adverse effects on their air traffic control service have been identified and substantiated by aviation stakeholders, work to identify and implement appropriate operational or technical mitigation solutions.
- 5.9.10 The radar calculation results will be produced using specialist propagation prediction software (Review Version 5) which incorporates the safeguarding criteria for a wide range of radar and radio navigation systems. The results will be verified using the Shuttle Radar Topography Mission (SRTM) dataset. By using two separate and independently generated digital terrain models, anomalies are identified, and consistent results assured. This modelling will form the basis of the assessment contained in the EIAR.
- 5.9.11 The EIAR will include a description of military and civilian aeronautical and radar issues relating to the Proposed Development. Consultation will be undertaken during the development process once the location of the turbines has been finalised with appropriate interested parties.

Assessment of Environmental Impacts and their Significance

Potential Impacts

Radar Equipped Licensed Aerodromes

- 5.9.12 The design process for the windfarm proposal will be iterative and will take into account any potential impact and any requirement for mitigation. Based on the Scoping layout, an initial review by WPAC shows that there is potential for the turbines to affect two airports, Glasgow and Edinburgh.

Glasgow Airport

- 5.9.13 Glasgow Airport is 31 km to the south-west and the Proposed Development is aligned with the approach for the main runway. Aircraft will be being sequenced to land in this area above an altitude of 3000 ft. The airport has two primary surveillance radars (PSR),

a standard PSR and a Terma Scanter 4002 radar used specifically for wind farm mitigation. Radar modelling has been undertaken with the results in **Table 5.8**.

Table 5.8: Radar Line of Sight Glasgow Airport PSR

Turbine	Radar Line of Sight (metres AGL)	Turbine	Radar Line of Sight (metres AGL)
1	423.5	9	244.4
2	429.2	10	288.3
3	419.9	11	257.8
4	410	12	188.3
5	399.8	13	137.5
6	347.5	14	164.3
7	335.3	15	282.5
8	269.4		

- 5.9.14 The results show that, based on 180 m tip heights only two of the turbines have the potential to be visible to the radar, T13 and T14. The applicant will consult with Glasgow Airport on this issue to explore whether a radar mitigation scheme will be required on the chosen windfarm layout proposal. Notwithstanding, the installed Terma radar is expected to be able to provide a suitable mitigation. This issue will be fully reported in the EIA Report.
- 5.9.15 The Proposed Development is also in an area where there are a number of published Instrument Flight Procedures (IFP). It is likely that an IFP check will be required to ensure the minimum obstacle clearance (MOC) will be maintained between the turbine tips and the procedures. Again, the applicant will explore this issue with Glasgow Airport and this issue will be addressed in the EIA Report.

Edinburgh Airport

- 5.9.16 Edinburgh Airport is approximately 46 km to the south-east of Proposed Development. The airport is also equipped with both a standard ATC PSR and a Terma, wind farm mitigation radar. Whilst the airport has requested to be consulted out to a distance of 40 km they are routinely consulted about proposed wind farms beyond that distance. Radar modelling for the PSR has been undertaken with the results shown in **Table 5.9**.

Table 5.9: Radar Line of Sight Edinburgh Airport

Turbine	Radar Line of Sight (metres AGL)	Turbine	Radar Line of Sight (metres AGL)
1	109.6	9	106.6
2	104.2	10	129.7
3	82.6	11	107.8
4	118.8	12	105.9
5	133.6	13	79.1
6	133.2	14	87.4
7	100.6	15	43.2
8	93.8		

- 5.9.17 The results show that currently, the Proposed Development will be visible to the Edinburgh PSR and will generate an area of radar clutter on the displays at the airport. The Site lies within ATC regulated airspace managed by Glasgow. the applicant will, therefore, initially consult with Edinburgh Airport to establish whether it is their responsibility or Glasgow to provide feedback on the fixed layout.
- 5.9.18 Should the effect be considered unacceptable in terms of the delivery of ATC services at Edinburgh, mitigation is available through the use of the Terma Scanter 4002 located at the airport. The results of the consultation will be reported fully in the EIA Report.

Non Radar Equipped Licensed Aerodromes

- 5.9.19 There are no non-radar equipped licensed aerodromes within the recommended consultation distance. The closest is Cumbernauld which is 12 km to the south. For an aerodrome of this type with a runway of less than 1100 metres, the recommended consultation distance is 5 km. Consultation is therefore not required.

Unlicensed Aerodromes

- 5.9.20 There are no unlicensed aerodromes marked on aviation charts or known within the 3 km consultation distance. This issue can be scoped out of the EIA Report

Ministry of Defence

- 5.9.21 **Air Traffic Control Radar** - The closest MOD ATC radar is at Leuchars Station (formerly RAF Leuchars) in Fife, over 80 km to the north-east. Radar modelling has been undertaken which shows there is no radar line of sight below 300 metres. The MOD will be consulted but it is anticipated that there will be no MOD ATC radar concerns with the Proposed Development.
- 5.9.22 **Air Defence Radar** – the closest MOD Air Defence radar is at Brizlee Wood, near Alnwick, over 150 km to the south-east. Radar modelling confirms that there is no possibility of the turbines being visible to the radar and therefore there should be no MOD objection. This will be confirmed by the MOD when consulted and reported upon in the EIA Report.

5.9.23 **MOD Low Flying** – the Proposed Development is located in an MOD defined ‘Blue’ area for wind farm and low flying consultation purposes. A ‘Blue’ area is defined as “a low priority military low flying area less likely to raise concerns”. A detailed low flying assessment will be undertaken and MOD consultation completed and reported upon in the EIA Report but an MOD objection is highly unlikely in this location. Infra-red lighting will be required to the MOD specification.

UK Met Office Radars

5.9.24 The Met Office will require to be consulted if a wind farm is to be built within 20 km of one of their radars. In this case the closest radar is at Holehead, 10 to 12 km to the south-west. Initial radar modelling shows that all of the turbines within the Proposed Development will be in line of sight of the radar and will require detailed technical analysis to be undertaken. The applicant will consult with the Met Office, however, given there are already turbines in this location, any additional effect is likely to be minimal. This issue will be fully reported in the EIA Report.

NATS En Route Ltd (NERL)

5.9.25 An initial assessment has been conducted to determine any effect of the Proposed Development on NERL communications, navigation and surveillance infrastructure. The closest long range ‘en route’ radar which provides cover over this location is at Lowther Hill, 85 km to the south. Radar modelling has been undertaken with the results shown in Table 5.10. The results show that every turbine will be visible to the radar. NERL will be consulted and it is likely that a radar mitigation scheme will need to be agreed. There are a number of options available that would provide suitable mitigation. This will be reported on the EIA Report.

Table 5.10: Radar Line of Sight Results Lowther Hill Radar

Turbine	Radar Line of Sight (metres AGL)	Turbine	Radar Line of Sight (metres AGL)
1	12.3	9	0
2	33.5	10	64.3
3	4.2	11	48.6
4	41.9	12	16
5	52.4	13	3.9
6	71.2	14	23.2
7	0	15	15.3
8	0		

5.9.26 Other NERL Radars – there are two other radars in the region that have been provided by developers in order to mitigate the effect of specific wind farms on the NERL infrastructure. These are located at Cumbernauld and Kincardine. Initial radar modelling shows that the turbines will be visible to both radars, however, there should be no operational effect as neither radar is used in the vicinity of the Proposed Development. Again this will be discussed with NERL through consultation and reported in the EIA Report.

Aviation Obstruction Lighting

- 5.9.27 CAA extant lighting policy is covered in 'CAA Policy Statement: Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150 m Above Ground Level (01/06/17). It states that any obstruction in excess of 150 metres above ground level constitutes an "en route navigation hazard". Wind turbines are lit with medium intensity (2000 candela) fixed red lights located on the highest practical point, in this case the nacelle. There is also currently a requirement for low intensity, 32 candela lights halfway up the tower of a limited number of the turbines. There are a number of mitigations that can be applied to minimise the effect of lighting on the surrounding area including reducing the number of turbines that need to be lit, reducing the brilliance of the lights to a minimum of 10% when the visibility in all directions exceeds 5 km and designing the lights to minimise downwards illumination. The CAA have recently released a draft change to the lighting requirements which is expected to be ratified and published in an update to CAP 764 which is due to be released shortly. In order to minimise landscape and visual impacts an Aviation Lighting Mitigation Plan (ALMP) will be written for inclusion within the EIA Report in accordance with best practice and which will also reflect the new CAA guidance and the results of consultation. It will also include an infra-red lighting layout to satisfy MOD requirements.

Assessment Methodology

- 5.9.28 Assessing significance in an aviation context is often controversial as there is no agreed definition of significance. This is due to the fact that whilst technical effects on communications, navigation and surveillance (CNS) systems are simple to identify and evaluate, operational and flight safety effects can be subjective and are often challenged. It is enough in this context to identify any technical effects and then, taking into account the statements in CAP 764 regarding the status of aviation stakeholders, in general to accept the judgement of those stakeholders in assessing the significance of the effects. The assessment therefore, will use the advice provided in CAP764 as the starting point in establishing the acceptability of the Proposed Development. This assessment will be produced in conjunction with the project landscape experts.

Questions for Consultees

- Is the proposed methodology considered acceptable?

5.10 Other Issues

Socio-economics, Land Use and Tourism

Introduction

- 5.10.1 This chapter will consider the potential socio-economic, land use, tourism and recreation effects from the Proposed Development. This includes consideration of existing land uses within the Site, employment generation and other economic effects, and local recreation and tourism activity.

Legislation, Policy and Guidance

- 5.10.2 There is no specific legislation or guidance available on the methods that should be used to assess the socio-economic impacts of a proposed onshore wind farm development. The proposed method has however been based on established best practice, including the used in UK Government and industry reports on the sector.
- 5.10.3 There is also no formal legislation or guidance on the methods that should be used to assess the effects that wind farm developments may have on general tourism and recreation interests. The proposed method will consider individual attractions and tourism facilities to assess if there could be any effects from the development.
- 5.10.4 For recreational assets, guidance has been provided by NatureScot on how to assess effects on recreational amenity and the approach outlined has been used (Scottish Natural Heritage, 2014). This takes into consideration a number of potential effects, including direct effect on facilities, such as limitation or restrictions on access, and effects on the intrinsic quality of the resources enjoyed by people. In general, this guidance would consider recreational and access impacts to potentially be significant if:
- permanent or long-term effects on the resources on which enjoyment of the natural heritage depends, in particular where facilities have been provided by SNH or others under statutory powers;
 - permanent or long-term change that would affect the integrity and long-term sustainable management of facilities which were provided by SNH or others under statutory powers;
 - where there are recreational resources for open air recreation pursuits affected by the proposal which have more than local use or importance, especially if that importance is of national significance;
 - major constraints on or improvements for access or accessibility to designated natural heritage sites; and
 - where mitigation and/or compensatory or alternative recreational provision is considered to be inadequate.
- 5.10.5 In addition, the desk study will take account of relevant local and national policy objectives. The most relevant are expected to include:
- Scottish Government (2022), Scotland's National Strategy for Economic Transformation;
 - Scottish Government (2018), Scotland's National Performance Framework;
 - Stirling Council (2020) 10 Year Strategy: 2020-2030;
 - The Stirling and Clackmannanshire City Region Deal;
 - City of Stirling (2021) Economic and Tourism Development Strategy 2021 - 2025
 - Scottish Tourism Alliance (2021), Scotland Outlook 2030; and
 - Loch Lomond & The Trossachs National Park (2017), National Park Partnership Plan 2018-2023.

Baseline

Study Area

- 5.10.6 The baseline description will cover and compare the study areas of:

- Stirling;
 - Scotland; and
 - the UK.
- 5.10.7 This is intended to encompass the areas where significant effects, as a result of the proposed Development, on employment and the economy could occur.
- 5.10.8 The socio-economic baseline shall be expanded on in the chapter through a review of publicly available data sources. This will include:
- the population characteristics of the local area, including local and national demographic trends;
 - deprivation statistics set within a national context;
 - employment and economic activity in the local area within the context of the national economy;
 - wage levels in the local area compared to the national level;
 - the industrial structure of the local economy compared to the national level; and
 - the role of the tourism sector in the local economy, with consideration of assets, including accommodation providers and recreational trails, within 15 km of the Proposed Development.
- 5.10.9 A three-tiered approach to the study area for tourism, recreation and land use effects will be adopted. A study area of 15 km from the Site will be used to identify tourism receptors, including accommodation, attractions and events. A study area of 5 km from the Site will be used to identify formal tourism and recreational receptors, generally businesses and/or attractions that charge an entry fee for admission or have a significant commercial element, and informal tourism and recreational receptors, which relate to walking routes and open spaces which aren't commercial in nature. However, direct impacts will only be assessed for receptors within the Site. The study area for land use covers all the land taken by the proposed Development either temporarily during construction or permanently during operation.

Assessment of Environmental Impacts and their Significance

Assessment Methodology

- 5.10.10 To assess the magnitude of socio-economic impacts, the level of activity/employment supported during the construction and operation phases will be estimated.
- 5.10.11 Government and industry reports will be used to determine the expected capital and operational expenditure associated with the Proposed Development, as well as the breakdown of expenditure by different contracts (e.g., turbine, balance of plant). An assumption will then be made based on the share of each type of contract that can be secured regionally and nationally. This increase in turnover will then be used to estimate the economic impact associated with the Proposed Development.
- 5.10.12 This will also consider the potential impacts of any energy storage systems that are co-located on the Site.
- 5.10.13 The impacts on tourism and recreation assets will be assessed with a focus on whether visitor behaviour is likely to change. For Tourism, this will include potential effects on visitor attractions and accommodation providers, in particular key features that make

them attractive. The focus of the assessment will be the potential impact that the Proposed Development could have on key drivers of tourism activity in the area. It will also consider the assets, or clusters of assets, in areas that have been identified as having significant effects in other chapters, including Traffic and Transport, Noise and Landscape and Visual Impact. For Recreation this will include a qualitative assessment of the effect of the Proposed Development on informal and formal recreation facilities and activities, including designated routes within the study area.

- 5.10.14 The assessment will be informed by the most up-to-date evidence on the relationship between tourism and onshore wind development.
- 5.10.15 Effects on recreational trails such as the West Highland Way will also be considered with a focus on whether the Proposed Development will affect access or reduce recreational amenity.
- 5.10.16 Consultee responses to scoping will be considered and issues related to socio-economics, land use, tourism and recreation will be addressed.
- 5.10.17 An assessment of the cumulative socio-economic, land use and tourism effects will be provided.
- 5.10.18 Initiatives such as community benefit funding and community ownership do not form part of the formal appraisal process within the planning system. However, these shall also be considered within the chapter to present a fuller picture of the economic and social impacts that the Proposed Development could have.
- 5.10.19 Criteria for determining the significance of effects will be based on the sensitivity of an economy or tourism and recreation asset, as well as the magnitude of impacts. This will include effects during the construction and operation phases.

Sensitivity of Receptor

Table 5.11: Sensitivity of receptor criteria

Sensitivity of Receptor	Criteria
High	<p>The receptor:</p> <ul style="list-style-type: none"> • has little or no capacity to absorb change without fundamentally altering its present character; or • is of high socio-economic, recreational, or tourism value; or • is of national or international importance; or • is accorded priority in national policy; or • has no alternatives with available capacity within its catchment area; or • is a destination in its own right (as regards tourism and visitor attractions)
Medium	<p>The receptor:</p> <ul style="list-style-type: none"> • has moderate capacity to absorb change without fundamentally altering its present character; or • has a moderate socio-economic, recreational or tourism value; or • is of regional importance; or • is accorded priority in local policy; or • has some alternatives with available capacity within its catchment area; or • is a destination for people already visiting the area (as regards tourism and visitor attractions); or • forms a cluster of low sensitivity receptors.
Low	<p>The receptor:</p> <ul style="list-style-type: none"> • is tolerant of change without detriment to its character; or • is of low socio-economic, recreational or tourism value; or • is of local importance; or • is accorded low priority in policy; or • has a choice of alternatives with available capacity within its catchment area; or • is an incidental destination for people already visiting the area (as regards tourism and visitor attractions)
Negligible	<p>The receptor is resistant to change and is of low socio-economic, recreational or tourism value or there is a wide choice of alternatives with available capacity within its catchment area.</p>

Magnitude of Impact

Table 5.12: Magnitude of impact criteria

Receptor	Magnitude of impact			
	High	Medium	Low	Negligible
Economy	An impact that would dominate	An impact that would be	An impact that would be	An impact that would not be

Receptor	Magnitude of impact			
	High	Medium	Low	Negligible
	over baseline economic conditions by >10 %.	expected to result in a moderate change to baseline economic conditions by >5 %.	expected to result in a perceptible difference from baseline economic conditions by >0.5 %.	expected to result in a measurable variation from baseline economic conditions.
Employment	An impact that would dominate over baseline labour market conditions and/or would affect a large proportion (>10 %) of the existing resident workforce.	An impact that would be expected to result in a moderate change to baseline labour market conditions and/or would affect a moderate proportion (>5 %) of the existing resident workforce.	An impact that would be expected to result in a perceptible difference from baseline labour market conditions and/or would affect a small proportion (>0.5 %) of the existing resident workforce.	An impact that would not be expected to result in a measurable variation from baseline labour market conditions.
Tourism and visitor economy	An impact that would dominate over baseline tourism and visitor economy conditions.	An impact that would be expected to result in a moderate change to baseline tourism and visitor economy conditions.	An impact that would be expected to result in a perceptible difference to baseline tourism and visitor economy conditions	An impact that would not be expected to result in a measurable variation from baseline tourism and visitor economy conditions
Tourism and visitor receptors	An impact that would be expected to cause a major restriction of access to or availability of tourism and visitor assets in the study area or would result in a major change to existing patterns of use.	An impact that would be expected to have a moderate restriction of access to or availability of tourism and visitor assets in the study area or would result in a moderate change to existing patterns of use.	An impact that would be expected to have a small restriction of access to or availability of tourism and visitor assets in the study area or would result in a small change to existing patterns of use.	An impact that would be unlikely to result in a noticeable difference to tourism and visitor assets in the study area.
Land use	An impact that would lead to a major restriction on the operation of a receptor, e.g., forestry business, or	An impact that would lead to a moderate to major restriction on the operation of the receptor.	An impact that would lead to a minor restriction on the operation of the receptor.	An impact that would lead to a negligible restriction on the use of the receptor.

Receptor	Magnitude of impact			
	High	Medium	Low	Negligible
	complete closure of receptor.			

Significance of Effect

Table 5.13: Significance of effect matrix

Sensitivity of Receptor	Magnitude of Impact			
	High	Medium	Low	Negligible
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

Questions for Consultees

- Is the scope of the proposed assessments appropriate?
- Are Consultees aware of any key sensitive receptors that should be considered?
- Are Consultees aware of any additional relevant consultees?

Infrastructure and Telecommunications

Introduction

- 5.10.20 Tall structures such as buildings and wind turbines can adversely affect the performance of fixed telecommunications links, if positioned close enough to those links.
- 5.10.21 The Proposed Development also has the potential for impacts on buried services due to excavations required to install foundations for infrastructure.

Guidance

- 5.10.22 Standards for the separation of wind turbines from fixed telecommunications links are set out in an Ofcom-recommended paper ‘A proposed method for establishing an exclusion zone around a terrestrial fixed radio link outside of which a wind turbine will cause negligible degradation of the radio link performance.’ (Bacon (2002)).
- 5.10.23 There is no standard guidance regarding setback distances between infrastructure and buried services.

Baseline

Study Area

- 5.10.24 The Site will be adopted in order to determine the fixed telecommunications link and buried services baseline.

Existing Baseline Conditions

- 5.10.25 The telecommunications baseline will be determined from consultations and by review of Ofcom data. Initial indications suggest that there are no telecommunications links with the potential to be adversely affected by the Proposed Development.
- 5.10.26 The buried services baseline will be determined through a desktop study and consultation with service providers.

Assessment of Effects

- 5.10.27 Baseline studies will identify any issues requiring mitigation or detailed assessment. Where potential impacts cannot be mitigated by design then technical mitigation solutions will be discussed with the relevant stakeholders.

Shadow Flicker

Introduction

- 5.10.28 This section considers shadow flicker, an effect caused in particular circumstances by the rotation of the turbine blades when the sun is shining, which can create a flickering or strobe-like effect. This can be a cause of annoyance at residences near wind developments.

Guidance

- 5.10.29 There are no formal guidelines currently available on what exposure would be acceptable in relation to shadow flicker. There is no standard for the assessment of shadow flicker. The Scottish Government's web-based guide relating to onshore wind turbines (Scottish Government 2013) suggests that shadow flicker should not cause nuisance and annoyance to dwellings beyond a distance of 10 rotor diameters from a wind turbine, which equates to up to 1630 m in this instance.
- 5.10.30 Department of Environment and Climate Change (DECC) studies have shown that in northern latitudes shadows from wind turbines can only be cast 130 degrees either side of north relative to the turbine due to the orientation of the earth's axis and the positioning of the sun. This equates to a region of 50 degrees either side of due south where a wind turbine will never cast a shadow and therefore properties within this region will experience no effects from shadow flicker.

Assessment of Environmental Impacts and their Significance

- 5.10.31 The Proposed Development will be designed where possible to avoid turbine placements within the Zone of Potential Shadow Flicker (ZPSF). Should this be achieved, then shadow flicker will be scoped out of the EIA. If it is not possible to avoid shadow flicker effects through turbine placement, then the dates, times and durations of shadow flicker events for each property within the ZPSF will be calculated using a computer model and an assessment of effects at these properties included in the EIAR. If necessary, potential mitigation measures could include the use of shadow flicker modules in the wind turbines which automatically cause them to stop operating under the conditions that would give

rise to shadow flicker at a sensitive receptor. This could be secured via a suitably worded planning condition.

Climate Change

Introduction

- 5.10.32 A key benefit of wind energy (in common with other renewable energy technologies) is the generation of low carbon electricity. This contrasts with much of the electricity distributed on the national grid generated by fossil fuels. Fossil fuel-generated electricity gives rise emissions of carbon dioxide and other greenhouse gases (GHGs) which trap heat within the atmosphere, leading to the destabilisation of the prevailing climate (climate change).
- 5.10.33 Operating wind farms deliver GHG savings by offsetting consumption of fossil fuel-generated electricity. However, the manufacture, construction and decommissioning of windfarms does result in GHG emissions, particularly where natural carbon stores such as peat and forestry are impacted.

Legislation, Policy and Guidance

- 5.10.34 The Scottish Government requires the nation-wide reduction of GHG emissions through the Climate Change (Scotland) Act 2009. The Act set a target of reducing GHG emissions by at least 80% by 2050, relative to the 1990 baseline year. In October 2019, this was amended by the Climate Change (Emissions Reductions Target) (Scotland) Act 2019. The amendment set out to achieve net zero by 2045 in line with the recommendations of the Climate Change Committee.
- 5.10.35 The Scottish Government provides a robust guidance framework for the delivery of carbon balance assessments through which the impact of proposed wind farm developments upon peatland can be identified. This framework makes use of the government's carbon calculator tool, developed in consultation with Scottish Environment Protection Agency (SEPA), Scottish Natural Heritage (SNH) and Forestry Research, and is considered to offer the best currently available method.
- 5.10.36 The following guidance will be followed during the assessment and preparation of the EIAR Chapter:
- SNIFFER (2021) Evidence for the third UK Climate Change Risk Assessment (CCRA3). Available at: <https://www.ukclimaterisk.org/wp-content/uploads/2021/06/CCRA-Evidence-Report-Scotland-Summary-Final-1.pdf>
 - Committee on Climate Change (2020) Reducing emissions in Scotland Progress Report to Parliament. Available at: <https://www.theccc.org.uk/publication/reducing-emissions-in-scotland-2020-progress-report-to-parliament/>
 - Institute of Environmental Management and Assessment (2017) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance.
 - NatureScot (2016) Carbon and Peatland map. Available at: <https://www.nature.scot/professional-advice/planning-and->

[development/planning-and-development-advice/soils/carbon-and-peatland-2016-map](#)

- Nayak et al. (2010) Calculating Carbon Savings from Windfarms on Scottish Peatlands - a New Approach
- Nayak et al. (2008) Calculating Carbon Savings from Windfarms on Scottish Peatlands - a New Approach
- Scottish Forestry Map Viewer: <https://scottishforestry.maps.arcgis.com/apps/webappviewer/index.html?id=0d6125cfe892439ab0e5d0b74d9acc18>

Baseline

- 5.10.37 The Site is greenfield land, with woodland to the south. According to the NatureScot Carbon and Peatland map (2016) the land predominantly comprises Class 1 peat soils in the north, and Class 5 peat soils underlying the woodland area in the south.
- 5.10.38 The area of young conifer woodland to the south of site covers approximately 108 Ha, with Touchadam Muir adjacent to the east of the woodland. There are numerous tracks and streams located within the woodland area.

Assessment of Environmental Impacts and their Significance

Potential Impacts

- 5.10.39 Given the baseline environmental characteristics, it is likely that the Site presently sequesters carbon. If disturbed, these carbon stores have the potential to release carbon into the atmosphere to form carbon dioxide. It is thus possible that in addition to the embodied GHG emissions associated with manufacture of the turbines and associated ancillary infrastructure, on-site activities during construction and decommissioning may contribute towards limiting the sequestration capacity of the Site.
- 5.10.40 However, this negative impact may be offset by the significant positive impact from generation of low carbon electricity by the Proposed Development. Depending on the proposed design, its net impact is expected to be substantially positive.
- 5.10.41 During the design process, the wind turbines will be sited to avoid the areas of deepest peat as far as practicable, and measures to minimise peat disturbance, especially during excavation, will be considered. To minimise peat disturbance in construction and decommissioning, best practice measures will be provided as part of the Construction Environmental Management Plan and Peat management Plan.

Assessment Methodology

- 5.10.42 A desk-based assessment will be undertaken using the latest version of the Scottish Government's Carbon Calculator Tool (v1.6.1) to quantify GHG emissions and savings over the project lifecycle (manufacture, construction, operation and decommissioning). The assessment will also estimate the Proposed Development 's net GHG impact and 'carbon balance period' (the time following the start of wind farm operation at which its embodied GHG emissions are offset through GHG savings from the wind farm's operation). The tool provides for the calculation of carbon dioxide (CO₂) emissions savings against:

- carbon loss due to turbine manufacture, construction, operation and decommissioning;
- carbon loss due to backup power generation;
- carbon loss from the soil;
- loss associated with runoff of dissolved and particulate organic carbon; and
- carbon gain associate with habitat improvements at site.

5.10.43 The assessment will be undertaken in accordance with current guidance on Calculating Potential Carbon Losses and Savings from Wind Farms on Scottish Peatland (Technical Note 2.10.0), and with reference to, inter alia, Calculating Carbon Budgets of Wind Farms in Scottish Peatland by Nayak et al. 2010 , Calculating Carbon Savings from Wind Farms on Scottish Peat Lands - a new approach by Nayak et al., 2010 and Carbon Implications of Windfarms Located on Peatlands - Update of the Scottish Government Carbon Calculator Tool by Smith et al., 2011.

5.10.44 The assessment will draw on site-specific information including:

- site characteristics (e.g., average temperature, wind speed);
- peat soil type and depth (from peat survey);
- water table depth before and after construction and decommissioning;
- development proposals (turbine number and output, access tracks, borrow pits, hard standing and foundation areas etc.); and
- post-decommissioning replanting, restoration and draining proposals.

5.10.45 The results of the assessment will be included in a Chapter of the EIAR. A record of all data used, and for what purpose, will be maintained throughout the assessment, and included within the appendices to the final EIAR.

5.10.46 .

Questions for Consultees

- Is the proposed methodology considered acceptable?

Forestry

Introduction

5.10.47 This section details the way in which potential effects of the Proposed Development on the woodland/forestry areas within the Site will be assessed. It is not proposed to provide a specific assessment chapter within the EIA report to deal with this aspect; however, it will be assessed where relevant in other technical chapters, primarily ecology, LVIA and hydrology.

Legislation, Policy and Guidance

5.10.48 Relevant policy and guidance which will be considered during the EIA. In Scotland, permanent deforestation is dealt with under the Scottish Government's "Control of Woodland Removal Policy" (Forestry Commission Scotland, 2009). The purpose of the policy is to provide direction for decisions on woodland removal in Scotland.

5.10.49 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. Where woodland is removed in association with development, developers will generally be expected to provide compensatory planting. In cases of woodland with a strong presumption against removal, such as ancient woodland, the compensatory planting area must exceed the area of woodland removed to compensate for the loss of environmental value.

5.10.50 The main forestry consultee is Scottish Forestry who will be consulted throughout the development of the proposals to ensure that the proposed changes to the woodlands are appropriate and address the requirements of the Control of Woodland Removal Policy and UK Forestry Standard Guidelines.

5.10.51 Legislation:

- Climate Change (Scotland) Act 2009.

5.10.52 Policy:

- Planning and development: trees and woodland (NatureScot).
- Right Tree in the Right Place - Planning for Forestry & Woodlands 2010,
- Scotland's Forestry Strategy 2019-2029 v.05/02/19;
- Control of Woodland Removal, Forestry Commission Scotland, 2009; and
- The UK Forestry Strategy 2017
- Stirling and Clackmannanshire Forestry and Woodland Strategy (2019)

5.10.53 Guidance:

- Guidance to Forestry Commission Scotland Staff on implementing the Scottish Government Policy on control of woodland removal, March 2015

Baseline

5.10.54 There is an area of privately owned commercial forestry to the south of the Site. This comprises coniferous plantation in rotation. The area is approximately 108 ha.

Survey Methodology

5.10.55 A site survey will be undertaken to collect mensuration data, identify onsite constraints in relation to forestry, consider opportunities for environmental enhancements, and assess the level of threat from wind.

Assessment of Environmental Impacts and their Significance

5.10.56 The Proposed Development has the potential for woodland loss. Where turbines are located within areas of forestry clear felling or keyholing will be used.

5.10.57 The effects of the changes to forest design as a result of the Proposed Development will be considered within the relevant chapters of the EIAR.

5.10.58 A Wind Farm Forest Design Plan will be presented in a separate factual Technical Appendix, using the following approach, together with a summary in the main Project Description and the description of the design evolution:

- The forestry baseline will describe the crops existing at time of preparation of the EIAR. This will include total area, species composition; age class structure, yield class, other relevant crop information, baseline felling and restocking plans, as available. The baseline will be prepared from existing records, site surveys and aerial photography;
- The changes to the forest structure resulting from the incorporation of the Proposed Development will be described within the Wind Farm Forest Design Plan. This will include the changes to, for example, the woodland composition and felling programmes;
- The changes to the woodland structure will be analysed and described including changes to species composition, age class structure, timber production, traffic movements and the felling and restocking plans. The resulting changes to the woodland structure and any requirement for compensation planting for any woodland loss will be considered in the context of the Control of Woodland Removal Policy and in consultation with Scottish Forestry; and
- Information will be presented in text, tables, and diagrams together with maps as necessary.

5.10.59 Consideration of the influence of forestry felling and management activities arising from the Proposed Development hydrology will be addressed in the in the Hydrology, Geology, and Hydrogeology chapter of the EIAR. Volumes of waste or harvested timber arising from felling operations associated with the Proposed Development will be included in the assessment of Traffic and Transport in the corresponding EIAR chapter.

5.10.60 Opportunities for compensatory planting and/or habitat improvement will be outlined in conjunction with the Ecology Chapter of the EIAR. This will include consideration of potential effects from the proposed planting upon other disciplines covered within the EIAR.

5.11 Issues Scoped Out

5.11.1 Above and beyond where it is proposed to scope out particular elements environmental aspects identified above, it is also proposed to scope out the following aspects.

Air Quality

5.11.2 The main source of impact on air quality would be increased traffic flows on local roads during construction and emissions from construction activities including exhaust fumes and dust generated from quarrying activities associated with borrow pits and unmade ground from borrow pits and access tracks in dry conditions.

5.11.3 It is considered that the emissions associated with these activities would be transient, localised and highly unlikely to have a significant effect upon local air quality. In addition, there are well established best practice measures applied to construction that will form an integral part of the development process (e.g., speed control, optimising deliveries to site, dust control, restrictions on idling plant/vehicles, etc). These controls and measures will form an integral part of the Construction Environmental Management Plan (CEMP) for the Proposed Development and will be detailed within the relevant parts of the EIAR.

5.11.4 There would be negligible emissions to air during operation, with the only source being occasional vehicles accessing the Site for maintenance purposes. For the reasons cited above Air Quality is therefore proposed scoped out from further assessment.

Population and Human Health

- 5.11.5 As per the EIA Regulations, an assessment of population and human health should be considered during the EIA process. It is proposed that this requirement will be covered through the findings of other assessments undertaken as part of the EIA process and so no dedicated EIA chapter will be produced.
- 5.11.6 Limited interactions with human health are anticipated. Properly designed and maintained wind turbines are a safe technology and the site design and in-built buffers from sensitive receptors will minimise any risk to human health resulting from the operation of the turbines.
- 5.11.7 Consideration will be given to the findings of the following assessments in the EIAR:
- Noise;
 - Residential Amenity;
 - Traffic and Transportation;
 - Telecommunications;
 - Aviation and Radar; and
 - Socio-economics and Land Use.
- 5.11.8 All other potential interactions with Human Health, building in Health and Safety best practice, and an appropriate approach to layout design, resulting from ice, lightning strike and structural failures are unlikely to occur and as a result, no adverse or significant effects are not anticipated.
- 5.11.9 Population and Human Health is therefore proposed to be scoped out from further assessment.

Vulnerability of the Development to Risks of Major Accidents and/or Disasters (including Climate Change)

- 5.11.10 None of the following climate trends identified in UKCP18⁴ would affect the Proposed Development with the exception of increased windstorms:
- Increased temperature;
 - Wildfire;
 - Changes in the frequency, intensity, and distribution of rainfall events (e.g., an increase in the contribution to winter rainfall from heavy precipitation events and decreases in summer rainfall);
 - Increased windstorms; and
 - Sea level rise.
- 5.11.11 Braking mechanisms installed on turbines allow them to be operated only under specific wind speeds and should severe windstorms be experienced, then the turbines would be shut down. In addition, given the elevated location of the Site, flooding will not pose a significant risk to the operation of the wind farm nor will the construction of the Proposed Development contribute to flooding elsewhere. Therefore, it is considered unlikely that significant effects will arise as a result of the Proposed Development, and this topic is proposed to be scoped out of the EIA.

⁴ Met Office, (2019) UKCP18 Science Overview Report.

Questions for Consultees

- Do consultees agree that air quality can be scoped out of the EIA?
- Do consultees agree that population and human health can be scoped out of the EIA?
- Do the consultees agree that vulnerability of the development to risks of major accidents and/or disasters (including climate change) can be scoped out of the EIA?

6 CONSULTATION & NEXT STEPS

6.1 Public Consultation

- 6.1.1 In accordance with established good practice, the Applicant is currently planning to conduct two rounds of public consultation. A combination of virtual and in-person methods will be used. Written public comments received in response to each of these methods will be documented and analysed, with any adjustments incorporated to the project design noted in the EIAR and the Pre-Application Consultation Report.
- 6.1.2 In order to allow early stakeholder engagement, an initial series of public consultation events will take place in June as follows:
- Gargunock Community Centre, Wednesday June 15th, 11am to 3pm.
 - Cambusbarron Bowling Club between, Wednesday June 15th, 4pm and 8pm.
- 6.1.3 The public consultation materials will also be available online on the dedicated project website: [www.earlsburnextension.co.uk].
- 6.1.4 A second round of public consultation events will be held at a later stage of the EIA and design process.

6.2 Consultation Bodies and Non-Statutory Consultees

- 6.2.1 As part of this scoping process the Applicant is inviting inputs from the consultation bodies and non-statutory consultees to inform the Proposed Development.
- 6.2.2 In addition to the receipt of this Scoping Report, consultees identified in the **Appendix 1** will receive a separate formal consultation email from the Scottish Government's Energy Consents Unit. Responses to this should be sent to econsentsadmin@gov.scot by the deadline specified in the email.

Copied responses should be sent to:

Joe Somerville
Associate Director
RSK Environment Ltd
65 Sussex St
Glasgow
G41 1DX

Tel: 0141 418 0471
Email: jsomerville@rsk.co.uk



APPENDIX 1

FIGURES
