11. Ecology

11.1 Introduction

11.1.1 This chapter of the EIA Report assesses the likely significant effects[35] of the Proposed Development with respect to ecology. The chapter should be read in conjunction with the development description provided in **Chapter 3 – Description of the Proposed Development** and with respect to relevant parts of other chapters, including **Chapter 12 – Ornithology** and **Chapter 13 – Geology, Hydrology and Hydrogeology**, where common receptors have been considered and where there is an overlap or relationship between the assessment of effects. In the Ecology Chapter, receptors are referred to as ecological features, to accord with the Chartered Institute of Ecology and Environmental Management (CIEEM 2018) "*Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*". The term ecological feature is defined in the guidance as pertaining to habitats, species and ecosystems.

11.2 Limitations of this assessment

11.2.1 The Ecobat[36] analysis provides a variety of outputs that are useful for interpreting the importance of a site with respect to bat activity and distribution. However, it is important to note that these outputs are considered in the context of the wider data collection from third parties, and the accuracy of results requires a considerable number of records to be present. For example, a reference range (i.e., the number of nights for each species that the data is compared to) of at least 200 is recommended to be confident in the relative activity level.

11.2.2 Due to the ongoing technical issues relating to the summing of genus level species in Ecobat, there is potential for the sum of *Pipistrellus* and *Nyctalus* species contacts, and thus the relative activity level of each genus, to be underestimated. For example, during nights in which both common pipistrelle and *Pipistrellus* species were recorded, the number of contacts for both will be added to the total sum *Pipistrellus*. However, on nights where common pipistrelle were recorded but *Pipistrellus* were not, the sum of common pipistrelle contacts will not be added to the overall *Pipistrellus* count, thus leading to an underestimation of total *Pipistrellus* contacts. This technical issue is currently being addressed by the Mammal Society, who are in the process of constructing an updated version of the Ecobat application.

11.2.3 Surveys for great crested newt ('GCN') were undertaken in June 2016. Some of the survey methods used become less effective in June (i.e., bottle trapping). However, as four visits were undertaken in June and four survey methods were used each time, the comparatively low suitability of the habitat for GCN and the fact that there were no desk study records returned for GCN, these surveys were considered to be appropriate to inform the assessment.

[35] In this Ecology chapter, the term 'potentially significant effects' is used in the sections prior to the 'scope of the assessment' (**Section 11.7**) being determined, as it accords with CIEEM guidance. The term 'likely significant effects' is used once the scope of the assessment has been determined. The use of this term is not to be confused with Likely Significant Effects (LSEs) as used in the context of the Habitats Regulations Appraisal.

[36] Ecobat is a tool which statistically analyses regional bat data to counteract the inherent subjectivity of bat assessments in order to provide context to focal site data.

11.2.4 No further limitations to the assessment were identified. As required by the relevant professional guidance (CIEEM, 2018), the precautionary principle has been adopted when undertaking the assessment to ensure that conclusions on residual effects are robust and realistic. Any assumptions made regarding effects to Important Ecological Features ('IEFs') are based on current guidance.

11.3 Relevant Legislation, Planning Policy, Technical Guidance

Legislative Context

11.3.1 The legislative context of this EIA Report is set out in **Chapter 5 – Planning Policy Context**. The following legislation has been considered in the assessment of the effects on ecological features[37]:

- Habitats Directive (Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora) as transposed into Scots Law by the Conservation (Natural Habitats &c.) Regulations 1994 (as amended in Scotland) (the "Habitats Regulations");
- Wildlife and Countryside Act 1981 (as amended in Scotland);
- Nature Conservation (Scotland) Act 2004 (as amended);
- Water Environment and Water Services (Scotland) Act 2003 (WEWS Act);
- Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003;
- Marine (Scotland) Act 2010; and
- The Protection of Badgers Act 1992.

Planning Policy Context

National Policies

11.3.2 A summary of the relevant national planning policies is given in **Table 11.1**.

Table 11.1 National Planning Policy issues relevant to ecology

Policy Reference	Policy Issue
Approved National Planning Framework 4 ('NPF4') 2023	Policies of relevance to this area of technical assessment are: • Policy 1: Tackling the Climate and Nature Crises • Policy 3: Biodiversity • Policy 4: Natural Places • Policy 6: Forestry, Woodland and Trees • Policy 9: Brownfield, Vacant and Derelict Land and Empty Buildings • Policy 11: Energy • Policy 20: Blue and Green Infrastructure

[37] The Chartered Institute for Ecology and Environmental Management (CIEEM) refer to biodiversity receptors within technical guidance as ecological features.

Policy Reference	Policy Issue
Protecting Designated Sites (NPF4, Page 40)	NPF4 requires locally, regionally, nationally and internationally important natural assets to be identified and appropriately protected through development plans.
NPF4: Biodiversity (Policy 3)	Policy 3(d) states that "*any potential adverse impacts, including cumulative impacts, of development proposals on biodiversity, nature networks and the natural environment will be minimised through careful planning and design.*". Policy 4 further states that "*Development proposals which by virtue of type, location or scale will have an unacceptable impact on the natural environment, will not be supported.*". It is noted that whilst effects on statutorily protected sites will be an important consideration, as set out in Policy 4 (Natural Places), designation does not impose an automatic prohibition on development.
Non-native Species	Where non-native species are present on site, or where planting is planned as part of a development, developers are required take into account the provisions of the Wildlife and Countryside Act 1981 relating to non-native species.
NPF4: Natural Places (Policy 4)	Policy 4(f) states that "*Development proposals that are likely to have an adverse effect on species protected by legislation will only be supported where the proposal meets the relevant statutory tests. If there is reasonable evidence to suggest that a protected species is present on a site or may be affected by a proposed development, steps must be taken to establish its presence. The level of protection required by legislation must be factored into the planning and design of development, and potential impacts must be fully considered prior to the determination of any application.*
NPF4: Woodland (Policy 6)	Policy 6(c) states that "*Development proposals involving woodland removal will only be supported where they will achieve significant and clearly defined additional public benefits in accordance with relevant Scottish Government policy on woodland removal. Where woodland is removed, compensatory planting will most likely be expected to be delivered.*":
UK Biodiversity Action Plan ('UKBAP') / UK Post-2010 Biodiversity Framework ('UKBAP')	The UKBAP, produced in 1994 by the UK Government, was a national strategy for the conservation of biodiversity. The UKBAP was updated in July 2012 with a plan which covers the period 2011-2020. This framework is implemented individually by each of the four UK countries. Within Scotland, the UKBAP is coordinated through the Biodiversity Action Reporting System ('BARS'), which is an online tool which contains a list of Scottish priority habitats and species (The Scottish Biodiversity List ('SBL'])). All UKBAP species and habitats are listed in the SBL.
Th Scottish Biodiversity Strategy 2045 (published in draft)	The Scottish Biodiversity Strategy '*sets out a nature positive vision for Scotland – one where biodiversity is regenerating and underpinning a healthy and thriving economy and society and playing a key role in addressing climate change. The Scottish Biodiversity Strategy will sit alongside Scotland's Climate Change Plan and, through developing and driving investment in nature-based solutions, will play a significant role in delivering our commitment to Net Zero. In its own right, it sets out how we will protect and regenerate biodiversity to ensure the sustainable flow of ecosystem services on which we all depend*.'
Scottish Biodiversity List ('SBL')	The SBL is a list of flora, fauna and habitats considered by the Scottish Ministers to be of principal importance for biodiversity conservation and its publication was a requirement of Section 2(4) of The Nature Conservation (Scotland) Act 2004.

Local Policies

Although the Proposed Development is located within the East Ayrshire Council ('EAC') area, the Dumfries and Galloway Development Plan has relevance considering the proximity of the Development Site to its administrative boundary.

The current development plan for East Ayrshire and Dumfries and Galloway for the Development Site comprises the adopted East Ayrshire Local Development Plan ('EAC LDP') 2017[38] and the Dumfries & Galloway Local Development Plan 2 (adopted 2019) ('the Dumfries and Galloway LDP').

Polices of relevance for the environment and nature conservation from both LDPs are presented in **Table 11.2** along with the relevant Local Biodiversity Action Plan ('LBAP').

Table 11.2 Development Plan Policy Issues Considered within the Assessment of Ecology

Policy reference	Policy Issue
East Ayrshire LDP **Overarching Policy OP1**	*"All development proposals will require to meet the following criteria in so far as they are relevant, or otherwise demonstrate how their contribution to sustainable development in the context of the subsequent relevant policies in the Local Development Plan and Scottish Planning Policy would outweigh any lack of consistency with relevant criteria:* (i) Comply with the provisions and principles of the LDP vision and spatial strategy, all relevant LDP policies and associated supplementary guidance and non-statutory guidance; *(ii)* Be fully compatible with surrounding established uses and have no unacceptable impacts on the environmental quality of the area; *(iii)* Ensure that the size, scale, layout, and design enhance the character and amenity of the area and creates a clear sense of place; *(iv)* Where possible, reuse vacant previously developed land in preference to greenfield land; *(v)* Be of the highest quality design by meeting with the provisions of SPP, the Scottish Government's policy statement Designing Streets, the Council's Design Guidance and any master plan/design brief prepared for the site; Prepare Master Plans/Design Statements in line with Planning Advice Notes 83 and 68 respectively where requested by the Council and/or where this is set out as a requirement in Volume 2 of the LDP;

[38] In December 2022, EAC agreed to submit Local Development Plan 2 to Scottish Ministers for Examination. This was submitted to the Scottish Government's Planning and Environmental Appeals Division (DPEA) on 24 February 2023 and, at the time of writing, is being processed by the DPEA.

Policy reference	Policy Issue
	(vi) Be compatible with, and where possible implement, projects shown on the LDP placemaking maps; *(vii)* Ensure that there is no unacceptable loss of safeguarded areas of open space/green infrastructure and prime quality agricultural land; *(viii)* Protect and enhance natural and built heritage designations and link to and integrate with green infrastructure where possible; *(ix)* Ensure that there are no unacceptable impacts on the landscape character or tourism offer of the area; *(x)* Meet with the requirements of all relevant service providers and the Ayrshire Roads Alliance; and *(xi)* Be accessible to all.
East Ayrshire LDP **ENV6: Nature Conservation**	*"The importance of nature conservation and biodiversity will be fully recognised in the assessment of development proposals.* *(i) Any development likely to have a significant effect on a Natura 2000 site which is not directly connected with or necessary to its conservation management must be subject to a "Habitats Regulations Appraisal". Such development will only be approved if the appraisal shows that there will be no adverse effect on the integrity of the site;* *(ii) Any development affecting a SSSI will only be permitted where it will not adversely affect the integrity of the area or the qualities for which it has been designated or where any significant adverse effects on the qualities for which it is designated are clearly outweighed by social, environmental or economic benefits of national importance.* *(iii) Any development that may adversely impact on areas of local importance for nature conservation, including provisional wildlife sites, local geodiversity sites and local nature reserves, will be expected to demonstrate how any impact can be avoided or mitigated.* *(iv) If there is evidence that protected species may be affected by a development, steps must be taken to establish their presence. The planning and design of any development which has the potential to impact on a protected species will require to take into account the level of protection afforded by legislation and any impacts must be fully considered prior to the submission of any planning application.*

Policy reference	Policy Issue
	Any new development must protect, and where appropriate incorporate and/or extend, existing habitat networks, helping to further develop the Central Scotland Green Network in Ayrshire.'
East Ayrshire LDP **ENV9: Trees, Woodland and Forestry**	*The Council will support the retention of individual trees, hedgerows and woodland within both settlements and rural areas, where such trees contribute to the amenity, nature conservation and landscape value of the area. There will be a presumption against the felling of ancient semi-natural woodland and trees protected by Preservation Orders.* *The Council will support proposals for woodland and forestry expansion where they:* *(i) Are consistent with the Ayrshire and Arran Forestry and Woodland Strategy and contribute to Ayrshire's green network;* *(ii) Take account of the landscape and ecological qualities of the area;* *(iii) Demonstrate that recreational opportunities have been fully considered.*
Dumfries & Galloway LDP **NE4: Sites of International Importance for Biodiversity**	'*Development proposals likely to have a significant effect on an existing or proposed Special Protection Area (SPA), existing or candidate Special Area of Conservation (SAC) or Ramsar Site, including developments outwith the site, will require an appropriate assessment and will only be permitted where:* • *the development does not adversely affect the integrity of the site; or* • *there are no alternative solutions;* • *there are imperative reasons of overriding public interest, including those of a social or economic nature; and* • *compensatory measures have been identified and agreed to ensure that the overall coherence of the Natura network is protected.'*
Dumfries and Galloway LDP **NE5: Species of National Importance**	'*Development proposals that would be likely to have an adverse effect on a European Protected Species will not be permitted unless it can be shown that:* • *there is no satisfactory alternative; and* • *the development is required for preserving public health or public safety or for other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment; and* • *the development would not be detrimental to the maintenance of the population of the species at a favourable conservation status in its natural range.'*
Dumfries and Galloway LDP	*'Development that affects Sites of Special Scientific Interest, not designated as International Sites, and other national nature conservation designations will only be permitted where:*

Policy reference	Policy Issue
NE6: Sites of National Importance for Biodiversity and Geodiversity	• *it will not adversely affect the integrity of the area or the qualities for which it has been designated; or* • *any such adverse effects are clearly outweighed by social, environmental or economic benefits of national importance.'*
Dumfries and Galloway LDP **NE7: Forestry and Woodland**	*The following policy will apply to those woodland/forestry felling, planting and replanting proposal which do not require planning permission but where the Council acts as a consultee to Forestry Commission Scotland.* *The council will support the creation and protection of sensitively designed and managed forests and woodlands.* *Proposals should seek to ensure that ancient and semi-natural woodland and other woodland with high nature conservation value are protected and enhanced.* *In determining its response to individual forestry felling, planting and replanting consultations where Forestry Commission Scotland are the determining authority, the Council will:* • *take into account environmental and other interests identified in the Forestry and Woodland Strategy including biodiversity, water (including flood risk management), soil and air, landscape setting, historic environment and land restoration;* • *consider the scheme's location as set out in the Forestry and Woodland Strategy;* • *seek to ensure an appropriate balance between both afforested and un-afforested areas in the locality;* • *encourage planting of a type, scale, design, age, composition and species mix that is appropriate to the locality;* • *actively encourage proposals to have a positive effect on nature conservation and/or natural and historic environment interest;* • *encourage proposals to take account of possible recreational use in the design of any planting schemes and indicate how such recreational uses have been investigated; and* • *ensure that proposals do not have an adverse impact on the road network.*
Ayrshire Local Biodiversity Action Plan ('LBAP')	The Ayrshire LBAP is referred to for species action plans and habitat action plans relevant to the Proposed Development.

Technical guidance

11.3.3 Publications that provide guidance that is relevant to the assessment of potentially significant effects on ecology are listed below:

- Chartered Institute of Ecology and Environmental Management (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal*

and Marine. Version 1.1 updated April 2022. Chartered Institute of Ecology and Environmental Management, Winchester;

- NatureScot, Natural England, Natural Resource Wales, Renewable UK, Scottish Power Renewable, Ecotricity Ltd, University of Exeter, Bat Conservation Trust (2021). Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation.
- Scottish Government (2020). The Scottish Biodiversity List (SBL);
- SNH (2018). Environmental Impact Assessment Handbook;
- SEPA (2017). *Land use planning system SEPA guidance note 4: Planning Guidance on wind farm developments* (including guidelines for groundwater unit staff and ecologists when assessing the impacts of wind farms on groundwater and associated receptors);
- SEPA (2010, 2nd edition). *Engineering in the water environment good practice guide: construction of river crossings;*
- Forestry Commission (2017). *UK forestry standard: the governments' approach to sustainable forestry*;
- CIRIA C648 (2006). *Control of water pollution from linear construction projects*;
- CIRIA C649 (2006). Control of Water Pollution from Linear Construction Projects - Site Guidance (2006);
- SNH (2013). *Constructed tracks in the Scottish Uplands.* Updated September 2015;
- Scottish Renewables, SNH, SEPA, Forestry Commission Scotland and Historic Environment Scotland and others (2019). *Good Practice during Wind Farm Construction* (4th Edition);
- Welstead, J., Hirst, R., Keogh, D., Robb G. and Bainsfair, R. (2013). *Research and guidance on restoration and decommissioning of onshore wind farms.* Scottish Natural Heritage Commissioned Report No. 591; and

11.3.4 Technical guidance used to define the survey methods and inform this assessment are referenced in **Appendix 11B – NVC Report**; **Appendix 11C – Protected Species Survey**; and **Appendix 11D – Baseline Ecology Report of Proposed Access Route**; **Appendix 11E – Bat Survey Report**; and **Appendix 11F – Aquatic Survey Report**.

11.4 Data Gathering Methodology

Study Area

11.4.1 The "Study Area" encompasses the area over which all desk-based and field data were gathered to inform the assessment presented in this chapter. Due to the presence of multiple ecological features and many potential effects, the level and type of data collection varies across the Study Area. The Study Area comprises:

- The Development Site (as defined in **Chapter 3 – Description of the Proposed Development**)[39];

[39] For descriptive purposes, the Proposed Development it is subdivided into the 'Main Site' - where the turbines and the new associated infrastructure would be located - and the 'Access Track', with reference to the existing access track that runs through the Pencloe Forest; connecting the main site to Afton Road.

- The desk study area for statutory and non-statutory ecological sites;
- The desk study area for legally protected and notable ecological features; and
- The field survey areas.

11.4.2 The extent of the desk study areas and field survey area (see **Table 11.3**) were determined based on best practice guidance and a high-level overview of the types of ecological features present, and the potential effects that could occur (see **Figure 11A**.1 Desk Study Area in **Appendix 11A**). The Study Area was defined on a precautionary basis to ensure that, as a minimum, the Zone of Influence[40] ('ZoI') relevant to all ecological features (see **Table 11.8** and **Section 11.7**) were covered during baseline data collection activities.

11.4.3 As the design of the Proposed Development has evolved iteratively, the Study Area, and its constituent parts, has been regularly reviewed to ensure that its extent was adequate to enable the assessment of all potentially significant effects of the ecological features identified. Changes to the area initially identified as being 'developable', or the precise nature of the development, have been reviewed in light of the ecological features present (this being informed by the data gathering exercise) and the potential effects that could occur if the Proposed Development were to proceed. At each stage of design evolution, the extent of the Study Area, including all of its components, was tested using the methodology described in **Section 11.7** to ensure adequate information was available on which to base an assessment.

As part of the design evolution, the redline boundary has slightly changed in places from the date the baseline reports were undertaken. However, ecological walkover surveys were undertaken considering the redline boundary and a buffer zone of at least a 50m and up to 250m dependent on the survey type, allowing boundary extensions to have been captured in the surveys.

Desk Study

11.4.4 A desk-based data-gathering exercise was undertaken to obtain existing information relating to relevant ecological features, these being: statutory and non-statutory biodiversity sites; habitats and species of principal importance[41]; legally protected and controlled species; and other conservation notable species that have been recorded over the previous 10 years (i.e., since 2009). **Table 11.3** lists the data compiled within the desk Study Area (which is the Development Site and the additional areas of search beyond and is shown in **Appendix 11A – Desk Study, Figure 11A Study Area**.

11.4.5 Where appropriate, data was drawn from existing ecological records and site information obtained through field surveys conducted in 2011 as part of baseline studies undertaken at the Development Site and adjacent areas for other development projects.

[40] The Zone of Influence (ZoI) in this context is the area over which an individual ecological feature may be subject to a potentially significant effect resulting from changes in the baseline environment due to the Proposed Development.

[41] Scottish Biodiversity List features

Table 11.3 Information relevant to the Desk Study

Ecological Feature	Example / Description	Desk Study Areas
Statutory sites designated under international conventions or European Directives	Wetlands of International Importance (also known as Ramsar sites), Special Areas of Conservation ('SACs') and Special Protection Areas ('SPAs')	The Proposed Development area and within 2km of it.
Statutory sites designated under national legislation	Sites of Special Scientific Interest ('SSSIs'), National Nature Reserves ('NNRs') and Local Nature Reserves ('LNRs')	The Development Site and within 2 km of it.
Locally designated sites	Often termed as Local Wildlife Sites ('LWS'), County Wildlife Sites ('CWS'), Sites of Interest for Nature Conservation ('SINC'), Local Nature Conservation Sites ('LNCS').	The Development Site and within 2 km of it.
Scottish Biodiversity List; Red listed species[42]; and legally protected species	Flora, fauna and habitats of principal importance for the conservation of biodiversity in Scotland. Species recorded on The IUCN Red List of Threatened Species and/or local Red Lists for the UK or relevant sub-units (e.g., regions or counties) and legally protected habitats and species include those listed on Schedules 1, 5 and 8 of the *Wildlife and Countryside Act 1981* (as amended in Scotland), those included on Schedules 2 and 4 of the Habitats Regulations. Badgers are protected under the Protection of Badgers Act 1992.	The Development Site and within 2 km of it (5 km for bat species).
Legally controlled species	Legally controlled species include those listed on Schedule 9 of the *Wildlife and Countryside Act 1981* (as amended in Scotland).	The Development Site and within 2km of it.

11.4.6 **Table 11.4** lists the organisations and other sources that have supplied data, together with the nature of the information provided.

Table 11.4 Sources of Desk Study Data

Source	Summary of Information provided
NatureScot's interactive map facility at (**https://sitelink.nature.scot/home**)	Access to data and information on key statutory designated sites across Scotland.
Scottish Environment Protection Agency ('SEPA') website (**www.sepa.org.uk)**	Information on the classification of the ecological status of waterbodies under the Water Framework Directive ('WFD') and Freshwater Fish Directive ('FFD').
National Biodiversity Network (NBN) gateway's information service (**http://data.nbn.org.uk**)	Commercially available records of protected and/or notable species from within the last ten years.

[42] Red listed species for the purposes of this assessment refer to those noted using IUCN criteria as being 'Near Threatened', 'Vulnerable', 'Endangered' and 'Critically Endangered', and those on present on local Red Lists in the categories 'Nationally Scarce' and 'Nationally Rare'.

Source	Summary of Information provided
Forestry and Land Scotland's ('FLS') online map (http://map.environment.scotland.gov.uk/landinformationsearch/lis_map.html);	Extents of woodland and forests (including ancient woodland inventory areas) and FLS approved areas for plantation.
South West Scotland Environmental Information Centre ('SWSEIC')	Records of protected/notable species within a 2km radius of the Development Site~ (extended to 5km for bat records)
Envirocentre (2011). ***Monquhill Wind Farm: Flora, Habitats and Vegetation.***	Protected species baseline surveys of the proposed Development Site.
Benbrack Wind Farm and Enoch Hill Wind Farm Reports (including the Environmental Statements)	Desk base review and protected species baseline surveys of the adjacent Enoch Hill Wind Farm ES (and subsequent post consent contextual material) and Benbrack Wind Farm.

Survey Work

11.4.7 Baseline surveys have been undertaken between 2016 - 2022, along with updated desk-based research as required to confirm baseline conditions. Where baseline reports in the appendices to this EIA Report remain unchanged from 2020, these are presented is appendices in their original format as Amec Foster Wheeler, Wood and E.ON branded documents.

11.4.8 A list of the ecological field surveys carried out to inform the preparation of this chapter is provided in **Table 11.5**. The detailed methodologies for, and results of, these surveys can be found in **Appendices 11B-11F**. Protected species surveys for otter, water vole, badger, red squirrel and pine marten were undertaken on 7 March 2023 in order to update the results of the ecological surveys outlined in **Table 11.5**. The results of these surveys are presented within the main EIA Report chapter (**Section 11.5**). The surveys undertaken in 2023 were adapted to fit the new site boundary to ensure that any additional new survey areas were included as part of the March 2023 surveys. Ecological assessment was based on a combination of previous baseline surveys reported in the **Appendices 11B-11F** and any new baseline data collected in March 2023, which is presented separately in the main EIA Chapter.

11.4.9 The site walkover undertaken in March 2023 indicated that the conditions have remained largely the same. However, it was considered relevant to survey for particularly mobile species such as otter, water vole, badger, red squirrel and pine marten as stipulated by NatureScot. Other species and habitat survey data was considered to remain valid from previous surveys.[43][44]

[43] https://www.nature.scot/professional-advice/protected-areas-and-species/licensing/species-licensing-z-guide

[44] Bat surveys will be undertaken during 2023/2024 in order to keep the baseline data up to date.

Table 11.5 Summary of Ecological Surveys

Survey	Relevant guidance	Field Survey Area	Survey period	Reference
National Vegetation Classification (NVC) survey **NVC (Ground truthing)**	NVC: Users' Handbook (Rodwell, 2006) whilst the survey was informed by the key references (Rodwell 1991a, 1991b, 1992, 1995, 2000b) for the identification of vegetation communities present.	Development Site with 250m buffer Development Site with 250m buffer	6 September to 27 October 2016 20-23 July 2020	**Appendix 11B**
Phase 1 habitat survey **Phase 1 habitat survey (Ground-truthing)**	Stace (2010) for higher plants and *Atherton et al*. 2010 for bryophytes (mosses and liverworts). The cover of plant species was estimated using the DAFOR scale[45].	Access track with 100m buffer Access track with 100m buffer	15-17 August 2017 20-23 July 2020	**Appendix 11D**
Otter surveys	CIEEM: Competencies for Species Survey: Eurasian Otter (CIEEM, 2013). Monitoring the Otter (Chanin, 2003).	Development Site with 250m buffer Access track with 100m buffer	05-08 September 2016 20-23 July 2020 06-08 September 2021 15-17 August 2017 20-23 July 2020 06-08 September 2021	**Appendix 11C** **Appendix 11D**
Water vole surveys	CIEEM: Competencies for Species Survey: Water Vole (CIEEM, 2013). Water vole conservation handbook (Strachan, 2011).	Development Site with 250m buffer Access track with 100m buffer	05-08 September 2016 20-23 July 2020 06-08 September 2021 15-17 August 2017 20-23 July 2020 06-08 September 2021	**Appendix 11C** **Appendix 11D**

45 DAFOR scale: Dominant, Abundant, Frequent, Occasional and (locally) Rare. A subjective, quick assessment of abundance, as described in: http://bsbi.org.uk/Sampling Guidance 2011.pdf. Accessed November 2017.

Survey	Relevant guidance	Field Survey Area	Survey period	Reference
Bats ***Preliminary roost assessment***	CIEEM: Competencies for Species Survey: Bats (CIEEM, 2013) 2016 BCT Guidelines (Collins, 2016). Bats and onshore wind turbines – survey, assessment and mitigation (NatureScot, 2021	Development Site	4 May 2016	**Appendix 11E**
Emergence/ re-entry surveys			07 September 2016 (dusk); 28 September 2016 (dawn); 18 May 2017 (dusk); and 26 June 2017 (dusk). 31 May 2021 (dusk); 09 July 2021 (dawn); and 06 September 2021 (dusk)	
Winter hibernation surveys			14 – 21 December 2016 (7 nights); 18 – 25 January 2017 (7 nights); and 28 February – 8 March 2017 (8 nights). 14-31 December 2021 (18 nights); 01-27 January 2022 (26 nights); and 01-23 February 2022 (22 nights)	
Manual bat activity surveys			Spring, summer and autumn 2016	
Static detector surveys			Spring, summer and autumn 2016 Spring, summer and autumn 2021	
Great crested newt surveys	Herpetofauna Workers Manual (Gent, 2003). 46.	Development site	May-June 2016	**Appendix 11C**
Habitat Suitability Index assessment			03 March 2016	

46

Survey	Relevant guidance	Field Survey Area	Survey period	Reference
Environmental DNA ('eDN') analysis			04 May 2016	
Torching, eggs search, refugia search and bottle trapping.			31 May 2016-01 June 2016 02 -03 June 2016 5 – 6 June 2016 19 – 20 June 2016	
Badger surveys	CIEEM: Competencies for Species Survey: Badger (CIEEM, 2013) Surveying Badgers (Harris, 1989).	Development Site with 250m buffer Access track with 100m buffer	05-08 September 2016 20-23 July 2020 15-17 August 2017 20-23 July 2020	**Appendix 11C** **Appendix 11D**
Red squirrel	CIEEM: Competencies for Species Survey: Red Squirrel (CIEEM, 2013); Gurnell et al. (2009).	Development Site with 250m buffer Access track with 100m buffer	05-08 September 2016 20-23 July 2020 06-08 September 2021 07 March 2023 15-17 August 2017 20-23 July 2020	**Appendix 11C** **Appendix 11D**
Pine marten	CIEEM: Competencies for Species Survey: Pine Marten (CIEEM, 2013). UK BAP Mammals: Interim Guidance for Survey Methodologies, Impact Assessment and Mitigation (Cresswell, 2013)	Development Site with 250m buffer Access track with 100m buffer	05-08 September 2016 20-23 July 2020 06-08 September 2021 15-17 August 2017 20-23 July 2020	**Appendix 11C** **Appendix 11D**
Aquatic surveys **Fish surveys** **Freshwater Pearl Mussel**	The Scottish Fisheries Co-ordination Centre ('SFCC') protocol for electrofishing Freshwater Pearl Mussel Survey Protocol (SNH, no date)	Watercourse crossings points and control sites	12-13 August 2020	**Appendix 11F**

Survey	Relevant guidance	Field Survey Area	Survey period	Reference
Freshwater Invertebrates	Sampling of Freshwater Benthic Invertebrates (SEPA, 2001).			

Habitat survey

11.4.10 An NVC survey, including recording of wetland habitats/ Ground Water Dependent Terrestrial Ecosystems ('GWDTEs") was completed between 6 September and 27 October 2016. The Study Area included all habitats at least: (i) 100m from roads, tracks and trenches, and (ii) 250m from the edge of foundations within the Development Site boundary, as per SEPA (2017) requirements. The survey area is described and illustrated within **Appendix 11B** and **Figures 11B.1-11B.4** of **Appendix 11B**.

11.4.11 NVC surveys allowed the identification and mapping of the dominant NVC habitats in accordance with standard guidance (Rodwell 1991a, 1991b, 1992 and 1995) and include the mapping of any habitat of conservation importance. In addition to the Rodwell NVC texts, Averis *et al*. (2004) provides a concise and up-to-date description of NVC communities and sub-communities of UK upland areas. Plant identification and classification was based on Stace (2010) for higher plants and Atherton *et al.* (2010) for bryophytes. A hand-held GPS was used to ensure that communities were mapped accurately. Quadrat data of representative samples of homogenous communities were taken using a set number of quadrats.

11.4.12 A Phase 1 habitat survey was also completed during 15-17 August 2017 along the existing access track, including a 100m buffer, which connects the Main Site to Afton Road. The survey area is described and illustrated within **Appendix 11D** and **Figures 11D.1** of **Appendix 11D**.

11.4.13 Ground truthing habitat surveys of both the Main Site and the Access Track were undertaken during 20-23 July 2020 (**Appendix 11C** and **Appendix 11D**).

Otter surveys

11.4.14 A detailed otter survey was carried out on all watercourses and waterbodies within the Study Area on 05-08 September 2016 (Main Site only) and 15-17 August 2017 (Access Track only) following standard methods (e.g., Chanin 2003 and NatureScot (no date), see **Appendix 11C** and **11D**). Surveying was then repeated across the whole Development Site, on 20-23 July 2020 (**Appendix 11C** and **11D**) and 06-08 September 2021 and 07 March 2023 to update the baseline. During these, searches for evidence of otter activity were carried out in accordance with the NatureScot guidance (NatureScot, no date) along sections of watercourses at least 250m from proposed turbine locations and their associated infrastructure, 250m from proposed crossing points and 100m either side of proposed access tracks in the Main Site and existing Access Track. Searches were completed along a corridor of at least 10m width along each bank. An examination of obvious features such as crevices and dense vegetation was undertaken along with careful searches of all habitats suitable for use as resting places (holts, couches etc.).

11.4.15 The presence/ absence of otters was determined using field signs of otter activity including otter spraints, footprints, tracks, slides and resting places or potential resting places. Any sightings of otter were also recorded (see **Appendix 11C** and **Appendix 11D**). Terminology used to describe resting sites used by otters is set out within **Appendix 11C** and **Appendix 11D**, i.e., use of 'holt' for below-ground resting sites and 'couch' for above ground resting sites.

11.4.16 All otter field signs were recorded and mapped, with standard key parameters including weather/ watercourses flow conditions and habitat suitability recorded.

Water vole surveys

11.4.17 A detailed water vole survey was carried out on all watercourses and waterbodies within the Study Area on 5-8 September 2016 following standard methods (Strachan *et al*., 2011) (**Appendix 11C**). Surveying was repeated on 20-23 July 2020 and 06-08 September 2021 in order to update baseline surveys. Searches were made for signs of water vole along all watercourse within the Study Area (the same Study Area as for otter), covering a corridor of up to 10m from the water's edge on either bank. Any signs including burrow entrances, tunnels in vegetation (runs), droppings or small groups of droppings (latrines), footprints, feeding stations (chopped up grass/ sedge/ rush) and grazed lawns were recorded. Any food remains at feeding stations were counted in order to provide an indication of the abundance of water vole individuals.

11.4.18 Habitat information and habitats suitability for supporting water vole was also assessed and recorded along with details of watercourses flow conditions (**Appendix 11C** and **Appendix 11D**).

Bat surveys

11.4.19 A suite of bat surveys was undertaken within the Main Site during 2016 and 2017 according to the prevailing best practice guidelines at the time, which included the 2012 Bat Conservation Trust guidelines (Hundt, 2012) and the 2016 BCT guidelines (Collins, 2016). Surveys were repeated in 2021 to update previous baseline survey results using current guidance (NatureScot, 2021). Surveys consisted of bat roost assessment, emergence/re-entry surveys, winter (hibernation) surveys, manual bat activity surveys and static bat activity surveys. The full bat report can be found in **Appendix 11E**.

11.4.20 The level of bat survey effort was based upon the level of survey effort required for a proposed wind farm site assessed as being low risk to bat populations, as outlined in BCT guidelines (Collins, 2016). This decision was based upon factors such as the homogeneity of the habitats within the Development Site, the presence of higher quality habitats within the wider landscape and the lack of records at the time for high-risk bat species within 5km of the Development Site.

11.4.21 External bat roost assessment surveys were undertaken at the disused Monquhill Farmhouse and associated outbuildings on 4 May 2016, and this was complemented by dusk emergence and dawn re-entry surveys (together with infra-red cameras on one occasion) to determine presence/ absence of bats within the building undertaken in 2016, 2017 and 2021. Furthermore, winter surveys were completed between December 2016 and March 2017 and between December 2021 and February 2022 to identify potential hibernation roost activity at the farmhouse.

11.4.22 Bat activity transect (manual) surveys were undertaken once per season (spring, summer and autumn 2016) by two surveyors walking along a single transect route, starting and ending at Monquhill Farmhouse, and encompassing forest rides, open moorland and Strandlud Hill, burns and access tracks within the Development Site, as well as Monquhill Farmhouse itself.

11.4.23 Automated (static) detector surveys were undertaken once per season, to coincide with the manual surveys in spring, summer and autumn 2016 and 2021. In 2016, six detectors were deployed across the Study Area within representative habitats including forestry rides, open moorland on Strandlud Hill, riparian habitat, Monquhill Farmhouse and the two turbine locations. An additional detector was placed at a control site outside the

Development Site along Afton Glen. In 2021, the number of detectors was reduced, with a detector placed at each of the two turbine locations with a third detector placed at the top of Stradlud Hill to provide a representative sample of bat activity across more open habitat within the Study Area. This methodology followed the most up to date guidance issued by NatureScot (2021).

Badger

11.4.24 A badger survey was undertaken across the Main Site with a 50m buffer on 05-08 September 2016 in combination with the surveys for other protected species such as otter and water vole following standard methods (Harris *et al.*, 1989, SNH, 2003) (**Appendix 11C**). A survey of the proposed access tracks in the Main Site and existing Access Track, which included a 100m buffer either side of the these, was undertaken on 15-17 August 2017 and surveys were repeated on 20-23 July 2020, 06-08 September 2021 and 07 March 2023 across the whole Development Site. The survey aimed to identify and examine areas where badgers might occur by noting any evidence of their presence. This included mammal paths/ runs, identification of badger guard hairs, paw prints, evidence of foraging, dung pits, latrines and badger setts. A mammal path was assumed to be used if the character of the path (in terms of size) was appropriate and/ or if any signs were in close vicinity (e.g., a badger sett).

Great crested newt

11.4.25 A Habitat Suitability Index ('HSI') assessment (Oldham, 2000) was undertaken on two ponds to assess their suitability to support great crested newt ('GCN') on 03 March 2016. Following the HSI assessment, an environmental DNA ('eDNA') survey of both ponds was undertaken on 04 May 2016.

11.4.26 The results of the eDNA analysis returned a positive result for one of the ponds and further GCN surveys were undertaken at this pond. The results of the HSI assessment, eDNA survey and population estimate survey are provided in **Appendix 11C**.

Other protected and / or notable species

11.4.27 Habitats on site were assessed on 05-08 September 2016, 20-23 July 2020, 06-08 September 2021 and 07 March 2023 (during the protected species surveys) for the potential to support other protected and notable species as follows.

11.4.28 *Fish:* The general suitability of watercourses and water bodies to support a range of fish species was assessed, including channel width, depths, flow, bank and substrate material, obstacles to upstream migration of, for example, sea trout, Atlantic salmon, lamprey species and eels. The potential for spawning sites was also assessed dependent on water conditions. Visual inspection of waterbodies was undertaken to detect the level of suspended solids. Incidental notes were taken on all of these features by surveyors whilst undertaking other surveys e.g., otter and water vole surveys (more information is provided in **Appendix 11F**).

11.4.29 *Red squirrel:* The general suitability of woodlands to support red squirrel was assessed in addition to a search for field signs for this species including dreys (distinctive bundles of twigs in trees) and chewed pinecones, which are often discarded on prominent features at feeding stations.

11.4.30 *Pine Marten:* The general suitability of woodlands to support pine marten was assessed in addition to a search for field signs for this species, including scats and dens.

11.4.31 Any incidental sightings of notable ecological features (including legally protected species) made during other surveys within the Study Area were recorded.

Aquatic surveys

11.4.32 A series of aquatic surveys targeting fish species, Freshwater Pearl Mussel and aquatic invertebrate populations were conducted by the Nith District Salmon Fisheries Board (NDSFB) in September 2020 to provide data relating to the Proposed Development. Aquatic surveys were conducted at eight separate sites (**Appendix 11F**) at locations in the River Nith catchment relevant to the Development Site: Carcow Burn, Tributary of Carcow Burn, Afton Water, Glenshalloch Burn and Connel Burn. Two sites (the Carcow Burn and Afton Water) were situated outside of the Development Area. The surveys are reported in detail in a separate report (**Appendix 11F**).

11.5 Overall Baseline

11.5.1 The description of the ecological features below provides a summary of the ecology baseline as determined through desk study and field survey. Further details of the desk study and field survey programme are provided in **Sections 11.10 – 11.17**, and detailed descriptions of the desk study and field survey results are provided in **Appendices 11A-11G.**

Current Baseline

Site Context and Surrounding Habitats

11.5.2 The Development Site lies at the south-western end of a ridge that runs from Ashmark Hill in the north-east to Strandlud Hill on the Development Site. The majority of the Development Site is forested with densely planted immature Sitka spruce plantation; the exception is an open boggy area on Strandlud Hill. Rides and several watercourses run through the forestry plantation. The derelict Monquhill Farmhouse is present within the Development Site.

11.5.3 The Development Site is bordered by similar forestry to the south, east and west and open moorland to the north, which is used primarily for sheep grazing, with habitats dominated by wet modified bog and marshy grassland. Several watercourses border the Development Site, including the Water of Deugh to the south-east. The Development Site also borders several consented wind farms, comprising Enoch Hill to the north-west, South Kyle and North Kyle to the west and Pencloe to the east. The operational Brockloch Rig Wind Farm extension lies to the south of the Development Site.

11.5.4 The planned Access Track to the Main Site starts at the entrance to Pencloe Farm off Afton Road south-west of New Cumnock. The Access Track runs north-south along Glen Afton, to the east of the Main Site and passes enclosed pasture, grazed by sheep and cattle before it enters FLS woodland to the west of Lochingerroch Burn. The Access Track from the Lochingerroch Burn to the Glenshalloch Burn is bordered by coniferous planation woodland and runs through several areas of windthrow. The Access Track then lies entirely within the forest block and joins the Main Site near the disused Monquhill Farmhouse.

Statutory Nature Conservation Sites

11.5.5 There are no statutory designated sites present within the Development Site or within a 2km radius.

Non-Statutory Nature Conservation Sites

11.5.6 There are six non-statutory sites within 2km of the Development Site, three of which are classed as Local Nature Conservation Sites ('LNCS'), while the remaining three sites are listed within the Ancient Woodland Inventory (**Table 11.6**).

Table 11.6 Non-statutory sites within 2km of the Development Site boundary

Site	Designation	Coordinates	Description	Distance and orientation from Site
Glen Afton	Local Nature Conservation Site	E 261799, N 610151	Semi-natural valley woodland, scrub and semi-improved grassland. Predominantly alder and birch with good shrub and ground layers.	Approximately 10m east of Development Site entrance
Connel Burn/ Benty Cowan	Local Nature Conservation Site	E 257783, N 609224	A variety of upland habitats along the upper Connel Burn including acidic and marshy grassland, blanket bog, species-rich ledges and numerous flushes.	Connel Burn/ Benty Cowan overlaps the Development Site
Afton Uplands	Local Nature Conservation Site	E 264963, N 608249	An extensive upland site which encompasses a range of upland mire, montane heath and grassland habitats. Alpine clubmoss and juniper are present, while stiff sedge is frequent over the summit of Craigbraneoch and Blackcraig.	200m east of the Development Site
Bolt Wood, Carcow Wood, and Un-named wood	Ancient Woodland Inventory	E 262992, N 607809 E 261642, N 609878 E 261479, N 611432	In Scotland, Ancient Woodland is defined as land that is currently wooded and has been continually wooded since at least 1750. Its age means that it is important for biodiversity and cultural identity.	1.5km south-east; 0.25km north-west; and 1.3km north-west

11.5.7 The Development Site is situated within a transition zone area of the Galloway and Southern Ayrshire Biosphere Reserve. The UNESCO Biosphere reserve was designated because of the combination of the area's "unique landscapes and wildlife areas and rich cultural heritage.

11.5.8 In addition, the Development Site lies within Carsphairn Forest, which is a former Red Squirrel Priority Woodland. While this area has now been superseded in terms of strategic priorities, Carsphairn Forest is still considered to be of local importance to red squirrel.

Habitats

11.5.9 For descriptive purposes, the Development Site is subdivided into the Main Site - where the turbines and the new associated infrastructure would be located - and the Access Track, which references the existing track that runs through the Pencloe Forest and connects the Main Site to Afton Road. A detailed summary of the habitats/vegetation

communities present across the Development Site is presented in **Appendix 11B** (Main Site) **and Appendix 11D** (Access Track).

Main Site

11.5.10 The Main Site is dominated by conifer plantation woodland which comprises 72.75ha of the total 128ha Development Site boundary. Smaller stands of upland habitats including modified blanket bog, grassland, mires, flushes and heath occur along forestry rides within the coniferous plantation and in the open areas bordering the plantation.

11.5.11 A detailed breakdown of NVC types, including extent of habitats is presented in **Appendix 11G**, **Table 11G.1**. The table also identifies whether these have the potential to be GWDTEs under SEPA guidance (SEPA, 2017).

Access Track

11.5.12 A total of 21 Phase 1 habitat categories were recorded within the Access Track Study Area.

11.5.13 **Table 11.7** summarises the Phase 1 habitat types recorded within the Study Area and identifies any associated NVC community and whether these have the potential to be GWDTEs under SEPA guidance (SEPA 2017). No targeted NVC surveys were carried out along the proposed Access Track as the habitat within this survey was found to be heavily modified as a result of agricultural and forestry activities. However, NVC communities have been determined using the Phase 1 habitat descriptions in order to highlight any potential GWDTEs.

Table 11.7 Phase 1 Habitat Types

Phase 1 Habitat	NVC Community	Potential Ground Water Dependent Terrestrial Ecosystem (SEPA, 2017)
A1.1.2 Broad-leaved woodland – plantation	N/A	N/A
A1.2.2 Coniferous woodland – plantation	N/A	N/A
A2.2 Scrub – scattered	N/A	N/A
A3.1 Broad-leaved parkland/ scattered trees	N/A	N/A
B1.2 Acid grassland – semi-improved	U4 semi-improved acid grassland (*Festuca ovina – Agrostis capillaris – Galium saxatile* grassland)	No
B2.2 Neutral grassland – semi-improved	MG9 semi-improved neutral grassland (*Holcus lanatus - Deschampsia cespitosa* grassland)	Yes
B4 Improved grassland	N/A	N/A
B5 Marsh/marshy grassland	M23 rush-pasture (*Juncus effusus/ acutiflorus – Galium palustre* rush-pasture)	Yes

Phase 1 Habitat	NVC Community	Potential Ground Water Dependent Terrestrial Ecosystem (SEPA, 2017)
C1.1 Continuous bracken	N/A	N/A
C3.1 Tall ruderal	N/A	N/A
D5 Wet heath/acid grassland	M15 wet heath (*Trichophorum cespitosum – Erica tetralix* wet heath	No
E1.7 Wet modified bog	M20 modified blanket bog *Eriophorum vaginatum* blanket mire	No
E1.8 Dry modified bog	M20 modified blanket bog *Eriophorum vaginatum* blanket mire	No
E2.1 Flush and spring – acid/neutral flush	M6 acid flush (*Carex echinata – Sphagnum recurvum/ auriculatum* mire)	Yes
G2 Running water	N/A	N/A
J1.1 Cultivated/disturbed land – arable	N/A	N/A
J1.2 Cultivated/disturbed land – amenity grassland	N/A	N/A
J2.4 Fence	N/A	N/A
J2.5 Wall	N/A	N/A
J3.6 Buildings	N/A	N/A
J5 Other (hardstanding)	N/A	N/A

Groundwater Dependent Terrestrial Ecosystems

11.5.14 The NVC survey identified the presence of a number of potential GWDTEs within the Proposed Development Site (**Appendix 11B**). The results of the extended Phase 1 habitat survey of the Access Track (**Appendix 11D**) were also used to inform the potential presence of GWDTEs. A full description of this assessment and the GWDTEs is provided in **Chapter 13 – Geology, Hydrology and Hydrogeology.**

Watercourses and waterbodies

11.5.15 The Development Site is situated on the watershed between the Nith and Dee catchments. The majority of the Development Site drains to the north-east into the Nith Glen via Carcow and Connel Burns, while a small area of it drains to the south-west into the Water of Deugh via a minor tributary (Bitch Burn). All watercourses on site are minor upland burns and rise in areas of wetland now dominated by conifer plantation forestry.

11.5.16 In general, watercourses are very narrow, shallow and fast-flowing, reflecting the proximity to the sources of these watercourses, whilst gravels and pools are present in some areas, the burns are typically rocky.

11.5.17 Two ponds are located within the Study Area, one on the top of Strandlud Hill (coordinated E 258290, N 606210) and one on a small tributary to Carcow Burn (coordinates E 258930, N 606510), 280m southwest of Monquhill.

11.5.18 Further details of these watercourses and waterbodies are included in **Appendix 11C** and **Chapter 13 – Geology, Hydrology (including flood risk) and Hydrogeology.**

Species

Otter

11.5.19 Otter surveys conducted during 2016, 2020, 2021 and 2023 identified otter activity on Carcow Burn and on Small Burn, with all signs recorded on the periphery of the Study Area. Signs recorded included spraints of various ages, two potential otter couches and one potential otter holt.

11.5.20 No evidence to indicate overland routes or connectivity between the two river catchments was found. However, there is no physical barrier to movement between the uppermost reaches of the Connel Burn and the unnamed tributary of the Water of Deugh on the south-western boundary of the Study Area, and it cannot be ruled out, therefore, that otter make use of this route for passing between the two catchments.

11.5.21 Further details on the findings of the otter field surveys are provided in **Appendix 11C** and **Appendix 11D.**

Water Vole

11.5.22 No evidence of water vole such as feeding remains, latrine sites, tunnel entrances or runs were recorded during the 2016 or the 2020, 2021 or 2023 surveys. In general, suitability for water vole is considered to be very low. Whilst a number of food plants are present adjacent to the narrow watercourses, banks are typically low and unsuitable for burrowing with little, if any, in-channel vegetation. The watercourses are also likely to experience sudden changes in water flow.

11.5.23 Further details on the findings of the water vole field surveys are detailed in **Appendix 11C** and **Appendix 11D.**

Bats

11.5.24 **Appendix 11E** presents the findings of the static detector, bat-activity transect, and emergence/ re-entry surveys undertaken in 2016/2017 and 2021/2022. A summary of the findings is provided below.

11.5.25 There is one building on site (the disused Monquhill Farmhouse) and this was assessed as having potential to support roosting bats. Surveys of this building confirmed a roost to be present at the farmhouse. Individual bats were seen emerging from and re-entering several features located at the western wall of the farmhouse. During surveys undertaken in 2016 / 2017 and 2021, three species (soprano and common pipistrelle and *Myotis* species) were confirmed to use the building for roosting.

11.5.26 During winter surveys undertaken between December 2016 and March 2017, and December 2021 and February 2022, to determine whether Monquhill Farmhouse supported a winter (hibernation) roost, no bat activity was recorded.

11.5.27 Given the low numbers of bats present, it was considered that the farmhouse is used as a small, mixed-species non-maternity roost.

11.5.28 Three dusk bat activity surveys were undertaken in May, June and October 2016. Very low levels of bat activity were recorded during the surveys with no bat passes recorded at all on the May survey, a single *Myotis* pass during the June surveys and a single soprano pipistrelle pass recorded during the October survey. On both occasions the passes were recorded along conifer plantation edges and the passes were brief, being consistent with bats passing between roosts and foraging areas associated with emergence after sunset.

11.5.29 Th automated bat detector surveys undertaken between 2017 and 2021 are not directly comparable, mainly due to the differences in number of days of recording time. Detectors were left out for longer periods during the 2021 surveys. However, it should be noted that Location 5, 6 and 7 during the 2017 surveys are similar in Location A, B and C during the 2021 surveys.

11.5.30 A total of 15,893 bat passes were recorded by seven static detectors deployed within the three recording periods (spring, summer and autumn 2016). The majority of these calls (14,198) were from the control site located outside of the Development Site in Afton Glen. Most of the calls recorded within the Development Site were from around the derelict Monquhill Farmhouse (a confirmed roost) and the disused caravan located near the farmhouse. Very low activity was recorded at the location of the proposed wind turbines. At least four species were recorded; common and soprano pipistrelle, Leisler's and Daubenton's bat. Passes which could not be accurately assigned to species level could be identified to genus level and *Myotis, Nyctalus* and *Pipistrellus* species were recorded. Common pipistrelle passes dominated with over 57% of the total bat activity followed by soprano pipistrelle (30%), Daubenton's bat (9%) and with other species/ species groups combining to give less than 1% of the total activity. Brown long-eared bat was only recorded on one occasion at the farmhouse.

11.5.31 The surveys undertaken during spring, summer and autumn 2021 showed that the three automated detectors recorded a total of 1192 contacts from at least five species/ species groups over 207 monitoring nights (averaging 5.76 contacts per night).

11.5.32 By far the most frequently encountered species was soprano pipistrelle, accounting for 43.29% of contacts, with activity recorded across all monitoring locations. The greatest level of soprano pipistrelle activity was recorded at monitoring location A (averaging 4.97 contacts per night). Monitoring location A was positioned on a wooden stake within a forest ride formed of modified bog, with coniferous plantation present in all directions.

11.5.33 The second most encountered species was the common pipistrelle, accounting for 25.84% of total contacts, with the greatest overall level of activity also recorded at monitoring location A (averaging 3.17 contacts per night). Contacts relating to the genus *Pipistrellus* (i.e., common or soprano pipistrelle calls that could not be attributed to a specific species) accounted for 13.43% of total contacts.

11.5.34 Remaining contacts were attributed to *Nyctalus* species (10.82%), *Myotis* species (5.96%), and brown long-eared bats (0.67%). The greatest overall level of *Nyctalus* activity was recorded at monitoring location A (0.83 contacts per night). Similar levels of *Myotis* activity were recorded at monitoring locations A and B (averaging 0.57 and 0.46 contacts per night respectively), both of which were positioned within forest rides.

11.5.35 **Table 11.8** presents the species composition at each of the seven detector locations. The majority of bat activity was recorded at the control location at Afton Glen, with peak bat activity recorded in spring. Activity at the edge of the Development Site around Monquhill Farmhouse (location 3 and 4) was moderate and the bat activity at locations furthest from the main river valley site (location 2, 5, 6 and 7), including at the two turbine locations (locations 6 and 7) all had very low or no bat activity.

Table 11.8 Species composition by detector location 2017

	Location 1 Afton Glen	Location 2 Fence/ 2nd ride	Location 3 Monquhill Farmhouse	Location 4 Caravan	Location 5 First Ride	Location 6 Strandlud Hill	Location 7 Pond
Common pipistrelle	11526	5	770	190	1	0	0
Soprano pipistrelle	2499	4	147	349	3	0	0
***Pipistrelle* sp.**	4	0	24	22	0	0	0
Brown long-eared	0	0	1	0	0	0	0
Daubenton's	77	4	41	77	26	0	0
***Myotis* sp.**	56	0	22	7	0	1	0
Leisler's	36	0	0	0	0	0	0
***Nyctalus* sp.**	0	0	1	0	0	0	0
Total	**14,198**	**13**	**1,006**	**645**	**30**	**1**	**0**

11.5.36 **Table 11.9** presents the species composition at each of the three detector locations used in 2021 (With Location A, B and C being similar to Location 5, 6 and 7 during the 2017 surveys). Direct comparisons between the 2017 and 2021 are not possible, primarily due to the differences in number of days of recording time the 2021 activity but there is a suggestion that there may have been an increase in bat contacts at all three locations, with moderate levels of activity recorded at location A and B and low levels of activity at location C.

Table 11.9 Species composition by detector location 2021

	Location A	Location B	Location C
Common pipistrelle	219	78	11
Soprano pipistrelle	343	154	19
Pipistrelle *sp*.	97	56	7
Brown long eared	1	6	1
Myotis *sp*.	39	32	0

	Location A	Location B	Location C
Nyctalus *sp.*	57	39	33
Total	756	365	71

11.5.37 Based on experience from similar upland sites within the south and west of Scotland, the level of bat activity recorded is typical of this type of upland habitat that is remote from the main valleys and, in this case, is dominated by dense coniferous plantation with a low level of habitat complexity. The survey results suggest that low numbers of soprano and common pipistrelle bats utilise the Development Site, including a confirmed roost within the disused Monquhill Farmhouse, supporting, three species (soprano and common pipistrelle and Myotis species). Low numbers of Daubenton's bat were also recorded within the main Development Site.

Badger

11.5.38 The only evidence of badger at the Development Site was a single badger print recorded along the existing track close to the derelict Monquhill Farmhouse. The presence of the print confirms that the Development Site is within the home range of at least one individual or group of badgers, although no setts or activity typically attributed to an actively defended territory were recorded. The home range of a group (i.e., the total area that group will visit within its lifetime) tends to be larger in relatively unproductive or marginal areas (i.e. those where badger's preferred habitat of arable, deciduous woodland, or grassland are absent, such as is the case at the Development Site) or where well-drained strata suitable for sett-building are scarce; and as such it may be greater than 120ha in size (Kruk, 1982). The print was identified in September 2016; coinciding with a period during which badger movements between territories have been observed to increase and when mating often takes place. The Development Site generally lacks suitable sett-building areas, with dry ground present in small areas at the upper reaches of the Connel Burn.

11.5.39 Further details on the findings of the badger field surveys are provided in **Appendix 11C** and **Appendix 11D.**

Great crested newt

11.5.40 Although the results of the eDNA analysis in May 2016 produced a positive result for the presence of GCN in Pond 1, no records of GCN were made during the 2016 presence/absence surveys. Only palmate newts (*Lissotriton helveticus*) were recorded during surveys, including adult male and females and immature "efts".

11.5.41 A positive eDNA result for GCN analysis may be a false positive or be as a result of the high sensitivity of the test (froglife, 2018). It is considered possible that the eDNA tests can detect GCN DNA brought in from wildfowl or from historic GCN presence. Following the completion of four survey visits using four different methods for searching during each, the comparatively poor habitat for breeding GCN and no records of this species being returned as part of the desk study, it is concluded that no GCN are present within the Study Area.

11.5.42 The detailed findings of the GCN field surveys are provided in **Appendix 11C**.

Pine Marten

11.5.43 Possible pine marten scats were recorded along forest rides within the Study Area during the 2023 surveys. No other signs of pine marten such as prints, dens or sightings were recorded, and no other evidence of pine martens was recorded in previous surveys (**Appendix 11C** and **Appendix 11D**). Pine martens are thought to only recently have been expanding their range in Southern Scotland after 200 years of absence and are now concentrated in four distinct areas which include a well-documented reintroduction programme in Galloway (west of the Development Site), and Annandale/Eskdalemuir (east of the Development Site). Between these areas pine martens have been reported lower in the Nith valley (over 20km east of the Development Site) although the otherwise isolated nature of the known populations suggests that human intervention as well as natural dispersal have aided their spread. Woodland cover within the Study Area, as with many afforested areas in Southern Scotland, is dominated by relatively young plantations at the closed canopy forest stage, which provide poor habitat quality for pine martens, lacking the essential resources i.e., den sites and prey items (particularly field vole) (Croose *et al*., 2014).

Red squirrel

11.5.44 No signs of red squirrel were recorded within the main Development Site however, a single red squirrel was sighted within woodland to the north of the Access Track in August 2017. No other signs of red squirrel such as discarded cones or dreys were recorded. Red squirrel habitat requirements are well documented[47]. Trees have to be old enough to produce seeds and woodland with a mix of tree species of different ages is preferred as it provides a more dependable supply of seed food. Although the Study Area contains forestry blocks which are over the 2,000 hectares indicated as providing opportunities for long-term red squirrel conservation, the blocks are even aged and dominated by Sitka spruce, therefore if red squirrels are present, they are likely to occur only in very low densities[48]. Further details on the methods and findings of the red squirrel field surveys together with the results of an ecological desk study are detailed in the technical baseline report (**Appendix 11C** and **Appendix 11D**).

Freshwater fish

11.5.45 Salmon were recorded at two survey locations, Site 1 on the Carcow Burn and Site 8 on the Afton Water, both sites are located outside of the Development Site and are downstream of the Proposed Development. These locations are at lower altitudes with good access for this species. The other survey locations were located high in the river catchment where the watercourses are smaller, and their course is interrupted by a series of natural falls and rock obstructions. Salmon are often denied access to these high-altitude sections of watercourse.

11.5.46 Trout were recorded at seven of the eight survey locations. Where trout were present, their population densities were good to excellent. The progeny of these trout will most likely smolt as a survival mechanism for the species due to the fact that habitat and sufficient food is not available for them to attain their full potential. A single European eel was found in the Carcow Burn at Site 1 (outside of the Development Site)

11.5.47 No lamprey species were recorded during the surveys.

[47] http://www.snh.org.uk/pdfs/publications/naturallyscottish/redsquirrel.pdf.

[48] http://www.red-squirrels.org.uk/habitat.asp.

11.5.48 The detailed results of the freshwater fish surveys undertaken in 2020 are provided in the Aquatic Survey Report (**Appendix 11F**).

Freshwater Pearl Mussel

11.5.49 No freshwater pearl mussels were recorded during the surveys.

Freshwater Invertebrates

11.5.50 The results show that healthy populations of aquatic invertebrates are present at all the sites surveyed.

Future Baseline

11.5.51 Determining a future baseline draws upon information about the likely future use and management of the Development Site in the absence of development, known population trends (for species), climate change and any other proposed developments (consented or otherwise) that may act cumulatively with the Proposed Development to affect ecological features.

11.5.52 It is unlikely that in the absence of the Proposed Development, any future baseline would be markedly different from the current baseline. Land use/management is currently anticipated to remain largely unchanged in the absence of development and it is therefore considered appropriate to use the current baseline for the purpose of this assessment.

11.6 Consultation

11.6.1 **Table 11.10** provides a summary of consultee comments about the Proposed Development and how these have been considered in this assessment.

Table 11.10 Summary of Consultee Comments Regarding Ecology

Consultee	Comments	Response and how considered in this chapter	Section Ref
East Ayrshire Council (EIA Scoping Opinion April 2020)	EIA Report must state whether or not appropriately qualified environmental scientists or ecologists, independent of the wind farm operator, are to be used as Clerk or Works or in other roles during construction to provide specialist advice.	The chapter discusses the Clerk of Works in the mitigation section of this chapter along with all necessary monitoring programmes.	**Section 11.10**
	Details of any ecological enhancement identified should be provided along with full details of what monitoring programmes have been / will be put in place during construction and operation.	Details of proposed monitoring programmes are detailed in Section 11.10.	**Section 11.10**
	Much of the main application site area is designated a Local Nature Conservation Site ('LNCS') as Connel Burn / Benty Cowan LNCS, whilst much of the length of Afton Road is also designated a LNCS. Note Afton Uplands LNCS is also located approximately 200m east of the application site. Impacts on these LNCS will need to be considered in the EIA.	An assessment of potential impacts upon these sites is presented in **Section 11.9** and **11.11** of this chapter.	**Section 11.9**
	Stated that the Scottish Wildlife Trust ('SWT') have responded and note the presence of the LNCS, and also raise concerns about impacts on the Connel Burn, though point out that the impact on sediment loads in other watercourses will also need to be considered. It also notes that the removal of forestry on the site may allow for the reinstatement of some areas of deep peat on site.	An assessment of the potential effects on Connel Burn / Benty Cowan LNCS is provided in **Section 11.9**. Mitigation measures to avoid/minimise effects on the Connel Burn and other watercourses are set out in **Section 11.8**.	**Section 11.8 and 11.91**

Consultee	Comments	Response and how considered in this chapter	Section Ref
	Advised contacting SNH to seek whether the proposed baseline surveys remain up to date or if new surveys will be required.	An extended Phase 1 Habitat survey of the development site was undertaken in July 2020 in order to check existing habitat conditions and protected species signs across both the Main Site and Access Track. Further protected species surveys were undertaken in September 2021 and March 2023. No GCN or bat surveys were undertaken in 2020. GCN were determined to be absent from the Site following surveys in 2016. Bat surveys were undertaken in 2016/2017 and 2021/2022 where survey methodologies followed the most up to date guidance. The site is particularly poor for bats being a densely planted conifer plantation with low habitat complexity and the habitat remains unchanged from previous surveys. It was considered that the baseline bat community it supports remains at the very low numbers recorded during previous survey. Full details of the bat surveys undertaken within the Development Site are presented in **Appendix 11E** and are discussed further in **Section 11.5** of this chapter	**Section 11.5 Appendix 11C and Appendix 11E**
	Noted that Nith District Salmon Fisheries Board ('NDSFB') requested that a full fisheries audit of all watercourses draining the site be undertaken and are willing to work with the Applicant. Advised that fish surveys be undertaken so that appropriate mitigation, if necessary, can be detailed.	NDSFB undertook a full fisheries audit of all watercourses draining the site in 2020 and the results of this survey have been used to inform the assessment within this chapter. A report of the surveys undertaken can be found in **Appendix 11F**.	**Appendix 11F**

Consultee	Comments	Response and how considered in this chapter	Section Ref
		Site specific mitigation measures are outlined in this chapter and will be incorporated into a Construction Environmental Management Plan ('CEMP').	
Nith District Salmon Fisheries Board (Scoping Response March 2020)	State that fish reside in the River Nith catchment within the vicinity of the Proposed Development and therefore fish surveys will be required for the board to demonstrate their statutory duty of care to migrating fish.	NDSFB undertook a full fisheries audit of all watercourses draining the site in 2020 and the results of this survey have been used to inform the assessment within this chapter. A report of the surveys undertaken can be found in **Appendix 11F**.	**Appendix 11F**
Scottish Wildlife Trust (Scoping Response March 2020)	State that the Scoping Report does not mention that the Development Site overlaps with the Connel Burn/Benty Cowan Local Nature Conservation Site. This is in the area around Strandlud Hill and towards the Craig of Bahoun. State there is no information on where the turbines will be placed so at this stage it is unclear what, if any, impact there will be to the wildlife on the site. State further surveys should be carried out to assess any likely impact in particular on any of the very steep ledges and crags where there may be some interesting plants.	An assessment of the potential effects on Connel Burn / Benty Cowan LNCS is provided in **Section 11.10**. The potential effects of the proposed development on the LNCS have been based on the LNCS overlapping with the Development Site in the assessment section of this chapter.	**Section 11.10**
	Recognise that the majority of the area is currently under forestry and likely to be of little wildlife interest but that there may be the opportunity to reinstate some of the areas of deep peat when the trees are removed.	Any potential restoration opportunities are discussed in **Section 11.8** of this chapter.	**Section 11.8**
NatureScot	Recommend that habitat surveys should include: • Phase 1 survey for all terrestrial habitats likely to be affected by the development. This should include an appropriate area beyond the footprint of the development to assess more distant effects and to inform any redesign or micrositing.	An extended Phase 1 Habitat survey was undertaken in July 2020 on the Development Site. This included ground truthing of previous surveys, including the NVC communities within the Main Site and also the	**Appendix 11B** **Appendix 11C**

Consultee	Comments	Response and how considered in this chapter	Section Ref
	• NVC survey of habitats listed on Annex 1 of the Habitats Directive and UKBAP Priority Habitats, accompanied by supporting quadrat information. • Records of any rare and scarce plant species.	Phase 1 habitat survey along the Access Track. The survey area extended 250m from the outermost point of the proposed infrastructure within the main Development Site and 100m along the proposed Access Track. These distances are the maximum ZoI which relate to potential effects on GWDTEs (SEPA, 2017) A desk study was carried out in 2020 and targeted protected and notable up to 2km from the main Development Site boundary. Full details of habitat surveys undertaken within the development site are presented in **Appendix 11B** and **Appendix 11D** and discussed within **Section 11.12** of this chapter. A full assessment of the potential impacts upon habitats is presented in **Section 11.12** of this chapter.	**Appendix 11B and Appendix 11D** **Section 11.12**
	Provided guidance in relation to Peat Surveys.	The results of peat surveys are presented in **Chapter 6 – Carbon Balance and Peat Management**.	**Chapter 6.**
	An assessment of impacts of hydrological changes (particularly related to groundwater) on habitats should also be included. Access tracks are the elements that will result in the greatest land take, habitat fragmentation and potentially hydrological disruption. It is therefore important that the track construction methods are clearly described in the EIA Report, along with the rationale for their type and location, and all direct and indirect impacts assessed.	GWDTEs are considered in **Appendix 11H** and a full hydrological assessment of the Development Site can be found in **Chapter 13 – Geology, Hydrology (including flood risk) and Hydrogeology**. Track construction methods are detailed in **Chapter 3 – Description of the Proposed Development.**	**Chapter 3** **Chapter 13** **Appendix 11H**

Consultee	Comments	Response and how considered in this chapter	Section Ref
	Survey results should be used to inform the design and layout process, so that the development avoids, where possible, fragile and priority habitats and other sensitive areas e.g., blanket bog and peat. Where this is not possible, suitable restoration and/or compensation measures should be presented in the EIA Report in the form of a draft Habitat Management Plan ('HMP'). HMPs should follow its guidance.	The survey results informed the proposed turbine layout and associated infrastructure e.g., areas of deep peat were avoided wherever possible, and the number of watercourse crossings were minimised as far as reasonably practicable.	**Section 11.8**

11.7 Scope of the Assessment

11.7.1 The method for determining the scope of the assessment within the ecology chapter differs from that used in other technical chapters within this EIA Report, in order to correspond with topic specific guidance (i.e., CIEEM 2018). However, the relevant receptors (i.e., ecological features), the spatial and the temporal scope are all defined in this section. The methodology followed has multiple stages, enabling the scope of the assessment to be progressively refined.

Ecological Features

Scoping - Determining Importance

11.7.2 For this ecological assessment the first stage in determining the scope of the assessment is to identify which ecological features identified through the desk study and field surveys (see **Section 11.5.**) are 'important'[49] in the context of the Proposed Development. Following CIEEM (2018) guidance, the importance of ecological features is first determined with reference to UK legislation and policy and then with regard to the extent of habitat or size of population that may be affected by the Proposed Development.

11.7.3 As the importance of ecological features is determined with regard to the extent of habitat or size of population that may be affected by the Proposed Development, the level of importance can differ from that which would be conferred by legislative protection or identification as a conservation notable species and from one development to another. For example, water vole is important at a national level because it is a SBL species and has experienced a population decline of more than 25% in the last 25 years. However, a small population that could be affected by a development would be assessed as being of less than national importance if there is alternative well-connected and suitable habitat nearby that has the capacity to support individuals that may be displaced.

11.7.4 Wherever possible, information regarding the extent and population size, population trends and distribution of the ecological features has been used to inform the categorisation described in **Table 11.11** to determine importance for the purposes of this assessment. Where detailed criteria or contextual data are not available, professional judgement was used to determine the level of importance.

11.7.5 An explanation of all determinations of importance are provided in this section, **Table 11.12** (for scoped in ecological features) and **Appendix 11H** (**Tables 11H.1** and **11H.2**) (for all ecological features both those scoped in and out) to ensure transparency.

[49] Importance relates to the quality and extent of designated sites and habitats, habitat/species rarity and its rate of decline. Ecological features that are not considered to be important are those that are sufficiently widespread, unthreatened and resilient and with populations that will remain viable and sustainable irrespective of the Proposed Development.

Table 11.11 Importance of Ecological Features in the context of the Proposed Development

Geographic Context of Importance	Example / Description
International or European[50]	1. Sites including SPAs, SACs, candidate SACs and Sites of Community Importance (SCI. Potential SPAs ('pSPA') and possible SACs ('pSACs') should also be considered in the same manner in accordance with National Planning Policy. 2. Areas of habitat or populations of species[51] which meet the published selection criteria for designation as an SAC or Ramsar site, but which are not themselves currently designated at this level.
National	1. A nationally designated site including SSSIs and National Nature Reserves ('NNRs'). 2. Areas (and the populations of species which inhabit them) which meet the published selection criteria guidelines for selection of biological SSSIs, but which are not themselves designated based on field data collected, and in agreement with SNH. 3. Scottish Biodiversity List ('SBL') habitats and species, Red listed and legally protected species that are not addressed directly in Part 2 of the "Guidelines for Selection of Biological SSSIs" but can be determined to be of national importance using the principles described in Part 1 of the guidance. 4. Areas of Ancient Woodland e.g., woodland listed within the Ancient Woodland Inventory.
Regional	1. SBL species considered to be of regional importance in the context of published information on population size and distribution.
County	1. Local Nature Reserves ('LNRs') and Non-statutory designated sites. 2. Areas which based on field data collected to inform the EcIA meet the published selection criteria for those sites listed above (for habitats or species, including those listed in relevant Local Biodiversity Action Plans) but which are not themselves designated.
Local	1. SBL habitats and species, Red listed and legally protected species that based on their extent, population size, quality etc. are determined to be at a lesser level of importance than the geographic contexts above. 2. Common and widespread semi-natural habitats occurring in proportions greater than may be expected in the local context. 3. Common and widespread native species occurring in numbers greater than may be expected in the local context.
Negligible	1. Common and widespread semi-natural habitats and species that do not occur in levels elevated above those of the surrounding area. 2. Areas of heavily modified or managed land uses (e.g., hard standing used for car parking, as roads etc.)

[50] Following the UKs exit from the European Union in January 2020, SACs and SPAs in the UK no longer form part of the EU's Natura 2000 ecological network. The legislation giving effect to these changes includes the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 in England and Wales and the Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019 in Scotland (the "2019 Regulations"). The 2019 Regulations have created a national/UK site network on land and at sea, including both the inshore and offshore marine areas in the UK. The national/UK site network includes pre-existing SACs and SPAs as well as new SACs and SPAs designated under the Habitats Directive as amended.

[51] This includes habitats and species listed under Annex I and Annex II of the Habitats Directive.

11.7.6 Where protected species are present and there is the potential for a breach of the legislation, those species should always be considered as 'important' features. With the exception of such species receiving specific legal protection, or those subject to legal control (e.g., invasive species), all ecological features that were determined to be of negligible importance have been scoped out of the assessment at this stage. Furthermore, ecological features of local importance were also scoped out at this stage where there was a specific technical justification to do so. This is because effects on them would not influence the decision-making about whether or not consent should be granted for the Proposed Development (in other words a significant effect in EIA terms could not occur). This approach is consistent with that described in CIEEM 2018. Specific justification for exclusion of each of these ecological features is provided in **Appendix 11H** (**Tables 11H.1** and **11H.2**).

11.7.7 All legally protected species and ecological features that are of sufficient importance were then taken through to the next stage of the scoping assessment.

Spatial Scope

11.7.8 The construction, operation and decommissioning phases of the Proposed Development may result in the following direct and indirect environmental changes that could significantly affect ecological features/receptors:

- Land take for construction or decommissioning of infrastructure (turbine bases, access tracks, site compounds);
- Direct loss, harm or disturbance during construction or decommissioning;
- Changes to the surface hydrology;
- Increased light, noise and vibration (disturbances);
- Increased vehicle movement; and
- Pollution associated with accidental spillage of fuels, oils, run-off and dust emission i.e., via direct contact, air or water.

11.7.9 Key to establishing which environmental changes may result in likely significant effects, is the determination of a ZoI for each important ecological feature identified. ZoIs differ depending on the type of environmental change (i.e., the change from the existing baseline) as a result of the Proposed Development and the ecological feature being considered.

11.7.10 The most straightforward ZoI to define is the area affected by land-take and direct land-cover changes associated with the Proposed Development. This ZoI is the same for all affected ecological features.

11.7.11 By contrast, for each environmental change that can extend beyond the area affected by land-take and land-cover change (e.g., increased noise associated with construction activities within the land-take area), the ZoI may vary between ecological features, dependent upon their sensitivity to the change and the precise nature of the change. For example, a water vole might only be disturbed by noise generated close to its burrow, while nesting marsh harrier might be disturbed by noise generated at a much greater distance, and other species (e.g., many invertebrates) may be unaffected by changes in noise. In view of these complexities, the definition of the ZoI that extends beyond the land-take area was based upon professional judgement informed (as far as possible) by a review of published evidence (e.g., disturbance criteria for various species) and discussions with the technical specialists who are working on other chapters of the EIA Report.

11.7.12 It should be noted that the avoidance of potentially significant effects through the design process is implicitly taken into account through the consideration of each ZoI, as are standard construction practices that are commonplace. When scoping in or out ecological features from further assessment, environmental measures (see **Section 11.8**) associated with general good practice that are described within the Code of Practice for planning and development (BSI, 2013) and *Good Practice during Wind Farm Construction* (Scottish Renewables *et al*., 2019) have been taken into account (e.g., dust suppression, appropriately scheduled vegetation removal etc.).

11.7.13 The ZoI for each of the ecological features scoped into the assessment on the basis of their importance is provided in **Table 11H.2** in **Appendix 11H**, together with a justification for scoping them in or out of the assessment on the basis of the spatial scope of the effects of the Proposed Development.

11.7.14 Ecological features that are scoped into the assessment (i.e., those of sufficient importance occurring within a relevant ZoI) are summarised in **Table 11.12**, along with a summary of the explanation behind their inclusion. For each ecological feature presented in **Table 11.12**, the potential environmental changes and potential significant effects resulting from the Proposed Development are provided.

Table 11.12 Likely Effects, ZoIs and Justification for Scoped in Ecological Features

Ecological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
Glen Afton Local Nature Conservation Site ('LNCS')	County	Local	Reduction in habitat quality as a result of hydrological connectivity, silt release and pollution incidents from construction activities.	Up to 10km downstream for the Development Site for hydrological connectivity.	Glen Afton LNCS is adjacent to the Development Site access and is located 4km downstream of the furthest proposed wind turbine, therefore there is potential for hydrological effects pathways along Afton Water which could increase sediment loading and pollutants entering the LNCS which could lead to reduction in habitat quality of the LNCS features. There is also potential for pollution events, including increased dust deposition given the LNCS' close proximity to the Access Track. As such, this site is included in further assessment within this chapter.
Connel Burn/Benty Cowan Provisional Local Nature Conservation Site	County	Local	Direct habitat loss resulting from construction activities.	Within the construction/ maintenance/ decommissioning area.	Connel Burn/ Benty Cowan LNCS is located within the Proposed Development footprint and so there would be direct and permanent habitat loss as a result of the Proposed Development. No botanically sensitive habitats were identified within the Study

Ecological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
					Area associated with the LNCS and habitats were assessed as generally being modified as a result of coniferous plantation woodland and grazing pressure, however given its status as a LNCS it is included in further assessment within this chapter.
			Reduction in habitat quality as a result of hydrological connectivity, silt release and pollution incidents from construction activities.	Up to 10km downstream for hydrological connectivity.	There is potential for sediment loading and pollution of watercourses that are located within the catchment for the Connel Burn/Benty Burn LNCS to arise from construction activities related to the Proposed Development.
Blanket Bog (M19, M20, M20i, M20ii)	European	Local	Permanent loss and temporary damage to terrestrial habitats.	Direct loss and temporary damage within the construction/ maintenance decommissioning area and up to 50m outside of the Development Site for pollution and dust deposition.	Blanket bog would be subject to both direct and indirect effects as a result of the Proposed Development. Direct habitat loss would result

Ecological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
			Indirect disturbance and changes to composition of plant communities resulting from hydrological change.	50m[52] beyond construction/ maintenance/ decommissioning areas.	from construction activities and there is potential for indirect effects as a result from changes in hydrology and through pollution and dust deposition which may affect habitats up to 50m around construction activities. M19 was recorded within the Study Area but outside of the Proposed Development area and would not be affected by the proposed works. Other examples of blanket bog are modified due to forestry, drainage and grazing pressures. Most of the blanket bog was determined to be inactive but a small area of blanket bog on Strandlud Hill was determined to be active. Blanket bog is an SBL Priority habitat and includes habitats/ vegetation communities listed on Annex I to the Habitats Directive. As it will be subject to both direct and indirect effects as a result of the Proposed Development it is

[52] The permeability of peat is generally low, and the effect of a ditch on groundwater levels is limited at distances exceeding about 50m. See NERC (1992). *Hydrology and Wetland Conservation*. Report to MAFF. Natural Environment Research Council.

Ecological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
					included for further assessment in this chapter.
Acid Flush (M6, M6a, M6b, M6d)	National	Local	Permanent loss and damage to terrestrial habitats including through pollution and dust deposition. Indirect disturbance and changes to composition of plant communities resulting from hydrological change.	Within and up to 50m from the construction/ maintenance/ decommissioning area. 250m beyond construction/ maintenance/ decommissioning areas.	Certain types of acid flush are SBL Priority habitat. M6 acid flush is widespread within the Study Area occurring as narrow linear stands within drainage ditches. As there would be direct habitat loss of this community it has been included for further assessment.

Ecological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
Marshy Grassland (M23. M23a, M23b) and Mire M25, M25b))	National	Local	Temporary and permanent loss and damage to terrestrial habitats Indirect disturbance and changes to composition of plant communities resulting from hydrological change.	Within and up to 50m from the construction/ maintenance decommissioning area 250m beyond construction/maintenance/ decommissioning areas	Marshy grassland would be subject to both direct and indirect effects as a result of the Proposed Development. Direct habitat loss would result from construction activities and there is potential for indirect effects as a result from changes in hydrology and damage due to pollution and dust deposition. Both marshy grassland and mire also contain GWDTE NVC communities (including M23 rush pasture and M25 mires), which may be sensitive to damage during construction works within a 250m ZoI. The potential effects of the Proposed Development on this community in terms of GWDTEs are assessed within **Chapter 13 – Geology, Hydrology and Hydrogeology**.

Ecological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
Semi-improved acid grassland (U2, U4, U4x, U5, U5a, U5b, U5c U6)	National	Local	Temporary and permanent loss and damage to terrestrial habitats including through pollution and dust deposition. Changes to composition of plant communities resulting from hydrological change	Within and up to 50m from construction/ maintenance/ decommissioning activities. 250m beyond construction/maintenance/ decommissioning	Certain types of acid grassland are SBL Priority habitat (mat grass and marsh bedstraw grassland). Acid grassland occurs as a large stand on Strandlud Hill, and along with wet modified blanket bog, occupies much of the area which is not coniferous plantation. An area of U5c acid grassland with higher levels of species richness occurs in the west of the Study Area, however, this would not be directly affected by the Proposed Development. Given that mat grass and marsh bedstraw grassland is considered an SBL Priority habitat and land take and land use during construction may lead to the loss/disturbance of this habitat, U5 acid grasslands are included in further assessment in this chapter.
Waterbodies (Watercourses)	National	Local	Disturbance of river habitats and pollution to watercourses and downstream waterbodies during construction, operation and	Within the construction/maintenance/ decommissioning area and up to 10km downstream from the Development Site through hydrological connectivity.	There are numerous watercourses within the Development Site which are considered an SBL Priority Habitat and also support SBL priority species, including otter

Ecological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
			decommissioning. Includes silt/ sediment and pollutant release, damaging fish habitats (inc. spawning habitat), potentially harming fish and associated adverse effects on fish and otter populations.		and fish. The watercourses within the site are also part of and linked to LNCS. In order to avoid any detrimental effects upon watercourses and the species they support, mitigation measures will be essential to avoid any significant effects as a result of the Proposed Development. As such, watercourses are included for further assessment within this chapter. The Proposed Development includes a number of culvert watercourse crossings. Works on these crossings during the construction and decommissioning phases would disturb in-stream and bank habitats and have associated risks of silt/pollutant discharges to watercourses. The operational development may also have associated pollution risk.
Otter	European	Local	Disturbance/ displacement to local otter population.	Otter are active within the Development Site.	Otter is a European Protected Species ('EPS') and an SBL Priority species. The Proposed Development footprint is within the home

Ecological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
					range of otters and therefore construction activity may give rise to the disturbance to the local otter population and there may be impacts to their prey species – either from the placement of infrastructure or due to noise disturbance.
			Direct damage to resting sites and disturbance to individuals using resting sites due to elevated levels of disturbance (such as increased noise, lighting, and human presence) during construction/ operation and decommissioning related works.	Resting sites: 30m from the proposed construction/ maintenance/ decommissioning areas (based on NatureScot protected species advice).	No confirmed otter resting sites (breeding or non-breeding) were identified during the surveys, but potential resting sites were identified along the Carcow Burn and a tributary of the Bitch Burn. As no confirmed resting sites were found within the Study Area, no effects in relation to known resting sites are anticipated. However, there is a risk that otter could establish resting sites such as couches in advance of construction as suitable habitat is present, and in the absence of mitigation, construction activities may cause disturbance or destruction of any new resting sites.

Ecological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
					An EPS licence[53] is likely to be required should proposed works occur within a threshold of disturbance within 30m of a non-breeding resting site and 200m of a breeding resting site.
			Temporary severance of otter habitat and commuting routes.	Within the construction/maintenance/decommissioning area.	Evidence of otter activity was recorded along the Small Burn, the Carcow Burn and Glen Afton in the form of spraints of varying ages, some being very fresh. The Proposed Development could therefore lead to temporary habitat severance and fragmentation of territories during construction or decommissioning phases, particularly during the construction of watercourse crossings.
			Direct mortality due to construction related activities	Within the construction/ maintenance. Decommissioning areas.	Evidence of otter activity was recorded along the Small Burn, the Carcow Burn and Glen Afton in the form of spraints. The Proposed Development could lead to incidents of

[53] Certain animals and plants in Scotland are given strict protection as European protected species. EPS licence is required under Conservation (Natural Habitats &c.) Regulations 1994 (as amended)

Ecological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
					mortality as a result of vehicle collision during construction or decommissioning phases in particular.
			Reduction in habitat quality as a result of hydrological connectivity and pollution incidents and impacts on prey.	River catchments (Glenshalloch Burn, Glenhastel Burn, Carcow Burn and Small Burn, Connel Burn) that intersect the Development Site.	Inputs of silt and other fine material including peat can cause damage to fish habitats and direct mortality to fish and fish eggs.
Bats	European	Local	Direct damage to roosting sites and disturbance to roosting individuals using roosting sites due to elevated levels of disturbance (such as increased noise, lighting, and human presence) during construction/operation and decommissioning related works.	Within the construction/ maintenance/ decommissioning areas. The temporary construction compound is proposed to be constructed adjacent to the disused Monquhill Farmhouse.	All UK bats are classed as EPS and are SBL Priority species. A bat roost was confirmed at Monquhill Farmhouse. The roost was assessed as a small, mixed-species, non-maternity roost. The presence of a single Myotis contact during the 2021/2022 hibernation surveys suggests there is potential for this structure to be a hibernation roost. A temporary construction compound will be installed next to Monquhill Farmhouse and indirect effects such as noise and lighting could cause disturbance to this roost.

Ecological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
					An EPS licence under regulation 44 of the Habitats Regulations is likely to be required should proposed works occur within a threshold of disturbance within 50m of a roosting site.
			Loss, damage or fragmentation of foraging and commuting habitat.	Within the construction/ maintenance/ decommissioning area.	Bat activity recorded within the main Development Site during transect surveys and static detector surveys was generally low. However, the Proposed Development could lead to temporary habitat severance during the construction or decommissioning phases e.g., due to lighting.
			Direct mortality or injury due to collision with turbines.	Within the construction/ maintenance/ decommissioning area.	Direct mortality is the main potential effect on bat populations. This can be a result of collisions with fast-moving turbine blades resulting in trauma injuries or barotrauma (internal haemorrhaging in the lungs resulting from rapid changes in pressure behind moving turbine blades).

Ecological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
Atlantic salmon	European	Local	Deterioration in fish populations due to loss of, or damage to, juvenile salmonid habitat at watercourse crossings; obstruction of spawning migration; harm to fish (direct physical harm/noise); degradation of fish habitats due to pollution/siltation; and harm to fish during operation (electromagnetic emissions).	Up to 10km downstream from the Development Site for hydrological connectivity.	Atlantic salmon were not recorded within the Development Site, and it was considered to be unsuitable due to its high altitude and the watercourses being unsuitable due to their small size and interruption by a series of natural falls and rock obstructions. This species was, however, recorded within the Afton Water and the Carcow Burn, which are both hydrologically linked to the Development Site. Atlantic salmon is a SBL species and has been subject to population declines on many rivers throughout Scotland. The Proposed Development will require up to six watercourse crossings. Works on these crossings during the construction and decommissioning phases have the potential to discharge silt and sediment into the watercourse, which could result in detrimental effects upon these fish species.

Ecological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
Sea/brown trout[54]	National	Local	Deterioration in fish populations due to loss of, or damage to, juvenile salmonid habitat at watercourse crossings; obstruction of spawning migration; harm to fish (direct physical harm/noise); degradation of fish habitats due to pollution/siltation; and harm to fish during operation (electromagnetic emissions).	Up to 10km downstream from the Development Site for hydrological connectivity.	Sea/brown trout was recorded within the Development Site. Sea/brown trout is a SBL species and sea trout in particular have been subject to population declines on many rivers throughout Scotland. The Proposed Development will require up to six watercourse crossings. Works on these crossings during the construction and decommissioning phases have the potential to disturb instream habitats, create a temporary barrier to fish movement and have associated risks of silt/pollutant discharges to watercourses. The operational development is likely to have associated electromagnetic emissions and limited pollution risk.
Freshwater Pearl Mussel	National	Local	Indirect effects due to effects on host fish species (salmonids) as set out above; and degradation of	Up to 10km downstream from the Development Site for hydrological connectivity.	This SBL species has not been recorded within the Development Site. It is included in the assessment as

[54] With regards to other species of fish of nature conservation importance, European eel were recorded outside the site in the Carcow Burn and while lamprey was not recorded, the catchment is potentially suitable. The predicted environmental changes, potential effects and ZoI considered for salmonids are similar for these (and other fish) and are therefore taken as proxy for lamprey and eel.

Ecological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
			habitats due to pollution/siltation.		it could occur within the catchment into which the Development Site drains. Works on watercourse crossings during the construction and decommissioning phases would disturb river habitats/substrates and have associated risks of silt/pollutant discharges to watercourses. The operational development is also likely to have limited pollution risk. The effects on salmonids outlined above could also have adverse effects on freshwater pearl mussels indirectly because salmonids are host vectors of juvenile mussels and have an important role in mussel reproduction/recruitment.

Temporal Scope

11.7.15 In line with the general approach to the EIA outlined in **Chapter 4 – Approach to Preparing the EIA Report,** the temporal scope of the ecological assessment covers a.) construction; b.) operation; and c.) decommissioning periods:

a. Construction of the Proposed Development would be completed over a period of up to 18 months. Working hours are likely to vary through the year, depending on day length, but would typically be between 07:00 to 19:00 hours on weekdays (Monday to Friday) and 07:00 to 13:00 hours on Saturdays (**Chapter 3 – Description of the Proposed Development**). Quiet on-site working activities (such as electrical commissioning) have been assumed to extend outside the core working times (where required).

b. Operation of the Proposed Development is anticipated to run for 35 years.

c. For the purposes of this EIA Report, it is assumed that above ground structures (wind turbines, kiosks, and control building/substation, battery storage) will be removed and below ground infrastructure (e.g., transmission cables) will be left in situ. As with below ground infrastructure, the removal and disposal of access tracks and crane hardstanding materials would have a greater environmental impact than leaving in situ and it is therefore assumed these will remain for use by the landowner.

11.7.16 The environmental changes identified could occur during the construction phase, operational phase and decommissioning phases of the Proposed Development. The potential effects of the environmental changes are considered with respect to their duration, frequency, timing and reversibility for each of the scoped in ecological features in **Table 11.12**.

11.8 Environmental Measures Embedded into the Development Proposals

Mitigation by Design

11.8.1 An iterative design process has been carried out, and a range of environmental measures have been embedded into the Proposed Development as outlined in **Chapter 3 – Description of the Proposed Development**. **Table 11.13** outlines how these embedded measures would influence the ecological assessment.

Land take and Design Optimisation

11.8.2 Ecological features have been considered at all stages of the design, from early feasibility to final layout. This approach aims to avoid or greatly reduce impacts on IEFs and other ecological features.

11.8.3 Site infrastructure has been designed as far as reasonably practicable to use the minimum land take. For instance, all access tracks have been designed to be linear, without loops, to avoid creating islands of habitat fragmentation.

11.8.4 The layout of the Proposed Development within Connel Burn/Benty Cowan Provisional LNCS has avoided vegetation communities for which the Site has been notified, including acid and marshy grassland, blanket bog, species rich ledges and numbers of flushes. The layout of the Proposed Development across the rest of the Development Site has also, wherever possible, avoided peatland habitat, and where avoidance has not been

possible, has been designed to avoid habitats of highest ecological importance and highest sensitivity to effects. This process has been informed by the NVC survey data (Technical **Appendix 11.B**), with preference for development in lower quality habitats (such as those heavily modified/drained), while avoiding as far as reasonably practicable higher quality areas (such as blanket bog).

11.8.5 The proposed control building and substation compound, battery storage, temporary construction compound and storage/laydown areas have been sited to avoid sensitive vegetation communities.

11.8.6 Another key design consideration has been the avoidance of habitats with potential groundwater dependency ('GWDTEs') and making use of existing tracks. Access to the Proposed Development will utilise the existing Access Track off Afton Road through Pencloe Forest.

Watercourses

11.8.7 The Proposed Development has been designed to minimise watercourse crossings and it is expected that six culverts will be required (one new culvert and five existing ones to be upgraded).

11.8.8 The layout of the Proposed Development has also been designed with a buffer of 50m around watercourses and waterbodies (excluding watercourse crossings) to minimise construction risks on the aquatic environment.

Bat habitat features

11.8.9 In line with current guidance (NatureScot *et al*, 2021) turbines will be positioned at least 50m (measured from blade-tip) from any features (i.e., key watercourses and woodland edge) within the Development Site likely to be used by commuting and foraging bats to reduce collision risk. Buffer distances have been applied during the design phase in order to avoid areas of habitat with potential to be utilised by commuting and foraging bats. Buffer distances were estimated using the following formula:

$$b = \sqrt{((50+bl)^2-(hh-fh)^2}$$

(Where b = buffer distance; bl = blade length; hh = hub height; fh = feature height

[all in metres])

11.8.10 For the purpose of the assessment, the buffer distance for the Proposed Development has been based on a turbine hub height of 81.9m, blade length of 68m and a feature height (fh) 10m for the coniferous woodland or 0m for watercourses. All turbines would therefore be located at least 93.56m away from woodland habitats features and 84.94m from well utilised watercourses within the Development Site to ensure there is a suitable buffer between turbine blade tips and any habitat features that may be utilised by commuting and foraging bats.

11.8.11 Although the 50m buffer between turbine blade tip and habitat features will be maintained on the Development Site, there is a short section of coniferous plantation (approximately 160m in length) on neighbouring land, that is located ~80m from the turbine base (T2), which is 5m less than the appropriate distance recommended by NatureScot *et al* (2021). Given the steep contour between the turbine location and the woodland (there is a 10m decrease in height), and the generally low number of bats recorded in this area, the 80m distance is considered acceptable in this instance.

11.8.12 **Table 11.13** outlines how embedded mitigation measures (project assumptions) during construction and operational phases of the Proposed Development influence the ecological assessment.

11.8.13 Full details of construction mitigation measures will be provided in a Construction Environment Management Plan ('CEMP') to be agreed with EAC, in consultation with NatureScot and SEPA, post-consent but prior to construction. A summary of measures to be included within the CEMP is provided below (**Table 11.13**) and in **Chapter 3 – Description of the Proposed Development**.

Table 11.13 Summary of the Embedded Environmental Measures and how these Influence the Ecological Assessment

Ecological feature	Changes and effects	Embedded measures and influence on assessment
CONSTRUCTION PHASE:		
All designated sites and habitats	Direct habitat loss and temporary disturbance during construction Indirect disturbance and changes to composition of plant communities resulting from hydrological change	The Development Site is situated in an area where peat deposits are found. The infrastructure design and construction methodology has been refined to minimise peat excavation from tracks and turbine infrastructure, but it has not been possible to avoid it entirely. An Outline Peat Management Plan ('PMP') has been prepared and it will be finished prior to construction and following completion of detailed ground investigations and micro-siting. The PMP will be further refined, and detailed methods and specification agreed with SEPA and NatureScot. This will address methods in respect of peat excavation, haulage, storage, re-use and degraded habitat restoration. The PMP will ensure that peat excavated during construction is safely and suitably re-used within the extent of the Development Site wherever possible. A Construction Environmental Management Plan ('CEMP') will be prepared which will set out a variety of control measures for managing the potential environmental effects of construction works including control and management of surface water runoff, waste and pollution control. The Development Site would be subject to restoration which would include reinstatement of vegetation at track edges. With the exception of the part of the temporary construction compound that will house the battery storage facility, the remainder of it and associated facilities will be removed and fully re-instated with vegetation/peat displaced from elsewhere on the Development Site and landscaped to match the local topography.
Watercourses, otters and freshwater fish	Silt/sediment and pollutant release, damaging fish habitats (including. spawning habitat), potentially	The following measures have been incorporated within the scheme design in order to minimise the risk of pollution and to ensure that impacts on watercourses are either avoided or reduced.

Ecological feature	Changes and effects	Embedded measures and influence on assessment
	harming fish and associated adverse effects on fish and otter populations.	The stockpiling of materials would be minimised, and any essential stockpiles would be located as far away as possible from watercourses. Watercourse crossings have been minimised as far as possible. At this stage, it is proposed that a simple culvert type construction will be employed, using a cross sectional area that will not impede flow of water. Design of culverts shall be to at least CIRIA Culvert Design and Operation Guide (RP901) standard. All crossings would be designed to accommodate 1 in 200-year peak flows to reduce the risk of flooding and would be developed in accordance with *Engineering in the Water Environment Good Practice Guide – River Crossings: Second Edition* (SEPA, 2010b) and *River Crossings and Migratory Fish: Design Guidance* (Scottish Executive 2000). A pollution prevention plan ('PPP') and Pollution Incident Response Plan ('PIRP') would be prepared and subject to consultation with SEPA and NatureScot in advance of any construction activities and implemented as part of the overall CEMP. This would set out site management and working practices and draw heavily upon SEPA's Pollution Prevention and Control Guidelines ('PPGs'). A construction area stand-off at least 50m has been applied to all watercourses (except for watercourse crossings).
Freshwater Fish (including salmon, trout and eel)	Obstruction of migration and associated adverse effects on fish spawning and recruitment. Risk of harm to fish during works at watercourse crossings.	Watercourse crossings have been minimised as far as possible. At this stage, it is proposed that a simple culvert type construction will be employed, using a cross sectional area that will not impede flow of water. Design of culverts shall be to at least CIRIA Culvert Design and Operation Guide (RP901) standard. All crossings would be designed to accommodate 1 in 200-year peak flows to reduce the risk of flooding and would be developed in accordance with *Engineering in the Water Environment Good Practice Guide – River Crossings: Second Edition* (SEPA, 2010b) and *River Crossings and Migratory Fish: Design Guidance* (Scottish Executive 2000).
	Loss/severance of, or damage to, watercourse habitat at watercourse crossings, including associated adverse effects on fish spawning and recruitment.	With the exception of work at watercourse crossings a buffer/exclusion zone (50m radius) around watercourses would be implemented. Watercourse crossing would be micro-sited as far as possible to avoid unconsolidated gravel and pebble substrates and riffle habitats. Six simple culvert type upgrades to existing crossings are proposed using a cross sectional area that would not impede flow of water. Culvert construction would be supervised by the ECoW, with culverts transferred to watercourse crossings intact, avoiding mixing concrete near to watercourse crossings.

Ecological feature	Changes and effects	Embedded measures and influence on assessment
	Silt/sediment and pollutant release, damaging fish habitats (including spawning habitat), potentially harming fish and associated adverse effects on fish populations.	See Watercourses, otters and freshwater fish above.
	Noise and vibration and associated harm to fish.	With exception of watercourse crossing (construction and operation), a buffer/exclusion zone (50m radius) around the watercourse network would be implemented, which would minimise noise/vibration effects on fish. Culverts would be installed (and decommissioned) from the bank, in low flows, where possible outside the period October to May inclusive and where possible during the period July to September inclusive to avoid sensitive periods for fish. This timing restriction would also apply to any construction/ excavation work within 50m of watercourses. Site supervision of works would be undertaken by a suitably experienced ECoW. Construction of watercourse crossings would be completed over a period of short duration and taking care to minimise noise/vibration, such as avoiding impacts between plant and riverbed/bank substrate and carefully lowering culverts into place.
Freshwater pearl mussel (and other freshwater invertebrates)	Disturbance/harm to freshwater pearl mussel and other freshwater invertebrates due to habitat degradation and disturbance.	Freshwater pearl mussels were not recorded during surveys in 2020 of the watercourses that cross the Development Site and the majority of the habitats at the survey locations were recorded as sub-optimal or unsuitable for this species. This species is therefore unlikely to be affected by the development proposals. However, on a precautionary basis, each watercourse crossing would be inspected for this species in advance of construction, extending 50m upstream and downstream, to verify this conclusion. In the unlikely event that freshwater pearl mussel is recorded, the crossing would be micro-sited to avoid this species in consultation with NatureScot. The measures set out above to minimise effects on fish would also minimise effects of changes in downstream water quality on freshwater invertebrates.
Otter	Killing/injury/disturbance due to construction works, including lighting, noise and human activity	A Species Protection Plan (SPP) for otter would be prepared to ensure compliance with legislation. It would include details of pre-construction surveys to check on the presence of otters and the following suite of embedded measures that would be implemented across the Development Site to avoid causing harm to or disturbing this species. Site supervision would be provided by a suitably experienced ECoW, who would be responsible for ensuring the successful implementation of embedded measures, including pollution prevention, monitoring of buffers around construction areas and reference to areas of high ecological

Ecological feature	Changes and effects	Embedded measures and influence on assessment
		sensitivity, and adherence to current construction best practice. Pre-construction verification check surveys would be undertaken for all protected species where potentially significant effects or legal breaches could occur otherwise. All works in proximity to waterbodies / watercourses would follow measures outlined in the CEMP, and those outlined for watercourses above, to ensure their complete protection against pollution, silting and erosion as further outlined in the PPP and PIRP. Strict speed limits would be followed on access tracks during all phases of development, and 'otter crossing' signs would be placed on the access tracks at all water crossings. Trenches, holes and pits would be kept covered at night or provide a means of escape for otters (and other fauna) that may become entrapped. Gates to compound areas would be designed sensitively to prevent mammals from gaining access and would be closed at night. Any temporarily exposed pipes would be capped when contractors are off site to prevent otter from gaining access. Any lighting used to accommodate works must be positioned to minimise light spill onto watercourses/ waterbodies. The ECoW would monitor otter activity upstream and downstream of the works using camera traps and may stop site activities at any time should they consider that the works are having a detrimental effect on otter. An emergency procedure would be implemented by site workers if otter are encountered. If an otter resting place was recorded all works within 30m of the resting place would cease as soon as it is safe to do so, and the ECoW would inspect the site and define appropriate measures (if required). Should construction activities take place at more than one watercourse at any one time, this would be subject to ECoW approval, to avoid any cumulative impact on otter activity. This includes any works taking place within 50m of the watercourse.
Bats	Killing/injury/disturbance due to construction works, including lighting, noise and human activity	A mixed species, non-maternity bat roost was identified at the Monquhill Farmhouse. In order to protect this roost from both potential direct and indirect effects the following embedded mitigation will be implemented. Site supervision would be provided by a suitably experienced Environmental Clerk of Works ('ECoW'), who would be responsible for ensuring the successful implementation of embedded measures, including pollution prevention, monitoring of buffers around construction areas and reference to areas of high ecological sensitivity, and adherence to current construction best practice. The ECoW would provide supervision during the works and would set up a 50m exclusion zone around Monquhill

Ecological feature	Changes and effects	Embedded measures and influence on assessment
		Farmhouse prior to works commencing so no works would be undertaken within this exclusion zone. Directional lighting and light spill within 50m of watercourses would be avoided during the hours of darkness (taken to be 30 minutes before sunset to 30 minutes after sunrise). No security lighting to be left on in-situ overnight where practicable. Turbines would be sited the minimum distance from suitable habitat features (equating to a stand-off area of 50m from blade tip to habitat feature) within the Development Site, based upon the calculation set out in paragraph 11.8.9) and in accordance with current guidance (NatureScot *et al*., 2021).
Water vole	Killing/injury/disturbance due to construction works, including lighting, noise and human activity	Although no evidence of water vole was identified at the Development Site, habitat with potential to support this species is present and so this species cannot be ruled out from future colonisation of the Development Site. Therefore, a pre-construction water vole survey will be carried out within a minimum of 50m of the location of each watercourse crossing. In the event that the presence of water voles is confirmed, a mitigation scheme will be agreed with EAC in consultation with NatureScot and will be implemented prior to construction. If required, this is likely to include water vole exclusion and habitat enhancement measures in accordance with current guidance (Strachan, Moorhouse & Gelling 2011).
Badger	Loss/fragmentation of habitat Killing/injury/disturbance due to construction works, including lighting, noise and human activity	Although no setts were recorded within the Development Site, evidence of badger in the form of a badger print was recorded. Therefore, a pre-construction badger survey will be carried out within a minimum of 50m of all proposed infrastructure. In the event that the presence of badger setts is confirmed, a mitigation scheme will be agreed and will be implemented prior to construction.
Reptiles and amphibians	Loss/fragmentation of habitat Killing/injury/disturbance due to construction works, including lighting, noise and human activity	Best practice for amphibians and reptiles will be implemented through compliance with a protected species method statement which will include the following measures (for legal protection purposes). The ECoW or a suitably qualified ecologist will check any existing or created piles of material suitable to provide shelter for reptiles and stone walls for resting/ hibernating amphibians and reptiles prior to site clearance/ dismantling and the storage of equipment.
Pine marten	Killing/injury/disturbance due to construction works, including	Potential pine marten scats were recorded however, no pine marten prints, or dens were recorded. Habitat with potential to support this species is considered to be limited at the Development Site but given the potential presence of pine

Ecological feature	Changes and effects	Embedded measures and influence on assessment
	lighting, noise and human activity	marten scat, this species cannot be ruled out from future colonisation of the Development Site. Pre-construction pine marten survey will be carried out within a minimum of 50m from proposed infrastructure. In the event that the presence of pine marten is confirmed, a mitigation scheme will be agreed with EAC in consultation with NatureScot and will be implemented prior to construction.
Red squirrel	Killing/injury/disturbance due to construction works, including lighting, noise and human activity	A single sighting of a red squirrel was made within the Study Area. A pre-construction red squirrel survey will be carried out within a minimum of 50m of all proposed tree felling areas. In the event that the presence of red squirrel dreys are confirmed, a mitigation scheme will be agreed and will be implemented prior to construction.
OPERATIONAL PHASE		
Watercourses, otters and freshwater fish	Pollution	The majority of the specific measures applied during ongoing and operational activities relate to the application of good practice in terms of managing and controlling activities to minimise the risk of pollution upon receptors and hydrological features. A detailed explanation of the general site pollution control, emergency procedures and contingency planning is set out within **Chapter 13 – Geology, Hydrology and Hydrogeology**. The potential risks to surface water during operation are likely to be limited and localised based on the planned turbine servicing works and the nature and volume of potentially polluting substances required. The operator would ensure a site-specific risk assessment is completed and that control measures are implemented to ensure all environmental risks are minimised. Storage, use and disposal of oils would be in accordance with good practice and SEPA guidance.
Freshwater fish	Electromagnetic emissions and harmful effects on fish	Cabling along access tracks would be over 50m from the watercourse network and buried. In a limited number of instances where cables cross watercourses these would be installed by directional drilling underneath the watercourse. This would minimise exposure of fish to electromagnetic emissions during operation.
Bats	Disturbance and/or displacement of commuting and foraging bats Injury / mortality resulting from collision with turbines / barotrauma during the operational phase.	In accordance with current guidance (NatureScot *et al*, 2021), turbines would be sited the minimum distance from suitable habitat features (equating to a stand-off area of 50m from blade tip to habitat feature), blade upon the calculation set out in paragraph 11.8.9). Good practice environmental measures would be adopted to minimise the risk of bats colliding with turbines during operation in accordance with current guidance (NatureScot *et al*, 2021). Turbines will have a minimum 50m stand-off distance between blade tips and high-value bat habitats, such as woodland and riparian features. Although this offset

Ecological feature	Changes and effects	Embedded measures and influence on assessment
		has been included in the design of the Proposed Development, this standoff buffer will be maintained throughout the operational life of the Proposed Development by ensuring that tree regeneration does not encroach on the buffer. Based on location-specific results of bat activity monitoring and assessment, both turbines pose some threat to potential collision risk to 'high risk' bat species. In order to reduce the potential for bat casualties at these locations, mitigation in the form of 'feathering' would be implemented. This process involves pitching turbine blades out of the wind to reduce rotation speeds while idling, in turn reducing the risk of bat injury / mortality. Feathering is considered 'best practice' and is recommended where there is uncertainty over collision risk posed to bats.
Otter, bats, reptiles and amphibians	Disturbance due to maintenance works	All operational and maintenance work requirements would be undertaken within working areas clearly defined in advance of works and the storage of materials would be restricted to areas of hardstanding, e.g., permanent tracks, crane pads or substation and control building, and associated infrastructure. There would be no works undertaken within 50m of the disused Monquhill Farmhouse to avoid disturbance to the bat roost. Strict speed limits would be followed on access tracks during all phases of development, and 'otter crossing' signs would be placed on the access tracks at all water crossings
	Disturbance due to artificial lighting	There would be no night working in order to avoid the use of artificial lighting which could disturb nocturnal species.
DECOMMISSIONING PHASE		
All ecological features	Similar changes and effects to construction phase	During the decommissioning of the Proposed Development, potential effects on ecological features are expected to be similar to those encountered during the construction phase and therefore similar environmental measures would be required. Any new legislation published prior to decommissioning would be adhered to and incorporated into an Environmental Management Plan prior to decommissioning taking place.

11.9 Assessment methodology

Introduction

11.9.1 The generic project-wide approach to the assessment methodology is set out in **Chapter 4 – Approach to Preparing the EIA Report**, and specifically in **Section 4.5**. However, whilst this has informed the approach that has been used in this ecological assessment, it is necessary to align, and adapt as appropriate, to the standard industry guidance

provided by CIEEM (2018) and the good practice during wind farm construction (Scottish Renewables et al, 2019).

11.9.2 The assessment has been based upon not only the results of the desk study and field surveys, but also relevant published information (for example on the status, distribution, sensitivity to environmental changes and ecology of the features scoped into the assessment, where this information is available), and professional knowledge of ecological processes and functions.

11.9.3 For each scoped-in ecological feature (see **Table 11.12**), potential effects were assessed against the current baseline conditions for that feature during construction, operation and decommissioning.

11.9.4 Throughout the assessment process, the initial results of the assessment regarding potentially significant effects have been used to inform whether additional baseline data collection is required, together with the identification of environmental measures that should be embedded into the Proposed Development to avoid or reduce adverse effects or to deliver enhancements (see **Section 11.8**). The results of the assessment, as set out in **Section 11.10** to **11.17**, therefore reflect the final scheme design (i.e., incorporating the environmental measures described in **Section 11.8** and **Table 11.13**).

11.9.5 The spatial extent of the assessment (see **Table 11.12**) reflects the area occupied by the ecological feature that is being assessed and, as a minimum, the ZoI of the changes that may affect it.

11.9.6 Where part of a designated site is located within the ecological ZoI relating to a particular biophysical change as a result of the Proposed Development, an assessment has been made of the effects on the designated site as a whole. A similar approach has been taken for areas of notable habitat.

11.9.7 For species that occur within the ZoI, the assessment has considered the total area that is used by the affected individuals or the local population of the species (e.g., for foraging or as breeding territories) rather than the footprint of the Development Site.

11.9.8 For any potential GWDTEs identified within the NVC Study Area, further hydrological assessment of these was undertaken to assess their level of groundwater dependency. For the potential GWDTEs that were subsequently assessed as likely to be groundwater dependent (referred to as 'assessed' GWDTEs where this was considered to be the case), the likely effects of development on these features were then determined (in terms of ecological interest) through qualitative assessment. Further detailed methodology for hydrological assessment of potential GWDTEs and confirmation of assessed GWDTEs is provided within **Chapter 13 – Geology, Hydrology and Hydrogeology**.

Significance Evaluation Methodology

Overview

11.9.9 CIEEM (2018) defines a significant effect as one "*that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general*".

11.9.10 When considering potentially significant effects on ecological features, whether these be adverse or beneficial, the following characteristics of environmental change are taken into account[55]:

- Extent – the spatial or geographical area over which the environmental change may occur;
- Magnitude – the size, amount, intensity or volume of the environmental change;
- Duration – the length of time over which the environmental change may occur;
- Frequency – the number of times the environmental change may occur;
- Timing – the periods of the day/year etc. during which an environmental change may occur; and
- Reversibility – whether the environmental change can be reversed through restoration actions.

Magnitude of Change

11.9.11 A scale for the magnitude of the environmental change as a result of the Proposed Development has been described in **Table 11.14** to provide an understanding of the relative change from the baseline position, be that an adverse or beneficial change.

Table 11.14 Guidelines for the Assessment of the Scale of Magnitude

Scale of change	Criteria and resultant effect
High	The change permanently (or over the long-term) affects a large area of habitat or large proportion of the wider species population. Conservation status is affected, reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area and relative to the wider habitat resource/species population. For designated sites, integrity is compromised. There may be a change in the level of importance of the receptor in the context of the project ZoI.
Medium	The change permanently (or over the long term) affects a small-medium area of habitat or small-medium proportion of the wider species population. Conservation status may be affected, reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area and relative to the wider habitat resource/species population. There may be a change in the level of importance of this receptor in the context of the project ZoI.
Low	The quality or extent of designated sites or habitats or the sizes of species' populations experience some small-scale reduction or increase. These changes are likely to be within the range of natural variability and they are not expected to result in any permanent change in the conservation status of the species/habitat or integrity of the designated site. The change is unlikely to modify the evaluation of the receptor in terms of its importance in the context of the project ZoI.
Very Low	Although there may be some effects on individuals or parts of a habitat area or designated site, the quality or extent of sites and habitats, or the size of species populations, means that they would experience little or no change. Any changes are also likely to be within the range of natural variability and there would be no short-

[55] The definitions of the characteristics of environmental change are based on the descriptions provided in CIEEM 2018. Other chapters in this EIA Report may use some of the same terms albeit with a different definition.

Scale of change	Criteria and resultant effect
	term or long-term change to conservation status of habitats/species receptors or the integrity of designated sites.
Neutral	A change, the level of which is so low, that it is not discernible on designated sites or habitats or the size of species' populations.

Determining Significance - Adverse and Beneficial Effects

11.9.12 Adverse effects are assessed as being significant if the favourable conservation status of an ecological feature would be lost as a result of the Proposed Development. Beneficial effects are assessed as those where a resulting change from baseline improves the quality of the environment (e.g., increases species diversity, increases the extent of a particular habitat etc., or halts or slows down an existing decline). For a beneficial effect to be considered significant, the conservation status would need to positively increase in line with a magnitude of change of 'high' as described in **Table 11.14**.

11.9.13 Conservation status is defined as follows (as per CIEEM, 2018):

- "*For habitats, conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and typical species within a given geographical area; and*
- *For species, conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area*".

11.9.14 The decision as to whether the conservation status of an ecological feature would alter has been made using professional judgement, drawing upon the information produced through the desk study, field survey and assessment of how each feature is likely to be affected by the Proposed Development.

11.9.15 A similar procedure is used where designated sites may be affected by the Proposed Development, except that the focus is on the effects on the integrity of each site; defined as:

- "*The coherence of its ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified*".

11.9.16 The assessment of effects on integrity draws upon the assessment of effects on the conservation status of the features for which the site has been designated. Where these features are not clearly defined, which is often the case for non-statutory biodiversity sites, it is necessary to use professional judgement to identify the interest features or obtain additional information about the interest features from SNH, Scottish Wildlife Trust or the local planning authority responsible for identifying these sites, so that sufficient information on which to base an assessment is available.

11.10 Assessment of Effects

Glen Afton Local Nature Conservation Site

Current Baseline

11.10.1 Glen Afton LNCS is located approximately 10m east of the Access Track to the Main Site and is linked to the Development Site by hydrological pathways. Glen Afton LNCS comprises semi-natural woodland, scrub and semi-improved grassland and includes the Afton Water.

Predicted Effects and their Significance

Reduction in habitat quality as a result of hydrological connectivity and pollution incidents.

11.10.2 Potential effects on the hydrology of surface waters are addressed in detail in **Chapter 13 – Geology, Hydrology and Hydrogeology**.

11.10.3 The Proposed Development includes an extensive suite of embedded environmental measures to protect surface watercourses. These are detailed in **Section 11.8** and **Chapter 13 – Geology, Hydrology and Hydrogeology**, **Section 13.8** and include a 50m buffer zone applied to the entire river network, with the exception of water crossings, micro-siting of turbines, tracks and other infrastructure and careful access track drainage as set out in the CEMP and adherence to numerous relevant protocols, good practice guidance regarding wind farm construction (Scottish Renewable *et al*., 2019) and the construction of river crossings, *BS6031: 2009 Code of Practice for Earth Works*, WAT-SG-29 on Temporary Construction Methods and any dewatering CAR registration or licence requirements. Any dewatering would necessitate the use of measures to remove silt before discharge to a watercourse, such as silt traps, fences, straw bales, settlement lagoons and swales. Any discharge to surface water would require consent from SEPA and would be subject to conditions attached to the consent.

11.10.4 Through the implementation of embedded measures, the Proposed Development is anticipated to cause temporary (short term) change to the local hydrology regime (low magnitude), with negligible effects to the interest features of the LNCS. There would be **no likely adverse significant effects** on site integrity.

Connel Burn/Benty Cowan LNCS

Current Baseline

11.10.5 The proposed Development Site is located within the Connel Burn/Benty Cowan LNCS. The LNCS is comprised of a variety of upland habitats along the upper Connel Burn including acidic and marshy grassland, blanket bog, species-rich ledges and numerous flushes.

Direct loss and temporary disturbance of LNCS (construction)

11.10.6 The Proposed Development would result in permanent loss of habitat within the LNCS due to land take (prior to any habitat reinstatement or restoration) associated with the construction of access tracks, wind turbine foundations and crane pads.

11.10.7 The anticipated permanent loss of habitat within the LNCS is 0.89ha out of a total area of the LNCS of 1,319ha, which equates to 0.07% of the LNCS. Habitats that would be directly lost as a result of the Proposed Development include:

- 0.02 ha of U5a;
- 0.19ha of M20;
- 0.009 ha of M6b-M20 mosaic; and
- 0.009ha of M20-minor M6b mosaic.

11.10.8 None of these vegetation communities were identified as being notable for their botanical composition. However, M20 blanket bog is an Annex 1 habitat and is considered further in **Section 11.12**. The Proposed Development footprint is located within the south-western boundary of the LNCS and effects as a result of the Proposed Development would be restricted to the edge of the LNCS.

11.10.9 The majority of the Development Site within the LNCS is coniferous plantation woodland which surrounds the habitats listed above and this is a heavily modified habitat. As a result, the communities within the Proposed Development footprint have been subject to modification mainly as a result of increased drainage from the surrounding conifer plantation and also deer grazing.

11.10.10 Although there would be direct loss of habitats from within the LNCS, these habitats are heavily modified as a result of activities such as forestry operations and deer grazing. No notable botanical assemblages were recorded within the development footprint or the Study Area.

11.10.11 The effects of habitat loss within the LNCS would be minimised through the implementation of good practice measures (**Table 11.13**), including restoration of temporarily disturbed habitat and re-use of excavated peat within the Development Site.

11.10.12 Direct loss and temporary disturbance of the LNCS during construction activities is anticipated to be of a low magnitude of change in the short to medium term. There would be **no likely adverse significant effects** on its conservation status.

Indirect disturbance and changes to composition of plant communities within the LNCS resulting from hydrological change (construction)

11.10.13 Potential effects on the hydrology of surface water are addressed in detail in **Chapter 13 – Geology, Hydrology and Hydrogeology**.

11.10.14 The assessment of potential effects on local hydrology does not anticipate long term change to surface or subsurface water movement. Effects would be further minimised through the implementation of good practice measures (**Table 11.13**), including proposals for restoration of temporarily disturbed habitats within the LNCS. The Proposed Development is anticipated to cause temporary (medium term) change to the local hydrological regime (low magnitude), with potential minor changes to vegetation within the LNCS within the Development Site. There would be **no likely adverse significant**

effects on the conservation status of the LNCS resulting from hydrological change during construction.

Indirect disturbance and changes to composition of plant communities resulting from hydrological change (operation)

11.10.15 It is anticipated that the operational phase of the Proposed Development would not result in further habitat loss or degradation beyond that identified above in respect of construction, although it is possible that there may be some localised changes to the composition of communities within the Connel Burn/Benty Cowan LNCS during operation due to changes in hydrology resulting from longer-term changes in surface water flows.

11.10.16 Good practice would be adopted during maintenance works to minimise the potential for pollution or sedimentation of local watercourses. (**Table 11.13**).

11.10.17 The magnitude of change is expected to be low at worst and there would be **no likely adverse significant effects** on the conservation status of the LNCS resulting from hydrological change during operation.

Direct loss and temporary disturbance of Connel Burn/Benty Cowan LNCS due to land take associated with the decommissioning of site infrastructure; Indirect disturbance and changes to composition of plant communities resulting from hydrological change

11.10.18 During the decommissioning of the Proposed Development, potential effects on Connel Burn/Benty Cowan LNCS would be expected to be similar in nature (although reduced in extent and intensity as tracks and sub-surface infrastructure are expected to remain *in situ*) to those predicted during the construction phase, and similar environmental measures would be employed (**Table 11.13**). Any new legislation published prior to decommissioning would be adhered to and incorporated into the CEMP prior to decommissioning taking place.

11.10.19 The magnitude of change is expected to be very low at worst, with **no likely adverse significant effects** on the conservation status of the LNCS resulting during decommissioning.

Habitats and Plant Communities

11.10.20 The Proposed Development would result in both temporary and permanent habitat loss due to land take associated with the construction of access tracks, wind turbine foundations, crane pads, construction compound, and other associated infrastructure.

11.10.21 It is also possible that indirect effects on surrounding plant communities may occur, particularly from any changes in the hydrological regime.

Habitat Loss and/or Disturbance

11.10.22 The anticipated permanent habitat loss as a result of the Proposed Development is expected to be approximately 5.9ha, approximately 2.5ha of which is the existing Access Track between Afton Road and the Main Site. A breakdown of temporary[56] and permanent land take by infrastructure element is summarised in **Table 11.15**.

[56] Temporary land take around proposed infrastructure is required to facilitate construction and the indicative areas affected are itemised by element in Table 11.15. The areas affected will be used for construction plant for example and it is expected that these temporary land-take areas will be reinstated with vegetation from areas of permanent land take, including peat turves where appropriate, such that there is no net loss.

Table 11.15 Footprint Area by Component

Component	Indicative Temporary Land Take Areas (ha)	Indicative Permanent Land Take Areas (ha)
Turbine Foundations	0.36	0.18
Turbine Crane Pads (inc. auxiliary pads)	1.05	0.35
Blade Laydown Areas	0.25	N/A
Temporary Construction Compound	0.5	N/A (0.25ha will accommodate the battery storage compound, so captured in that row)
Control Building and Substation Compound	0.14	0.14
Battery Storage Compound	N/A	0.25
Access Tracks (inc. turning heads and junctions)	8.5	4.73
Passing Places	(accounted for in the access track temporary land take area)	0.24
Cable Trenches	(accounted for in the access track temporary land take area)	N/A
Staging Area (beside track)	0.11	N/A
Total	**10.9**	**5.9**

11.10.23 The permanent habitat losses are broken down by plant communities in **Table 11.16**.

Table 11.16 Permanent habitat losses by plant community (ha)

Habitat	Tracks (including turning heads and junctions) and passing places	Turbine Crane Pads/ Auxiliary pads	Control Building and Compounds	Battery Storage	Blade laydown areas	Turbine Bases	Total Operational Land-take	Temporary Construction Compound	Staging Area
M6									
M6b-M6d-M23b-minor U5									
M6b-M20									
M15	0.004								
M20	0.12	0.04			0.02	0.0007			
M20-M6b	0.02								
M23			0.01	0.04					
M23a	0.000215		0.0005						
M23b	0.02			0.02				0.07	
M23a-M20	0.004								
M23a-M25-minor PG	0.03								
M23a - U5									

Habitat	Tracks (including turning heads and junctions) and passing places	Turbine Crane Pads/ Auxiliary pads	Control Building and Compounds	Battery Storage	Blade laydown areas	Turbine Bases	Total Operational Land-take	Temporary Construction Compound	Staging Area
M23a-U2-U5-M6d	0.04								
M25a-U6- minor M23a									
M23b-PG	0.04								
U5-M6b	0.01	0.04				0.07			
U5a	0.15								
PG-M23a- minor M23	0.12								
M23a-M25-minor PG									
PG-M25-M23b	0.02								
U6									
Coniferous plantation woodland	1.02	0.27	0.12	0.17	0.23	0.08		0.17	
Acid grassland – semi-improved	0.40								0.05

Habitat	Tracks (including turning heads and junctions) and passing places	Turbine Crane Pads/ Auxiliary pads	Control Building and Compounds	Battery Storage	Blade laydown areas	Turbine Bases	Total Operational Land-take	Temporary Construction Compound	Staging Area
Neutral grassland – semi-improved	0.0003								
Improved grassland	0.04								
Marshy grassland	0.24								0.06
Wet dwarf shrub heath	0.0007								
Wet heath/acid grassland	0.01								
Wet modified bog	0.02								
Flush and spring – acid/neutral flush	0.02								
Existing hardstanding	2.44		0.007	0.007				0.01	
Total	4.76	0.35	0.14	0.24	0.25	0.15	5.89	0.25	0.11

11.10.24 The indicative permanent land take area as a result of the Proposed Development, which includes ~2.5ha of existing Access Track, is ~5.9ha and the habitat loss set out in **Table 11.16** shows that the habitat most affected is coniferous plantation woodland (~2ha).

Blanket bog communities

Current Baseline

11.10.25 M20 dry modified blanket bog (*Eriophorum vaginatum* blanket mire) is an important community within the Study Area occupying the second largest extent of area, following coniferous woodland plantation. The modified dry blanket bog makes up a large proportion of Strandlud Hill and also occurs as large stands within the forestry rides (and also in mosaic with a large range of vegetation communities along the forestry rides). The vegetation assemblage of M20 dry modified blanket bog varies locally within the Study Area due to a number of factors including drainage and (deer) grazing, giving rise to two distinct variants: M20i and M20ii, which do not fit readily within the NVC.

11.10.26 M20i dry modified blanket bog (*Eriophorum vaginatum* blanket mire, variant) supports a greater diversity of plant species and a greater quantity of (browsed) dwarf shrubs and *Sphagnum* than the other variant of the M20 habitat occurring within the Study Area. The M20i dry modified blanket bog occurs primarily within the middle of the Study Area, particularly within and adjacent to Strandlud Hill. This M20 variant is dominated by common cottongrass, with abundant wavy-hair grass, purple-moor grass, bilberry, *Sphagnum capillifolium*, *Pleurozium schreberi* and *Hypnum jutlandicum*, locally frequent heather, crowberry, heath-rush, hare's tail cottongrass, deergrass, *Sphagnum palustre*, *Sphagnum fallax* and *Polytrichum commune*, occasional heath bedstraw, *Polytrichum* sp., and tormentil, and rare species include cross-leaved heath and common sedge.

11.10.27 M20ii dry modified blanket bog (*Eriophorum vaginatum* blanket mire, variant) occurs, with frequency, along the forestry rides upon peat which ranges from 0.75-1m in depth. This dry M20ii variant supports a greatly varying assemblage dominated by mosses; with locally abundant *Polytrichum commune*, *Hylocomium splendens*, *Pleurozium schreberi*, *Sphagnum capillaris*, *Sphagnum fallax* and common cottongrass and a range of locally occasional species, some of which include *Rhytidiadelphus squarrosus*, *Rhytidiadelphus loreus*, *Hypnum jutlandicum*, soft-rush, creeping-bent and bilberry.

11.10.28 Modified blanket bog communities cover approximately 43.3ha of the Study Area.

Predicted Effects and their Significance

Direct loss and temporary disturbance of blanket bog habitats due to land take associated with the construction of site infrastructure

11.10.29 The anticipated direct loss of blanket bog habitat, inclusive of mosaic habitats, during construction of the Proposed Development is expected to be 0.20ha. Although small areas were assessed as active within the Study Area (those located in the middle of Study Area in Strandlud Hill), the majority of the blanket bog within the Study Area was assessed as inactive and modified due to drainage and deer grazing.

11.10.30 The area of direct loss (0.20 ha) comprises 0.47% of the blanket bog resource within the Study Area, which is assessed as being of Local importance for this habitat. A PMP will set out good practice guidelines to ensure peat is protected as far as possible and reinstated wherever possible (**Table 11.13**).

11.10.31 Direct loss and temporary disturbance of modified blanket bog during construction activities is anticipated to be of a low magnitude of change in the short to medium term. **No likely adverse significant effects** on its conservation status are anticipated.

Indirect disturbance and changes to composition of plant communities resulting from hydrological change (construction)

11.10.32 Potential effects on the hydrology of surface waters are addressed in detail in **Chapter 13 – Geology, Hydrology and Hydrogeology.**

11.10.33 Hydrological changes including fluctuations in water levels, flows and quality and physical disturbance of the peat, leading to derogation and/or pollution of groundwater and surface water and disruption and breakdown of peat structure supporting blanket bog communities can occur for a variety of reasons:

- Soil compaction and the introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels;
- Dewatering during construction associated with the excavation of the turbine foundations leading to a decline in groundwater levels;
- Site activities during construction, operation and decommissioning resulting in the release of pollutants and the subsequent contamination of groundwater;
- Physical disturbance of the peat and groundwater throughflow could occur as a result of excavation works and peat stockpiling/removal;
- Disruption of flow paths and changes to drainage regime during construction and throughout operation can be associated with increases in runoff and less on-site water retention;
- Disruption of ground during construction leading to increased sediment loading; dewatering and/or drainage during construction disrupting groundwater support (baseflow) to watercourses; discharge to surface water of groundwater intercepted during construction associated with the excavation of the turbine foundations and increasing flows and sediment loading; and
- Site activities during construction, operation and decommissioning resulting in the release of pollutants and the subsequent contamination of surface waters.

11.10.34 On areas of peat depths greater than 1m, floating roads are proposed. In a floating road, the weight of the road is supported by the peat beneath, thereby avoiding the need to construct foundations extending through to the underlying solid stratum. Even with floating roads, some interruption of surface and near-surface flows can occur, which could in turn lead to loss of blanket bog specialised vegetation in nearby areas.

11.10.35 Changes in the local hydrological regime as a result of disturbance can be particularly accentuated if drainage ditches are placed in areas of deep peat. Although the area directly disturbed by the construction works is relatively localised, the nature of the peat is such that where the living bog vegetation is located, disturbance can result in a wider zone of potential hydrological perturbation. Longer-term, a change in surface water levels could result in a habitat dominated by plant species that prefer drier conditions, such as grasses and marginal or inundation species depending on the hydrological changes.

11.10.36 Effects would be minimised through the implementation of a PMP (**Table 11.13**).

11.10.37 In summary, the Proposed Development is anticipated to cause temporary (medium term) change to the local hydrology regime (low magnitude), with possible minor changes in the composition of blanket bog vegetation of Local importance. There would be **no likely**

adverse significant effects on the conservation status of blanket bog resulting from hydrological change during construction.

Direct loss and temporary disturbance of blanket bog habitats (operation)

11.10.38 It is not expected that there would be any further direct loss or temporary disturbance of blanket bog, on which basis there would be **no likely significant effects** on this receptor during the operational phase.

Direct loss and temporary disturbance of blanket bog habitats due to land take associated with the decommissioning of site infrastructure; indirect disturbance and changes to composition of plant communities resulting from hydrological change

11.10.39 During the decommissioning of the Proposed Development, potential effects on blanket bog communities would be expected to be similar in nature to those during the construction phase and similar environmental measures would be likely to be employed (**Table 11.13**). Any new legislation or guidelines published prior to decommissioning would be adhered to and incorporated into a management plan prior to decommissioning taking place.

11.10.40 Direct loss and temporary disturbance of blanket bog during decommissioning activities is anticipated to be of a very low magnitude of change in the short to medium term. There would be **no likely adverse significant effects** on its conservation status.

Semi-improved acid grassland

Current Baseline

11.10.41 Several semi-improved acid grassland communities are present within the Development Site.

11.10.42 U2 semi-improved acid grassland (*Deschampsia flexuosa* grassland) which was not definable to sub-community level occurs as a minor to major community in mosaic with: U5 acid grassland; M23a and M23b rush-pasture; and M6d acid flush in two locations along forestry rides in the north-east and the south.

11.10.43 U2a semi-improved acid grassland (*Deschampsia flexuosa* grassland, *Festuca ovina – Agrostis capillaris* sub-community) occurs in mosaic with: U5c acid grassland; and M23 rush-pasture in the Study Area as a moderate sized mosaic on a steep hillside in the west; and a small narrow mosaic in the south. The semi-improved U2a acid grassland is dominated by wavy-hair grass, with abundant sheep's-fescue, common bent and the bryophytes *Hylocomium spledens* and *Polytrichum* sp., frequent sweet vernal grass, Yorkshire-fog, heath bedstraw, heath wood-rush and common sorrel, and a number of occasional species which include mat-grass, and the bryophytes *Rhytidiadelphus squarrosus*, *Pleurozium schreberi*, *Pseudoscleropodium purum* and *Sphagnum capillifolium*.

11.10.44 U4 semi-improved acid grassland (*Festuca ovina – Agrostis capillaris – Galium saxatile* grassland) is the dominant acid grassland in the north of the Study Area occurring as small to moderate sized stands and in mosaic with: M23 rush-pasture; M6 and M6b acid flush; provisional grassland; U6 acid grassland on embankments and sloping ground in the north of the Study Area.

11.10.45 U4x semi-improved acid grassland variant (*Festuca ovina – Agrostis capillaris – Galium saxatile* grassland, species-poor variant) occurs within a mosaic with: U6 acid grassland; provisional grassland; and M6b acid flush in the south-west of the Study Area. This

species poor variant of U4 acid grassland is dominated by common bent, frequent sweet vernal-grass, tormentil and heath bedstraw.

11.10.46 U5 semi-improved acid grassland (*Nardus stricta – Galium saxatile* grassland) occurs as a moderate stand in the north-east and in mosaic with provisional grassland; U2 and U6 acid grassland; M23a and M23b rush-pasture; M25 mire; M6b and M6d acid flush; M15 wet heath; and M20 blanket bog throughout the Study Area on drier sloping ground and along sections of the forestry rides. The U5 grassland supports locally abundant wavy-haired grass, mat-grass, common sedge, velvet bent, *Rhytidiadelphus squarrosus* and locally frequent species include sweet vernal-grass, heath bedstraw and *Pleurozium schreberi*.

11.10.47 U5a semi-improved acid grassland (*Nardus stricta – Galium saxatile* grassland, species-poor sub-community) occurs as a large stand on Strandlud Hill occupying, along with wet modified blanket bog, much of the open (non-plantation) space here. This species poor grassland is very tightly grazed and mossy, supporting locally abundant wavy-haired grass, mat-grass, heath rush and the mosses *Hylocomium splendens, Polytrichum strictum*, *Pleurozium schreberi, Polytrichum commune,* locally frequent bilberry, heath bedstraw and *Sphagnum capillifolium*, locally occasional species include common cottongrass, tormentil, *Sphagnum fallax, Polytrichum juniperinum, Rhytidiadelphus squarrosus, and Rhytidiadelphus loreus,* with a small range of rarely occurring species.

11.10.48 U5b semi-improved acid grassland (*Nardus stricta – Galium saxatile* grassland, *Agrostis canina – Polytrichum commune* sub-community) occurs as a small stand within a wider area of M25 mire on sloping ground in the north of the Study Area. This species poor sub-community is a grassy sub-community; dominated by mat-grass but also supports abundant velvet bent and wavy-haired grass, frequent *Rhytidiadelphus squarrosus* and creeping bent grass, and rarely occurring purple-moor grass, field woodrush, heath rush, Yorkshire-fog, tormentil and heath bedstraw.

11.10.49 U5c semi-improved acid grassland (*Nardus stricta – Galium saxatile* grassland, *Carex panicea – Viola riviniana* sub-community) occurs in the west of the Study Area, on a steep west-facing hill, in an intricate mosaic with U2a acid grassland and M23a rush-pasture. The U5c acid grassland is the most species rich grassland within the Study Area; and includes an element of basic flushing; with abundant Hylocomium splendens, mat-grass, sheep's-fescue, velvet bent, Yorkshire-fog, tufted-hair grass, wavy-haired grass, sweet-vernal grass and violet sp., locally abundant selfheal, common sedge, carnation sedge and *Sphagnum squarrosum*, frequent creeping bent, heath bedstraw, *Rhytidadelphus squarrosus, Pleurozium schreberi,* occasional species include bilberry, flea sedge, heath milkwort, common sorrel, and ribwort plantain, *Pseudoscleropodium purum*, and rare species include wild thyme.

11.10.50 U6 semi-improved acid grassland (*Juncus squarrosus – Festuca ovina* grassland) occurs as a small stand in the north-east and in the mosaic with provisional grassland; U4 and U5 acid grassland; M23a and M23b rush-pasture; M25a mire; M6, M6b and M6d acid flush; M20 blanket bog; and scattered coniferous trees in the north and south. This grassland occurs predominantly as patchy vegetation on exposed, damaged peat and also in the east on shallow soil along forestry tracks that are becoming overgrown. This grassland supports a locally abundant cover of mosses and a range of graminoid species, many of which occur at low frequencies; it is dominated by heath rush, with abundant wavy-haired grass, mat-grass, *Polytrichum commune*, *Rhytidiadelphus squarrosus*, *Pleurozium schreberi,* locally abundant purple-moor grass, common sedge, bent grass, *Polytrichum strichum*, *Hylocomium spledens,* and frequent to occasional species include common cottongrass, hare's-tail cottongrass, bilberry, heath bedstraw, tormentil, *Polytrichum juniperinum* and Sitka spruce seedlings.

11.10.51 Semi-improved acid grassland communities cover approximately 18.23ha of the Study Area.

Predicted Effects and their Significance

Direct loss and temporary disturbance of semi-improved grassland due to land take associated with the construction of site infrastructure (construction)

11.10.52 The anticipated direct loss of semi-improved acid grassland, inclusive of mosaic habitats, during construction of the Proposed Development is expected to be 0.77ha.

11.10.53 The area of direct loss (0.77ha) comprises 4.22% of the semi-improved acid grassland resource within the Study Area, which is assessed as Local importance for this habitat.

11.10.54 Direct loss and temporary disturbance of acid grassland during construction activities is anticipated to be of a very low magnitude of change in the short to medium term. There are **no likely adverse significant effects** on the conservation status of this habitat.

Indirect disturbance and changes to composition of plant communities resulting from hydrological change (construction)

11.10.55 Potential effects on the hydrology of surface waters are addressed in detail in **Chapter 13 – Geology, Hydrology and Hydrogeology**.

11.10.56 The assessment of local hydrology does not anticipate long term change to surface or subsurface water movement. Effects would be further minimised through the implementation of good practice measures (**Table 11.13**), including proposals for full habitat re-instatement or restoration of temporarily disturbed habitat. The Proposed Development is anticipated to cause temporary (medium term) change to the local hydrology regime (low magnitude), with potential minor changes to semi-improved acid grassland vegetation within the Development Site which is assessed as being of Local importance for this habitat. There are **no likely adverse significant effects** on the conservation status of semi-improved acid grassland resulting from hydrological change during construction.

Direct loss and temporary disturbance of marshy grassland due to land take associated with the construction of site infrastructure (operation)

11.10.57 It is not expected that there would be any further direct loss or temporary disturbance of semi-improved acid grassland during the operational phase, on which basis there would be **no likely adverse significant effects** on this receptor.

Direct loss and temporary disturbance of semi-improved acid grassland due to land take associated with the decommissioning of site infrastructure and Indirect disturbance and changes to composition of plant communities resulting from hydrological change

11.10.58 During the decommissioning of the Proposed Development, potential effects on semi-improved acid grassland communities would be expected to be similar in nature (although reduced in extent and intensity as tracks and sub-surface infrastructure are expected to remain *in situ*) to those during the construction phase, and similar environmental measures would be likely to be employed (**Table 11.13**). Any new legislation published prior to decommissioning would be adhered to and incorporated into a management plan prior to decommissioning taking place.

11.10.59 Direct loss and temporary disturbance of semi-improved acid grassland during decommissioning activities is anticipated to be of a very low magnitude of change in the

short to medium term. There are **no likely adverse significant effects** on its conservation status.

Marshy grassland communities

Current Baseline

11.10.60 M23 rush-pasture (*Juncus effusus/ acutiflorus – Galium palustre* rush-pasture) which could not be precisely allocated to a sub-community is widespread in the Study Area, occurring as small stands in a forestry ride in the north-east and a steep hillside to the west. It occurs predominately in mosaic with a wide range of vegetation communities/ habitats which include: MG9 neutral grassland; provisional grassland; U4 acid grassland; M23b rush-pasture; M6, M6b and M6d acid flush; M15 wet heath; M20 modified blanket bog and E4 bare peat.

11.10.61 M23a rush-pasture (*Juncus effusus/ acutiflorus – Galium palustre* mire, *Juncus acutiflorus* sub-community) is widespread throughout the Study Area, occurring as small to moderate stands in the north-east, north-west and east in association with moving water and forestry rides. It is widespread within mosaics with other vegetation communities which include: MG9 neutral grassland; provisional grassland; U2, U2a, U5, U5a and U6 acid grassland; M23 and M23b rush-pasture; M6, M6a, M6b and M6d acid flush; M15 wet heath; M20 modified blanket bog; and M25 and M25a mire. The M23a rush-pasture is dominated by graminoids supporting abundant sharp-flowered rush, creeping bent, mat-grass and wavy-haired grass, frequent Yorkshire-fog and creeping soft-grass and occasional purple moor-grass, sweet vernal-grass, soft-rush, compact rush and carnation sedge. The mire supports frequent bryophytes, including *Hylocomium splendens* and *Rhytidiadelphus squarrosus,* and frequent herbs include creeping buttercup, common sorrel, marsh thistle, marsh violet, heath bedstraw and cleavers.

11.10.62 M23b rush-pasture (*Juncus effusus/ acutiflorus – Galium palustre* rush-pasture, *Juncus effusus* sub-community) is widespread in the Study Area occurring as small to moderate stands in the north-east associated with the movement of water. It is widespread in mosaics with a range of vegetation communities including: U2, U5 and U6 acid grassland; MG9 neutral grassland; provisional grassland; M25 mire; M23a rush-pasture; and M6, M6a, M6b and M6d acid flush. The M23b rush-pasture is dominated by soft-rush, with abundant common sorrel, occasional Yorkshire-fog, creeping bent, tufted hair-grass, *Rhytidiadelphus squarrosu*s, common bent, sharp-flowered rush and *Polytrichum commune*, whilst rare species include creeping buttercup, marsh willowherb and marsh bedstraw.

11.10.63 Marshy grassland communities cover approximately 24.18ha of the Study Area.

Predicted Effects and their Significance

Direct loss and temporary disturbance of marshy grassland due to land take associated with the construction of site infrastructure (construction)

11.10.64 The anticipated direct loss of marshy grassland during construction of the Proposed Development, inclusive of mosaic habitat, is expected to be 0.65 ha. This comprises 2.7% of the marshy grassland resource within the Development Site, which is assessed as being of Local importance for this habitat.

11.10.65 Direct loss and temporary disturbance of marshy grassland during construction activities is anticipated to be of a very low magnitude of change in the short to medium term. There are **no likely adverse significant effects** on its conservation.

Indirect disturbance and changes to composition of plant communities resulting from hydrological change (construction)

11.10.66 Potential effects on the hydrology of surface waters are addressed in detail in **Chapter 13 – Geology, Hydrology and Hydrogeology**.

11.10.67 The assessment of local hydrology does not anticipate long term change to surface or subsurface water movement. Effects would be further minimised through the implementation of good practice measures (**Table 11.13**), including proposals for full habitat re-instatement or restoration of temporarily disturbed habitat. The Proposed Development is anticipated to cause temporary (medium term) change to the local hydrology regime (low magnitude), with potential minor changes to marshy grassland vegetation within the Development Site, which is assessed as being of Local importance. There would be **no likely adverse significant effects** on the conservation status of marshy grassland resulting from hydrological change during construction.

Direct loss and temporary disturbance of marshy grassland due to land take associated with the construction of site infrastructure (operation)

11.10.68 It is not expected that there would be any direct loss or temporary disturbance of marshy grassland and therefore there would be **no likely adverse significant effects** on this receptor during the operational phase.

Direct loss and temporary disturbance of marshy grassland due to land take associated with the decommissioning of site infrastructure; Indirect disturbance and changes to composition of plant communities resulting from hydrological change

11.10.69 During the decommissioning of the Proposed Development, potential effects on marshy grassland communities would be expected to be similar in nature (although not necessarily reduced in extent and intensity as tracks and sub-surface infrastructure below 1m are expected to remain in situ) to those during the construction phase and similar environmental measures would be likely to be employed. Any new legislation published prior to decommissioning would be adhered to and incorporated into a management plan prior to decommissioning taking place.

11.10.70 Direct loss and temporary disturbance of marshy grassland during decommissioning activities is anticipated to be of a very low magnitude of change in the short to medium term. There would be **no likely adverse significant effects** on its conservation status.

Mire communities

Current Baseline

11.10.71 M25 mire (M*olinia caerulea – Potentilla erecta* mire) occurs locally as small to moderate stands in sloping ground in the east of the Study Area and within mosaics with a range of vegetation communities including: U5 acid grassland; M23, M23a and M23b rush-pasture; provisional grassland; M6 acid flush; M15 wet heath; and M20 modified blanket bog along forestry rides and at the edge of the coniferous plantation. The species-poor M25 mire supports abundant purple moor-grass, *Hylocomium splendens*, tufted hair-grass, *Sphagnum capillifolium,* common cottongrass, occasional heath bedstraw, tormentil, *Pleurozium schreberi, Polytrichum stricta, Rhytidiadelphus squarrosus,* and rare bilberry and sheep sorrel.

11.10.72 Small stands of M25b mire (M*olinia caerulea – Potentilla erecta* mire, *Anthoxanthum odoratum* sub-community), too small to map, occur upon a small number of hillocks to the north-east of the Study Area within a wider area of mire. This M25b mire supports

abundant purple moor-grass, abundant, green-ribbed sedge, red fescue, creeping bent and Yorkshire-fog, with a range of plant species occurring occasionally including creeping bent, devil's-bit scabious, soft-rush, marsh thistle, tormentil and marsh ragwort.

11.10.73 Mire communities cover approximately 2.05ha of the Study Area.

Predicted Effects and their Significance

Indirect disturbance and changes to composition of plant communities resulting from hydrological change (construction)

11.10.74 Potential effects on the hydrology of surface waters are addressed in detail in **Chapter 13 – Geology, Hydrology and Hydrogeology.**

11.10.75 The assessment of local hydrology does not anticipate long term change to surface or subsurface water movement. Effects would be further minimised through the implementation of good practice measures (**Table 11.13**), including proposals for full habitat re-instatement or restoration of temporarily disturbed habitat and the re-use of excavated peat within the Development Site. The Proposed Development is anticipated to cause temporary (medium term) change to the local hydrology regime (low magnitude), with potential minor changes to mire vegetation within the Development Site which is assessed as being of Local importance for this habitat. There are **no likely adverse significant effects** on the conservation status of mire resulting from hydrological change during construction.

Direct loss and temporary disturbance of mire due to land take associated with the construction of site infrastructure (operation)

11.10.76 It is not expected that there would be any direct loss or temporary disturbance of mire and therefore there would be **no likely adverse significant effects** on this receptor during the operational phase.

Direct loss and temporary disturbance of mire due to land take associated with the decommissioning of site infrastructure

11.10.77 During the decommissioning of the Proposed Development, potential effects on mire communities would be expected to be similar in nature (although not necessarily reduced in extent and intensity as tracks and sub-surface infrastructure below 1m are expected to remain in situ) to those during the construction phase and similar environmental measures would be likely to be employed. Any new legislation published prior to decommissioning would be adhered to and incorporated into a management plan prior to decommissioning taking place.

11.10.78 Direct loss and temporary disturbance of mire during decommissioning activities is anticipated to be of a very low magnitude of change in the short to medium term. There would be **no likely adverse significant effects** on its conservation status.

Acid Flush

Current Baseline

11.10.79 M6 acid flush (*Carex echinata – Sphagnum recurvum/ auriculatum* mire) is widespread within the Study Area occurring as narrow linear stands within drainage ditches, including within the coniferous woodland plantation and in small to large mosaic with: U2, U4, U5

and U6 acid grassland; M23, M23a and M23b rush-pasture; M25 mire; M6b acid flush; M15x wet heath; and M20 blanket bog. The M6 acid flush vegetation includes abundant *Sphagnum* sp., with locally abundant bottle sedge, and locally occasional devil's-bit scabious.

11.10.80 M6a acid flush (*Carex echinata – Sphagnum recurvum/ auriculatum* mire, *Carex echinata* sub-community), an acid flush supporting locally abundant star sedge, occurs locally as narrow linear stands; and as part of two small mosaics with M23b rush-pasture; as M6d acid flush.

11.10.81 M6b acid flush (*Carex echinata – Sphagnum recurvum/ auriculatum* mire, *Carex nigra-Nardus stricta* sub-community) is the best fit for a widespread vegetation sub-community occurring upon the damaged, drained peat along the forestry rides. The M6b acid flush occurs in mosaic predominately with: M20 blanket bog; and to a lesser extent with U4, U5 and U6 acid grassland; M23, M23a and M23a rush-pasture; and M6 and M6d acid flush. The M20 blanket bog, along the forestry rides, grades in and out of the M6b sub-community, which is species-poor, supporting locally dominant - abundant common sedge, locally abundant hare's-tail cottongrass, and locally abundant – occasional common cottongrass, locally frequent *Sphagnum palustre*, *Sphagnum capillaris, Sphagnum fallax,* star sedge, sheep's-fescue, bent grass and *Polytrichum commune*, locally occasional soft-rush. In drier stands of M6b, sphagnum cover is much reduced or replaced by abundant *Hylocomium splendens* and *Pleurozium schreberi*, occasional *Pseudoscleropodium purum* and *Hypnum cupressiforme,* whilst other species in these drier stands include abundant common sedge, common mat-grass and occasional Sitka spruce seedling, soft-rush, tormentil and the lichen *Cladonia* sp.

11.10.82 M6d acid flush (*Carex echinata – Sphagnum recurvum/ auriculatum* mire, *Juncus acutiflorus* sub-community) occurs in small stands throughout the Study Area, with the largest stand flushing into the Carcow Burn in the north-east. The M6d acid flush occurring on sloping ground is dominated by sharp-flowered rush, with locally abundant bryophytes including *Sphagnum palustre, Sphagnum capillifolium*, *Polytrichum commune, Hylocomium splendens* and *Rhytidiadelphus squarrosus*, and grasses including creeping bent, creeping soft-grass, wavy-hair grass and tufted hair-grass, and occasional herbs which include common sorrel, heath bedstraw, marsh marigold and tormentil.

11.10.83 Acid flush communities cover approximately 6.53ha of the Study Area.

Direct loss and temporary disturbance of acid flush due to land take associated with the construction of site infrastructure (construction)

11.10.84 The anticipated direct loss of acid flush, inclusive of mosaic habitats, during construction of the Proposed Development is expected to be 0.16ha.

11.10.85 The area of direct loss (0.16ha) comprises 2.45% of the acid flush resource within the Study Area, which is assessed as being of Local importance for this habitat. This loss would result from potential upgrades to the existing access track.

Direct loss and temporary disturbance of acid flush during construction activities is anticipated to be of a very low magnitude of change in the short to medium term. There would be **no likely adverse significant effects** on its conservation status.

Indirect disturbance and changes to composition of plant communities resulting from hydrological change (construction)

11.10.86 Potential effects on the hydrology of surface waters are addressed in detail in **Chapter 13 – Geology, Hydrology and Hydrogeology**.

11.10.87 The assessment of local hydrology does not anticipate long term change to surface or subsurface water movement. Effects would be further minimised through the implementation of good practice measures (**Table 11.13**), including proposals for full habitat re-instatement or restoration of temporarily disturbed habitat. The Proposed Development is anticipated to cause temporary (medium term) change to the local hydrology regime (low magnitude), with potential minor changes to acid flush vegetation within the Development Site which is assessed as being of Local importance for this habitat. There would be **no likely adverse significant effects** on the conservation status of acid flush resulting from hydrological change during construction.

Direct loss and temporary disturbance of acid flush due to land take associated with the construction of site infrastructure (operation)

11.10.88 It is not expected that there would be any direct loss or temporary disturbance of acid flush and therefore there would be **no likely adverse significant effects** on this receptor during the operational phase.

Direct loss and temporary disturbance of acid flush due to land take associated with the decommissioning of site infrastructure

11.10.89 During the decommissioning of the Proposed Development, potential effects on acid flush communities would be expected to be similar in nature (although not necessarily reduced in extent and intensity as tracks and sub-surface infrastructure below 1m are expected to remain in situ) to those during the construction phase and similar environmental measures would be likely to be employed. Any new legislation published prior to decommissioning would be adhered to and incorporated into a management plan prior to decommissioning taking place.

11.10.90 Direct loss and temporary disturbance of acid flush during decommissioning activities is anticipated to be of a very low magnitude of change in the short to medium term. There would be **no likely adverse significant effects** on its conservation status.

Watercourses

Current Baseline

11.10.91 The Development Site is drained by numerous watercourses that flow into the River Nith approximately 6km to the north, albeit via extensively modified drainage, or north-east into the Afton Water. The tributaries comprise the following (from west to east of the Development Site): the Small Burn flowing into the Connel Burn (River Nith), and three tributaries to the Carcow Burn, namely Glenhastel, Auchincally, and Glenshalloch Burns. The Carcow Burn flows to the north-east into the Afton Water, which flows from the Afton Reservoir approximately 5km to the south-east of the Development Site north to meet the River Nith north of New Cumnock. The Lochingerroch Burn flows directly into the Afton Water and drains the area east of the proposed access trackway at Pencloe.

Predicted Effects and their Significance

Habitat loss/damage, hydrological change, temporary disturbance and pollution during construction

11.10.92 Potential effects of the Proposed Development are related to the disturbance of the watercourse habitats during the construction and decommissioning of crossings, the release of sediment/silt into the channel during construction and decommissioning, and

the risk of accidental pollution spills during the construction, decommissioning and operational phases.

11.10.93 The effects on watercourses would be minimised through the implementation of embedded environmental measures (**Table 11.13**), which would result in construction/decommissioning effects on watercourses being limited to localised loss/disturbance of river habitats during installation of culverts and limited release of sediment at watercourse crossings, which would be localised, temporary and of short duration.

11.10.94 Due to the number of watercourses and preferential flow pathways on the Development Site, and limitations regarding access locations, it is not possible for the Proposed Development to take place without some crossings, though the number of these has been minimised as far as was practicable. The types of water crossing available typically comprise bridges, culverts and causeways. Bridges tend to have lesser hydrological and ecological effects, but where there are small or indistinct channels with little topographic variability, culverts are more appropriate from an engineering perspective. It is likely that the water crossings will be simple type culverts as a result of the topography of the Development Site.

11.10.95 Adherence to the Engineering in the Water Environment Good Practice Guide - River Crossings: Second Edition (SEPA, 2010b), River Crossings and Migratory Fish: Design Guidance (Scottish Executive 2000) and CIRIA Culvert Design and Operation Guide (C689) helps to minimise potential hydrological (including morphological) effects. All watercourse crossings would be designed to convey a 1 in 200-year return period flood event with an allowance for climate change, and each watercourse/flow pathway crossing has been considered individually with respect to topography and hydrology. The proposed locations and types of watercourse and flow path crossings are shown in **Chapter 13 – Geology, Hydrology and Hydrogeology**: **Figure 13.6.**

11.10.96 Six simple culvert type constructions are proposed using a cross sectional area that would not impede flow of water, wherever the trackway crosses a watercourse within the Development Site. The design of culverts would be to at least CIRIA Culvert Design and Operation Guide (RP901) standard and the culvert structure would not affect either the channel or banks. The existing alignment of the watercourses would remain unchanged.

11.10.97 During construction, the Proposed Development would result in a low magnitude of change over a short duration which would not alter the conservation status of watercourses, which are considered to be of Local importance. There would be **no likely adverse significant effects**.

Habitat loss/damage, temporary disturbance and pollution during operation

11.10.98 The potential risks to watercourse habitats during the operation of the Proposed Development are likely to be limited and localised, relating to planned turbine servicing works. The operator would ensure a site-specific risk assessment is completed and that control measures are implemented to ensure major environmental risks are minimised. Storage, use and disposal of oils would be in accordance with relevant legislation, good practice and SEPA guidance (refer to **Chapter 13 – Geology, Hydrology and Hydrogeology**).

11.10.99 During operation, the Proposed Development would result in a very low magnitude of change and not alter the conservation status of watercourses. There would be **no likely adverse significant effects**.

Habitat loss/damage, temporary disturbance and pollution during decommissioning

11.10.100 During the decommissioning of the Proposed Development, potential impacts on watercourses would be expected to be similar to those during the construction phase, albeit change magnitude is likely to be reduced as tracks and sub-surface infrastructure below 1m are expected to remain in situ. Similar environmental measures as those embedded in the design/construction phase would be employed to mitigate the effects of decommissioning on watercourses. Any new legislation or guidelines published prior to decommissioning would also be adhered to and reflected/incorporated in the environmental measures to be implemented during decommissioning.

11.10.101 The access track is expected to be left in situ meaning no instream works would be required during decommissioning.

11.10.102 During decommissioning, the Proposed Development would result in a very low magnitude of change that would not alter the conservation status of watercourses. There would be **no likely adverse significant effects**.

Fish

Baseline Conditions

11.10.103 No salmon were recorded within the Development Site; however, they were found to be present at two sites along the Carcow Burn and the Afton Water. Sea/brown trout were found at four of the six survey sites within the Development Area and also at the two sites outside of the Development Area (Carcow Burn and Afton Water). A single eel was also recorded along the Carcow Burn, outside of the Development Site. No lamprey was recorded as part of the electrofishing surveys.

11.10.104 The baseline status of fish populations within the Development Site in 2020 is set out in detail in the appended survey report (**Appendix 11F**).

Predicted Effects and their Significance

Obstruction of upstream or downstream fish migration (construction)

11.10.105 Construction of watercourse crossings can lead to obstruction of upstream or downstream migration of anadromous species (including salmon, sea trout, sea lamprey and river lamprey), catadromous species (including eels), and species that do not migrate to sea but which migrate within river catchments (such as brown trout and brook lamprey), with associated adverse effects on fish spawning and recruitment.

11.10.106 The construction of crossings would take place over short/discrete sections of watercourse and the work would be of short duration. The effects on fish would be minimised through the implementation of best practice measures (**Table 11.13**).

11.10.107 There are six proposed water crossings, and they are likely to comprise a simple culvert type design due to the Development Site topography. Adherence to the Engineering in the Water Environment Good Practice Guide - River Crossings: Second Edition (SEPA, 2010b), River Crossings and Migratory Fish: Design Guidance (Scottish Executive 2000) and CIRIA Culvert Design and Operation Guide (C689) will help to minimise potential hydrological (including morphological) effects upon fish.

11.10.108 The construction of watercourse crossings is therefore likely to have localised, short duration, very low magnitude effects on fish, avoiding the main period when salmonids migrate and spawn. The Proposed Development is therefore not predicted to create

obstacles to migration/spawning and there would be **no likely adverse significant effects** on the conservation status of the species of fish of interest.

Harm to fish at watercourse crossings (construction)

11.10.109 Work within and near the channel has the potential to harm fish, for example where a discrete section of watercourse is temporarily dammed and depleted to allow culvert installation or due to noise/vibration impulses which can harm fish. The effects on fish would be minimised through the implementation of good practice measures (**Table 11.13**).

11.10.110 These measures would mean noise/physical disturbance of fish is of short duration and very low magnitude, likely affecting only small numbers of fish, over a small area and avoiding sensitive periods. There would be **no likely adverse significant effects** on the conservation status of the species of fish of interest.

Damage/disturbance to fish habitats at watercourse crossings (construction)

11.10.111 The construction of six watercourse crossings would result in limited loss/disturbance of in-channel and bankside habitats, which can result in loss of streambed refugia, cover (all recorded species) and spawning habitat. The effects on fish would be minimised through the implementation of good practice measures (**Table 11.13**).

11.10.112 These measures would mean that the connectivity of watercourse habitats is maintained and effects on fish habitats are localised, of short duration, very low magnitude and avoid spawning redds/habitats. There would be **no likely adverse significant effects** on the conservation status of fish.

Silt/sediment and pollutant release to watercourses (construction)

11.10.113 The release of silt/sediment and or accidental pollution (e.g., oil spill from plant/equipment) can harm fish directly or damage fish habitats, for example by smothering spawning redds with silt or discharging toxic pollutants. The effects on fish would be minimised through the implementation of good practice measures, including the CEMP (**Table 11.13**).

11.10.114 These measures would result in construction effects of sediment/pollutant release on watercourses being limited to localised loss/disturbance of river habitats and limited release of sediment at watercourse crossings, which would be localised, temporary and of short duration. This would result in a low magnitude of change and there would be **no likely adverse significant effects** on the conservation status of fish.

Silt/sediment and pollutant release to watercourses (operation)

11.10.115 The potential risks of discharges to watercourse habitats during the operation of the Proposed Development are likely to be limited and localised, relating to planned turbine servicing works. The operator would ensure a site-specific risk assessment is completed and that control measures are implemented to ensure all environmental risks are minimised. Storage, use and disposal of oils would be in accordance with relevant legislation, good practice and SEPA guidance (refer to **Chapter 13 – Geology, Hydrology and Hydrogeology)**. The operational effects of the Proposed Development on fish are therefore likely to be of very low magnitude and there would be **no likely adverse significant effects** on the conservation status of fish.

Electromagnetic emissions (operation)

11.10.116 The effects of electromagnetic emissions from turbines and cabling on freshwater fish are not well documented, therefore the risk of effects on these species has been minimised through the iterative wind farm design process. The turbines would be over 100m from the watercourse network and cabling would extend along access tracks and hence be over 50m from the watercourse network and buried. In a limited number of instances where cables cross watercourses these would be installed by directional drilling and would also remain buried. These design measures should minimise exposure of fish to electromagnetic emissions during the operational phase. This would result in a very low magnitude of change and there would be **no likely adverse significant effects** on the conservation status of fish.

Effects during decommissioning

11.10.117 During the decommissioning of the Proposed Development, potential effects on fish (all recorded species) would be expected to be similar (although not necessarily reduced in extent and intensity as tracks and sub-surface infrastructure below 1m are expected to remain in situ)) meaning no instream works would be required during decommissioning. Similar environmental measures as those embedded in the design/construction phase would be employed to mitigate the effects of decommissioning on fish. Any new legislation or guidelines published prior to decommissioning would also be adhered to and reflected/incorporated in the environmental measures to be implemented during decommissioning.

11.10.118 During decommissioning, the Proposed Development would result in a very low magnitude of change and not alter the conservation status of the fish species of interest. There would be **no likely adverse significant effects**.

Fresh Water Pearl Mussel

Silt/sediment and pollutant release to watercourses

11.10.119 The release of silt/sediment and or accidental pollution (e.g., oil spill from plant/equipment) can harm freshwater pearl mussel as they are filter feeders and require clean, fast flowing water. Any potential effects on freshwater pearl mussel would be minimised through the implementation of good practice measures, including the CEMP (**Table 11.13**).

11.10.120 These measures would result in construction/operation/ decommissioning effects of sediment/pollutant release on watercourses being limited to localised loss/disturbance of river habitats and limited release of sediment at watercourse crossings, which would be localised, temporary and of short duration. This would result in a very low magnitude of change and there would be **no likely adverse significant effects** on the conservation status of freshwater pearl mussel.

Otters

Baseline Conditions

11.10.121 During the 2016 surveys otter activity was recorded on Carcow Burn and on Small Burn, and all signs recorded were on the periphery of the Study Area. A total of four spraints of various ages were recorded and a single potential holt site in the form of a shelf or depression in bank-side substrate adjacent to the water was recorded. Less conspicuous

laying-up opportunities exist in dense grass and in the root boles of wind thrown trees on the edges of forestry rides and watercourse valleys; these being too numerous to map.

11.10.122 The otter activity recorded on the Development Site in 2020 was very similar to that recorded during the 2016 surveys, with signs of activity recorded on either the Carcow Burn or the Small Burn on the periphery of the Study Area. A total of seven spraints of various ages were recorded and two potential otter couches were recorded, one on the Carcow Burn and the other on a tributary to the Bitch Burn.

11.10.123 No evidence to indicate overland routes or connectivity between the two river catchments was found, although it cannot be ruled out that otter would pass between them.

11.10.124 The baseline status of otter populations within the Development Site is detailed in the appended survey report (**Appendix 11C**).

Predicted Effects and their Significance

Disturbance and displacement of otter population including damage to resting sites (Construction)

11.10.125 No confirmed otter resting places were identified during the surveys, but potential resting places were identified along the Carcow Burn and the Bitch Burn. As no confirmed otter resting sites were found within the area of the Proposed Development, no effects in relation to known resting sites are anticipated. However, as there is a risk that otter could establish resting sites such as couches in advance of construction as suitable habitat is present, and in the absence of mitigation, construction activities may cause disturbance or destruction of any new resting sites.

11.10.126 Otters are highly mobile and can move away from areas of disturbance, however, regardless of classification, any works that may result in disturbance of otters using a resting site during construction or operation require implementation of appropriate mitigation measures and, if necessary, standard licensing procedures. To determine whether any otter resting sites are present which could be subject to disturbance, pre-construction otter surveys will be undertaken within a radius of 250m around each proposed turbine location and associated infrastructure, 250m upstream and downstream of each water crossing location and 100m either side of access tracks in accordance with NatureScot guidance. This will inform consultation with NatureScot, mitigation plans and/or licence applications if evidence of an otter resting place is found. These surveys will be undertaken no more than six months prior to the start of construction.

11.10.127 In the context of its EPS status, works that can be expected to cause disturbance to otters or which may result in damage or destruction to their places of shelter should only proceed after an appropriate licence has been issued by NatureScot. In its guidance, NatureScot advises that disturbance during development works can be minimised by establishing a 30m work exclusion zone around an otter shelter/resting place (increased to 100m for breeding or natal holts), although NatureScot should be consulted to determine whether any proposed measures incorporated into the Proposed Development are sufficient to avoid the need for a licence. If resting sites become established during construction, all contract and site operatives will be briefed on the location of such sites to avoid any accidental damage or disturbance. Exclusion zones around such sites or programming of works to avoid sensitive areas will be considered where appropriate, under the direction of an ECoW (**Table 11.13**).

11.10.128 Although otter activity was recorded, no otter resting places were confirmed within the Development Site. Due to the extent of available watercourses surrounding the Development Site that will remain undisturbed during construction, if an otter resting place is established within the Development Site, availability of foraging and shelter habitat

resource are not considered to be limiting factors within the Development Site. Given the temporary nature of the construction works, the magnitude of change is considered to be low and there would be **no likely adverse significant effects** on otter populations.

Temporary severance of otter habitat and commuting routes (construction)

11.10.129 There is also potential for construction activities to cause fragmentation of otter habitat and prevent the free movement of otters across their territories.

11.10.130 The Proposed Development includes six culverted crossings. In the event that construction activities are scheduled to take place at more than one watercourse at any one time, this would be subject to ECoW approval, to avoid any cumulative impact on otter activity. Mitigation measures are detailed in **Table 11.13** but would include mammal ledges in culverts and covering trenches to avoid trapping otters.

11.10.131 Given the relatively low level of otter activity recorded within the Development Site, the Proposed Development is likely to represent only a very small proportion of an otter's foraging territory, with alternative routes available including overland routes, and as such, the works would not be expected to result in permanent blockage of existing commuting routes.

11.10.132 On this basis, and in light of the embedded measures outlined in **Table 11.13**, the temporary loss or barrier effects during the construction of watercourse crossings would result in a low magnitude of change to the otter populations, and there would be **no likely adverse significant effects** on otter.

Direct mortality of individual otters (construction)

11.10.133 Construction and decommissioning phases of the Proposed Development would bring vehicles to a previously undeveloped area, and therefore there is potential for otters to be hit by vehicles. However, with the adoption of the environmental measures detailed in **Table 11.13**, the risk of direct mortality to individuals during the construction and decommissioning phases is low. It is therefore considered that the construction and decommissioning phases would result in a low magnitude of change to the otter population, and there would be **no likely adverse significant effects**.

Reduction in habitat quality as a result of pollution incidents (all phases)

11.10.134 With the adoption of the environmental measures detailed in **Table 11.13** and those set out for watercourses and fish species of interest, reduction of food resource due to pollution of habitats used by otter, during all phases of the Proposed Development, is considered to be low. The overall magnitude of change to the otter population is considered low and there would be **no likely adverse significant effects** on otter.

Disturbance and displacement otter population (Operation)

11.10.135 Operational effects on otters would be limited to potential occasional disturbance during routine maintenance and monitoring visits during the day to the Proposed Development. Such disturbance is likely to be sporadic, resulting in a very low magnitude of change and there would be no likely significant effects on otter.

Disturbance and displacement of otter population (Decommissioning)

11.10.136 During the decommissioning of the Proposed Development, potential effects on otters would be expected to be similar in nature to those during the construction phase and similar environmental measures are likely to be employed. Any new legislation or

guidelines published prior to decommissioning would be adhered to and incorporated into a management plan prior to decommissioning taking place.

11.10.137 The resultant magnitude of change on the otter population is considered to be low and there would be **no likely adverse significant effects** on otter.

Bats

Baseline Conditions

11.10.138 The only feature within the Development Site which is considered suitable to support roosting bats is at the disused Monquhill Farmhouse, which has been shown to support very low numbers of at least three species (common pipistrelle, soprano pipistrelle and Myotis species (thought to be Daubenton's bat)). Given the emergence/re-entry patterns, which have been established through a series of surveys in 2016-17 and 2021-2022, it is considered that the farmhouse represents an occasional roost or day roost rather than a maternity roost (which would have a higher conservation value). As such, the roost is considered to be of local value.

11.10.139 As has been observed at other similar sites nearby (e.g., Lorg, Quantans Hill and the adjacent Enoch Hill), buildings which are otherwise isolated from other similar features are commonly used by bats for roosting. Having foraging habitat available nearby makes the exploitation of such features – even on a sporadic basis – beneficial to individuals which roost or hibernate elsewhere within a locality (e.g., at lower altitudes or where optimal/near-optimal food resources are available).

11.10.140 Five bat species were recorded within the Development Site during the static detector surveys: common and soprano pipistrelle, Brown long-eared bat, Leisler's and Daubenton's bat and these are considered below.

Pipistrelle species

11.10.141 Pipistrelle species (common and soprano pipistrelle only) dominated the activity on-site.

11.10.142 No calls were attributed to Nathusius' pipistrelle, which is rare although widespread across the UK. Recent southern Scotland surveys indicate that southern Scotland is likely to contain at least a few maternity colonies and a few hundred individuals. The risks to this species as a result of the Proposed Development are considered negligible as the current evidence suggests that the species does not use it.

11.10.143 Both soprano and common pipistrelle were recorded at all survey locations on the Site. Foraging and social calling behaviour were also observed in many of the calls, implying the regular presence of more than one bat using features across the Site. The Afton Glen detector accounts for the majority of the recorded bat activity of these species and it is considered that this location would provide the most productive insect prey resource and that activity would be concentrated in this area, with forays onto the moorland and forested areas during suitable weather conditions.

Myotis species

11.10.144 It was not possible to definitively categorise Myotis bat calls to species level. The higher number of calls from this species group at detector location 3 (the Monquhill Farmhouse) is likely to be a result of Myotis bats exiting/entering the roost here. Only very low levels of activity were recorded within the Development Site (Annex 11E.3) suggesting that although the bats are roosting within it, they more commonly forage and commute in adjacent areas.

11.10.145 Myotis bats can travel long distances, flying at low altitudes, from their roosts to their foraging grounds, typically up to 6km away. Myotis bats are fairly widespread throughout the UK and appear to be increasing over most of their range. Myotis bats typically exploit aquatic and wetland habitats with a dietary preference for small flies, caddis flies and mayflies.

11.10.146 All species within the genus Myotis are afforded the same level of protection but no Myotis species have been included on the UK BAP priority species list or the SBL.

Brown long-eared bat

11.10.147 A single brown long-eared bat was recorded during static detector surveys at the Monquhill Farmhouse in 2017 and were recorded at all static detector locations in 2021. There was an overall low level of brown long-eared bat activity across the Study Area.

11.10.148 The brown long-eared bat is widespread throughout most of Britain (except in northern Scotland and offshore Isles) (e.g., Dietz *et al.* 2009). This species of bat is often associated with open woodland which can include deciduous and coniferous habitats. They can be found foraging and commuting along hedgerows, treelines and sheltered valleys. During the summer, brown long-eared bats often roost in the roofs of buildings and can be found often in clusters around ridge ends or around chimneys. They are often found to hibernate in cooler places such as within crevices in caves. They are commonly found to occupy holes in trees, bat and bird boxes.

Nyctalus species

11.10.149 Even small increases in mortality rates can have significant effects on populations of noctule and Leisler's bats, which have comparatively short average lifespans and low birth rates (e.g., Dietz *et al*. 2009).

11.10.150 During the 2016 surveys, low numbers of Leisler's passes (total 36) were recorded at the Afton Glen (control) detector location with no confirmed noctule activity at all. A single *Nyctalus* pass was recorded at the Monquhill Farmhouse (a single individual, assumed to be passing through the Development Site), and because of the absence of confirmed noctule activity, this pass is assumed to have been Leisler's bat. Noctule is considered to be absent from the Development Site. In 2021, the static recorders suggested that *Nyctalus* activity across the Study Area was low to moderate with most activity occurring during the Summer months.

11.10.151 Leisler's bats are considered to be scarce in Britain, with the UK population being estimated as 28,000 (Battersby, 2005) although recent estimates are that the Scottish population exceeds early estimates. Leisler's bats are assessed as being at high risk from wind turbines at both the individual and population levels. Their wing morphology makes them high, fast and efficient fliers, the compromise being that they are best suited to open habitats as they are not very manoeuvrable. They also forage over long distances (Altringham, 2003) with several foraging areas visited in a night from a roost. This species has been noted to prefer foraging over pasture as well as woodland edge and riparian habitats, and even forages over coastal areas.

11.10.152 The report on high-risk bat species in southern Scotland (Newson *et al*, 2017) indicates that the Development Site is on the periphery of the known distribution of Leisler's bat in this region, although the habitats adjacent to the control detector in Afton Glen reflect the habitat preferences of this species. The observed small numbers of passes per night during spring and summer 2016 is representative of a small number of individuals foraging within the glen. As there is no data for autumn 2016 it is not known whether there is any seasonal variation in activity. However, the data collected from the adjacent Enoch Hill

Wind Farm (as reported in **Appendix 11.E**) indicate that the open areas at lower elevations of the glens are of higher value to this species relative to upland areas.

Predicted Effects and their Significance

Potential disturbance to roosts (construction)

11.10.153 A non-maternity, bat roost supporting low numbers of bats was confirmed at the Monquhill Farmhouse. The Proposed Development would include measures to prevent damage to the roost or disturbance of bats within the roost (in compliance with legislation) (see **Table 11.13**). With the adoption of these measures, the risk of disturbance to the roost is considered to be low. The overall magnitude of change to bat populations as a result of any disturbance of roosts, as a result of the Proposed Development, is considered to be low and there are **no likely adverse significant effects.**

Direct mortality/injury (operation)

11.10.154 The main risk to bats from operational wind farm developments relates to:

- Direct collision with fast-moving turbine blades resulting in trauma injuries; and
- Barotrauma (i.e., internal haemorrhaging in the lungs resulting from rapid changes in air pressure behind moving turbine blades).

11.10.155 The degree of population-level risk from collision with wind turbines/barotrauma for those bat species identified to utilise the Site are shown in **Table 11.17**.

Table 11.17 Level of Potential Vulnerability of Bat Species in Scotland

	Collision Risk			
Relative Abundance		Low	Medium	High
	Common species			Common pipistrelle Soprano pipistrelle
	Rarer species	Brown long-eared bat Daubenton's bat Natterer's bat		
	Rarest species	Whiskered bat Brandt's bat		Nathusius' pipistrelle Noctule Leisler's bat

Table extracted from SNH *et al* (2021).
Yellow – low population vulnerability; Amber – medium population vulnerability; Red – high population vulnerability.

11.10.156 Results of the bat activity survey indicate that at least three bat species classified as 'high risk' of turbine collision have been confirmed to utilise the Site – these are common pipistrelle, soprano pipistrelle and *Nyctalus* species.

Common pipistrelle and soprano pipistrelle

11.10.157 **Table 11.17** illustrates that common and soprano pipistrelle have a medium population vulnerability that is classified as high risk of collision with wind turbines. Results of the potential collision risk assessment (as required by NatureScot *et al*., 2021) indicates that

the Site is considered to pose a medium collision risk, though this increases to high collision risk during elevated periods of activity. However, through taking into account the embedded mitigation described in **Table 11.13** (maintaining a minimum buffer distance between turbines and habitat features that may be utilised by commuting and foraging bats and blade feathering), the potential magnitude of change in terms of collision/barotrauma mortality for populations of common and soprano pipistrelle is considered to be low and there would be **no likely adverse significant effect** on the populations of these species**.**

Nyctalus species

11.10.158 Results of the site-wide potential collision risk assessment for *Nyctalus* species suggest a median risk category score of 6 and a maximum risk category score of 12, indicating that the overall collision risk to *Nyctalus* bat species was assessed as 'medium'.

11.10.159 The embedded mitigation described in **Table 11.14** (maintaining a minimum buffer distance between turbines and habitat features that may be utilised by commuting and foraging bats and blade feathering), the potential magnitude of change in terms of collision/barotrauma mortality for populations of *Nyctalus* is considered to be low and there would be **no likely adverse significant effects** on *Nyctalus* populations.

Residual Effects

11.10.160 Taking account of the implementation of the embedded mitigation measures described, no significant effects on IEFs as a result of the Proposed Development are predicted. **Table 11.18** summarises the significance of effect for each IEF.

Table 11.18 Summary of Residual Effects

Important Ecological Feature	Summary of Predicted Effects (during construction, operation and decommissioning)	Importance of IEF in context of Proposed Development[1]	Magnitude of Change[2]	Significance[3]	Summary Rationale
Glen Afton Local Nature Conservation Site	Reduction in habitat quality as a result of hydrological connectivity and pollution incidents.	Local	Low	Not significant	Through the implementation of embedded measures, the Proposed Development is anticipated to cause temporary (short term) change to the local hydrology regime (low magnitude), with negligible effects to interest features of the LNCS, which would not alter the integrity of the site.
Connel Burn/ Benty Cowan LNCS	Direct habitat loss as a result of the Proposed Development. Reduction in habitat quality as a result of hydrological connectivity and pollution incidents.	Local	Low	Not significant	Connel Burn/ Benty Cowan LNCS is located within the Proposed Development footprint and there would be some limited habitat loss. In addition, there is hydrological connectivity with the Development Site and the LNCS and so there is potential for hydrological effects pathways, which could lead reduction in habitat quality. Through the implementation of embedded measures, the Proposed Development is anticipated to cause temporary (short term) change to the local hydrology regime (low magnitude), with negligible effects to the interest features of the LNCS,

Important Ecological Feature	Summary of Predicted Effects (during construction, operation and decommissioning)	Importance of IEF in context of Proposed Development[1]	Magnitude of Change[2]	Significance[3]	Summary Rationale
					which would not alter the integrity of the site.
Blanket bog communities	*Direct loss and temporary disturbance of blanket bog habitats due to land take associated with the construction of site infrastructure* *Indirect disturbance and changes to composition of plant communities resulting from hydrological change*	Local	Low Low	Not Significant	The area of direct loss (0.20ha) comprises 0.47% of the blanket bog resource within the Study Area, which is assessed as being of Local importance for this habitat. Direct loss and temporary disturbance of sensitive blanket bog habitats during construction activities is anticipated to result in a low magnitude of change in the short to medium term. The overall effect on the conservation status of blanket bog would be not significant.
Semi-improved acid grassland	*Direct loss and temporary disturbance due to land take associated with the construction of site infrastructure* *Indirect disturbance and changes to composition of plant communities resulting from hydrological change*	Local	Very Low Very Low	Not Significant	The area of direct loss (0.77ha) comprises 4.22% of the semi-improved acid grassland resource within the Study Area, which is assessed as Local importance. Direct loss and temporary disturbance of semi-improved acid grassland during construction activities is anticipated to result in a very low magnitude of change. The Proposed Development is anticipated to cause temporary

Important Ecological Feature	Summary of Predicted Effects (during construction, operation and decommissioning)	Importance of IEF in context of Proposed Development[1]	Magnitude of Change[2]	Significance[3]	Summary Rationale
					(medium term) change to the local hydrology regime (low magnitude), with some potential localised change in the composition of vegetation. The overall effect on the conservation status of semi-improved acid grassland would be not significant.
Marshy grassland (M23. M23a, M23b)	*Permanent loss due to land take associated with the construction of site infrastructure* *Indirect disturbance and changes to composition of plant communities resulting from hydrological change*	Local	Very Low Low	Not Significant	The area of direct loss (0.65ha) comprises 2.7% of the marshy grassland resource within the Development Site, which is assessed as being of Local importance. Direct loss and temporary disturbance of marshy grassland during construction activities is anticipated to result in a very low magnitude of change. The Proposed Development is anticipated to cause temporary change in the medium term to the local hydrology regime (low magnitude), with some potential change in the composition of vegetation. The overall effect on the conservation status of marshy grassland would be not significant.

Important Ecological Feature	Summary of Predicted Effects (during construction, operation and decommissioning)	Importance of IEF in context of Proposed Development[1]	Magnitude of Change[2]	Significance[3]	Summary Rationale
Mire (M25, M25b)	Indirect disturbance and changes to composition of plant communities resulting from hydrological change	Local	Very Low	Not Significant	The Proposed Development is anticipated to cause temporary change in the medium term to the local hydrology regime (very low magnitude), with some potential change in the composition of vegetation. The effect on the conservation status of mire would be not significant.
Acid Flush	Permanent loss and damage to terrestrial habitats Indirect disturbance and changes to composition of plant communities resulting from hydrological change	Local	Very Low Very Low	Not Significant	The area of direct loss (0.16ha) comprises 2.45% of the acid flush resource within the Study Area, which is assessed as being of Local importance. Direct loss and temporary disturbance of acid flush during construction activities is anticipated to result in a very low magnitude of change. The Proposed Development is anticipated to cause temporary change in the medium term to the local hydrology regime (very low magnitude), with some potential change in the composition of vegetation. The overall effect on the conservation status on acid flush would be not significant.
Watercourses	*Habitat loss/damage, hydrological change, temporary disturbance and*	Local	Low	Not Significant	Embedded mitigation measures in the design of the Proposed

Important Ecological Feature	Summary of Predicted Effects (during construction, operation and decommissioning)	Importance of IEF in context of Proposed Development[1]	Magnitude of Change[2]	Significance[3]	Summary Rationale
	pollution during construction/operation/decommissioning				Development, along with specific construction/ operation/ decommissioning mitigation and application of best practice would mean that the effects on watercourses would be limited to localised disturbance during installation of culverts and limited release of sediment. These changes would be localised, temporary and of short duration. They would not alter the conservation status of watercourses and would be not significant.
Otter	Disturbance and displacement of otter populations including damage to resting sites Temporary severance of otter habitat and commuting routes Direct mortality of individual otters Reduction in habitat quality as a result of pollution incidents.	Local	Low Low Low	Not Significant	Due to the extent of available watercourses surrounding the Development Site that will remain undisturbed during construction, availability of foraging, shelter habitat resource is not considered to be a limiting factor within the Development Site. Sensitive design layout and the protection of watercourses, as well as the implementation of an Otter Protection Plan and other embedded measures during construction would ensure that the change magnitude with regards to disturbance/ displacement would be low.

Important Ecological Feature	Summary of Predicted Effects (during construction, operation and decommissioning)	Importance of IEF in context of Proposed Development[1]	Magnitude of Change[2]	Significance[3]	Summary Rationale
					The overall effect on the conservation status on otter would be not significant.
Bats	*Damage/disturbance to roosts*	Local	Low	Not Significant	Embedded mitigation would reduce the risk of damage or disturbance to the roost at the Monquhill Farmhouse. With these measures in place, the magnitude of change in respect of disturbance to bats roosting within the Development Site is considered to be low and the resultant effect on bats would be not significant.
	Direct mortality/injury as a result of collision with wind turbines. *Soprano and common pipistrelle bats* *Brown Long-eared bats* *Leisler's bats* *Myotis bats*		 Low Negligible Low Low	Not Significant	Low levels of bat activity were recorded at all detector locations within the Development Site in comparison with a control detector positioned outside the Development Site boundary during the 2017 surveys. Activity levels appeared greater around the turbine locations during the 2021 surveys, however, overall,

Important Ecological Feature	Summary of Predicted Effects (during construction, operation and decommissioning)	Importance of IEF in context of Proposed Development[1]	Magnitude of Change[2]	Significance[3]	Summary Rationale
					remaining low to moderate. Activity recorded in the coniferous plantation woodland is considered likely to represent small numbers of bats passing multiple times during foraging. Activity was seen to be lowest at those locations which are remote from the main valleys with the control site located at Glen Afton showing much greater levels of activity. The above factors indicate that the risks to local bat populations are likely to be low. The magnitude of change with respect to mortality/injury of bats is considered to be Low and the resultant effect as a result of the Proposed Development would be not significant.
Atlantic salmon, sea trout, brown trout (and other fish)	*Obstruction of upstream or downstream fish migration* *Harm to fish at watercourse crossings* *Damage/disturbance to fish habitats at watercourse crossings* *Silt/sediment and pollutant release to watercourse crossings (construction)*	Regional	Very Low Very low Very low Very Low	Not Significant	Embedded mitigation measures during construction, operation and decommissioning would reduce the risk of effects on these species as a result of pollution/siltation and the construction of watercourse crossings. Any effects would be localised and of short duration, avoiding the main period when salmonids migrate and spawn. The Proposed Development would not create obstacles to migration/

Important Ecological Feature	Summary of Predicted Effects (during construction, operation and decommissioning)	Importance of IEF in context of Proposed Development[1]	Magnitude of Change[2]	Significance[3]	Summary Rationale
	Silt/sediment and pollutant release to watercourses (operation) *Electromagnetic emissions* *Effects during decommissioning*		Very low Very low		spawning and the effects on these fish species would be not significant.
Freshwater pearl mussel	*Silt/sediment and pollutant release to watercourses*	Local	Very Low	Not Significant	Freshwater pearl mussels have not been recorded within the Development Site and are unlikely to be affected by the Proposed Development. The measures to mitigate effects on salmonids would also protect this species should they be present within the catchments of watercourses that cross the Development Site.

1. The importance of the feature is defined as per **Table 11.13**, **Section 11.7**, using the criteria set out in **Table 11.13**, and method in **Section 11.7**.
2. The magnitude of change on a receptor resulting from activities relating to the development is defined using the criteria set out in **Section 11.9**, **Table 9.13** above and is defined as neutral, very low, low, medium, and high.
3. The significance of the environmental effects is either significant or not significant subject to the evaluation methodology outlined in **Section 11.9**.

Assessment of Cumulative Effects

11.10.161 Significant effects may not occur when considering the Proposed Development in isolation, but when potentially significant effects are considered in combination with nearby existing or proposed developments, significant cumulative effects may arise during each phase of the development. The context in which cumulative effects are considered depends upon the ecology of the species of habitat in question. The need to consider cumulative effects is a requirement of the EIA process, as specified in the EIA Regulations.

11.10.162 Assessment of cumulative effects has been limited to blanket bog and bats.

- The majority of wind farm developments for which EcIA documents were available (Enoch Hill, Benbrack, Hare Hill Ext, Pencloe, Sandy Knowe, Lethans, Glenmuckloch, Sanquhar II and Cornharrow Resubmission) involved the loss of at least some bog and flush habitats. However, the loss was typically small and at some sites was more than off-set through habitat creation/restoration. Therefore, **no significant adverse cumulative effects** on blanket bog habitats are considered likely.
- Meaningful cumulative assessment for bats is not possible. However, following the implementation of proposed embedded measures, there is no potential for significant effects as a result of the Proposed Development and it can be reasonably concluded that there would be no **significant adverse cumulative effects** on bats.

Consideration of Optional Additional Mitigation or Compensation

11.10.163 No additional mitigation measures are proposed to further reduce effects that are identified in this EIA Report. This is because sufficient relevant and implementable measures have been embedded into the development proposals and these are considered to be effective in mitigating potentially significant effects as a result of the Proposed Development.

11.11 Implementation of Environmental Measures

11.11.1 **Table 11.19** describes the environmental measures embedded within the Proposed Development and the mechanism by which they would be implemented (e.g., planning condition) and who is responsible for their implementation.

Table 11.19 Summary of Environmental Measures Relevant to Ecology

Environmental measure	Responsibility for implementation	Compliance mechanism
CONSTRUCTION PHASE		
Preparation and implementation of Peat Management Plan and Construction Environmental Management Plan (CEMP)	Developer	Planning condition
Protected species pre-construction surveys including, otter, water vole, badger, red squirrel and pine marten.	ECoW.	Planning condition
	Developer	Planning condition

Environmental measure	Responsibility for implementation	Compliance mechanism
Preparation and implementation of Otter Species Protection Plan	Developer	Planning condition
Preparation of reinstatement and restoration plan	Developer	Planning condition
Toolbox talks	Construction Manager and ECoW.	CEMP
Adherence to Pollution Prevention Plan as fully detailed in **Chapter 13 – Geology, Hydrology and Hydrogeology**.	Construction Manager and ECoW.	Planning condition
Watercourse exclusion zones (50m buffers) and restrictions on timing of works within these zones implemented through the CEMP	Developer/Contractor	Planning condition
Culvert designs and construction in accordance with SEPA good practice. Construction/installation and monitoring requirements implemented via the CEMP	Developer/Contractor	Planning condition
Measures to control silt/sediment and pollution and limit noise emissions and light pollution implemented through the CEMP, Water Management Plan, Peat Management Plan and Pollution Prevention Plan.	Developer/Contractor	Planning condition
Monitoring of effects on freshwater ecology to be set out in an Environmental Monitoring Plan (fish, freshwater invertebrates and water quality and river habitats) and implemented. Monitoring the effects on bat roosts and otter populations	Developer/Contractor	Planning condition
OPERATION PHASE		
Water quality protection measures (e.g., adherence to SEPA PPGs).	Developer and ECoW	Planning condition
All maintenance working areas would be clearly defined.	Developer and ECoW	Planning condition
Pollution risk due to operational activities including servicing and maintenance to be minimised through operator risk assessments and appropriate preventative measures	Developer/Operator	CAR License
DECOMMISSIONING PHASE		
Preparation and implementation of a Restoration and Decommissioning Plan.	Developer	Planning condition