

Chapter 8: Ecology

Contents

8.1	Introduction	5
8.2	Scoping	5
8.3	Legislation and Planning Policy	5
8.4	Methodology	10
8.5	Field Survey Methodologies	11
8.6	Ecological Impact Assessment (EcIA)	17
8.7	Baseline	23
8.8	Phase 1 Habitats and NVC communities (Site Survey)	26
8.9	Groundwater Dependent Terrestrial Ecosystems (GWDTEs)	29
8.10	Species (Site Survey)	32
8.11	Assessment of Impacts	36
8.12	Receptor Assessment	38
8.13	Mitigation	45
8.14	Statement of Significance Summary	50

Tables

Table 8.1 – Guidelines for assessing the potential suitability of proposed development sites for bats, based on the presence of habitat features within the landscape

Table 8.2 – Minimum Survey Standards Minimum standards for bat surveys at proposed wind farm developments

Table 8.3 - Approach for Evaluating the Value or Sensitivity of Ecological Receptors in Scotland

Table 8.4 – Definition of spatial effect magnitude on IEFs

Table 8.5 – Definition of temporal effect magnitude on IEFs

Table 8.6 – Groundwater Dependency Scores

Table 8.7 – Bat Species Recorded

Table 8.8 – Total Bat Passes

Table 8.9 – Results of Electrofishing 2018

Figures

Figure 8.1 - Survey Area with buffers

Figure 8.2 - Phase 1 Habitats

Figure 8.3 - NVC Habitats

Figure 8.4 - Target Notes for Habitat Survey

Figure 8.5 - Route of Bat Transect and Locations of Remote Detectors

Figure 8.6 - Protected species evidence (non sensitive)

Figure 8.7 - Fish survey locations

Figure 8.8 - Bat Activity Survey Results

Appendices

Appendix 8.1 – Survey Staff

Appendix 8.2 – Locations of Static Recorders, Dates and Times

Appendix 8.3 – Designated Sites within 20 km of Herds Hill

Appendix 8.4 – Ancient Woodland

Appendix 8.5 – Desktop Results Habitats and Species

Appendix 8.6 – Phase 1 Habitat Target Note Descriptions

Appendix 8.7 – NVC Descriptions

Appendix 8.8 – Plant Species List

Appendix 8.9 – Important Ecological Features (IEFs) – Habitats

Appendix 8.10 – Important Ecological Features (IEFs) – Species

Appendix 8.11 – Dimensions used in Habitat Loss Calculations

Appendix 8.12 – Cumulative Impacts within the Natural Heritage Zone

Appendix 8.13 – Residual Effects

Glossary

Term	Definition
Cumulative effect	The combined effect of the assessed project in combination with the effects from a number of different projects, on the same single receptor/resource
Designated site	An area afforded protection under an International Convention, European Directive or a piece of UK legislation due to its nature conservation or landscape value.
Ecological Receptor	Includes any living organisms other than humans, the habitat which supports such organisms or natural resources which could be adversely affected by the development.
Effect	Term used to express the consequence of an impact. The significance of effect is determined by correlating the magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
Environmental Impact Assessment	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. Involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive, including the publication of an Environmental Impact Assessment Report.
Impact	Change that is caused by an action; for example, land clearing (action) during construction which results in habitat loss (impact).
Magnitude	A combination of the extent, duration, frequency and reversibility of an impact.
Mitigation	Measures (which may include process or design) intended to avoid, reduce and where possible, remedy significant adverse impacts of a development.
Remote Detector	Bat detectors left in situ over a number of days in strategic points to record bat activity.
Sensitivity	The extent to which a study subject can accept a change of a particular type and scale without unacceptable adverse effects.
Significance	The significance of an effect combines the evaluation of the magnitude of an impact and the sensitivity of the receptor.
Site of Special Scientific Interest	Sites providing statutory protection for the best examples of the UK's flora, fauna, or geological or physiographical features. These sites are also used to underpin other national and international nature conservation designations.
Special Area of Conservation	Protected sites designated under the EC Habitats Directive. Article 3 of the Habitats Directive requires the establishment of a European network of important high - quality conservation sites that will make a significant contribution to conserving the 189 habitat types and 788 species identified in Annexes I and II of the Directive (as amended).
Special Protection Area	Sites providing statutory protection for a number of rare, threatened or vulnerable bird species and also for regularly occurring migratory species.

Abbreviations

Abbreviation	Description
ASSI	Area of Special Scientific Interest
BCT	Bat Conservation Trust
BSG	British Geological Society
BTO	British Trust for Ornithology
DGC	Dumfries and Galloway Council
EclA	Ecological Impact Assessment
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
GWDTE	Groundwater Dependent Terrestrial Ecosystem
LBAP	Local Biodiversity Action Plan
MSS	Marine Scotland Science
NDSFB	Nith District Salmon Fishery Board
NHZ	Natural Heritage Zone
NNR	National Nature Reserve
NVC	National Vegetation Classification
pSAC	Proposed Special Area for Conservation
pSPA	Proposed Special Protection Area
RSPB	Royal Society for the Protection of Birds
SAC	Special Area for Conservation
SEPA	Scottish Environmental Protection Agency
SNCO	Statutory Nature Conservation Organisation
SPA	Special Protection Area
SPP	Scottish Planning Policy
SSSI	Site of Special Scientific Interest
ZOI	Zone of Influence



Chapter 8: Ecology

8.1 Introduction

8.1.1 This chapter describes the Ecological Impact Assessment (EclA) of the proposed Herds Hill Wind Farm development, as required by the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017. It does not include an assessment of impacts on the ornithology of the site, which is covered separately in Chapter 7 of this Environmental Statement (ES). Any sensitive locational information relating to protected species is provided in a separate Confidential Annex due to the risk of persecution.

8.1.2 This EclA is based upon:

- An Extended Phase 1 Habitat Survey carried out by Starling Learning in 2023;
- An NVC survey carried out by Starling Learning over the same period;
- Protected species surveys carried out by Starling Learning over 2022 to 2023;
- Ecological records gathered during the construction and post construction at Sanquhar Community Wind Farm;
- Historical records from ecological surveys for Sanquhar Wind Farm in 2010 and 2011; and
- Existing records of protected habitats/species provided through consultation.

8.1.3 The aims of this EclA are to:

- Establish a robust and accurate ecological baseline for the site;
- Identify and evaluate the nature conservation/biodiversity interest present;
- Identify any potential impacts arising from the development proposals (construction and operational stages);
- Establish the magnitude and significance of those identified impacts;
- Identify mitigation measures to address the significant impacts;
- Assess any residual impacts and the need for any compensation; and
- Assess cumulative impacts from other surrounding developments.

8.2 Scoping

8.2.1 During the scoping stage of the EIA process, a Scoping Report was submitted to DGC, and their Scoping Opinion was provided on 25/08/2023. However, no information was provided by DGC which related to ecology. The Applicant has therefore been guided by their Agent and the consultants at Starling Learning in relation to the work required for this application, based on their previous experience of working on wind farms within Dumfries & Galloway and Scotland.

8.3 Legislation and Planning Policy

8.3.1 The main relevant legislation and policy documents relating to nature conservation which have been consulted for this EclA are listed below:

- Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) (the ‘Habitat Regulations’)¹;
- Wildlife & Natural Environment (Scotland) Act 2011²;
- Wildlife & Countryside Act 1981 (as amended)³;
- Nature Conservation (Scotland) Act 2004 (as amended)⁴;
- Wild Mammals (Protection) Act 1996⁵;
- Protection of Badgers Act 1992⁶;
- The Convention for the Conservation of European Wildlife and Natural Habitat (The Bern Convention) 1979;
- The Institute of Ecology and Environmental Management (2006) Guidance for Ecological Impact Assessment in the United Kingdom;
- Scottish Executive Guidance on European Protected Species, Development Sites and the Planning System (Scottish Executive, 2001);
- National Planning Framework 4 (NPF4);
- PAN 58: Environmental Impact Assessment (Scottish Executive, 1998);
- PAN 60: Planning for Natural Heritage (Scottish Executive, 2000);
- The Consolidated Scottish Planning Policy Statement 2010;
- Dumfries and Galloway Local Plan 2019 (LDP2);
- The UK Post 2010 Biodiversity Framework;
- Scottish Biodiversity List;
- Dumfries and Galloway Local Biodiversity Action Plan 2009;
- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (the ‘Habitats Directive’)⁷;

¹ The UK Government (1994). *The Conservation (Natural Habitats, &c.) Regulations. 1994*. Available at: <http://www.legislation.gov.uk/uksi/1994/2716/contents/made>

² The UK Government (2011). *Wildlife & Natural Environment (Scotland) Act. 2011*. Available at: <http://www.legislation.gov.uk/asp/2011/6/contents/enacted>

³ The UK Government (1981). *Wildlife & Countryside Act (as amended).1981*. Available at: <http://www.legislation.gov.uk/ukpga/1981/69>

⁴ The UK Government (2004). *Nature Conservation (Scotland) Act (as amended). 2004*. Available at: <http://www.legislation.gov.uk/asp/2004/6/contents>

⁵ The UK Government (1996). *Wild Mammals (Protection) Act. 1996*. Available at: <http://www.legislation.gov.uk/ukpga/1996/3/contents>

⁶ The UK Government (1992). *Protection of Badgers Act. 1992*. Available at: <http://www.legislation.gov.uk/ukpga/1992/51/contents>

⁷ European Council (1992). *Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna. 1992*. Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:01992L0043-20070101>

- Council Directive 78/659/EEC on the quality of fresh waters needing protection or improvement in order to support fish life (the 'Freshwater Fish Directive')⁸, transposed into Scots law by the Surface Waters (Fishlife) (Classification) (Scotland) Regulations 1997⁹;
- Council Directive 2000/60/EC ('Water Framework Directive')¹⁰, transposed into Scots law by the Water Environment and Water Services (Scotland) Act 2003 (the WEWS Act)¹¹;
- Salmon and Freshwater Fisheries Act 1975¹²; and
- Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003¹³;

Legislation

- 8.3.2 The ecological receptors included in this assessment are habitats, notable flora and populations of non-avian fauna (mammals, amphibians, reptiles and invertebrates) of conservation concern that have the potential to be affected by the development. This includes consideration of habitats listed in Annex 1 of the EC Habitats Directive (Council Directive 97/62/EC on the Conservation of Natural Habitats and of Wild Fauna and Flora), UK and local Biodiversity Action Plan habitats and species, notable or protected plant species (Nationally Rare, Nationally Scarce species; species listed on Schedule 8 of the Wildlife and Countryside Act 1981). This also includes Ground Water Dependant Terrestrial Ecosystems (GWDTEs) and groundwater fed habitats such as peatlands. This assessment also includes protected faunal species listed on Schedule 5 of the Wildlife and Countryside Act 1981, Schedule 2 of the UK Habitats Regulations 1994, and those on the Scottish Biodiversity List 2005 requiring conservation action.
- 8.3.3 A summary of the offences relating to species listed on Schedule 2 of the Habitats Regulations are given below. These offences relate to all life stages of the animal (i.e. egg, larval, adult).

⁸ European Council (1978). *Council Directive 78/659/EEC on the Quality of Fresh Waters needing Protection or Improvement in order to Support Fish Life (the 'Freshwater Fish Directive')*. 1978. Available at: <http://rod.eionet.europa.eu/instruments/210>

⁹ The Scottish Government (1997). *The Surface Waters (Fishlife) (Classification) (Scotland) Regulations. 1997*. Available at: <http://www.legislation.gov.uk/en/uksi/1997/2471/regulation/7/made>

¹⁰ European Council (2000). *Council Directive 2000/60/EC, establishing a framework for the Community action in the field of water policy ('Water Framework Directive')*. 2000. Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0060>

¹¹ The Scottish Government (2003). *Water Environment and Water Services (Scotland) Act. 2003*. Available at: <http://www.legislation.gov.uk/asp/2003/3/contents>. [Accessed 14/09/2015]

¹² The UK Government (1975). *Salmon and Freshwater Fisheries Act. 1975*. Available at: <http://www.legislation.gov.uk/ukpga/1975/51>

¹³ The UK Government (2003). *Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act. 2003*. Available at: <http://www.legislation.gov.uk/asp/2003/15/contents>

8.3.4 It is an offence to deliberately or recklessly:

- Capture, injure or kill such an animal;
- Harass an animal or group of animals;
- Disturb an animal while it is occupying a structure or place used for shelter or protection;
- Disturb an animal while it is rearing or otherwise caring for its young;
- Obstruct access to a breeding site or resting place, or otherwise deny the animal use of that place;
- Disturb an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species;
- Disturb an animal in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young;
- Disturb an animal while it is migrating or hibernating;
- Damage or destroy a breeding site or resting place of such an animal (this does not need to be deliberate or reckless to constitute an offence and is irrespective of whether an animal is present at that time).

8.3.5 Species listed on Schedule 2 include all British bat species, otters and great crested newts.

8.3.6 For plant species listed on Schedule 8, it is an offence to deliberately or recklessly pick, collect, cut, uproot or destroy any such plant. This offence applies to all stages of their biological cycle.

8.3.7 **The Wildlife and Countryside Act 1981 (as amended)** remains one of the main pieces of legislation relating to wildlife protection in Scotland. Part 1 of the Act details a large number of offences in relation to the killing and taking of wild birds, other animals and plants, according to their listing on a number of Schedules. Protected animals are listed on Schedule 5 and plants on Schedule 8. It is also an offence under this Act to cause the spread of non-native invasive plant species which are listed on Schedule 9. All birds are protected during the nesting season, with some species listed on Schedule 1 gaining additional protection from disturbance. The relevant offences relating to birds are detailed in the Ornithology Section (Chapter 7) of this ES.

8.3.8 The following provides a summary of the offences relating to animals listed on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended).

8.3.9 It is an offence to intentionally or recklessly:

- Kill, injure or take an animal listed on Schedule 5;
- Damage, destroy or obstruct access to any structure or place which such an animal uses for shelter or protection;
- Disturb an animal when it is occupying a structure or place for that purpose;
- Possess or control, sell, offer for sale or possess or transport for the purpose of sale any live or dead animal or any derivative of such an animal;
- Knowingly causing or permitting any of the above acts to be carried out is also an offence.

8.3.10 **The Nature Conservation (Scotland) Act 2004** makes a number of amendments to the Wildlife and Countryside Act 1981, strengthening the legal protection for species and introducing

‘reckless’ acts to the offences. It also imposes a duty on every public body to further the conservation of biodiversity and to publish lists of species of flora and fauna and habitats of principal importance.

- 8.3.11 **The Protection of Badgers Act 1992** protects badgers and their setts and makes it an offence to:
- Wilfully kill, injure, take or attempt to kill a badger;
 - Wilfully or recklessly damage, destroy or obstruct access to a sett or any entrance of a sett;
 - Wilfully or recklessly disturb a badger whilst it is in a sett.
 - Additional offences relate to cruelty; digging, dogs entering setts, possession and sale and marking.
- 8.3.12 Section 33 of the **Wildlife and Natural Environment (Scotland) Act 2011** amends the Protection of Badgers Act 1992 by creating a new offence of knowingly causing or permitting offences under that Act.
- 8.3.13 The **Salmon and Freshwater Fisheries Act 1975** states under Poisoness matter and polluting effluent: any person who causes or knowingly permits to flow, or puts or knowingly permits to be put, into any waters containing fish or into any tributaries of waters containing fish, any liquid or solid matter to such an extent as to cause the waters to be poisonous or injurious to fish or the spawning grounds, spawn or food of fish, shall be guilty of an offence. It also states there is a duty to make and maintain fish passes where they are present in any waters frequented by salmon or migratory trout.
- 8.3.14 Part 5 Section 36 amends the **Nature Conservation (Scotland) Act 2004** by inserting a new Section into that Act, which requires those public bodies subject to the biodiversity duty to prepare and publish reports on compliance with that duty every 3 years.

Planning Policy

- 8.3.15 NPF4 is the national spatial strategy for Scotland which sets out new requirements for development to deliver positive effects, primarily under Policy 3. This states that all development will contribute to the enhancement of biodiversity, including where relevant restoring degraded habitats. Proposals for local development will include appropriate measures to conserve, restore and enhance biodiversity in accordance with national and local guidance.
- 8.3.16 For national and major developments, or those subject to Environmental Impact Assessment (EIA), proposals will only be supported where it can be demonstrated that it will conserve, restore and enhance biodiversity, including nature networks, so they are in a demonstrably better state than without intervention. Only when actions result in biodiversity being left in a better state than before development are positive effects secured.
- 8.3.17 In relation to sites of international importance (such as Special Protection Areas (SPAs) and Special Areas of Conservation (SACs)) which form a network of protected areas known as Natura 2000, any development plan or proposal which is likely to have a significant effect on a Natura site, and is not directly connected with or necessary to the conservation

management of that site, must be subject to an appropriate assessment by the planning authority. Ramsar sites, internationally important wetlands, also fall within this requirement.

- 8.3.18 A number of habitat and species action plans have been developed to guide the conservation of biodiversity at a variety of levels within the UK. A list of habitats and species considered to be of principal importance for the conservation of biodiversity within the UK as a whole was initially published in 1994. This was used to inform the publication of the Scottish Biodiversity List which was published in 2005 and lists those habitats and species of importance within Scotland. At a more local level, there are a number of local biodiversity action plans, with the Dumfries and Galloway LBAP being the relevant plan covering the proposed wind farm site.

8.4 Methodology

Desk Study

- 8.4.1 A desktop study and consultation exercise was carried out prior to any fieldwork, to collate existing background information on the ecology of the site. This included a search for statutory and non-statutory sites designated for their nature conservation value, records of protected or notable species within the site or surrounding habitats, which could be impacted by the scheme and habitats or features of interest. The search area for protected species records was determined by the particular species and ranged between 1 km and 10 km from the site boundary. The following data sources were consulted:

- NatureScot - Sitelink map;
- Forestry Commission Scotland Land Information Search;
- Forestry Commission Scotland Upper Nithsdale Land Management Plan 2018 to 2028;
- National Biodiversity Atlas (NBN Atlas) (only for scoping, no records from this site are included);
- SEPA;
- South West Scotland Environmental Information Centre (SWSEIC);
- The Amphibian and Reptile Conservation Trust;
- <http://www.trout-salmon-fishing.com/scotland-river-nith.htm>;
- <https://www.river-nith.com/the-trust/conservation/>;
- Nith District Salmon Fishery Board¹⁴;
- Aerial photography; and
- Adjacent wind farm Environmental Statements.

Parke, D. (2016). Electrofishing Survey of the River Nith to Assess Aquatic Populations in the Vicinity of the Proposed North Lowther Energy Initiative¹⁴ Nith District Salmon Fishery Board.

8.5 Field Survey Methodologies

Field Survey areas

8.5.1 Herds Hill Wind Farm has been surveyed over 2022 to 2023 and the following ecological surveys were carried out:

- Phase 1 habitat survey;
- NVC;
- Bats;
- Badgers *Meles meles*;
- Otters *Lutra lutra*;
- Water Voles *Arvicola amphibius*;
- Reptiles; and
- Amphibians.

8.5.2 The ecology surveys were carried out by Starling Learning. Details of surveyors are given in Appendix 8.1.

Phase 1 Habitat Survey Methodology

8.5.3 The Phase 1 Habitat Survey followed the standard methodology described in 'Guidelines for Baseline Ecological Assessment'¹⁵, which augments the methods described in the 'Handbook for Phase 1 Habitat Survey: a Technique for Environmental Audit'¹⁶. Aerial photographs were used to inform the field survey and photographs taken in the field were also used to help define the boundaries between the different habitats.

8.5.4 Each habitat was classified in the field and its extent mapped onto ordnance survey maps (1:10,000). Notes were made in the field relating to dominant plants, their associates, structure of vegetation or points of general conservation/ecological interest, including the presence, or potential presence of notable or protected species on the site. Botanical taxonomic nomenclature follows that of Stace¹⁷.

8.5.5 An area based mainly on a 500m buffer round the turbines has been used as reference for discussion of habitat loss due to the wind farm infrastructure. That area is presented as a Phase 1 habitat survey map, over which the infrastructure can be viewed. Standard Phase 1 survey codes are used.

8.5.6 The results are shown on Figure 8.2 and the target notes on Figure 8.4.

NVC Survey Methodology

8.5.7 NVC survey was undertaken at the same time as the Phase 1 survey to enable identification of wetland habitats that might include Groundwater Dependent Terrestrial Ecosystems

¹⁵ Spon. E & FN. Institute for Environmental Assessment (1995). Guidelines for Baseline Ecological Assessment.

¹⁶ Joint Nature Conservation Committee JNCC (2010). Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit. JNCC, Peterborough

¹⁷ Stace. C (1997). *A New flora of the British Isles*. Cambridge University Press, Cambridge

(GWDTEs). Guidance in the JNCC Handbook National Vegetation Classification, Users Handbook¹⁸ was followed and used, which enabled surveyors to classify homogenous stands of vegetation using quadrat data.

- 8.5.8 NVC community names are attached to each habitat polygon throughout the survey buffer round the wind farm infrastructure and a specific map is available that enables the infrastructure to be viewed overlying the NVC communities, with a buffer of 250m round deep excavations, such as borrow pits or turbine bases, and a buffer of 100m round shallow excavations, such as roads or temporary construction compounds.
- 8.5.9 The available NVC descriptions (Rodwell *et al*, Averis *et al* 1991) were consulted and the report draws on the surveyors' long experience of NVC survey.
- 8.5.10 The survey included consideration of GWDTEs as outlined in SEPA Land Use Planning System Guidance Note 4 (LUPS GU4) and a discussion of likely impacts on these communities as a result of the development and ways in which these impacts could be mitigated. GWDTEs are discussed later in Section 8.9.
- 8.5.11 The habitat surveys were carried out by Keith Watson of Starling Learning. The results are shown on Figure 8.3.

Protected Species Surveys Methodology

- 8.5.12 A number of surveys for protected species were carried out and the methodologies are described below. The survey area with buffers is shown on Figure 8.1.

Bats

- 8.5.13 Surveys were based on the methodology recommended for onshore wind farms within the Bat Conservation Trust (BCT) Bat Surveys: Good Practice Guidelines 2016¹⁹, and the following reports have been taken into consideration: 'Bats and Onshore Wind Turbines Interim Guidance' produced by Natural England²⁰, the DEFRA report 'Understanding the Risk to European Protected Species (Bats) at Onshore Wind Turbine Sites to inform Risk Management'²¹ and Eurobats: 'Guidelines for consideration of bats in wind farm projects'²²
- 8.5.14 Field bat surveys included the following:
- Potential roost survey searches;

¹⁸ Rodwell J.S. (2006) *National Vegetation Classification. Users Handbook*. JNCC

¹⁹ Hundt L. (2012) *Bat surveys – Good Practice Guidelines (2nd Edition)*. Bat Conservation Trust, London.
Hundt L. (2016) *Bat surveys – Good Practice Guidelines (3rd Edition)*. Bat Conservation Trust, London.

²⁰ Bats and onshore windfarms (interim Guidance) TIN051. Natural England

²¹ University of Exeter (2010). *Understanding the Risk to European Protected Species (Bats) at Onshore Wind Turbine Sites to inform Risk Management*. DEFRA

²² Rodrigues L. et al (2014). *Guidelines for consideration of bats in wind farm projects*. Eurobats

- A bat activity survey following a transect to assess use of the site; and
 - Remote bat surveys using static bat detectors.
- 8.5.15 The survey area was assessed for roosting potential for bats prior to activity surveys. Any potential roost sites including trees and buildings were plotted on a map and their proximity to the wind farm considered. There were very few trees within the survey area and they were assessed for their potential to support roosting bats. This involved undertaking a field visual survey, using close focussing binoculars, from ground level to identify any potential features that may be of value to roosting bats. Such features are splits and fissures in trunks and limbs; rot holes, woodpecker holes, loose bark and a dense covering of mature ivy. Trees were ranked in order of their potential value to bats in accordance with the BCT Guidelines 2012, which ranges from a confirmed roost to trees with no potential to support roosting bats. There are no buildings within the survey area. A description of these categories is provided in Table 8.1. Trees were classified with a view to carrying out emergence surveys on those with roost potential and likelihood of being affected by the development.
- 8.5.16 Table 8.2 below is replicated from the BCT Guidelines 2016²³ and details factors to consider in determining survey effort and site risk and it details minimum survey standards recommended for onshore wind turbine development, replicated from the BCT Guidelines 2015²⁴.

Table 8.1 – Guidelines for assessing the potential suitability of proposed development sites for bats, based on the presence of habitat features within the landscape

Suitability	Description Roosting Habitats	Commuting and foraging habitats
Negligible potential	Negligible habitat features on site likely to be used by roosting bats	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low potential	<p>A structure with one or more potential roost sites that could be used by bats opportunistically. However these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation).</p> <p>A tree of sufficient size and age to contain PRFs but with none seen from the ground</p>	<p>Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat.</p> <p>Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.</p>

²³ Hundt L. (2016) Bat surveys – Good Practice Guidelines (3rd Edition). Bat Conservation Trust, London. Table 4.1

²⁴ Hundt L. (2012) Bat for Professional Ecologists (3rd Edition). Bat Conservation Trust, London Table 10.2

	or features seen with only very limited roosting potential.	
Moderate potential	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	<p>Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back to gardens.</p> <p>Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.</p>

Table 8.2 – Minimum survey standards for bat surveys at proposed wind farm developments

	Site Risk Level (taking into account factors detailed in Table 8.2)		
	Low risk	Medium risk	High Risk
Roost surveys			
Selection of roosts requiring further survey	If evidence of roosting by medium or high-risk species and/or roosts of district importance and above (see Table 8.1) is found, further survey should follow SNCO guidance and guidelines where possible		
Activity surveys			
Survey area*	Up to 200 m+ rotor radius from turbine locations or potential turbine locations	Up to 200 m+ rotor radius from turbine locations or potential turbine locations	Up to 200 m+ rotor radius from turbine locations or potential turbine locations
Ground level transect surveys	One visit per transect each season (spring, summer and autumn)	One visit per transect each month (April-Oct)	Up to two visits per transect each month (April to October)
Automated surveys at ground level	10 consecutive nights for each single or pair of locations within the survey area, per season	10 consecutive nights for each single or pair of locations within the survey area, per month	Up to 2 sets of 10 consecutive nights for each single or pair of locations within the survey area, per month
Automated surveys at height**	For surveys undertaken from masts (met mast or other) survey effort is as outlined above for surveys at ground level		

*This should include potential turbine locations plus the nearest habitat features likely to be used by bats

** Essential in addition to ground level surveys if keyholing

- 8.5.17 There is no real potential for roosting within the survey areas. Most of the area is high, open farmland and moorland. However it was considered to have some suitability for foraging as there are a number of watercourses with some adjacent vegetation. The site risk level was regarded as low risk. The level of survey included a search for roost sites, one transect survey, and automated remote bat detectors left in location for ten consecutive nights for each season.
- 8.5.18 One survey to assess bat activity was carried out. This evening survey consisted of two surveyors walking a transect route through the wind farm development area including all three of the turbine locations. The primary aim of these surveys was to establish the presence of any bats in the area, and any key foraging areas or commuting routes. Surveyors used Echometer Touch connected to Ipads, frequency division detectors (Batbox baton, Batbox duet.) connected to digital audio recorders (Swissonic mdr2, zoom h2) for later sonogram analysis using 'Batscan' software.
- 8.5.19 The route is shown on Figure 8.5.
- 8.5.20 The remote bat detectors (Songmeter SM2 bat +) were placed adjacent to turbine locations. The static recorders were left in place for ten consecutive nights each season to record all bat activity during that period, which was later analysed using Analook software. At each site one of the recorders was mounted on a guyed post at a height of approximately 2.5m in order to record higher flying bats.
- 8.5.21 The locations of the static bat detectors are detailed in Appendix 8.2 and shown on Figure 8.5
- 8.5.22 Bat surveys were carried out by Davy Galbraith and David Stevenson of Starling Learning.

Otters

- 8.5.23 The site was searched for any signs of otter, which included tracks, spraints, couches, lie ups, feeding remains and potential holts in accordance with guidance provided by Macdonald *et al* (1998)²⁵.
- 8.5.24 Surveys were carried out at each location and concentrated on watercourses with efforts focused on any islands and large boulders in mid-stream and under bridges, as these are the usual sites to find otter spraints and feeding remains. Periods of heavy rainfall and high water levels were avoided for the surveys to ensure that signs had not been washed away.
- 8.5.25 The site has a number of watercourses considered suitable for otters, including the Kello Water and its tributaries. Small trout were observed in several of these watercourses.
- 8.5.26 The locations of any field signs were recorded using a handheld GPS device. Non sensitive results are shown on Figure 8.6.

²⁵ McDonald et al. 1998. Proposals for future monitoring of British mammals. Department of the environment, Transport and the Regions, London.

8.5.27 Otter surveys were carried out by Alan Wood, and Liam Anton of Starling Learning.

Water Vole

8.5.28 Water vole surveys were carried out in conjunction with the otter survey following the accepted methodology described in the Water Vole Conservation Handbook²⁶. This involves searching for characteristic signs of water vole presence, such as droppings, latrines, feeding stations, burrows, runways in vegetation and footprints.

8.5.29 Each watercourse was surveyed by two recorders; one in the water and one on the bank and any signs of water vole were recorded using a handheld GPS device.

Badgers

8.5.30 Surveys were carried out during winter months when vegetation is lower. Up to 1 km from the site boundary, was searched for any signs of badger activity such as setts, either single isolated holes or a series of holes likely to be interconnected underground; faeces and latrines, scratching posts, usually at the base of trees; footprints, hairs, foraging and diggings signs and well-defined trails. Any evidence of badgers was recorded using a GPS device and non sensitive evidence is shown on Figure 8.6.

8.5.31 Badger surveys were carried out by Diane Lyons and Alan Wood of Starling Learning, in accordance with recommended guidelines²⁷.

Brown Hare and Mountain Hare

8.5.32 Hares were surveyed for during all other surveys.

Fish

8.5.33 Fish surveys were carried out in previous years for the Community Windpower Sanquhar II development²⁸ with four locations on the Kello Water surveyed (which are approximately 1.5 to 4km from the proposed turbines). The results have been included in this report to provide background information. These surveys are carried out to primarily assess the densities of juvenile salmonid species of fish present in the watercourses. The salmonid species targeted are juvenile Atlantic salmon (*Salmo salar*) and Sea/brown trout (*Salmo trutta*). Although the fisheries surveys do not target non-salmonid species they are captured

²⁶ Strachan, R. and Moorhouse (2006/2011). *Water Vole Conservation Handbook*. English Nature, the Environment Agency & the Wildlife Conservation Research Unit, Oxford.

²⁷ Hutchison, I. (2009). *Scottish Badgers-Windfarms-Policy Statement*. Scottish Badgers; and Harris S., Cresswell P & Jefferies D. (1989). *Surveying Badgers*. Occasional Publication of the Mammal Society.No.9, Mammal Society Bristol.

²⁸ Electrofishing Survey To Assess Fish Populations In The Vicinity Of The Proposed Sanquhar II Windfarm Site. Volume 1 Baseline survey (2018) Nith District Salmon Fishery Board

as a matter of course during these surveys. Other species typically found in watercourses within the Nith catchment include eel, stone loach, minnow, lamprey, stickleback and grayling. Of significance to any construction project will be the presence of lamprey or eel due to their protected status. There are three different species of lamprey that reside within the River Nith; sea lamprey, river lamprey and brook lamprey.

8.5.34 To accurately assess the populations of fish throughout the survey, a method of electrofishing was adopted which could efficiently capture the appropriate age classes and species likely to be present. The method adopted entailed selecting natural features on the river that provided boundaries to each electrofishing site. Features such as shallow riffles at the top and bottom of a section of river were typically utilised. Once a site had been selected, the electrofishing team systematically worked from downstream to upstream following a carefully agreed pattern removing all fish caught. Working in an upstream direction prevents any sediment caused by wading in the river from obscuring the working area. Stunned fish downstream were drawn downstream towards the hand-held dip net which was lifted clear of the water after each sweep; to permit the removal of captured fish for transfer into water-filled buckets.

8.5.35 The four sites surveyed are shown on Figure 8.7.

Reptiles

8.5.36 All records of reptiles were recorded during all other surveys. Results are shown on Figure 8.6.

Amphibians

8.5.37 All records of amphibians were recorded during all other surveys.

8.6 Ecological Impact Assessment (EclA)

General

8.6.1 This EclA is carried out in accordance with the guidance set out in the Institute of Ecology and Environmental Management (IEEM) Guidelines for Ecological Impact Assessment (2006)²⁹ and Guidelines for Ecological Impact Assessment 2nd Edition (2016)³⁰. This section defines the methodology used to assess the significance of effects through the process of an evaluation of the sensitivity (a combination of Nature Conservation Value and Conservation Status) and the magnitude of effect.

8.6.2 In order to accurately assess the potential impacts likely to occur from the development of the wind farm, the baseline conditions of the site need to be established, and which ecological

²⁹ CIEEM (2006) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal. Chartered Institute of Ecology and Environmental Management, Winchester

³⁰ CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester

features (habitats, species, ecosystems and their functions/processes) are likely to be affected by the proposal, both within and adjacent to the development area.

8.6.3 There are a wide range of criteria which will determine the sensitivity of each ecological feature. Examples include:

- Any site designations;
- Naturalness;
- Rarity of habitat, plant and animal species;
- Habitat diversity and connectivity;
- Habitats and species in decline; and
- Large populations or concentrations of species considered uncommon or declining in a larger context.

8.6.4 The Nature Conservation Value is defined on the basis of the geographic context given in Table 8.3 below, which follows the guidance detailed in CIEEM 2016³¹.

Table 8.3 – Approach for Evaluating the Value or Sensitivity of Ecological Features in Scotland

Sensitivity of Receptor	Examples (Guidance to evaluation)
International	<p>An internationally designated site or candidate site (SPA, pSPA, SAC, pSAC, Ramsar site, Biogenetic Reserve).</p> <p>A viable area of a habitat type listed in Annex I of the Habitats Directive, EU 1992 or smaller areas of such habitat which are essential to maintain the viability of a larger whole.</p> <p>Any regularly occurring population of an internationally important species, which is threatened or rare in the UK, i.e. it is a UK Red Data Book species or listed as occurring in 15 or fewer 10 km² in the UK (categories 1 and 2 in the UK Biodiversity Action Plan (BAP)) or of uncertain conservation status or of global conservation concern in the UK BAP.</p> <p>A regularly occurring, nationally significant population/number of any internationally important species.</p>
National (Scotland)	<p>A nationally designated site (SSSI, ASSI, NNR, Marine Nature Reserve) or a discrete area, which the country conservation agency has determined meets the published selection criteria for national designation (e.g. SSSI selection guidelines) irrespective of whether or not it has yet been notified.</p> <p>A viable area of a priority habitat identified in the UK BAP, or of smaller areas of such habitat, which are essential to maintain the viability of a larger whole.</p> <p>Any regularly occurring population of a nationally important species, which is threatened or rare in the region or county (see local BAP).</p>

	<p>A regularly occurring, regionally or county significant population/number of any nationally important species. A feature identified as of critical importance in the UK BAP.</p>
Regional (Southwest Scotland)	<p>Viable areas of key habitat identified in the Regional BAP or smaller areas of such habitat, which are essential to maintain the viability of a larger whole. Viable areas of key habitat identified as being of Regional value in the appropriate Natural Area profile. Any regularly occurring, locally significant population of a species listed as being nationally scarce which occurs in 16-100 10 km² in the UK or in a Regional BAP or relevant Natural Area on account of its regional rarity or localisation. A regularly occurring, locally significant number of a regionally important species. Sites, which exceed the County-level designations but fall short of SSSI selection guidelines, where these occur.</p>
County (Dumfries and Galloway)	<p>Semi-natural ancient woodland greater than 0.25 hectares (ha). County/Metropolitan sites and other sites which the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves selected on County / metropolitan ecological criteria (County/Metropolitan sites will often have been identified in local plans). A viable area of habitat identified in LBAP. Any regularly occurring, locally significant population of a species which is listed in a County/Metropolitan “red data book” or BAP on account of its regional rarity or localisation. A regularly occurring, locally significant number of a County/ Metropolitan important species.</p>
District (Western Southern Uplands)	<p>Semi-natural ancient woodland smaller than 0.25 ha. Areas of habitat identified in a sub-County (District/Borough) BAP or in the relevant Natural Area profile. District sites that the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves selected on District/ Borough ecological criteria (District sites, where they exist, will often have been identified in local plans). Sites/features that are scarce within the District/Borough or which appreciably enrich the District/Borough habitat resource. A diverse and/ or ecologically valuable hedgerow network. A population of a species that is listed in a District/Borough BAP because of its rarity in the locality or in the relevant Natural Area profile because of its regional rarity or localisation. A regularly occurring, locally significant number of a District / Borough important species during a critical phase of its life cycle.</p>
Local	<p>Areas of habitat considered to appreciably enrich the habitat resource within the context of the Parish or neighbourhood, e.g. species rich hedgerows. A regularly occurring but low number of locally common protected species within or adjacent to the Development area. Local Nature Reserves selected on Parish ecological criteria.</p>

Very local	Areas of habitat that have a limited ecological value. Plant assemblages tend to be species poor, but may be utilised by a small number of faunal species. Those habitats that have an effect of enriching and complimenting the local natural environment to a small degree.
Negligible	Areas of habitats considered to be of very limited ecological value. They are not representative of natural habitats and are very species poor. Those habitats that do not enrich the local natural environment.

- 8.6.5 Those ecological features identified to be potentially affected by the development and deemed to be of local importance or above, are termed ‘Important Ecological Features’ (IEFs).
- 8.6.6 Designated sites can be readily assigned to an appropriate level. For example, a site with a designation assigned through European legislation, such as a Special Protection Area (SPA) or a Special Area of Conservation (SAC), would be considered of International significance, a SSSI designated by UK statute would be of National significance and a site designated by a Local Authority would be of District importance. Where a feature has value at more than one level, its overriding value is that of the highest level. However, some sites may be designated for different features at the European and National levels, so these features should be valued accordingly.
- 8.6.7 The assignment of undesignated features, such as Biodiversity Action Plan (BAP) habitats and species, or areas of ancient woodland, may not fall clearly into the designations as described above. Therefore, a number of other criteria are used to assess the nature conservation value of a defined area of land. Accepted criteria are set out in ‘A Nature Conservation Review’ (Ratcliffe, 1977)³¹, and include diversity, rarity, naturalness, intrinsic appeal, typicalness and recorded history.
- 8.6.8 Features, which have no ecological value in themselves, may still be regarded as important if they serve an ecological function, such as acting as a buffer against negative effects, or enabling the effective conservation of a more valuable area. This also applies to features, which aid the dispersal, migration and genetic transfer of species such as rivers, small woods, ponds, hedgerows and field boundaries.
- 8.6.9 Impacts may be defined as direct (e.g. direct habitat loss or destruction of an otter holt) or indirect (e.g. disturbance during construction or change in habitat suitability due to run off or impeded drainage).
- 8.6.10 The IEEM guidelines set out the process for assessment in the following stages:
- Description of the ecological baseline i.e. results of fieldwork and desktop study;
 - Identification of IEFs, i.e. the species of ecological value within the zone of influence;
 - Determination of the nature conservation value of the IEFs;

³¹ Ratcliffe, D. 1977. *A Conservation Review*. Cambridge University Press.

- Identification of the potential impacts due to construction, operation and decommissioning of the development on the IEFs;
- Determination of the magnitude of impact on the IEFs taking into account the sensitivity of the receptor and the duration and reversibility of the impact;
- Determination of the significance of the impact based on the interaction between the magnitude/duration, the nature conservation value and the likelihood of the impact occurring;
- Identification of mitigation measures to reduce or avoid negative impacts;
- Determination of the residual impact following mitigation; and
- Identification of any monitoring requirements.

Magnitude of Effect

- 8.6.11 The magnitude of effect refers to the level of changes in the extent and integrity of the ecological feature. A definition of ecological integrity is given within the Scottish Executive Circular 6/1995 (2000)³² stating “*The integrity of a site is 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*”. Although this applies specifically to European designated sites such as SACs it is applied to wider countryside habitats for the purpose of this assessment.
- 8.6.12 Determining the magnitude of any likely effects requires an understanding of how the ecological feature will respond to development during and after construction. The effects can be adverse, neutral or beneficial.
- 8.6.13 Effects on IEFs can be judged in terms of magnitude in space and time. Magnitude refers to the scale of the impact. This may relate to the loss of a breeding population or the displacement of an individual species.
- 8.6.14 Magnitude is assessed at five levels for spatial effects as shown in Table 8.4.
- 8.6.15 Magnitude is also assessed at five levels for temporal effects, as shown in Table 8.5. Duration is defined as the time for which the impact is expected to last before recovery.

³² Scottish Executive (2000). Nature Conservation: implementation in Scotland of EC Directives on the conservation of natural habitats and of wild flora and fauna and the conservation of wild birds (The Habitats and birds Directives). Revised guidance updating Scottish Office Circular no. 6/1995. Accessed via: <http://www.scotland.gov.uk/library3/nature/habd-00.asp>

Table 8.4 – Definition of spatial effect magnitude on IEFs

Negative Effect Magnitude	Description
Very high	Total or almost complete loss of the receptor. Loss or very major alteration to key elements/features of the baseline conditions such that the post development character/composition/attributes will be fundamentally changed and may be lost from the site altogether. The conservation status of the receptor would be affected Guide: <20% of population remains
High	Result in large scale, permanent changes in the receptor and likely to change its ecological integrity. These effects are likely to result in overall changes in the conservation status of a receptor. Guide: 20-80% of population lost
Medium	Include moderate scale, long-term changes in a receptor or larger scale temporary changes, but the integrity of the receptor is unlikely to be affected. This may mean that there are temporary changes in the conservation status of the receptor but these are reversible and unlikely to be permanent. Guide: 5-20% of population lost
Low	Include effects that are small in magnitude, have small-scale temporary changes, and where integrity is not affected. These effects are unlikely to result in overall changes to the conservation status of a receptor. Guide: 1-5% of population lost
Negligible	No perceptible change in the ecological receptor. Guide: 1% of population lost

Table 8.5 – Definition of temporal effect magnitude on IEFs

Duration	Definition
Permanent	Effects continuing indefinitely beyond the span of one human generation (taken as above 26 years) except where there is likely to be substantial improvement after this period.
Long term	Between 15 and up to (and including) 25 years
Medium term	Between 5 and up to (but not including) 15 years
Short term	Up to (but not including) 5 years
Negligible	No effect

Frequency and Timing

8.6.16 The number of times an activity occurs will have an impact on ecological features. The timing too is significant if the activity takes place during a critical period e.g. when birds are nesting.

Reversibility

- 8.6.17 An irreversible effect is one from which recovery is not possible within a reasonable timescale or if there is no possibility of action being taken to repair it. A reversible effect is one where recovery can take place or can be reversed by mitigation.

Assessment of Cumulative Impacts and Effects

- 8.6.18 NatureScot (2012) Cumulative Assessment is used to inform the cumulative assessment, and the assessment of effects for surrounding developments will be taken into consideration as part of this.

Defining Ecologically Significant Effects

- 8.6.19 The significance of potential effects is determined by considering the value of the receptor and the magnitude of the effect and using professional judgement as to whether the integrity of the receptor will be affected.
- 8.6.20 Significance can be considered to be major (long term significant adverse effects), moderate (medium term or partially significant adverse effects), minor (insignificant level or temporary leading to no effect on the integrity) or negligible (no effect). Major and moderate effects are considered to be significant in accordance with EIA regulations.
- 8.6.21 Effects are more likely to be considered significant where they affect species of a high conservation value or where the magnitude of the effect is high. Effects considered not significant would apply to situations where the receptor is of a low conservation value, the integrity is not threatened or the magnitude is low.
- 8.6.22 For species not protected by site designation or a level of protection, judgment is made as to whether the development could have a significant adverse impact on the overall population, range or distribution.

Assessment of residual impacts

- 8.6.23 If a potential impact is determined to be significant, mitigation measures to avoid, reduce or prevent the impact are suggested wherever possible. Remaining residual impacts will then be discussed.
- 8.6.24 In order to test whether or not an impact will affect the integrity of a site or ecosystem and thereby significant, it is necessary to understand whether the changes arising from the proposed development are likely to move the baseline conditions at the site or ecosystem closer to, or further from the condition, which constitutes 'integrity' for that system.

8.7 Baseline

- 8.7.1 The proposed Herds Hill Wind Farm site lies in the Southern Uplands, south of the villages of Kirkconnel and Sanquhar and to the west of Drumbuie Farm. The turbines are proposed to be sited south of the Kello Water on farmland and moorland. The land rises to Brunt Rig (340m+ above sea level (asl)), where the western turbine (T2) is located, and the southern one (T1) is only slightly lower at 330m; the northerly turbine (T3) is at 270m.

- 8.7.2 A total of three turbines are proposed, and all will be positioned on open ground. The access track will use the existing site entrance and access track constructed for and used for the operational Sanquhar Community Wind Farm.
- 8.7.3 The Zone of Influence (ZOI) is identified as the area and resources that may be influenced by the development. It includes a radius around turbines, ancillary structures, borrow pit and access tracks of 500m for the Phase 1 habitat survey, 250m radius for NVC survey and assessment of GWDTEs, and 100m for protected species.

Desk Study

Natural Heritage Zone

- 8.7.4 Natural Heritage Zones are a system devised by NatureScot. It comprises sub divisions of Scotland based on wildlife, natural features, landforms, geology, land use and human impact. The proposed Herds Hill Wind Farm is within the Western Southern Uplands and Inner Solway Natural Heritage Zone.

Designated Sites

- 8.7.5 All statutory and non statutory designated sites within 20km of the site boundary are described in Appendix 8.3. There are four statutory sites within the 20km area namely Muirkirk and North Lowther Uplands SPA, North Lowther Uplands SSSI, Tynron Juniper Wood and Upper Nithsdale Woods SAC. None have direct links to the Herds Hill site.
- 8.7.6 There are a number of non statutory sites including areas of Ancient Woodland, Priority Areas for Red Squirrel Conservation (PARCs) and a Forestry and Land Scotland (FLS) Natural Reserve.
- 8.7.7 Information was obtained from the Ancient Woodland Inventory regarding the locations of significant woodland areas close to the development. There are many small sites, both ancient woodlands and long-established woodlands, located within the Nith valley and in Glen Afton. Many of which are un-named. They are all either not connected to, or are further than 4km away from the development and cannot be impacted in any way by the proposal. A representative sample of these sites is provided in Appendix 8.4.
- 8.7.8 The Nith Valley is a Priority Area for Red Squirrel Conservation. However no woodland will be impacted by this development.
- 8.7.9 The Kello Water is a FLS Natural Reserve³³ and several of its tributaries drain from the development site.
- 8.7.10 The majority of the non statutory sites are not within the same hydrological unit as the development and therefore cannot be directly impacted by any difference in the amount of drainage waters or any extra siltation resulting from it.

³³ https://forestryandland.gov.scot/images/corporate/design-plans/dumfries-borders/Upper_Nithsdale/Upper_Nithsdale_LMP_text_v2.pdf

Habitat and Plant Species Records

- 8.7.11 Records of protected plants and plants on the LBAP lists and protected species provided through consultation are provided in Appendix 8.5.
- 8.7.12 The British Geological Survey (BSG) maps show the underlying geology as sedimentary greywacke sandstones (Kirkholm Formation) of Ordovician age. The superficial deposit map shows two small pockets of peat (in T3 and to edge of T2), but elsewhere there is no data, except for till deposits on the lower slopes of T3 and most of T1.
- 8.7.13 A peat depth survey carried out by Scottish Woodlands in 2019 shows areas of deep peat (>50cm) on the edge of the location of T3.
- 8.7.14 Of relevance to the development, Dumfries and Galloway LBAP habitat action plans³⁴ have been written for River Headwaters, Blanket Bogs, Purple Moor Grass and Rush Pasture, Acid Grasslands, Inland Rock Outcrops, Upland Heaths, Native Woods, Agriculturally Improved Grasslands, and Traditional Field Boundaries.
- 8.7.15 Of relevance to the Proposed Development are LBAP species action plans for Atlantic salmon European eel *Anguilla anguilla*, adder *Vipera berus*, water vole, common pipistrelle *Pipistrellus pipistrellus*, brown long-eared bat *Plecotus auritus*, whiskered bat *Myotis mystacinus*, noctule bat *Nyctalus noctula*, soprano pipistrelle *Pipistrellus pygmaeus*, Daubenton's bat *Myotis daubentonii*, Natterer's bat *Myotis nattereri*, Leisler's bat *Nyctalus leisleri*, red squirrel *Sciurus vulgaris*, brown hare *Lepus europaeus*, otter, and badger.
- 8.7.16 The protected or nationally scarce plant species hairy stonecrop *Sedum villosa*, Juniper *Juniperus communis*, Field Gentian *Gentianella campestris*, Wilson's Filmy Fern *Hymenophyllum wilsonii* were all recorded within 2km of the development site. Locally rare Northern Bedstraw *Galium boreale* and Mountain Everlasting *Antennaria dioica* were also found within 2km.

Protected Species Records

- 8.7.17 Red Squirrels are found in the various forests directly adjacent to the site and the forests are within a Priority Area for Red Squirrel Conservation (PARC).
- 8.7.18 Otters have been recorded in many of the watercourses in the area including the Birk Burn and the Kello Water.
- 8.7.19 Water voles have been recorded within the 10km square.
- 8.7.20 Badgers have been recorded in the various forests adjacent.

³⁴ www.dumgal.gov.uk/index.aspx?articleid=1978.

- 8.7.21 A variety of bat species have been recorded in the area Common Pipistrelle *Pipistrellus pipistrellus*, Soprano Pipistrelle *Pipistrellus pygmaeus*, Natterer's Bat *Myotis nattereri*, and Brown Long-eared *Plecotus auritus* have all been recorded foraging within 2km.
- 8.7.22 Brown hare *Lepus europaeus* and mountain hare *Lepus timidus* have been recorded within the area.
- 8.7.23 Red Deer *Cervus elaphus* and Roe Deer *Capreolus capreolus* have been recorded in the area.
- 8.7.24 Common Lizard *Zootoca vivipara* and Adder *Vipera berus* have both been recorded in the area.
- 8.7.25 Common Toad *Bufo bufo* and Common Frog *Rana temporaria* have also been recorded within the site.
- 8.7.26 Desk-top records show a presence of Atlantic Salmon *Salmo salar* and Brown/Sea Trout *Salmo trutta* in various watercourses within 1km. European Eel *Anguilla anguilla* and Brook Lampetra *Lampetra planeri*, Sea Petromyzon *Petromyzon marinus* and River Lamprey *Lampetra fluviatilis* has also been recorded in the Nith. In addition, the Nith District Salmon Fishery Board and the Association of Salmon Fishery Boards have stocked the Kello Water and the River Nith with salmon and have also undertaken enhancement works.
- 8.7.27 All protected species records recorded through the desktop search are listed in Appendix 8.5.

8.8 Phase 1 Habitats and NVC communities (Site Survey)

- 8.8.1 The land presents an open grazed graminoid (grass-like) landscape throughout, although there is quite a contrast between the vegetation of lower and higher elevation turbine locations.
- 8.8.2 The following habitats were recorded during the Phase 1 Habitat survey. Some are too small to map and are given as Target Notes in Appendix 8.6. NVC descriptions are outlined in Appendix 8.7. Plant species lists are provided in Appendix 8.8. Comments are made below on these small areas of habitat and the main habitats which are described in Sections 8.8.4 to 8.8.17:
- A1.1.1 Semi-natural broad-leaved woodland (A Woodland and scrub);
 - B1.1 Unimproved acid grassland (B Grassland and marsh);
 - B1.2 Semi-improved acid grassland (B Grassland and marsh);
 - B5 Marsh/marshy grassland (B Grassland and marsh);
 - C1.1 Continuous bracken (C Tall herb and fern);
 - C3.2 Non-ruderal (Tall herb and fern);
 - D2 Wet dwarf shrub heath (D Heathland);
 - D6 Wet heath/acid grassland mosaic (D Heathland);
 - E1.6.1 Blanket bog (E Mire);
 - E1.7 Wet modified bog (E Mire);
 - E1.8 Dry modified bog (E Mire);
 - E2.1 Acid/neutral flush (E Mire);
 - G1 Standing water (G Open water);
 - G2 Running water (G Open water);

- I2.1 Quarry (I Rock exposure and waste); and
 - J4 Bare ground (J Miscellaneous).
- 8.8.3 The following text provides descriptions of the vegetation present in the three turbine survey areas with Phase 1 habitat maps coded to the NVC. Further details on the species present can be found in the target notes. The main Phase 1 habitats found during the survey are discussed in broad groupings in the following sections and are shown on Figure 8.2 and the target notes are on Figure 8.4. The NVC habitats are shown on Figure 8.3.

Habitats and vegetation

- 8.8.4 The site encompasses a broad range of open habitat types with variations reflecting the topography and drainage, and historical land use management. Graminoid (grass-like growth) vegetation dominates throughout, but this does include elements of wetter mire and bog and short grazed areas of dwarf shrub heath, and in the lower lying hill sides extensive areas of drained rush dominated pasture.
- 8.8.5 The southern turbine (T1 now T2) is situated on level to gently sloping ground and consists of mostly graminoid, modified, but very wet bog vegetation; deep peat is shown in the extreme but mostly over the wall of the site boundary. The vegetation is quite complicated (even though appearing superficially similar). The poorly draining blanket bog is interspersed with ridges and steeper slopes with acidic grassland, and crossed by numerous deep drains or erosion like flushes supporting rush dominated acidic mire.
- 8.8.6 The western turbine (T2 now T3) is located on the highest ground, and presents a contrast between its southern and northern halves. The former is similar to the vegetation found at T1 and with a notable depression supporting deep peat bog vegetation, flanked by rush dominated mire. The central summit supports acidic grassland and shallow bog or wet heath vegetation, but the northern slopes are dominated by heavily drained rush dominated pasture, presumably enriched by agricultural treatments in the past. A burn occurs to the western edge, within the survey buffer zone, but outside the site boundary.
- 8.8.7 The northern turbine (T3 now T1) occurs at a lower elevation on a hill side slope. It is virtually covered by regularly drained rush pasture with a few pockets of wet acidic grassland (presumably relics of precursor vegetation) and ridges with free draining, enriched pasture favoured by stock; much of the rush pasture is grassy with grasses and herbs indicating former enrichment. A small watercourse crosses the survey area and becomes very steep below.

Woodland and Scrub

- 8.8.8 Woodland and scrub are generally absent from the survey area. There are a couple of scattered rowan and hawthorn along two of the burns but neither support any strictly woodland ground flora (a few ferns patches occur, and there are a couple of bracken stands (NVC U20).

Grassland

- 8.8.9 Although graminoid vegetation occurs throughout, areas of true grassland are rather limited. At T2 and T3 there are quite large areas of acidic grassland, mostly on ridges and associated slopes. The grassland is strongly acidic (NVC U6) and typically supports heath rush (*Juncus*

squarrosus) wavy hair-grass (*Deschampsia flexuosa*), bent (*Agrostis canina* s.l.), sheep's fescue (*Festuca ovina*), occasionally mat grass (*Nardus stricta*), often much common sedge (*Carex nigra*) but herbs tend to be limited to heath bedstraw (*Galium saxatile*) and tormentil (*Potentilla erecta*) and hypnoid mosses such as *Pleurozium schreberii* and *Rhytidiadelphus squarrosus*. The grassland is often flushed, where common sedge predominates in a transition to more acidic mire (NVC M6). Some steep slopes occur with affinities to mat grass grassland (NVC U5) but that species was not predominant, and these areas are transitional to freer draining bent – fescue grassland (NVC U4a).

- 8.8.10 Locally, particularly on transitions to bogs, the acidic grassland can be wet and with some bog-moss (*Sphagnum* spp.) (NVC U6a) and is intermediate with graminoid bog vegetation (see below); however some areas on closer inspection have affinities to wet heath (NVC M15), with short grazed deer-grass (*Trichophorum germanicum*), heather (*Calluna vulgaris*) and purple moor-grass (*Molinia caerulea*).
- 8.8.11 Freer draining grassland, along watercourse sides and local ridges are less acidic and support bent - fescue type grassland (NVC U4); species include common bent (*Agrostis capillaris*), red fescue (*Festuca rubra*) and sweet vernal-grass (*Anthoxanthum odoratum*); herbs vary but can include common sorrel (*Rumex acetosa*), ribwort plantain (*Plantago lanceolata*), meadow buttercup (*Ranunculus acris*), heath bedstraw (*Galium saxatile*) and tormentil (*Potentilla erecta*). However, away from the watercourses this grassland is associated with rocky ridges and slopes (more so at T3) and appear more enriched (perhaps due to agricultural treatment but more likely to be stock dunging) and species can include much Yorkshire-fog (*Holcus lanatus*) and white clover (*Trifolium repens*) (NVC U4b), with some affinities to semi-improved NVC MG6 pasture. The ridges often have tussocks of soft-rush (*Juncus effusus*) but are not marshy.
- 8.8.12 Most of T1, and the northern part of T3, is covered by rush pasture dominated by sharp-flowered rush (*Juncus acutiflorus*) but although typically a mire community in the NVC (NVC M23a) it is derived from heavy draining and presumably agricultural enrichment. True marsh species can occur but tend to be more restricted to the drains e.g. marsh bedstraw (*Galium palustre*). Associates appear to be fairly uniform throughout and include Yorkshire-fog (*Holcus lanatus*) red fescue (*Festuca rubra*), sweet vernal-grass (*Anthoxanthum odoratum*), brown bent (*Agrostis canina* s.s.), crested dog's-tail (*Cynosurus cristatus*), meadow-grasses (*Poa* spp.) and occasional tufted hair-grass (*Deschampsia cespitosa*); herbs typically include buttercups (*Ranunculus acris* and some *R. repens*), tormentil (*Potentilla erecta*), common sorrel (*Rumex acetosa*), marsh thistle (*Cirsium palustre*) and white clover (*Trifolium repens*); sometimes there are more acidic elements (e.g. mat grass, common sedge) indicating relics of precursor wet acidic grasslands, but such areas seem scarce although being an extensive area it is hard to check everywhere (but they tend to be at transition zones fed by acidic waters).

Mires and bogs

- 8.8.13 Bog vegetation is widespread at T2 and the southern edge of T3, even though little deep peat is shown on the BGS maps. Most of the bog is graminoid in appearance, with much hare's-tail cotton-grass (*Eriophorum vaginatum*) (NVC M20b) but closer inspection reveals much wetter and more diverse associates than typical of the vegetation, in particular the cover of bog-moss (typically *Sphagnum fallax*) and hair-cap moss (*Polytrichum commune*). Vascular plant associates include crossed-leaved heath (*Erica tetralix*), blaeberry (*Vaccinium myrtillus*), deer-

grass (*Trichophorum germanicum*), purple moor-grass (*Molinia caerulea*), cranberry (*Vaccinium oxycoccos*), wavy-hair grass (*Deschampsia flexuosa*), heath rush (*Juncus squarrosus*), tormentil (*Potentilla erecta*) and sometimes short heather (*Calluna vulgaris*). The vegetation is typically tussocky with drier hummocks with blaeberry, wavy hair-grass and hypnoid mosses, but also some *Sphagnum capillifolium* and *Polytrichum strictum*, but also wetter channels (with much bog-moss).

- 8.8.14 At several areas, (not restricted to the BGS deep peat zones) there is more diversity with species such as bog asphodel (*Narthecium ossifragum*), crowberry (*Empetrum nigrum*), sundew (*Drosera rotundifolia*), and much bog-moss including *Sphagnum papillosum* and rarely *S. magellanicum*. Such bog areas are more typical of less modified blanket bog vegetation (NVC M17). At the deep peat south of the wall (at T1 now T2) there are small patches of drier NVC M19 blanket bog, marked by tall heather, but usually restricted to deep peat edges.
- 8.8.15 At transitional areas to acidic grassland on drier ridges or slopes, on shallower peats (but seemingly over 40cm) the graminoid vegetation is intermediate to the drier modified bog, but at some areas closer inspection shows much short grazed heather, deer-grass and purple moor-grass indicating wet heath (NVC M15).
- 8.8.16 To the margins of the bog areas, and often crossing as drains, there are rush dominated areas. The drains tend to be dominated by soft-rush (*Juncus effusus*) usually over a carpet of bog-moss (*Sphagnum fallax*) (NVC M6c) but there are large areas dominated by sharp-flowered rush (*Juncus acutiflorus*) but also with the bog-moss (NVC M6d); the latter tends to occur at flushed areas to the margins (often much broader) but separating the two can be time consuming. Where there is more mineral influence e.g. from adjacent rock run-off, or about watercourses, the vegetation can be more diverse (NVC M23a) with species such as marsh thistle (*Cirsium palustre*), marsh bedstraw (*Galium palustre*), marsh willowherb (*Epilobium palustre*), marsh violet (*Viola palustris*) and tormentil (*Potentilla erecta*). As noted above under grasslands, this vegetation merges with that of the drained rush pasture found at the western and northern turbines T3, and T1.

Water Habitats

- 8.8.17 Several watercourses flow through the site. The March Burn, Quintin's Burn, and the Thwarter Burn are all tributaries of the Kello Water. To the southeast is the Barr Burn which is a tributary of the Euchar Water.
- 8.8.18 There is one small area of standing water which is an attenuation pond which was part of the surface water management measures for the construction of the Sanquhar Wind Farm.

Natural rock exposures and waste

- 8.8.19 To the east of the site is an existing quarry; stone was excavated from this for the construction of the Sanquhar Wind Farm. This will act as the borrow pit for the Herds Hill site.

8.9 Groundwater Dependent Terrestrial Ecosystems (GWDEs)

- 8.9.1 The NVC communities identified over the course of the surveys have been assessed against criteria provided in SEPA guidance relating to groundwater dependency, which is set out in

Table 8.6. Further information regarding the groundwater dependency is detailed in the following paragraphs and a map is available showing the wind farm infrastructure overlying the NVC communities within a buffer defined by 100m from access tracks and 250m around deeper excavations.

Table 8.6 – Groundwater Dependency Scores

Score	Description
1	Denotes 'Strong dependency on groundwater discharge from bedrock or superficial aquifers at a majority of sites'
2	Denotes 'Likely to be some dependency on groundwater discharge at a majority of sites – either direct from recognised aquifers or indirectly as recharge from minor aquifers in superficial deposits. Water from other sources (surface run off, overbank flooding etc) may also be very important;'
3	Denotes 'Groundwater discharge usually irrelevant. Site fed by other water sources. This may include components of ombrogenous systems with intrinsic groundwater system fed by rain.'

- 8.9.2 In relation to the above table, U6 *Juncus squarrosus-Festuca ovina* grassland, M15 *Trichophorum cespitosus-Erica tetralix* wet heath, and MG10 *Holcus lanatus-Juncus effusus* rush-pasture have a groundwater dependency score of 2, considered likely to be moderately groundwater dependent.
- 8.9.3 M6 *Carex echinata-Sphagnum fallax/denticulatum mire* and M23 *Juncus effusus/acutiflorus-Galium palustre* rush, are thought to be likely to be highly groundwater dependant and have the groundwater dependency score of 1.
- 8.9.4 Several intermediate communities were mapped during the habitat survey, including two of the communities mentioned above, NVC U6-M15, and others such as NVC M23b-M6c, or M23a-U4. In those cases, where the constituent communities have the same score, a similar groundwater dependency might be expected. Where one of the constituent had a score of 1 and the other was considered to have low groundwater dependency, the resulting intermediate vegetation would be considered to have a lower, moderate dependency.
- 8.9.5 The GWDTE communities have been identified using the plant communities described in the SEPA guidance and are now assessed in the following paragraphs for their specific groundwater dependency at the site, considering field observations and characteristics of the site’s underlying soils, geology and hydrology.
- 8.9.6 Several soil types are shown in The National Soil Map of Scotland (1:250 000), in various broad aggregations. Dystrophic peat, peaty podzols and peaty gleys shown beyond the western extent of the site and stretching eastwards to account for the soils beneath T1, the new location for T2 and the western part of the survey buffer around T3. The eastern part of that survey buffer has a different type of soil mapped, a mixture of peaty gleys and non-calcareous gleys.

- 8.9.7 The peaty and imperfectly-draining soil types account for the wetland habitats of mire and wet to damp grasslands that dominate the site.
- 8.9.8 Two separate rock formations underlie the study area. There are Greywackes from the Ordovician Age (Kirkholm Formation) which underlie the majority of the site, specifically the turbine area and connecting tracks between the turbines. At the very lowest elevations of the site, where the control room and substation are proposed to be located, the underlying rocks are from the Clackmannan Group (Carboniferous Period).
- 8.9.9 Where the deep excavations would be undertaken for turbine locations, the aquifer is classed as being of low productivity, with limited groundwater present in the near-surface weathered zone and secondary fractures. The aquifer associated with the Clackmannan Group is classed as being of moderate productivity; though classification is based on rock from The Passage Formation, which is not recorded in Scotland. In both sets of rocks, flow is considered to take place almost always through fractures and other discontinuities, or, in the case of the Clackmannan Group rocks, due to disturbance from past mining activities.
- 8.9.10 NVC M15 wet heath community (present only in the transitions M20-M15 and U6-M15) and NVC U6 grassland can be removed from the discussion first. These communities are often direct replacements for the ombrotrophic bog communities (NVC M17, M19 and M20 occur at the site) due to either long-term grazing pressure (U6), or at the thinning edge of deeper peat areas and that is considered to be the case here. The other 'score 2' community, NVC MG10 rush-pasture, was found where the margins of the existing access track to the operational Sanquhar Wind Farm had been colonised by weedy vegetation dominated by soft rush. In that situation the community has low groundwater dependency.
- 8.9.11 Several examples of acidic NVC M6 mire (both M6c and M6d) and some of the more minerotrophic M23 mire (or 'rush-pasture') occur, often in transitional communities, such as M6d-M23a. Many of those are found in a linear network of natural surface depressions (and also within man-made drains or 'grips') within larger tracts of ombrogenous mire. In those situations these examples are considered also to be dependent on rainfall, indicative of near-surface flows through long-established natural seepage lines and ditches.
- 8.9.12 On the lower slopes, north of the location of T1 but also along a wide length of the slopes down to the Kello Water, there are several much more extensive examples of M23 rush-pasture, almost all M23a *Juncus acutiflorus* sub-community. The soils here are likely more shallow peats and gleys, presumably mineral-enriched either naturally or after many years' agricultural management. The rush-pastures are drained by many closely-spaced ditches.
- 8.9.13 At these locations the M23 rush-pasture community is thought to have low groundwater dependency: the soils are kept wet by rainfall and seepages from the deeper peat layer on the higher ground, retaining much water due to their imperfect draining.

8.10 Species (Site Survey)

Bats

- 8.10.1 The proposed development is situated on open moorland and farmland habitats. According to the Bat Conservation Trust Guidelines (2015) these habitats are judged to be of low value to bats.

Roost Survey Results

There are no roosting opportunities on site. There are no buildings within the 100m buffer, no bridges and no mature trees with suitable features such as cracks, holes, dead wood or thick ivy cover. There are a number of farms and homes to the north of the development site including Drumbuie, however none are within the 100m buffer and any bat roost would not be directly affected.

Bat Activity Survey Results

- 8.10.2 All records of bats during the transect survey were of common pipistrelle *Pipistrellus pipistrellus* and soprano pipistrelle *Pipistrellus pygmaeus*. There were 24 passes of common pipistrelle and 12 passes of soprano pipistrelle. There was very little activity at the start of the transect route near the existing wind farm track and working round the turbine area to the east near T2. Only one bat (the first bat recorded, at 20:37, around 35 minutes after sunset) was active there along the eastern extent of the transect, including along the edge of the recently-established woodland there. The bat was close to the margins of the Thwarter Burn. On reaching the large extents of rush-pasture approaching the Kello Water both species of pipistrelle began to be regularly recorded, both over the open pasture and then close along the edge of the southern slopes of the watercourse. A small cluster of those records were from the north of T1, close to the Kello Water. Upon climbing the slopes back up to the access track, bat passes continued to be detected, initially, of both species. On reaching the more gentle gradients below Brunt Rig there were no further records until a single soprano pipistrelle pass was recorded from the ridge above, between Brunt Rig and the wind farm access track. That was the last bat recorded, at 22:13. Results are shown on Figure 8.8.

Remote Bat Detector Results

- 8.10.3 The results from the remote detectors are detailed in Table 8.7 below.

Table 8.7 – Bat species recorded by the remote detectors

Date	Detector Number	Species	Number of Passes
Spring 20/04/2023 to 30/04/2023	1	<i>Pipistrellus pipistrellus</i>	39
		<i>Pipistrellus pygmaeus</i>	28
		<i>Pipistrellus</i> spp	22
		<i>Myotis</i> species	3
		<i>Nyctalus noctula</i>	2
	2	<i>Pipistrellus pipistrellus</i>	38
<i>Pipistrellus pygmaeus</i>	31		
<i>Pipistrellus</i> spp	6		

	3	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus spp</i> <i>Myotis species</i> <i>Nyctalus noctula</i>	26 25 11 16 2
Summer 22/06/2023 to 02/07/2023	1	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus spp</i> <i>Myotis spp</i> <i>Nyctalus noctula</i>	45 27 26 5 1
	2	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus spp</i> <i>Myotis spp</i> <i>Nyctalus noctula</i> <i>Nyctalus spp</i>	36 20 18 6 1 1
	3	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus spp</i> <i>Myotis spp</i>	22 14 10 5
Autumn 2023 30/08/2023 to 09/09/2023	1	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus spp</i> <i>Plecotus auritus</i> <i>Myotis spp</i>	30 45 39 2 2
	2	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus spp</i> <i>Myotis spp</i>	16 12 5 3
	3	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Myotis spp</i> <i>Nyctalus noctula</i>	19 25 4 1

8.10.4 Static remote detectors generally had low numbers of bats recorded, and as with the activity transects, the majority were pipistrelle species. Detector 1 was the busiest presumably as it is nearest a watercourse (Quintin’s Burn) and nearest to the Kello Water. Other bat species included low numbers of *Myotis* species, brown long-eared bats, noctules and *Nyctalus* species.

8.10.5 Table 8.8 summarises the number of bat passes recorded each month. The numbers of bat passes are low with the highest being at the T1 area with 118 passes over ten days in autumn 2023.

8.10.6 Bats were also recorded in other lower areas as surveyors left the site including the Kello Water and the Birk burn areas. This highlights the preference for lower areas by the bats.

Table 8.8 – Total Bat Passes

Survey period	Detector ID	Total passes over 10 days	Maximum Bat activity (passes per night)	Maximum bat activity level (low, moderate, high)	Average bat activity (mean or median bat passes per night)	Bat activity level (Low, Moderate, High)
Spring 2023	1	94	21	Low	9.4	Low
	2	76	18	Low	7.6	Low
	3	80	22	Low	8.0	Low
Summer 2023	1	105	17	Low	10.6	Low
	2	82	16	Low	8.2	Low
	3	51	12	Low	5.1	Low
Autumn 2023	1	118	28	Low	11.8	Low
	2	36	11	Low	3.6	Low
	3	49	10	Low	4.9	Low

Otters

8.10.7 Very little otter evidence was recorded apart from several spraints on the Thwarter Burn and the Kello Water. It is highly likely that most watercourses and bodies within the ZOI are used by a small population of otters at certain times of year especially in spring when otters are likely to use the watercourses to access moorland pools, when amphibians are active.

Water Vole

8.10.8 No evidence of Water Voles was found. Generally the watercourses were largely too fast flowing and rocky to be suitable.

Badgers

8.10.9 Low level badger activity was found in various areas throughout the site with paths, foraging and dung recorded. Two setts were located over 100m distant from any part of the development. Non sensitive badger information is shown on Figure 8.6 and sett information is detailed in the Confidential Annex.

Brown Hare

8.10.10 A small number of brown hares were recorded with more occasionally observed in fields and on roads to the north of development site. Records are shown on Figure 8.6. No mountain hares were recorded.

Red Squirrels and Pine Marten

8.10.11 No red squirrels or pine martens were located during the survey

Other Mammals

8.10.12 Roe Deer *Capreolus capreolus* and Red Deer *Cervus elaphus* were often seen using the edges of the conifer woodland to the south and feeding out on to the moorland.

Herds Hill Wind Farm

- 8.10.13 Fox *Vulpes vulpes* droppings, tracks and paths were common throughout the site.
- 8.10.14 Molehills *Talpa europaea* are common in various areas.
- 8.10.15 Occasional field vole *Microtus agrestis* were noted on the moorland with latrines and runs noted in grassy areas.
- 8.10.16 A weasel *Mustela nivalis* or stoat *Mustela erminea* scat was recorded on site.

Reptiles

- 8.10.17 Common Lizard was recorded occasionally with most records in the Drumbuie Moorhead area. Records are shown on Figure 8.6.

Amphibians

- 8.10.18 Frogs and occasionally toads were recorded in wet areas on the moor in spring.

Fish

- 8.10.19 The fish surveys were carried out in 2017 and 2018. Whilst this set of fisheries surveys was intended to provide baseline information for the proposed Sanquhar II Wind Farm, NDSFB was able to assess the results gained against archive information held on all of the tributaries surveyed.
- 8.10.20 The period over which the surveys were conducted included one of the driest summers experienced in the River Nith catchment. Watercourses which were marginal at best, in terms of supporting fish populations, continued to support fish but those fish utilised deeper habitats to cope with unusual temperatures. Typically pools and freshets, where oxygen levels were higher, were highly populated.
- 8.10.21 Results are given below in Table 8.11. The survey concludes that the upper reaches of the Kello Water has brown trout and in the lower reaches, within the vicinity of the proposed Herds Hill wind farm, both Atlantic salmon and brown trout are present. It can be assumed that at least some of the tributaries flowing from the site into the Kello Water will also have migratory salmonids.

Table 8.9 - Fish Survey Results 2018 (Source: Nith District Salmon Fishery Board)

Watercourse	Site code	Sampling date	Salmon fry (/100m ²)	Salmon parr (/100m ²)	Trout fry (/100m ²)	Trout parr (/100m ²)	Other species present
Un-named tributary of Kello Water	15	29/08/18	0	0	0	0	-
Kello Water	16	29/08/18	0	0	0	5.45	-
Kello Water	17	29/08/18	5.50	13.2	8.8	3.30	-

Kello Water – additional site	38	10/09/18	0.64	3.52	8.00	3.84	-
-------------------------------	----	----------	------	------	------	------	---

Evaluation of Ecological Features

8.10.22 Appendix 8.9 provides an evaluation of the ecological value of the habitat IEFs recorded within the site and Appendix 8.10 provides an evaluation of the ecological value of the species IEFs.

8.11 Assessment of Impacts

Construction and Operational Impacts

8.11.1 Within this section, the ways in which habitats and species may be affected by the wind farm development are discussed.

8.11.2 The key issues are:

- Loss of and disturbance to significant habitat;
- Effect on hunting and foraging grounds, shelter and roost sites, breeding sites, corridors for migration and dispersal and stop over sites; and
- Effect on population cycles, survival rates, reproduction rates, and seasonal behaviour.

8.11.3 These could be affected by:

- The effects of direct habitat loss due to land-take from the access tracks, the turbine bases and the ancillary structures;
- The effects of indirect habitat loss. Species may be disturbed and displaced from the proximity of the wind turbines. Such disturbance may occur as a consequence of construction work, maintenance, and visitors or due to the presence of the wind farm close to protected structures or feeding sites or on habitual flight routes; and
- The potential killing or injury of bats due to the effects of collision with rotating turbine blades, overhead wires, guy lines and fencing.

8.11.4 For habitats and most species, the vast majority of impacts relating to the development of wind turbines within the ZOI are associated with the construction phase. For bats, there is the risk of collision with the operational turbines. Loss or disturbance to significant habitats can be significant and can also have long-term impacts on species through potential loss of breeding and/or foraging habitat, or important wintering habitat. Construction activities themselves can result in disturbance of species through lighting, noise or potential pollution incidents, as well as potential injury to species due to site clearance works such as digging of borrow pits or turbine bases.

8.11.5 There are also potential disturbance issues relating to noise of the operational turbines, as well as higher levels of disturbance resulting from an increase in visitors to the site. This could result in displacement of certain sensitive species from the area, resulting in a change in the local distribution and/or abundance of species. Operational impacts could occur over the

operational lifetime of the wind farm, although some species may become habituated to the conditions on site so these impacts may lessen over time.

- 8.11.6 The potential impacts associated with the habitats and species of importance recorded in the area are detailed below. The significance of these impacts is assessed first of all in the absence of any mitigation.

Effects Scoped Out

- 8.11.7 On the basis of the field survey work undertaken, the professional judgement of the ecology team, experience from other relevant projects and taking account of policy guidance and standards, the following topic areas have been scoped out of the current assessment. Appendices 8.9 and 8.10 discuss the IEFs and their significance at Herds Hill.

Habitats

- Effects on all habitats classified as low Nature Conservation Importance;
 - Effects on IEF habitats that despite their various levels of significance (National importance, UK BAP, Scottish Biodiversity list priority species, Dumfries and Galloway LBAP key ecosystem) they are considered to be of very local or local value at this site and habitat loss will be low;
 - Effects on adjacent habitats of medium and high Nature Conservation importance, due to the positioning of the turbine infrastructure and access track, will be unaffected by the development;
- 8.11.8 This therefore excludes the following:

Designated and Non Statutory Sites

- On the basis that there are no designated sites within the site. The nearest, Muirkirk and North Lowther Hills SPA and SSSI will not be impacted on. Therefore designated sites are now scoped out.

Habitats

- Semi-natural broad-leaved woodland;
- Continuous bracken;
- Non-ruderal;
- Standing water; and
- Bare ground.

Protected Species

- No evidence of Water Voles was found and therefore this species has been scoped out;
- No evidence of Red Squirrel or Pine Marten was found and these species are unlikely to be affected by the development even if present, therefore these too have been scoped out.
- However the situation with this species can change and they will be considered in the pre construction surveys;
- Effects on all species classified as of low Nature Conservation Importance. Despite negative impacts being negligible, they will be taken into consideration and negative impacts avoided.

8.12 Receptor Assessment

8.12.1 For each habitat and species taken to be an IEF, an assessment is made of the impacts on the Scottish population and also the population of the NHZ.

8.12.2 The assessment will identify whether the impact is likely to adversely affect the conservation status of each of the species, without any consideration of possible mitigation.

Effects Assessed

8.12.3 Potential effects are evaluated in respect of habitats and species of high or moderate Nature Conservation Importance whose regional populations could be potentially affected by the Proposed Development. Emphasis is given to species identified as sensitive receptors.

8.12.4 Potential effects are assessed for the non statutory designations located on site, Kello Water.

8.12.5 Potential Effects are assessed for the following habitats:

- Unimproved acid grassland;
- Semi-improved acid grassland;
- Marsh/marshy grassland;
- Wet dwarf shrub heath;
- Wet heath/acid grassland mosaic;
- Blanket bog;
- Wet modified bog;
- Dry modified bog;
- Acid/neutral flush;
- Running water; and
- Quarry.

8.12.6 Potential effects are assessed for the following species of medium and high conservation importance:

- Bats;
- Otters;
- Badgers;
- Roe Deer;
- Brown Hare;
- Common lizard;
- Common Frog and common toad;
- Migratory salmonids.

8.12.7 The vast majority of impacts relating to the development of wind turbines within the ZOI are associated with the construction phase. Loss of habitat can have long-term impacts on species through potential loss of breeding and/or foraging habitat, or important wintering habitat. Construction activities themselves can result in disturbance of species through lighting, noise or potential pollution incidents, as well as potential injury to species due to site clearance works such as the digging of borrow pits or turbine bases.

- 8.12.1 Potential impacts which could occur as a result of the operation of the wind farm relate largely to risk of collision for bats.
- 8.12.2 There are also potential disturbance issues relating to noise of the operational turbines, as well as higher levels of disturbance resulting from an increase in visitors to the site. This could result in displacement of certain sensitive species from the area, resulting in a change in the local distribution and/or abundance of species. Operational impacts could occur over the operational lifetime of the wind farm, although some species may become habituated to the conditions on site so these impacts may lessen over time.
- 8.12.3 The potential impacts associated with the habitats and species of importance recorded in the area are detailed below. The significance of these impacts is assessed in the absence of any mitigation.

Western Southern Uplands and Inner Solway Natural Heritage Zone

- 8.12.4 There are a number of objectives and actions addressing the priorities of the Western Southern Uplands and Inner Solway Natural Heritage Zone. The ones likely to be impacted upon are:
- To encourage sustainable rural development and to maintain and restore semi natural habitats in farmland in lowland and upland areas and enhance linkages and corridors;
 - To maintain and enhance landscapes, including designed Landscapes, coast, lowland and upland farmland, woods and forests, and geological and geomorphological sites;
 - To encourage natural river processes, maintain sustainable aquatic biodiversity including fish populations, and improve water quality and riparian habitat throughout river catchments; and
 - To maintain populations of characteristic species and increase overall species diversity.
- 8.12.5 The proposed development has the potential to adversely affect semi natural habitats and landscapes in farmland in upland areas. There is also the potential to adversely affect the aquatic environment. However there is also the potential to enhance habitats and species diversity. These effects are dealt with in the sections below.

Designated Sites

- 8.12.6 There are no statutory designated sites with potential habitat connections to the development site. There is one non statutory site with links to the development site, that of the Kello Water FLS Nature Reserve.
- 8.12.7 The main risk is from silt and other pollutants during the construction phase of the wind farm which has the potential to affect the integrity of the watercourse and the wildlife utilising it. This is considered to be potentially of **medium magnitude** and of **moderate significance**.

Habitats

Impacts of Construction

- 8.12.8 Direct impacts of construction take the form of loss of habitat through land-take for infrastructure construction such as turbine bases, access tracks, site compound, electricity substation and borrow pits.
- 8.12.9 Indirect impacts of construction include: changes to existing hydrology that could lead to detrimental changes in wetland habitats as a result of increased drainage and/or dewatering; increased pollution risk associated with accidental spillages of fuels and oils; increases in silt-laden run-off and fugitive dust emissions; changes in current land management (e.g. grazing regimes).
- 8.12.10 The dimensions used to calculate habitat loss are given in Appendix 8.11 and the amounts of the various habitats that will be lost due to the development footprint (based on the 500m buffer around the turbines).
- 8.12.11 A total of approximately 3.695 ha of habitat would be lost to the development. The direct impacts are generally considered to be **negligible**. There will be no loss of blanket bog or wet modified bog. There will be a small loss of 0.287 ha of dry modified bog. This equates to 0.277 ha at T2, 0.0058 ha at T3 and 0.0042 ha at the edge of the existing track where the new spur leads to T1 and T3. This community is the relatively poor quality M20b (dominated by hare's-tail cottongrass), in places transitional to acid grassland or wet heath. This is assessed as being of **low magnitude, permanent and of minor significance**.
- 8.12.12 There will be a loss of 0.755 ha of unimproved acid grassland and 0.277 ha of semi-improved acid grassland and 2.295 ha of marshy grassland. Direct impact on these other affected habitats is considered to be **minor, hence insignificant**, due to their small size.
- 8.12.13 There is **no loss** of GWDTE habitat.

Other Construction Impacts

- 8.12.14 During the construction phase there is scope generally for negative impacts on habitats through the following:
- Spillage of fuels and lubricants associated with vehicles and machinery;
 - Spillage of cement;
 - Leaching of alkalis into the soil during construction of the turbine bases;
 - Deposition of excavated material onto surrounding vegetation communities;
 - Disruption to the flow of groundwater;
 - Discharge of silt into watercourses.
- 8.12.15 Indirect impacts are also likely and are detailed below.

Short Term Impacts

- 8.12.16 If disturbed ground is left bare after all construction operations are completed, erosion of loose material is likely to take place after heavy rain, with a likely loss of soil and established

plant species through further erosion and with a risk of vegetation communities down-slope being buried and damaged.

- 8.12.17 Run-off carrying silt has high potential to pollute watercourses affecting aquatic vegetation and potentially fish and otters.

Long Term Impacts

- 8.12.18 Increased levels of drainage will arise following the construction of cut tracks and turbine crane hardstands. Where new cut tracks follow contour lines, down slope areas can be deprived of normal water flow as it may be diverted away by new drains that lie beside the tracks.
- 8.12.19 Significant negative impact is possible on wetland habitats such as bog, and marshy grassland.
- 8.12.20 Drying conditions would lead to the ground no longer being able to support the current diversity of water-loving plants and some conversion over time of habitats such as marshy grassland to dry grassland.
- 8.12.21 If disturbed soil is left bare for too long after working, for instance, along the edges of the tracks or around turbine areas and crane hardstanding, grasses or rushes are likely to temporarily benefit. These changes are likely to be noticed in a fairly short period of time. Prolific seeders, notably Soft Rush *Juncus effusus*, can colonise very quickly.
- 8.12.22 If these areas are sown with specific species in order to stabilise them, there is the further possibility of preferential grazing of these sown areas on the young fresh growth.
- 8.12.23 Direct outflow from cross drains onto wet areas with silty or saturated soil can cause damage to vegetation through scouring during times of heavy rainfall. The resulting erosion is very hard to repair and can lead to significant damage over a long period of time.
- 8.12.24 The positioning of tracks can cause fragmentation of habitat with a resulting loss of capacity for genetic exchange between the newly separated areas.
- 8.12.25 It is possible that construction materials foreign to the site may import seeds of plants that do not belong in the habitats or invasive pest species and permit their establishment on disturbed areas.
- 8.12.26 The construction will result in a mixture of temporary and permanent impacts. Many negative impacts will be negligible however some such as the drying of bog habitats, potential to disrupt the flow of groundwater within GWDTEs and water pollution are considered to be negative, of **medium magnitude, permanent** and of **moderate significance** and **reversible**.

Operational Impacts

- 8.12.27 Potential operational impacts include disturbance to flora and fauna resulting from turbine operation and maintenance and any changes in land management, such as changes to grazing.
- 8.12.28 Operational checks, servicing and repair will be undertaken on the turbines on a routine basis following the commissioning of the new wind farm. Since all movement of vehicles will be undertaken using the new access tracks there will be no additional disturbance to the habitats.

- 8.12.29 A possible impact is that run-off from the surfaces of the access tracks, could contaminate watercourses and water bodies.
- 8.12.30 No changes in the management of the site are expected following the construction of the wind farm. The open moorland and pasture will continue to be used for the grazing of livestock.
- 8.12.31 It is considered that this impact will be of **low magnitude, long term** and therefore of **minor significance** and **reversible**.

Species

Bats

- 8.12.32 No bat roosts were located. Bats were generally recorded at least half an hour after sunset and therefore it is considered likely that the roost locations are not on site and that bats are flying from some distance away to forage on site. Therefore it is considered unlikely that any roosts will be affected by construction of the wind farm. The effects of construction on bat roosts are therefore considered to be **negligible**.
- 8.12.33 Bats were recorded foraging and commuting in low numbers within the site. Therefore bats could potentially be directly impacted by loss of foraging/commuting habitat associated with construction of the wind farm, as well as indirect impacts via disturbance during the construction period. The majority of the bats recorded during the activity survey were along the watercourses and there is likely to be low impact on the moorland. The level of impact will be dependant on the time of year. If construction takes place during spring or summer, the negative impact has the potential to be greater. However as bats feed at night and return to roost early morning their activity time is likely to be out with construction hours. Negative impacts of construction are considered to be **of low magnitude, short term** and of **minor significance**.
- 8.12.34 The majority of the bats recorded foraging and commuting were for common and soprano pipistrelle, which are both common and widespread species but high flying and at risk of collision. Low numbers of bats were recorded crossing the moorland where the turbines are to be located. The impact on bats from the operational wind farm is considered to be of **low magnitude, long term** and **minor significance**.

Otters

- 8.12.35 There is the potential for impacts on otters through direct habitat loss and disturbance during the construction phase. However the turbine locations themselves are unlikely to impact on otters and the loss of habitat is considered **negligible**.
- 8.12.36 No otter holts and lie ups were recorded so no protected structure is likely to be impacted upon by turbine bases, tracks or any other infrastructure. Otters are foraging in the area and there is potential for some disturbance and displacement during construction. However disturbance and displacement during construction is considered to be of a **low magnitude, short term** and of **minor significance**.
- 8.12.37 There is potential for indirect impacts as a result of deterioration in water quality due to pollution incidents during construction. In addition, there is also the potential for otters to

become injured or trapped by falling into deep excavations associated with borrow pits or construction of turbine bases. The indirect negative impact of construction is considered to be of **medium magnitude, short term** and of **moderate significance**.

- 8.12.38 Although otters have been recorded within the site, it is considered that this species is unlikely to suffer any significant negative impacts from the operation of the wind farm. As otters are mostly active at dusk and dawn there is unlikely to be any significant disturbance to this species due to an increase in visitor numbers.

Badgers

- 8.12.39 There is unlikely to be any significant loss of habitat due to construction of the turbine bases and access tracks. No setts will be lost or disturbed as none were located within 100m of any part of the development. There will be a small loss of foraging habitat. However the negative impact on badgers due to habitat loss is considered to be **negligible**.

- 8.12.40 There could however be some disturbance to badgers during the construction phase, due to noise and vibration associated with construction activities, particularly the excavation of borrow pits. However no sett was located within 100m. As above with otters, there is also the potential for badgers to become injured or trapped by falling into deep excavations associated with borrow pits or construction of turbine bases. It is therefore considered probable that the negative impacts could be of **low magnitude, short term** and of **minor significance**.

- 8.12.41 Badgers are unlikely to suffer significant negative effects from the operational wind farm.

Brown Hares

- 8.12.42 There is a possibility of disturbance to leverets if construction takes place during the breeding season. Impacts are considered to be **negligible**.

Deer

- 8.12.43 There is some potential for negative impacts for red and roe deer during construction of the proposed wind farm. As deer leave their fawns lying in vegetation in spring, there is potential for disturbance. This is considered to be **short term** and of **low magnitude** and of **minor significance**.

Common Lizard

- 8.12.44 Common lizard has the potential to lose some habitat on the moorland section of the wind farm. Although the amount of direct habitat loss is very small and the impact is considered to be **negligible**.

- 8.12.45 However, there is the potential that there could be negative impacts during construction of the proposed wind farm through the risk of injury due to site clearance works. If ground clearance takes place from early spring to late summer there is the likelihood of disturbance to breeding habitat. If during autumn and winter, then there is the risk of disturbing hibernating animals. The impact is considered to be of **low magnitude, short term** and of **minor significance**.

- 8.12.46 It is likely that the negative impacts of the operating wind farm will be **negligible**.

Migratory salmonids

- 8.12.47 As the development is proposed for adjacent to the Kello Water containing migratory salmonids there is a possibility of a negative impact on the population due to silt and other water pollutants. The development has two main water crossings over the Thwarter Burn and Quintin's Burn although the crossings are near the upper reaches of the watercourses and they are small and mainly wet flushes. Culverts and bridges can cause problems for fish trying to pass upstream and downstream. The effects of construction and operation have the possibility of being of **medium magnitude, long term** and of **moderate significance**.

Amphibians

- 8.12.48 There will be a small loss of habitat for amphibians. If construction takes place during the spring or summer, there could potentially be an impact if there is silt run off into small ponds and construction on wetter areas of the moor. The effects of construction are considered to be **negligible**. The effects of the operational wind farm are considered **negligible**.

Decommissioning Impacts

- 8.12.49 Although difficult to anticipate the extent of impacts, which could result due to decommissioning of the site at this time, potential issues are likely to relate to disturbance associated with removal of turbines and turbine bases. Given that the vehicles involved in decommissioning will be able to use the existing infrastructure it is unlikely that there will be further significant habitat loss. Impact on protected species is expected to be similar to that during construction, if not slightly reduced.

Assessment of Cumulative Residual Effects

- 8.12.50 There are a number of other developments in the area, which need to be considered in terms of cumulative impacts. These include operational, consented/under construction and wind farm applications currently going through the planning process.
- 8.12.51 There are a large number of wind farms within 15km within the NHZ and adjacent NHZ within 15km. These include the existing Sanquhar Community Wind Farm, the consented Sanquhar II Community Wind Farm, Whiteside Hill Wind Farm and Sandy Knowe. Many of these are located on similar habitats.
- 8.12.52 Appendix 8.12 outlines the impacts on habitats and species at a number of adjacent wind farms less than 10km from Herds Hill for which EIAs were available.
- 8.12.53 The significant number of wind farms within the NHZ will mean a cumulative loss of a variety of habitats. There will be varying amounts of loss of several of the habitats of national value across all these sites. However, the majority of the EIAs conclude no or minor significant impacts to habitats. With mitigation at Herds Hill, the cumulative residual effect is therefore considered to be **negligible**.
- 8.12.54 With regard to species, these additional developments, together with the proposed wind farm are likely to result in some negative impacts due to additional direct loss of habitat suitable for foraging and refuge for the wildlife, which has been recorded in the area, as well as negative impacts due to higher levels of disturbance/displacement over a much wider area.

However as the proposal at Herds Hill would not appear to have a significant negative effect on species of conservation concern, the cumulative impact is considered to be **negligible**.

8.13 Mitigation

Construction Phase

- 8.13.1 A Habitat Management and Enhancement Plan (HMEP) including a Species and Habitat Protection Plan (SPP) will be written post planning consent as part of a programme of mitigation measures associated with the construction and operation of the wind farm. This will be designed to minimise any negative impacts on habitats and species. There is also the possibility of gaining a positive impact on the site through careful mitigation design to enhance existing retained habitats for notable species recorded on the site, which would assist the Council in discharging its biodiversity duty.
- 8.13.2 It is proposed that this HMEP will be a working document which will evolve following discussions between the Applicant, the landowners, the ECoW and organisations with responsibility for and an interest in key wildlife species such as the Biodiversity Officer, NatureScot and the RSPB to develop an effective and workable plan for the site. The priority will be to:
- Examine ways to minimise disturbance and possible problems for key species;
 - Examine how the value might be improved by changes in land management; and
 - Increase overall biodiversity through management targeted at specific species.
- 8.13.3 A brief outline of mitigation for each habitat and species is provided below, but will be covered in further detail in the HMEP.
- 8.13.4 An Ecological Clerk of Works (ECoW) will be employed to ensure compliance with planning regulations and to ensure the protection of habitats and wildlife.

Habitats

- 8.13.5 The locations for all infrastructure including turbine bases, tracks, borrow pit, site storage area and temporary construction compounds have already been designed and chosen to reduce impact on the most important habitats and avoidance of GWDTes.
- 8.13.6 The Construction and Environmental Management Plan (CEMP) will include a constraints map detailing all GWDTes. These will also be included in the SEPA Construction Site Licence with details on avoidance or measures to greatly reduce negative impacts. Prior to construction the footprint of the wind farm will be walked by the ECoW with the site engineer and the GWDTes identified with discussions regarding whether any amendments are required, these will be discussed with SEPA and any amendments made to the Construction Site Licence.
- 8.13.7 Improvements are likely to be possible by arranging a suitable micro-siting allowance enabling fine adjustments to be made in the field in consultation with the ECoW.
- 8.13.8 Bog enhancement will take place in the area to compensate for the loss of dry modified bog. There will be approximately 0.287 ha of bog lost and in keeping with good practice, ten times

- the amount minimum should be enhanced. Therefore, a minimum of 3ha of bog will be enhanced with the plan discussed with NatureScot prior to implementation.
- 8.13.9 Robust surface water management measures including suitably sized attenuation ponds in groups of three, silt traps and silt nets will be put in place following good practice and these will be overseen by and agreed with the ECoW. All locations of the pollution prevention measures will be detailed in the SEPA Site Construction Licence.
- 8.13.10 Construction phase impacts resulting from pollution by fuels, oil, servicing chemicals and leaching from cement will be avoided by the adoption of best working practices, choice of the most appropriate cement mix and design of servicing areas.
- 8.13.11 During construction, the working area will be kept to a minimum to avoid unnecessary peripheral habitat disturbance and the accumulation of unnecessary amounts of loose material that might be washed away during periods of heavy rain.
- 8.13.12 Good practice will be followed to design an effective drainage system to allow proper distribution of water to down slope areas. Where cut tracks are used these will have cross pipes inserted at suitable intervals to spread out the supply of water.
- 8.13.13 The outflow from cross drains will be carefully designed to vent diffusely, close to the ground, and will be positioned to avoid areas with silty or saturated soil.
- 8.13.14 Wherever necessary, floating tracks will be used to traverse mire habitats, allowing water to pass underneath the track, or through its lower layers. This will be necessary over areas of wet modified bog.
- 8.13.15 Where flush habitat has to be crossed an additional lower layer design will be used with perforated pipes spaced over the width of the flush and set within a matrix of open graded free draining material wrapped in separator geotextile.
- 8.13.16 Regular inspections will be made to check whether the drainage systems remain operating as intended. This should ensure a proper supply of water for sensitive communities.
- 8.13.17 Best practice will be employed during and after deep excavations for turbines and borrow pits. Settling ponds will be used to store excess water accumulating in the excavation areas. Clean filtered water from the settling ponds will be released in appropriate areas, maintaining water supply to downslope wetland communities.
- 8.13.18 Turves with vegetation representative of the site from excavation work will be stored for use in dressing the disturbed edges around the infrastructure. This will prevent the erosion of loose soil and colonisation by undesirable plant species.
- 8.13.19 No suggestions can be made to mitigate for fragmentation of habitat but this is almost certain to be of low significance.
- 8.13.20 Some of the habitat enhancement at Herds Hill will focus on improving the condition of the upland habitat complex of heathland and mire. These habitats have been subject to management drainage for many years and heavily grazed, leading to a loss of diversity. Much blanket bog has been slowly converted to poorer quality dry modified bog. The dry modified

bog has been identified as having the potential for recovery and would respond to a programme of grip-blocking and a reduction in grazing pressure.

- 8.13.21 Habitat enhancement will also include the establishment of cleuch woodland. At present very little broadleaved woodland exists at the site. The biodiversity of the site would be improved for many species including black grouse, merlin, and songbird populations and would enrich the available habitat for ring ouzel that has previously bred in the area. Native tree species will include hawthorn *Crataegus monogyna*, downy birch *Betula pubescens*, aspen *Populus tremula*, rowan *Sorbus aucuparia*, juniper *Juniperus communis* and willow species *Salix species*.

Species

Bats

- 8.13.22 To minimise the potential for disturbance to bats during the construction process, if construction works are undertaken during the active season for bats, it is recommended that construction activities are limited to daylight hours and no work is undertaken at dawn or dusk near to preferred foraging areas for bats. This would limit the potential for disturbance to bats by avoiding the need for night-time lighting on site, which could deter foraging around the site. It would also attract moths to the lights encouraging bats to feed around them.
- 8.13.23 To minimise the potential for collision, turbines will be placed a minimum distance of 50 m from tip of blade from forest edges.
- 8.13.24 Broad-leaved tree planting within the cleughs away from turbine locations will enhance foraging opportunities in these areas rather than over open moorland. Bat boxes will be erected in suitable locations such as at Drumbuie Farm and in woodland distant from the turbines.
- 8.13.25 If the above recommendations are put in place, this would reduce the potential of disturbance, displacement and collision on bats so that it is considered that a negative impact will be of a **low magnitude** and **of minor significance**.

Otters

- 8.13.26 The access track generally avoids crossing watercourses. A pre-construction survey for otters will be carried out to determine the current status of otter on the site at that time and ensure that, if there has been any recent change in otter activity around the site, any necessary mitigation measures, which have been proposed, can be implemented where necessary.
- 8.13.27 The ECoW, in liaison with the construction engineers, will ensure the location of the access tracks and structures are more than 30m from a potential holt or lie-up (100m for a breeding holt), a strict precautionary method of working will be set in place by the ECoW. This may necessitate an application for a European Protected Species Licence (EPSL) from NatureScot prior to any works being carried out. However, it may also be possible to avoid any potential for disturbance to otters by careful timing of the works and sensitive working methods, depending on the proximity of the holt/lie up to the works, and thereby avoid the need for a licence.

- 8.13.28 Any culverts or bridges will be designed with sufficient headroom to allow passage by otters along watercourses, including during spate conditions, and to maintain water quality and flow. This may necessitate the inclusion of ledges and diversionary fences to facilitate movement but the specific design will be agreed with SEPA/NatureScot prior to construction.
- 8.13.29 Any dense vegetation, beside watercourses, will be retained to provide suitable cover for lie-up areas and facilitate movement of otters through the site. Site contractors should be informed of any sensitive areas to ensure no accidental disturbance to holts or resting places.
- 8.13.30 If culverts or piping are to be stored on site, these will be capped to avoid entrapment of otters inside. In addition any excavations over 0.5m deep, such as turbine bases or borrow pits, will be covered over at night or ramped on one side to enable otters to escape if they fall in. Temporary fencing will also be installed around these excavations to avoid animals falling in.
- 8.13.31 Strict pollution prevention measures will be implemented to ensure no impacts on water quality, which could have indirect impacts on the otter population. These will include standard good practice measures to control silt levels, oil and fuel spills. Water monitoring will be carried out.
- 8.13.32 If all the above recommendations are put in place, it is considered that the impact of the construction of the wind farm is likely to be **negligible** and **not significant**. Enhancement measures for otter will also be implemented, including planting up riparian corridors within the cleughs to increase cover/refuge opportunities for this species. A number of attenuation ponds will be designed to be wildlife friendly and will be left on site for amphibians thus providing a food source for otters. If these enhancement measures are put in place it is probable that this may have a **positive** impact on otter within the Zone of Influence due to the additional cover facilitating movement through the site.

Badgers

- 8.13.33 A pre-construction check will be made on the site to check for any newly excavated setts, which could be impacted by the construction. If identified, a 30m buffer zone will be implemented around any setts to avoid any potential disturbance to badgers inside during the construction process. Disturbance will be avoided during the breeding season (December to June). These buffer zones will be set up by the ECoW on site who will monitor badger use of the site during construction to further assess the disturbance impacts associated with construction and advise construction workers if any changes are necessary. Setts within 100 m of a borrow pit will require a license from NatureScot and excavation of them will not take place during the period December to June. Exclusion of badgers from setts will not be considered unless it is really necessary.
- 8.13.34 Sources of seasonal food will be included in the HMEP such as planting of fruit trees e.g. gean, elder, apple and plum.
- 8.13.35 Planting of hawthorn will take place close to the setts to help protect them.
- 8.13.36 The mitigation which has been recommended to avoid otters becoming trapped in piping or excavations on site during the construction process will also ensure the protection of badgers. It is therefore extremely unlikely that there would be a significant impact on badgers due to

the construction of the proposed wind farm and negative impacts are considered to be **negligible**. Planting to improve foraging opportunities is likely to result in a **positive impact** on badgers.

Deer

- 8.13.37 Red and roe deer will benefit from the woodland planting as this will provide shelter. Checks of vegetation during ground clearance will ensure no impacts on fawns.

Brown Hares

- 8.13.38 Vegetation checks will also ensure leverets are not disturbed. Impacts are considered negligible.

Migratory salmonids

- 8.13.39 Robust surface water management measures will be put in place following good practice and overseen by the ECoW. Water quality monitoring will take place. All infrastructure will be located a minimum of 50 m from any watercourse. Any culverts and bridges will be designed to allow fish passage at all times, this will be carried out in conjunction with the Nith District Salmon Fishery. With these measures in place the impact can be reduced to a **low magnitude, short term**, possibly even **negligible** and **not significant**.

Reptiles

- 8.13.40 Carrying out ground clearance out with spring and summer months will minimise disturbance to reptiles. However there is the possibility of disturbing hibernating reptiles. Any suitable hibernaculums that require to be removed for construction such as stone walls will be deconstructed in July (post breeding and prior to hibernation). This will be overseen by the ECoW. New hibernaculums will be constructed on site.
- 8.13.41 This should ensure minimum disturbance to reptiles and impacts can be considered to be **negligible**.

Amphibians

- 8.13.42 As with reptiles, avoiding ground clearance in spring and summer will minimise disturbance to amphibians.
- 8.13.43 Strict pollution measures during construction will minimise the risk of pollution to wet areas and ponds.
- 8.13.44 Habitat enhancement will also take place including creation of wildlife friendly attenuation ponds for construction which will be left on site following completion of construction.
- 8.13.45 This should ensure minimum disturbance to amphibians and any negative impact can be considered to be **negligible**.

Decommissioning Impacts

- 8.13.46 If the recommendations given above to avoid significant impacts on habitats and species during construction of the wind farm are also implemented during the decommissioning phase, it is probable that there would be no significant impacts during decommissioning of the wind farm site. However this would need to be re-assessed at a later stage taking into consideration the actual status of species and habitats present on the wind farm site at that time.

Cumulative Impacts

- 8.13.47 The primary concern regarding the assessment of cumulative effects is to identify situations where the effects on habitats and species although acceptable at an individual development may be more significant if combined with adjacent developments. With good practice and mitigation it is likely that there will be a small cumulative impact but this is considered to be **negligible**.

Residual Effects

- 8.13.48 Residual effects following mitigation are summarised in Appendix 8.13. Following mitigation, negative impacts on habitats will be of varying magnitudes but the majority can be considered to be of a **low magnitude** and of **minor significance**, possibly even **negligible, temporary and not significant**.
- 8.13.49 The impacts on protected species are all considered to be **low or negligible**.

8.14 Statement of Significance Summary

- 8.14.1 The scope of the ecological assessment was determined through a combination of desk study, fieldwork, consultation and analysis of data. Fieldwork included a Phase 1 habitat survey, NVC survey and field assessment for protected species.
- 8.14.2 It is considered that the development of the Herds Hill wind farm is likely to have few negative impacts on the habitats of the site. Measures are described to minimise the impact on habitats and compensatory measures will ensure that the negative impacts are of low magnitude of low significance or negligible.
- 8.14.3 There is potential to disturb and displace various protected species including bats, otters, badgers and reptiles. Care has been taken to avoid disturbance of protected species, negative impacts have been mitigated for and it will be possible to comply fully with wildlife protection legislation.

Appendix 8.1 — Survey Staff

Starling Learning is an ecological consultancy, habitat management and environmental education agency. Established in June 1996 and has six full time and several contract staff.

Liz Parsons and Joe Greenlees have worked with the company since 1996, Alan Wood since 1998, Diane Lyons and Davy Galbraith since 2004. The others have worked with the company for at least five years.

Ecological survey experience includes a wide range of habitat and protected species surveys at many wind farms and other sites.

Our clients are wide ranging and include wind farm companies, local authorities, conservation organisations, golf courses and other consultancies. A few examples are shown below:

Community Windpower

Spango 2012, 2013, 2016

Sanquhar, 2011, 2013, 2015, 2016, 2017 to 2018

Scoop Hill 2017 to 2020

Millour Hill, Dalry 2010 to 2011, 2015 to 2016, 2023

Aikengall, Dunbar. Spring 2004 and 2011 and 2013, 2015, 2016, 2018

We have acted as Ecological Clerk of Works at Aikengall I, Sanquhar, Sneddon Law, Dalry and Calder Water windfarms.

Clean Earth Energy

Merkland – 2022 to 2023

South Brownhill – 2022-2023

Low Drumclog – 2021

Rigmuir – 2021

ECoW for Rigmuir -2023

East Dunbartonshire Council

Wide range of ecological surveys including update of LNCSs

North Ayrshire Council

Update of LNCSs

Glasgow City Council

Glasgow Farmland Bird Surveys

NatureScot

Various surveys including Muirkirk and North Lowther Uplands breeding wader survey

AMEC

Dalry by- pass 2011, breeding bird survey

Greengairs Tip, 2012, breeding bird survey

Various windfarm ornithological surveys, 2013

Herds Hill Wind Farm

Survey staff	Occupation	Relevant qualifications and main experience
Liz Parsons	Director of Starling Learning	Has co-ordinated and assisted with many wind farm surveys since 2004. BSc (Hons) Geography/Geology 2.1, Strathclyde University
Alan Wood	Senior Ecologist and Ecological Clerk of Works	Very experienced ornithologist, fieldwork experience includes many surveys for the Scottish Ornithologists Club and British Trust for Ornithology as well as 16 years of experience with Starling Learning
Joe Greenlees	Senior Ecologist and Ecological Clerk of Works, Starling Learning	Has assisted with many wind farm surveys since 2004. Main experience includes ecological survey work of birds, and protected species. HNC Countryside Management, Barony College
David Galbraith	Ecological Surveyor, Starling Learning	Has assisted with many of the bird survey projects listed above. Carries out all habitat surveys for Starling Learning. GIS technician
Diane Lyons	Ecological surveyor, lead field teacher	Has assisted with many of the survey projects listed above. Main experience includes ornithological and mammal survey. BSc Countryside Management, Auchincruive.
Liam Anton	Ecological Surveyor, Starling Learning	Ecological surveyor since 2018
Gerry Devaney	Ecological Surveyor, Starling Learning	Ecological surveyor since 2018
Keith Watson	Botanist, contract staff	Has worked as contractor for Starling Learning since 2008. He is the BSBI recorder for Renfrewshire and has extensive experience of botanical survey.

Appendix 8.2 — Remote Detector Locations

Detector Number	Location	Dates	Recording times (hrs)
1	NS 72965 09074	20/04/2023 to 30/04/2023 22/06/2023 to 02/07/2023 30/08/2023 to 09/09/2023	21.00 to 05.45
2	NS 73130 08250	20/04/2023 to 30/04/2023 22/06/2023 to 02/07/2023 30/08/2023 to 09/09/2023	21.30 to 05.50
3	NS 72250 08560	20/04/2023 to 30/04/2023 22/06/2023 to 02/07/2023 30/08/2023 to 09/09/2023	21.35 to 05.30

Appendix 8.3 – Designated Sites within 20 km of Herds Hill
Statutory Sites

Site Name and Designation	Distance from Site	Reasons for Designation	Potential for Impacts
European Designated Sites			
Upper Nithsdale Woods SAC (various sites)	10km & 15km	Broad-leaved, mixed and yew woodlands.	No direct habitat connections. No potential for impacts.
Muirkirk and North Lowther Uplands SPA	4km	Aggregations of breeding and wintering upland birds.	No direct habitat connections No potential for impacts.
Tynron Juniper Wood SAC	18km	Juniper on heaths or calcareous sands	No direct habitat connections. No potential for impacts.
Airds Moss SAC	17 km	Blanket Bog	No direct habitat connections No potential for impacts.
National Designated Sites			
Polhote and Polneul Burns SSSI	3km	A geological SSSI comprising two burns draining into the Nith. The valleys of the burns feature important exposures.	No direct habitat connections. No potential for impacts.
Nith Bridge SSSI	15km	Quaternary geology and geomorphology	No potential for impacts.
Fountainhead	7km	A geological SSSI on Hare Hill east of New Cumnock that is the site of a former antimony mine.	No direct habitat connections. No potential for impacts.
Lagrae Burn SSSI	5km	Upper carboniferous stratigraphy.	No direct habitat connections No potential for impacts.
North Lowther Uplands SSSI (subsumed within Muirkirk and North Lowther Uplands SAC)	4 km	Aggregations of breeding and wintering upland birds.	No direct habitat connections No potential for impacts.
Chanlockfoot SSSI	10 km	Upland mixed Ash woodlands.	Directly adjacent to Scour Water. Possible potential for impacts.
Stenhouse Wood SSSI	18 km	Upland mixed ash wood	No direct habitat connections No potential for impacts.
Back Wood SSSI	4 km	Broad-leaved, mixed and yew woodlands.	No direct habitat connections No potential for impacts.

Herds Hill Wind Farm

Mennoch Water SSSI	12 km	Aggregations of breeding birds.	No direct habitat connections No potential for impacts.
Muirkirk Uplands SSSI	4 km	Aggregations of breeding birds.	No direct habitat connections No potential for impacts.
Coshogle Wood SSSI	13 km	Broad-leaved, mixed and yew woodland/Upland oak woodland	No direct habitat connections No potential for impacts.
Carron Water and Hapland Burn SSSI	15.3 km	Igneous petrology/ stratigraphy	No direct habitat connections No potential for impacts.
Leadhills- Wanlockhead SSSI	17 km	Mineralogy	No direct habitat connections No potential for impacts.
Shiel Dod SSSI	19 km	Upland habitat assemblage	No direct habitat connections No potential for impacts.

Appendix 8.4 – Non-statutory Sites (representative sample for Ancient Woodland and Long-established Woodland sites)

Site Name and Designation	Distance from Site	Reasons for Designation	Potential for Impacts
Listed Wildlife Sites			
Glenmaddie Wood	2.5 km	Upland ash wood	No direct habitat connections No potential for impacts.
Ancient woodland/Long-established woodland sites			
Burnfoot Belt	700m	Ancient woodland of semi-natural origin	No direct habitat connections No potential for impacts.
Barr Plantation	1.5 km	Long established woodland of plantation origin	No direct habitat connections No potential for impacts.
Un-named	1.5 km	Long-established woodland of plantation origin	No direct habitat connections. No potential for impacts.
Libry Moor Plantation	1.5km	Long-established woodland of plantation origin	No direct habitat connections. No potential for impacts.
Corserig Plantation	700m	Long-established woodland of plantation origin	No direct habitat connections. No potential for impacts.
Other sites			
Kello Water	0.5 km	FCS Natural Reserve	Tributaries of the Kello within the development. Possible potential for impacts.

Appendix 8.5 – Desktop Results Habitats and Species

Common Name	Source	Location and distance from development
HABITATS		
Blanket Bog	FCS	In areas adjacent to Corserig and Polskeoch Forests 1km
Blanket mire communities	Sanquhar II Wind Farm ES	
Wet modified bog	Lorg Wind Farm ES	1km
Upland Heathland	FCS Lorg Wind Farm ES	In areas adjacent to Corserig and Polskeoch Forests 1km
Marshy grassland	Sandy Knowe ES	2 km
Woodland and scrub	FCS	In areas adjacent to Corserig and Polskeoch Forests
Acid Grassland	FCS Sandy Knowe ES	In areas adjacent to Corserig and Polskeoch Forests 2km
Rock Exposures	FCS	In areas adjacent to Corserig and Polskeoch Forests
PLANT SPECIES		
Hairy Stonecrop <i>Sedum villosum</i>		Corserig, 1km
Juniper <i>Juniperus communis</i>	Sanquhar I Wind Farm ES SWSEIC FCS	Kello Water Corserig, 1km
Field Gentian <i>Gentianella campestris</i>		Corserig, 1km
Filmy Fern <i>Hymenophyllum species</i>		Kello Water
Northern Bedstraw <i>Galium boreale</i>		Corserig, 1km
Mountain Everlasting <i>Anntennaria dioica</i>		Corserig, 1km
MAMMALS		
Red Squirrel <i>Sciurus vulgaris</i>	FCS	Corserig and Polskeoch Forest, directly adjacent
Otter <i>Lutra lutra</i>	FCS Harehill Wind Farm Extension ES Sanquhar I Wind Farm Sandy Knowe ES	Watercourses in the Corserig and Polskeoch areas Polstacher Burn, 2km and Bottom Burn, 1km Lie up on Glengap Burn, 1 km and records on Kello Water, Polneul Burn, Polhote Burn, Polbroc Burn and Polmeur Burn, 2 km
Badger	FCS Sandy Knowe ES	Corserig and Polskeoch Forest, 1km Badger setts recorded, 1km
Common Pipistrelle <i>Pipistrellus pipistrellus</i>	Sandy Knowe Wind Farm ES	Activity, 2km

Herds Hill Wind Farm

Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	Sanquhar I Wind Farm ES Sandy Knowe ES	Kello Water Activity, 2km
Daubenton's Bat <i>Myotis daubentonii</i>	Sandy Knowe Wind Farm ES	1 bat recorded, 2 km
Mountain Hare <i>Lepus timidus</i>	Hare Hill Wind Farm ES	Known to occur in the area
Red Deer <i>Cervus elaphus</i>	FCS	Corserig and Polskeoch Forest
Roe Deer <i>Capreolus capreolus</i>	FCS	Corserig and Polskeoch Forest
FISH		
Atlantic Salmon <i>Salmo salar</i>	FCS Nith District Salmon Fishery Board	Kello Water and Nith
Brown/Sea Trout par and fry <i>Salmo trutta</i>	FCS Nith District Salmon Fishery Board	Kello Water and Nith
European Eel <i>Anguilla anguilla</i>	Nith District Salmon Fishery Board Various web sites on the Nith	Nith, 2.2 km
Sea Lamprey <i>Petromyzon marinus</i>	Nith District Salmon Fishery Board Various web sites on the Nith	Nith, 2.2 km
River Lamprey <i>Lampetra fluviatilis</i>	Various web sites on the Nith	Nith, 2.2 km
Brook Lamprey <i>Lampetra planeri</i>	Various web sites on the Nith	Nith, 2.2 km
REPTILES AND AMPHIBIANS		
Common Lizard <i>Zootoca vivipara</i>	Sanquhar I Wind Farm	Mid Hill, 2.5km
Common Toad <i>Bufo bufo</i>		Various records in 10km
Common Frog <i>Rana temporaria</i>		Various records in 10km
Adder <i>Vipera berus</i>	Amphibian and Reptile Conservation Trust	NS7000 and NS 6000

Appendix 8.6 – Phase 1 Target Notes

No.	Grid Reference (NS)		Description
1	73185	08346	Deep peat (over 50cm) with graminoid bog (but local ericoid elements) with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Carex nigra</i> , <i>Juncus squarrosus</i> , <i>Erica tetralix</i> , <i>Eriophorum angustifolium</i> , <i>Vaccinium oxycoccos</i> , <i>Drosera rotundifolia</i> , <i>Sphagnum fallax</i> , <i>Polytrichum commune</i> , local <i>S. capillifolium</i> and <i>S. papillosum</i> ; frequent hummocks with <i>Vaccinium myrtillus</i> , <i>Deschampsia flexuosa</i> and hypnoid mosses).
2	73174	08313	Local ridges (some rock) with acid grassland (<i>Juncus squarrosus</i> , <i>Deschampsia flexuosa</i> , <i>Anthoxanthum odoratum</i> , <i>Vaccinium myrtillus</i>) and lining drain margins; latter with <i>Juncus effusus</i> and much <i>Sphagnum fallax</i> plus <i>Carex nigra</i> , <i>Potentilla erecta</i> and some <i>Epilobium palustre</i> .
3	73164	08280	Graminoid bog on deep peat of raised area with <i>Eriophorum vaginatum</i> and <i>Sphagnum fallax</i> plus <i>Erica tetralix</i> , <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Deschampsia flexuosa</i> , <i>Carex nigra</i> , <i>Drosera rotundifolia</i> , <i>Empetrum nigrum</i> , <i>Calluna vulgaris</i> , <i>Sphagnum capillifolium</i> , <i>S. papillosum</i> , <i>Aulacomnium palustre</i> and <i>Polytrichum commune</i> ,
4	73164	08397	Fence area with rather intermediate relic graminoid bog (patchy <i>Eriophorum vaginatum</i> but frequent <i>Sphagnum fallax</i>) grading to wet acidic grassland (<i>Juncus squarrosus</i> , <i>Festuca ovina</i> , <i>Deschampsia flexuosa</i> increasing)
5	73205	08408	Graminoid bog with <i>Eriophorum vaginatum</i> , <i>Sphagnum fallax</i> and <i>Polytrichum commune</i> , plus much <i>Molinia caerulea</i> and <i>Vaccinium myrtillus</i> plus <i>Trichophorum germanicum</i> , <i>Erica tetralix</i> , <i>Carex nigra</i> and occasional <i>Polytrichum strictum</i> hummock.
6	73136	08469	Acidic grassland slope here wetter and with some wet heath (or bog) relics with <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> and <i>Sphagnum</i>
7	73118	08414	Rather intermediate boggy slope (some wet heath like) with <i>Eriophorum vaginatum</i> , <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Carex nigra</i> , <i>Juncus squarrosus</i> , <i>Deschampsia flexuosa</i> , <i>Calluna vulgaris</i> , <i>Polytrichum commune</i> and <i>Sphagnum</i> spp.
8	73089	08471	Large <i>Juncus mire</i> with <i>Sphagnum</i> , varying though with <i>Juncus acutiflorus</i> and <i>Juncus effusus</i> dominated zones; locally some herbs along flushed burn sides.
9	72996	08473	Boggy area (peat c. 40 – 50cm) with deep drains, but often grading to similar looking acidic grassland; <i>Eriophorum vaginatum</i> , <i>Sphagnum fallax</i> and <i>Polytrichum commune</i> plus <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Deschampsia flexuosa</i> , <i>Festuca ovina</i> and <i>Potentilla erecta</i> .
10	72970	08414	Bog cell with locally diverse species including <i>Trichophorum germanicum</i> , <i>Erica tetralix</i> , <i>Narthecium ossifragum</i> , <i>Empetrum nigrum</i> , <i>Vaccinium oxycoccos</i> and <i>Sphagnum papillosum</i> .
11	73003	08351	Drier ridge with <i>Deschampsia flexuosa</i> , <i>Molinia caerulea</i> , <i>Carex nigra</i> , <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> and hypnoid mosses but much <i>Juncus</i> marsh about drains.
12	72992	08318	Boggy area (peat 50cm +) with <i>Eriophorum vaginatum</i> , <i>Vaccinium myrtillus</i> , <i>Molinia caerulea</i> , <i>Deschampsia flexuosa</i> , <i>Trichophorum germanicum</i> , <i>Erica tetralix</i> and <i>Sphagnum capillifolium</i> .

Herds Hill Wind Farm

13	72896	08241	Bog with <i>Eriophorum vaginatum</i> and <i>Sphagnum fallax</i> and <i>Polytrichum commune</i> (some <i>S. papillosum</i>) plus <i>Vaccinium myrtillus</i> , <i>Deschampsia flexuosa</i> , <i>Carex nigra</i> , <i>Trichophorum germanicum</i> and <i>Erica tetralix</i> .
14	73024	08227	Extensive <i>Eriophorum vaginatum</i> – <i>Sphagnum</i> bog, with <i>Juncus squarrosus</i> , <i>Potentilla erecta</i> , <i>Vaccinium myrtillus</i> , <i>Deschampsia flexuosa</i> , <i>Carex nigra</i> and <i>Polytrichum commune</i>
15	73066	08236	Long wet flush with much <i>Carex nigra</i> plus <i>Sphagnum</i> , <i>Eriophorum vaginatum</i> , <i>Potentilla erecta</i> , <i>Epilobium palustre</i> and <i>Vaccinium oxycoccos</i> .
16	73113	08265	Tussocky <i>Eriophorum vaginatum</i> with <i>Vaccinium myrtillus</i> , <i>Deschampsia flexuosa</i> , <i>Juncus squarrosus</i> , <i>Molinia caerulea</i> , <i>Trichophorum germanicum</i> , <i>Erica tetralix</i> , <i>Sphagnum fallax</i> , <i>Polytrichum commune</i> and some hummocks with <i>Sphagnum capillifolium</i> and <i>Polytrichum strictum</i> .
17	73262	08254	Broad block between fences of disturbed peaty soil (difficult to categorise) with scattered <i>Juncus effusus</i> , <i>J. bulbosus</i> , <i>Agrostis canina</i> , <i>Deschampsia flexuosa</i> and occasional <i>Sphagnum</i> (south side more mire like).
18	73180	08219	Much bare peat with prominent <i>Deschampsia flexuosa</i> but also some bog elements colonising: <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> , <i>Potentilla erecta</i> , <i>Carex nigra</i> and <i>Juncus bulbosus</i> .
19	73119	08116	Extensive tussocky graminoid bog (on deep peat): <i>Eriophorum vaginatum</i> plus <i>Deschampsia flexuosa</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Carex nigra</i> , <i>Sphagnum fallax</i> and <i>Polytrichum commune</i> , plus local <i>Calluna vulgaris</i> , <i>Trichophorum germanicum</i> , <i>Erica tetralix</i> , <i>Vaccinium oxycoccos</i> , <i>Empetrum nigrum</i> , <i>S. capillifolium</i> and <i>S. papillosum</i> .
20	73339	08213	Over wall bog edges with much <i>Calluna vulgaris</i> (often tall and leggy) with <i>Eriophorum vaginatum</i> , <i>Empetrum nigrum</i> and <i>Sphagnum capillifolium</i> ; below <i>Juncus effusus</i> – <i>Sphagnum</i> mire (gullies and drains).
21	73307	08164	Tussocky <i>Eriophorum vaginatum</i> bog with <i>Deschampsia flexuosa</i> , <i>Polytrichum commune</i> , <i>Pleurozium schreberii</i> , <i>Carex nigra</i> , <i>Vaccinium myrtillus</i> , <i>Potentilla erecta</i> , <i>Erica tetralix</i> , <i>Empetrum nigrum</i> and occasional <i>Dryopteris fern</i> (some <i>D. carthusiana</i>); <i>Calluna vulgaris</i> increases to the west.
22	73270	08107	Bog more diverse with increasing <i>Calluna vulgaris</i> (much tall and leggy but seems much dieback), with <i>Vaccinium oxycoccos</i> , <i>Dr</i> , <i>Empetrum nigrum</i> , <i>Sphagnum capillifolium</i> and <i>Polytrichum strictum</i> .
23	73182	08034	Fairly diverse bog with <i>Eriophorum vaginatum</i> and <i>Calluna vulgaris</i> plus <i>Erica tetralix</i> , <i>Vaccinium oxycoccos</i> , <i>Drosera rotundifolia</i> and bog-moss includes some <i>Sphagnum magellanicum</i> .
24	72399	08357	Steepening slope with better draining (but still flushed) grassland with frequent <i>Nardus stricta</i> and <i>Carex</i> spp., but also much <i>Juncus acutiflorus</i> , either in flushes down slope or along the lower slopes (merging with lower lying more acidic bog margin rush dominated mire).
25	72153	08370	Graminoid bog spills down slope and meets lower-lying bog along leveller ground; the latter with more typical bog elements (but still appearing graminoid and otherwise similar); species include <i>Eriophorum vaginatum</i> , <i>Trichophorum germanicum</i> , <i>Erica tetralix</i> , <i>Molinia caerulea</i> , <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Vaccinium oxycoccos</i> , <i>Drosera rotundifolia</i> <i>Sphagnum fallax</i> and <i>S. papillosum</i> . Some peat edges to north (but graminoid bog continues below – with some mire gullies or drains).
26	72268	08427	Quite diverse but graminoid bog (<i>Eriophorum vaginatum</i> , <i>Trichophorum germanicum</i> , <i>Erica tetralix</i> , <i>Molinia caerulea</i> , <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Vaccinium oxycoccos</i> , <i>Drosera rotundifolia</i> and <i>Sphagnum</i> spp.); undulating bog surface with some wetter hollows (more <i>Sphagnum</i>) and drier

Herds Hill Wind Farm

			ridges (with <i>Deschampsia flexuosa</i> , <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> and <i>Sphagnum capillifolium</i>).
27	72231	08506	Upper area of leveller ground with deep peat and relic bog (or wet heath) vegetation but short grazed: <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Eriophorum vaginatum</i> , <i>Deschampsia flexuosa</i> , <i>Potentilla erecta</i> , <i>Drosera rotundifolia</i> and mosses include <i>Sphagnum papillosum</i> , <i>S. fallax</i> , <i>S. capillifolium</i> , <i>S. magellanicum</i> and <i>Aulacomnium palustre</i> .
28	72250	08562	Acidic grassland on upper slope with <i>Festuca ovina</i> , <i>Deschampsia flexuosa</i> , <i>Juncus squarrosus</i> , <i>Agrostis canina</i> prominent, but few herbs (some <i>Potentilla erecta</i>) and hypnoid mosses; locally wetter and flushed with much <i>Carex nigra</i> and some short-grazed <i>Molinia caerulea</i> .
29	72306	08475	Wet acidic grassland and bog (peat c. 40cm +) with <i>Juncus squarrosus</i> but also much <i>Trichophorum germanicum</i> , <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> , <i>Erica tetralix</i> and <i>Sphagnum</i> .
30	72108	08438	<i>Juncus acutiflorus</i> with <i>Sphagnum</i> spills from bog but becoming increasingly minerotrophic as it feeds extensive rush pasture below (<i>Myosotis secunda</i> , <i>Equisetum fluviatile</i> , <i>Ranunculus flammula</i> , <i>Galium palustre</i>).
31	72050	08502	Burnside slopes with mix of less acidic grassland (mostly) and <i>Juncus</i> flushes; steeper sides (some rock exposure) with <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Oreopteris limbosperma</i> , <i>Digitalis purpurea</i> , <i>Alchemilla glabra</i> , <i>Veronica officinalis</i> , <i>Chamerion angustifolium</i> and <i>Hieracium triviale</i> .
32	72115	08628	Extensive hill slope with drained rush pasture dominated by <i>Juncus acutiflorus</i> with <i>Holcus lanatus</i> , <i>Agrostis canina</i> , <i>Juncus effusus</i> , <i>Deschampsia cespitosa</i> , <i>Cirsium palustre</i> , <i>Potentilla erecta</i> , <i>Ranunculus flammula</i> , <i>Epilobium palustre</i>).
33	72195	68636	Up slope wet flushed grassland with much <i>Carex nigra</i> plus <i>Juncus squarrosus</i> , <i>Deschampsia flexuosa</i> , <i>Festuca ovina</i> , <i>Molinia caerulea</i> , <i>Potentilla erecta</i> and hypnoid mosses; some local patches with <i>Sphagnum</i> and <i>Polytrichum commune</i> .
34	72286	08635	Spill of wet acidic grassland <i>Festuca ovina</i> , <i>Deschampsia flexuosa</i> , <i>Molinia caerulea</i> , <i>Nardus stricta</i> , <i>Juncus squarrosus</i> , <i>Potentilla erecta</i> and <i>Carex nigra</i> .
35	72335	08643	<i>Juncus acutiflorus</i> rush pasture dominates hillside slope (drained) with <i>Agrostis canina</i> , <i>Holcus lanatus</i> , <i>Anthoxanthum odoratum</i> , <i>Molinia caerulea</i> , <i>Ranunculus acris</i> , <i>Rumex acetosa</i> , <i>Potentilla erecta</i> , <i>Cirsium palustre</i> and <i>Viola palustris</i> .
36	72477	08607	Leveller shoulder between ridge and hill slope supporting relic bog: <i>Eriophorum vaginatum</i> and <i>Sphagnum fallax</i> with <i>Calluna vulgaris</i> , <i>Trichophorum germanicum</i> , <i>Vaccinium myrtillus</i> , <i>Carex nigra</i> , <i>Juncus squarrosus</i> , <i>Vaccinium oxycoccos</i> , <i>Drosera rotundifolia</i> , <i>Sphagnum papillosum</i> , <i>S. capillifolium</i> , <i>S. magellanicum</i> , <i>Rhytidiadelphus loreus</i> and <i>Polytrichum strictum</i> .
37	73095	09092	Extensive hillside slope, with regular deep drains, dominated by rush pasture: <i>Juncus acutiflorus</i> with <i>Holcus lanatus</i> , <i>Agrostis canina</i> , <i>Anthoxanthum odoratum</i> , <i>Festuca rubra</i> , <i>Cynosurus cristatus</i> , <i>Poa</i> spp and occasional <i>Deschampsia cespitosa</i> ; herbs typically include <i>Cirsium palustre</i> , <i>Ranunculus acris</i> , <i>R. repens</i> , <i>Potentilla erecta</i> , <i>Trifolium repens</i> but only a few truly marshy species (these mainly in deep drains).
38	73136	09049	Rush pasture locally slightly drier with less rush but more prominent grasses (as, <i>Holcus lanatus</i> , <i>Festuca rubra</i> , <i>Nardus stricta</i>) but similar overall appearance and species.

Herds Hill Wind Farm

39	73191	09203	Ridge of more acidic grassland (but with rush) with <i>Nardus stricta</i> , <i>Agrostis canina</i> , <i>Festuca ovina</i> , <i>Anthoxanthum odoratum</i> , <i>Potentilla erecta</i> and some <i>Pedicularis sylvatica</i> and <i>Carex binervis</i>
40	73180	09257	Slightly gentler slope with a more acidic rush pasture (<i>Nardus stricta</i> , <i>Festuca ovina</i> , <i>Agrostis canina</i> , <i>Potentilla erecta</i> , <i>Carex nigra</i> , <i>Luzula multiflora</i>) but rather diffuse and mixed with less acidic indicators (e.g. <i>Ranunculus acris</i> , <i>Cirsium palustre</i> , <i>Festuca rubra</i> , <i>Trifolium repens</i>).
41	73124	09352	Hillside slope, with deep drains, dominated by rush pasture: <i>Juncus acutiflorus</i> with <i>Holcus lanatus</i> , <i>Anthoxanthum odoratum</i> , <i>Festuca rubra</i> , plus <i>Cirsium palustre</i> , <i>Ranunculus acris</i> , <i>Rumex acetosa</i> , <i>Potentilla erecta</i> , <i>Trifolium repens</i> , <i>Viola palustris</i> but with occasional more acidic element (<i>Carex nigra</i> , <i>Nardus stricta</i> , <i>Agrostis canina</i>).
42	73015	09345	Several drier ridges with short grazed more enriched pasture (and occasional soft-rush); pasture includes some <i>Cynosurus cristatus</i> , <i>Plantago lanceolata</i> , <i>Trifolium repens</i> and <i>Ranunculus</i> spp.
43	72972	09244	Extensive rush pasture <i>Juncus acutiflorus</i> with <i>Holcus lanatus</i> , <i>Agrostis canina</i> , <i>Anthoxanthum odoratum</i> , <i>Deschampsia cespitosa</i> , <i>Potentilla erecta</i> , <i>Trifolium repens</i> , <i>Ranunculus acris</i> , <i>Cirsium palustre</i> and <i>Prunella vulgaris</i> .
44	72967	09191	Rush pasture here locally more acidic (with <i>Nardus stricta</i> , <i>Agrostis canina</i> , <i>Carex panicea</i> , <i>Viola palustris</i> , <i>Potentilla erecta</i> , and some <i>Sphagnum</i>) but also more enriched elements such as <i>Holcus lanatus</i> and <i>Ranunculus acris</i> .
45	72839	09033	Extensive rush pasture <i>Juncus acutiflorus</i> with <i>Holcus lanatus</i> , <i>Anthoxanthum odoratum</i> , <i>Agrostis canina</i> , <i>Anthoxanthum odoratum</i> , <i>Poa humilis</i> , <i>Potentilla erecta</i> , <i>Rumex acetosa</i> , <i>Trifolium repens</i> , <i>Ranunculus acris</i> , <i>Cirsium palustre</i> and occasional <i>Nardus stricta</i> .
46	72872	09253	Steepening burn sides with short grazed, but freely draining acidic grassland; burn sides with some herbs (e.g. <i>Viola riviniana</i> , <i>Pilosella officinarum</i> , <i>Euphrasia</i> sp, <i>Carex flacca</i> , <i>Valeriana officinalis</i>) and ferns (<i>Dryopteris affinis</i> and some <i>Phegopteris connectilis</i>). Burn rocks with <i>Racomitrium aciculare</i> , <i>Rhynchostegium riparioides</i> , <i>Fontinalis antipyretica</i> , <i>Breutelia chryscoma</i> , <i>Philonotis fontana</i> and <i>Thamnobryum alopecurum</i> .
47	72749	09289	Steepening slope with much to frequent rush but grasses becoming more prominent (<i>Holcus lanatus</i> , <i>Deschampsia cespitosa</i> , <i>Anthoxanthum odoratum</i> , <i>Agrostis canina</i>).
48	72841	09346	Very steep escarpment slopes with acidic grassland plus ferns (including stands of bracken) and scattered hawthorns; <i>Juncus acutiflorus</i> forms steep flushes down gullies from above.
49	72886	09275	Steep sides and rocks with quite a high species diversity supporting ferns (<i>Oreopteris limbosperma</i> , <i>Athyrium filix-femina</i> and some bracken patches), <i>Crepis paludosa</i> , <i>Filipendula ulmaria</i> , <i>Luzula pilosa</i> , <i>Oxalis acetosella</i> and <i>Thymus polytrichus</i>).

Appendix 8.7 – NVC Descriptions

The following NVC communities were identified on the survey site as either communities in their own right or as components in intermediate communities. Site-specific descriptions of the vegetation and species occurring in each community can be found in Section 8.8 Phase 1 Habitat survey and NVC Communities survey. Further details of the vegetation at individual locations can be found in the target notes (Appendix 8.6).

M6 *Carex echinata-Sphagnum fallax/denticulatum* mire

NVC M6 mire present in the survey area is represented by M6c (dominated by *Juncus effusus*) and M6d (*Juncus acutiflorus* sub-community). Those sub-communities are characterised by the dominant rush species growing over a carpet of bog-mosses, mainly *Sphagnum fallax*, with some *Sphagnum palustre*, and frequently *Polytrichum commune*. Associates include *Carex nigra*, *Carex echinata*, *Agrostis canina*, *Viola palustris* and *Rumex acetosa*.

M15 *Trichophorum cespitosum-Erica tetralix* wet heath

Mixtures of *Trichophorum cespitosum*, *Erica tetralix*, *Calluna vulgaris* and *Molinia caerulea* define this habitat. Associates include *Narthecium ossifragum*, *Potentilla erecta* and *Eriophorum angustifolium*.

M19 *Calluna vulgaris-Eriophorum vaginatum* mire

Calluna vulgaris and *Eriophorum vaginatum* are predominant in this community that generally contains a lesser proportion of bog-mosses than either NVC M17 or NVC M18. Common vascular associates are *Vaccinium myrtillus*, *Eriophorum angustifolium* and *Empetrum nigrum*. On the highest ground there is often *Vaccinium vitis-idaea* and *Rubus chamaemorus*. Bog-mosses are typically represented by *Sphagnum capillifolium*, but wetter areas have *Sphagnum papillosum* and *Sphagnum fallax*. *Aulacomium palustre* can be also be present in wetter areas. Hypnoid mosses are frequent, including *Hypnum jutlandicum* and *Pleurozium schreberi*. Where bog-moss forms tight hummocks, there is often *Polytrichum strictum*.

M20 *Eriophorum vaginatum* mire

NVC M20 community is found on some of the high peaty ridges on the site - and often extends down shallow slopes – where grazing has been heavier. The chief characteristic of the vegetation is dominance by tussocky *Eriophorum vaginatum*. The community encompasses both Phase 1 categories of dry modified bog (E1.8) and wet modified bog, with *Molinia caerulea* playing an increased role in transitional communities (E1.7). The community is characterised by tussocky *Eriophorum vaginatum* domination, often with acid grassland elements and hypnoid mosses. This habitat is represented on site by the sub-community M20b *Calluna vulgaris-Cladonia* species sub-community. Bog-mosses are usually limited to *Sphagnum capillifolium* and *S. fallax*. Hypnoid mosses, *Hypnum jutlandicum*, *Pleurozium schreberi* and *Hylocomium splendens* are usually more prominent in the *Eriophorum* tussocks.

M23a *Juncus effusus/acutiflorus-Galium palustre* rush-pasture

This community is distributed through the site in ditches, along the margins of watercourses or in valley bottoms or on sloping ground within damp pastures. This habitat is represented on site by the sub-community M23a dominated by *Juncus acutiflorus*. The M23a *Juncus acutiflorus* sub-community

Herds Hill Wind Farm

can be quite species-rich with associates such as *Filipendula ulmaria*, *Galium palustre*, *Lotus pedunculatus*, *Mentha aquatica*, *Succisa pratensis*, *Lychnis flos-cuculi*, *Cirsium palustre*, *Viola palustris*, *Ranunculus* spp. and *Rumex acetosa*. Common mosses are *Calliergonella cuspidata*, *Polytrichum commune* and *Pseudoscleropodium purum*. Many heavily drained stands contain acid grassland elements, giving a type of vegetation not yet included in the NVC, and are difficult to code at NVC level.

MG6 *Lolium perenne*-*Cynosurus cristatus* grassland

NVC MG6 grassland is a common community of improved pastures. The sward often has little variety. *Lolium perenne* is usually the most abundant grass and there can be much *Cynosurus cristatus* and *Festuca rubra*. *Holcus lanatus*, *Dactylis glomerata* and *Poa* spp can be frequent. *Dicotyledonous* associates are *Trifolium repens*, *Cerastium fontanum*, *Plantago lanceolata*, *Ranunculus acris*, *Achillea millefolium* and *Bellis perennis*.

U4 *Festuca ovina*-*Agrostis capillaris*-*Galium saxatile* grassland

NVC U4 is a common community in acid grassland habitat where the underlying soils are less peaty and are more mineral-influenced. The defining characteristic is the presence of the named community grasses, *Festuca ovina* and *Agrostis capillaris*, as well as *Anthoxanthum odoratum* (NVC U4a). Other typical acid grassland species also occur, such as *Nardus stricta*, *Deschampsia flexuosa*, and *Luzula multiflora*. The most common herb associates are *Galium saxatile* and *Potentilla erecta*. *Rumex acetosa* and *Vaccinium myrtillus* can occur and can be frequent but not usually abundant. The most common moss species in general is *Rhytidiadelphus squarrosus* and there can be much *Pseudoscleropodium purum*. Other mosses such as *Pleurozium schreberi*, *Hylocomium splendens*, *R. loreus* and *Hypnum jutlandicum* are found more commonly in specific sub-communities. There are several examples of the *Holcus lanatus*-*Trifolium repens* sub-community U4b in areas where there has likely been some agricultural improvement.

U5 *Nardus stricta*-*Galium saxatile* grassland

A small proportion of the acid grassland is made up of this community, generally on steepening slopes, near burn sides, or free draining ridges but also on some of the higher ground and ridges where it is often associated with NVC U6 below. The defining characteristic is the dominance or abundance of the grass *Nardus stricta*. Typical associates are *Deschampsia flexuosa*, *Festuca ovina*, *Agrostis vinealis*, and *Anthoxanthum odoratum* and more local *Luzula multiflora*, *Carex binervis*, *C. pilulifera*, *C. panicea*, *Galium saxatile* and *Potentilla erecta*. *Vaccinium myrtillus* can be frequent but not usually abundant. Mosses include *Pleurozium schreberi*, *Hylocomium splendens*, *Rhytidiadelphus squarrosus*, *R. loreus* and *Hypnum jutlandicum*. NVC U5b sub-community is typical of the higher areas, where species such as *Deschampsia flexuosa*, *Carex nigra* and *Polytrichum commune* are well represented.

U6 *Juncus squarrosus*-*Festuca ovina* grassland

U6 grassland is characterised by an abundance of the rush species *Juncus squarrosus*. Graminoid associates include a limited range of common grass species such as *Festuca ovina*, *Deschampsia flexuosa*, *Nardus stricta*, *Agrostis vinealis*, *Agrostis canina* and *Anthoxanthum odoratum* and the wood-rush *Luzula multiflora*. The common herbs *Galium saxatile* and *Potentilla erecta* are usually present and there can be frequent *Vaccinium myrtillus*. The most common communities on sloping areas or where the ground has been subject to draining and heavy grazing are NVC U6c and U6d.

Herds Hill Wind Farm

Where the ground is more saturated, on flatter ground and on deep peat, the vegetation is represented by the NVC U6a sub-community, marked by *Eriophorum vaginatum* tussocks and the prominence of bog-mosses such as *Sphagnum capillifolium* and *S. fallax*.

Intergrading vegetation is found between NVC U6 and other grassland communities, as mentioned above. There are also intermediate stands of vegetation between NVC U6 and the various blanket bog and modified bog communities.

U20 *Pteridium aquilinum*-*Galium saxatile* community

NVC U20 is dominated by *Pteridium aquilinum*. The fern is accompanied by *Anthoxanthum odoratum*, *Festuca ovina*, *Holcus lanatus*, *Galium saxatile*, *Potentilla erecta* and *Rumex acetosa*. The mosses *Rhytidiadelphus squarrosus*, *Pseudoscleropodium purum* and *Hypnum jutlandicum* are common. This community is found in the steep sided watercourses where there are occasional trees.

Appendix 8.8 – Plant Species List

Scientific Name	Common Name
<i>Agrostis canina</i>	Velvet Bent
<i>Agrostis capillaris</i>	Common Bent
<i>Agrostis vinealis</i>	Brown Bent
<i>Alchemilla glabra</i>	Smooth Lady's-mantle
<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass
<i>Athyrium filix-femina</i>	Lady-fern
<i>Blechnum spicant</i>	Hard-fern
<i>Callitriche stagnalis sens. lat.</i>	Common Water-starwort
<i>Calluna vulgaris</i>	Heather
<i>Cardamine pratensis</i>	Cuckooflower
<i>Carex binervis</i>	Green-ribbed Sedge
<i>Carex echinata</i>	Star Sedge
<i>Carex flacca</i>	Glaucous Sedge
<i>Carex leporina</i>	Oval Sedge
<i>Carex nigra</i>	Common Sedge
<i>Carex panicea</i>	Carnation Sedge
<i>Cerastium fontanum</i>	Common Mouse-ear
<i>Chamerion angustifolium</i>	Rosebay Willowherb
<i>Cirsium arvense</i>	Creeping Thistle
<i>Cirsium palustre</i>	Marsh Thistle
<i>Cirsium vulgare</i>	Spear Thistle
<i>Crataegus monogyna</i>	Hawthorn
<i>Crepis paludosa</i>	Marsh Hawk's-beard
<i>Cynosurus cristatus</i>	Crested Dog's-tail
<i>Deschampsia cespitosa</i>	Tufted Hair-grass
<i>Deschampsia flexuosa</i>	Wavy Hair-grass
<i>Digitalis purpurea</i>	Foxglove
<i>Drosera rotundifolia</i>	Round-leaved Sundew
<i>Dryopteris affinis agg.</i>	Scaly Male-fern
<i>Dryopteris carthusiana</i>	Narrow Buckler-Fern
<i>Dryopteris dilatata</i>	Broad Buckler-fern
<i>Empetrum nigrum</i>	Crowberry
<i>Epilobium brunnescens</i>	New Zealand Willowherb
<i>Epilobium obscurum</i>	Short-fruited Willowherb
<i>Epilobium palustre</i>	Marsh Willowherb
<i>Equisetum fluviatile</i>	Water Horsetail
<i>Erica tetralix</i>	Cross-leaved Heath
<i>Erica vagans</i>	Cornish Heath
<i>Eriophorum angustifolium</i>	Common Cottongrass
<i>Eriophorum vaginatum</i>	Hare's-tail Cottongrass
<i>Euphrasia agg.</i>	Eyebright

Herds Hill Wind Farm

<i>Festuca ovina agg.</i>	Sheep's-fescue
<i>Festuca rubra agg.</i>	Red Fescue
<i>Filipendula ulmaria</i>	Meadowsweet
<i>Galium palustre</i>	Marsh-bedstraw
<i>Galium saxatile</i>	Heath Bedstraw
<i>Hieracium vulgatum</i>	Common Hawkweed
<i>Holcus lanatus</i>	Yorkshire-fog
<i>Holcus mollis</i>	Creeping Soft-grass
<i>Hypochaeris radicata</i>	Cat's-ear
<i>Juncus acutiflorus</i>	Sharp-flowered Rush
<i>Juncus bulbosus</i>	Bulbous Rush
<i>Juncus effusus</i>	Soft-rush
<i>Juncus squarrosus</i>	Heath Rush
<i>Lotus pedunculatus</i>	Greater Bird's-foot-trefoil
<i>Luzula campestris</i>	Field Wood-rush
<i>Luzula multiflora</i>	Heath Wood-rush
<i>Luzula pilosa</i>	Hairy Wood-rush
<i>Molinia caerulea</i>	Purple Moor-grass
<i>Myosotis secunda</i>	Creeping Forget-me-not
<i>Nardus stricta</i>	Mat-grass
<i>Narthecium ossifragum</i>	Bog Asphodel
<i>Oreopteris limbosperma</i>	Lemon-scented Fern
<i>Oxalis acetosella</i>	Wood-sorrel
<i>Pedicularis sylvatica</i>	Lousewort
<i>Phegopteris connectilis</i>	Beech Fern
<i>Picea sitchensis</i>	Sitka Spruce
<i>Pilosella officinarum</i>	Mouse-ear-hawkweed
<i>Plantago lanceolata</i>	Ribwort Plantain
<i>Plantago major</i>	Greater Plantain
<i>Poa humilis</i>	Spreading Meadow-grass
<i>Poa trivialis</i>	Rough Meadow-grass
<i>Polygala serpyllifolia</i>	Heath Milkwort
<i>Potamogeton polygonifolius</i>	Bog Pondweed
<i>Potentilla erecta</i>	Tormentil
<i>Prunella vulgaris</i>	Selfheal
<i>Pteridium aquilinum</i>	Bracken
<i>Ranunculus acris</i>	Meadow Buttercup
<i>Ranunculus flammula</i>	Lesser Spearwort
<i>Ranunculus repens</i>	Creeping Buttercup
<i>Rumex acetosa</i>	Common Sorrel
<i>Rumex acetosella</i>	Sheep's Sorrel
<i>Rumex obtusifolius</i>	Broad-leaved Dock
<i>Sagina filicaulis</i>	Upright Pearlwort
<i>Sagina procumbens</i>	Procumbent Pearlwort

Herds Hill Wind Farm

<i>Salix cinerea</i> subsp. <i>oleifolia</i>	Rusty Willow
--	--------------

<i>Scorzoneroideis autumnalis</i>	Autumn Hawkbit
<i>Senecio sylvaticus</i>	Heath Groundsel
<i>Sorbus aucuparia</i>	Rowan
<i>Stellaria alsine</i>	Bog Stitchwort
<i>Stellaria graminea</i>	Lesser Stitchwort
<i>Thymus polytrichus</i>	Wild Thyme
<i>Trichophorum germanicum</i>	Deergrass
<i>Trifolium repens</i>	White Clover
<i>Urtica dioica</i>	Common Nettle
<i>Vaccinium myrtillus</i>	Bilberry
<i>Vaccinium oxycoccos</i>	Cranberry
<i>Valeriana officinalis</i>	Common Valerian
<i>Veronica chamaedrys</i>	Germander Speedwell
<i>Veronica officinalis</i>	Heath Speedwell
<i>Veronica serpyllifolia</i>	Thyme-leaved Speedwell
<i>Viola palustris</i>	Marsh Violet
<i>Viola riviniana</i>	Common Dog-violet
Bryophytes	
<i>Aulacomnium palustre</i>	
<i>Breutelia chrysocoma</i>	
<i>Campylopus flexuosus</i>	
<i>Fontinalis antipyretica</i>	
<i>Hylocomium splendens</i>	
<i>Hypnum cupressiforme</i>	
<i>Hypnum jutlandicum</i>	
<i>Philonotis fontana</i>	
<i>Platyhypnidium riparioides</i>	
<i>Pleurozium schreberi</i>	
<i>Polytrichum commune</i>	
<i>Polytrichum strictum</i>	
<i>Racomitrium aciculare</i>	
<i>Rhytidiadelphus loreus</i>	
<i>Rhytidiadelphus squarrosus</i>	
<i>Sphagnum capillifolium</i>	
<i>Sphagnum fallax</i>	
<i>Sphagnum magellanicum</i>	
<i>Sphagnum palustre</i>	
<i>Sphagnum papillosum</i>	

Appendix 8.9 – Important Ecological Features (IEFs) – Habitats

Habitat Type	NVC Habitats	Nature Conservation Evaluation (Level of Ecological Value)	Site Value (Description)
Unimproved acid grassland and Semi improved acid grassland	U6 <i>Juncus squarrosus-Festuca ovina</i> grassland U5 <i>Nardus stricta-Galium saxatile</i> grassland U4 <i>Festuca ovina-Agrostis capillaris-Galium saxatile</i> grassland MG6 <i>Lolium perenne-Cynosurus cristatus</i> grassland	Local Lowland acid grassland is a Scottish Biodiversity list priority habitat UK BAP priority habitat (Lowland dry acid grassland) D&G LBAP priority habitat	LOW Acid grassland is the most extensive open habitat within the study area for the wind farm and is common and widespread in the uplands of Dumfries and Galloway. The habitat is generally species-poor due to heavy grazing over a long period. The habitat contributes to the open upland habitat mosaic. The grassland directly supports ground-nesting birds such as skylark and meadow pipit.
Marsh/marshy grassland	M23a <i>Juncus effusus/acuteiflorus-Galium palustre</i> rush-pasture	Local UK BAP priority habitat Upland flushes, fens and swamps. Regarded as a habitat of National importance but Local at this site.	LOW Marshy grassland is the second largest open habitat after acid grassland. The habitat contributes to the ecological mosaic and supports a small population of breeding waders.
Wet dwarf shrub heath	M15 <i>Trichophorum cespitosum-Erica tetralix</i> wet heath	County/District Annex I North Atlantic wet heaths with <i>Erica tetralix</i> Lowland heathland is Scottish Biodiversity List priority habitat UK BAP upland heaths D&G LBAP priority habitat	LOW Wet heath occupies a much smaller proportion of the site than the related bog habitats and the extensive dry heath. It occurs to the margins of bog habitats on damp slopes on thinner peat and forms a component in several areas of wet heath/acid grassland mosaic. It adds to the important mosaic of open habitats at the site.
Blanket bog	M6 <i>Carex echinata-Sphagnum fallax/denticulatum</i> mire M19 <i>Calluna vulgaris-Eriophorum vaginatum</i> mire M20 <i>Eriophorum vaginatum</i> mire	County Annex I Blanket bogs UK BAP Blanket bog D&G LBAP priority habitat Recognised as being of International value but of County value at this site	HIGH Blanket bog rich in <i>Sphagnum</i> mosses accounts for a relatively small proportion of the open upland habitats. It is confined to small and fragmented sections scattered throughout the site at locations where the ground has escaped heavy grazing or drainage over time. The habitat is a significant component within the important mosaic of upland habitats within the study area and lends much ecological diversity.
Wet modified bog	M20 <i>Eriophorum vaginatum</i> mire M25 <i>Molinia caerulea-Potentilla erecta</i> mire (and transitional communities)	County International (Blanket bog) UK BAP Blanket bog Scottish Biodiversity List priority Habitat	MEDIUM Wet modified bog is not at all extensive within the site but lends some ecological diversity as part of an important suite of open upland habitats and has good potential to be restored.
Dry modified bog	M20 <i>Eriophorum vaginatum</i> mire	County Annex I Blanket bogs UK BAP Blanket bog Scottish Biodiversity List priority Habitat	MEDIUM Dry modified bog is more extensive than the blanket and wet modified bog. This habitat too has good potential for restoration.
Acid/neutral flush	M6 <i>Carex echinata-Sphagnum fallax/denticulatum</i> mire	Local National (UK BAP 'Upland flushes, fens and swamps') D&G LBAP priority habitat UK BAP Blanket bog	LOW This habitat is not diverse botanically, but it contributes to the ecological mosaic and supports invertebrates and upland birds particularly in winter months.

Herds Hill Wind Farm

		Scottish Biodiversity List priority Habitat	
Running water	-	Regional Scottish Biodiversity List priority habitat UK BAP Priority Habitat, (Rivers) Kello Water FLS Nature Reserve	MEDIUM The Kello Water and its tributaries is a significant watercourse in the region.
Quarry	-	Negligible	LOW This habitat type has generally poor species diversity but can provide nesting habitat for gulls.



Appendix 8.10 – Important Ecological Features (IEFs) – Protected Species

Species	Conservation Importance at Herds Hill	Legal status	Nature Conservation Evaluation
Bats	High (National) but Low (Local) at Herds Hill	W & CA 1981 (as amended) and the EU Habitats Directive (EPS)	Schedule 2. European Protected Species – all bat species Scottish Biodiversity List Soprano Pipistrelle: UK BAP, D&G LBAP Scottish Biodiversity List and EPS; Common Pipistrelle, Noctule, Brown Long-eared bat, Scottish Biodiversity List and EPS
Otter	High (National)	W & CA 1981 (as amended) and the EU Habitats Directive (EPS) Schedule 6	European Protected Species Scottish Biodiversity List D&G LBAP
Badger	Low (Regional)	Protection of Badgers Act 1992 Protection under Schedule 6 of the W & CA Act 1981 (as amended)	Scottish Biodiversity List D&G LBAP
Roe deer	Low (Local)	Protected under the Deer (Scotland) Act 1996	Scottish Biodiversity List Red Deer listed as High Importance in D&G LBAP associated with Grassland and Heathland habitats and both Red and Roe associated with woodland habitats.
Brown Hare	Low (Local)	Protected under in the W & CA 1981 (as amended) in the closed season	Scottish Biodiversity List
Common Lizard	High (National) but Low (Local) at Herds Hill	Protected against killing under the W & CA 1981 (as amended)	Scottish Biodiversity List
Common Frog	Low (Local)	Section 9(5) of the W & CA 1981	A declining species in the UK
Common Toad	Low (Local)	Section 9(5) of the W & CA 1981	Scottish Biodiversity List
Migratory salmonids,	High (National)	Atlantic Salmon protected under Schedule 3 of the EU Habitats Directive (EPS)	UK BAP Dumfries and Galloway LBAP (apart from Trout) Scottish Biodiversity List



Appendix 8.11 – Loss of Habitat Herds Hill

Habitat loss is based on the following measurements:

Feature	Final Dimensions	Dimensions used for Habitat Loss
Turbine Foundations	20.5 x 20.5	28 x 28
Access Track	5m running width	10m width (to include cabling)
Crane Hardstanding	1500m ²	1925m ²
Temporary construction/site storage compounds	Variable to suit design	As mapped in GIS

The loss of habitat types to all wind farm infrastructure is detailed below:

Habitat Type	Loss of Habitat (ha)
A1.1.1 Semi-natural broad-leaved woodland	0
B1.1 Unimproved acid grassland	0.755
B1.2 Semi-improved acid grassland	0.277
B5 Marsh/marshy grassland	2.295
C1.1 Continuous bracken	0
C3.2 Non-ruderal	0
D2 Wet dwarf shrub heath	0
D6 Wet heath/acid grassland mosaic	0
E1.6.1 Blanket bog	0
E1.7 Wet modified bog	0
E1.8 Dry modified bog	0.287
E2.1 Acid/neutral flush	0
G1 Standing water	0
G2 Running water	0
I2.1 Quarry	unknown
J4 Bare ground	0.081
Total habitat loss	3.695 ha



Appendix 8.12 – Cumulative Impacts of Wind Farms and other Developments less than 10 km distant

Development	Habitat/species	Predicted Impacts
Sanquhar I	Blanket bog Protected species	Small loss of this habitat and some drying of bog habitats. Negligible impacts on species with mitigation.
Sanquhar II	Blanket bog Protected species	Small loss of this habitat and some drying of bog habitats. Negligible impacts on species with mitigation.
Whiteside Hill	Acid grassland, marshy grassland and modified bog Otter, Atlantic salmon and brown trout	Impacts to habitats considered to be of minor significance. Impacts on otter and fish of minor significance
Twentyshilling Hill	Wet modified bog Improved grassland Badger, Otter, Water Vole Bats	No significant effects are predicted as a result of constructing, operating and decommissioning of the proposed Twentyshilling Hill Wind Farm either alone or in combination with other schemes in the region
Sandy Knowe and Extension	Blanket bog, dry modified bog, marshy grassland, dry heath, acid grassland, acid/neutral flushes Otter Amphibians and reptiles Freshwater fish	Following mitigation negligible impacts on most habitats but positive for blanket bog and acid neutral flushes; Negligible effects on otter; Bats generally low and negligible with some positive effects; Generally negligible for amphibians and reptiles, some positive effects; Negligible for freshwater fish
Lorg	Dominated by dry modified bog, wet modified bog and marshy grassland. These habitats are affected by sheep grazing and artificial drainage which have degraded their conservation value. Otters, bats, badgers	No significant effects on any plant communities of high nature conservation value are predicted as a result of the Proposed Development. No significant effects are predicted on any animal species of high nature conservation value or any legally protected animal species. No significant cumulative effects on ecological receptors are predicted to occur.

Herds Hill Wind Farm

Glenmuckloch	Mire habitats Otter, badgers, bats, common lizard and migratory fish	Minor effects are identified for mire habitat. No effects are predicted for protected species
Afton	Acid grassland, wet modified bog Otter, Migratory salmonids, population of trout and grayling	Small loss of acid grassland and bog habitats Potential disturbance to otter Water pollution potentially a problem for fish. But through mitigation all impacts on ecology considered to be of minor significance
Windy Standard Brockloch Rig Windy Standard III	Dominated by mature conifer plantation, remnants of mire 'wet modified bog', grassland and heathland. Suitable habitat for otter and red squirrel, and field signs of these species were found during surveys. Potentially suitable foraging and commuting habitat for badger and bats, but not considered suitable for badger sett construction or for bat roosts, and levels of recorded bat activity were very low. Considered to be sub-optimal for pine marten and water vole, and no conclusive evidence of these species was observed.	The EIA for the original wind farm is no longer publically available and therefore no assessment regarding residual cumulative effects is possible. Assessment of effects on valued ecological receptors determined that the proposed Development, both alone and in combination with other developments within a 10 km radius, would have no greater than a low or negligible impact on ecological receptors and therefore no significant impacts in terms of the EIA regulations.
Penbreck/Carmacoup Wind Farm	Mainly conifer plantation, small areas of blanket bog and dry heath. No protected mammals were recorded.	Most of construction work predicted to affect low conservation value habitats therefore impacts insignificant, impacts to bog deemed to be minor. No significant ecological effects of the development.
Hare Hill and Hare Hill Extension	Bog, wet heath and acid grassland habitats Bats, Otter, Migratory salmonids	The EIA for the original wind farm is no longer publically available and therefore no assessment regarding residual cumulative effects is possible. For the extension, slight adverse insignificant effects on bog, wet heath and acid grassland habitats.

Herds Hill Wind Farm

		Slight adverse insignificant effects on bats, otters, reptiles and migratory salmonids
Ashmark Hill	Broad-leaved woodland, improved, acid, calcareous and marshy grassland, wet and dry modified bog Otters Bats	No information available on assessment of impacts.
Benbrack	Dominated by dry and wet modified bog and marshy grassland Otter, badger, bats	No significant effects are predicted on any plant communities of high nature conservation value. No significant effects are predicted on any animal species of high nature conservation value or any legally protected animal species. One scheme at application stage (South Kyle) was included in the cumulative impact assessment. No significant cumulative effects on ecological receptors are predicted to occur.
Blackcraig Hill	Otter Pine marten	A habitat loss totalling around 0.5% of the site area was predicted, with no more than a further 1.5% considered to be at risk of change due to the development. Provided the appropriate mitigation measures were adopted no significant effects were anticipated. Overall, with the proposed mitigation and best practice procedures, the development was expected to have a low impact on the ecology of the site.
Lethans and Extension	Blanket bog, valley mire, plantation woodland, water bodies Bats,	After mitigation measures have been implemented the residual impacts of the Development are considered to be of minor or negligible significance (not significant)
Longburn	Dominated by marshy and acid grasslands, modified bog and blanket bog. Otters, badgers, bats, brown trout, amphibians and reptiles	A number of the habitats within the site are potentially groundwater dependent; including flushes, various grasslands, bog (blanket and modified) and wet heath. All adverse residual effects will be reduced to negligible effects with the

Herds Hill Wind Farm

		<p>application of appropriate mitigation with the exception of minor adverse effects to otter and freshwater fish during the construction.</p> <p>Taking into consideration other wind farm developments, the Proposed Development is considered to have a moderate to minor cumulative adverse effect on the regional extent of blanket bog and groundwater dependant habitats. With regards to protected species, the Proposed Development is not expected to result in cumulative ecological effects greater than those predicted for the Proposed Development alone.</p>
Margree	<p>Blanket bog, marsh, marshy grassland, wet heath, raised bog</p> <p>Bats, otter, red squirrel, salmonids, freshwater pearl mussels</p>	<p>Implementation of the proposed mitigation measures will result in the overall effects on habitats and species of conservation interest being not significant in the long-term</p>
Over Hill	<p>Blanket bog, conifer plantation, marshy grassland</p> <p>Otter, red squirrel, bats, common lizard</p>	<p>Moderate adverse effects for bog habitats predicted, reduced with good practise and mitigation.</p> <p>Effects on bats considered negligible.</p> <p>Cumulative effects within 5 km considered insignificant.</p>
Pencloe	<p>Coniferous plantation, acid, marshy and neutral grassland, dry and wet dwarf shrub heath, blanket bog, flush</p> <p>Bats, otter, water vole</p>	<p>Provided that the peatland restoration and management measures are implemented, significant positive impacts are expected from the creation of 23.6 ha of peatland habitats. These measures greatly outweigh the permanent loss of 2.6 ha wet heath, blanket bog and flush throughout the application site and the additional 9.69 ha subject to disturbance.</p> <p>Diversifying the plantation with 181.5 ha of broadleaved woodland and increasing the cover of open habitats within 28.8 ha of land adjacent to watercourses are also likely to have significant positive impacts for a wide range of plant and animal species.</p>
Windy Rig	<p>Acid and marshy grassland, blanket bog, dry dwarf shrub heath</p>	<p>It has been assessed that no significant impacts are predicted for fauna and habitats identified within the</p>

Herds Hill Wind Farm

	Otter, bat, badger, red squirrel, pine marten	development area during construction, operation, and decommissioning.
The Rigg open cast coal development	Improved, semi improved, marshy and acid grassland Badgers, Otters, Bats, Water Voles	No effects have been predicted on the Muirkirk and Lowther Uplands SPA. Impacts on habitat within the site include the loss of 1km ² semi improved grassland, 10ha of semi improved acid grassland, 12ha of improved grassland and a minimal area of marshy grassland. Restoration has been predicted to improve biodiversity and there for there is predicted to be no long term residual impacts. The operation of the mine will result in the loss of 5ha of wet modified bog which cannot be restored after operation. The losses of all other habitats are considered to be not significant. There is not predicted to be any significant impacts on any protected species including badger, bats, otter and water vole.
Rigg North open cast coal development	Bats Otter	Short term minor significant impacts were predicted for all habitat types due to habitat loss. Bats and otter were predicted to be impacted by disturbance and loss of habitat during the operational stage. Both species were predicted to experience a Probable minor significance of effect. After operation a restoration programme which will result in a neutral effect on all receptors in the long term.
Glenmuckloch Surface Coal Mine	A range of heath, mire and grassland habitats over peat of varying depths, with larger areas of standing water. Smaller bog pools and wet flushes are also present throughout the wetter areas of the site. To the west, habitats are dominated by acid grassland	No significant impacts were predicted for protected species. It was considered that no adverse impact on the integrity of the SPA would result from the development.
Euchanhead	No significant impacts are anticipated for any habitats	Salmonids, reptiles- low impact and not significant

Herds Hill Wind Farm

	with the exception of M18 Blanket bog, where predicted losses to a regionally important habitat would result in a significant negative effect	Otter and bats – no significant impacts
--	---	---

Appendix 8.13 – Residual Effects

Feature and Type of Disturbance	Significance without Mitigation	Proposed Mitigation/Enhancement	Residual Significance
Designated Sites	No impacts	No impacts	No impacts
Non statutory designated sites	Kello Water, impacts of medium magnitude and of moderate significance.	Robust surface water mitigation measures, following good practice	Impacts of low magnitude, temporary and minor significance
Habitats	Loss of habitats, low in magnitude and of minor significance During construction, many negative impacts are considered to be of medium magnitude, of moderate significance and mainly temporary. Operational impacts are low magnitude, long term and of minor significance and reversible.	Position the turbines, access tracks and other infrastructure on habitats of lowest value, where possible, overseen by ECoW. Good practice followed, Habitat retention, management, and creation.	Extremely unlikely to have a long-term negative effect, therefore low magnitude and of minor significance.
Protected Species			
Bats	No bat roosts affected. The effects of construction low magnitude, temporary and of minor significance. During operation, due to risk of collision, negative impacts low magnitude, long term and minor significance	Limit working to daylight hours only to avoid need for artificial lighting. Attempt to create foraging habitat away from the turbines Provide bat boxes in suitable locations.	Improved roosting opportunities. Impacts low magnitude and of minor significance. Potential for some positive impact through provision of bat boxes and other habitat enhancements for foraging away from turbines.
Otters	Negligible negative impact due to direct habitat loss.	Pre-construction surveys.	Extremely unlikely to have a significant negative impact.

Herds Hill Wind Farm

	<p>Construction impacts on protected structures negligible, and temporary.</p> <p>However, negative impacts of medium magnitude, short term and of moderate significance due to potential pollution of watercourses.</p> <p>Operational impacts negligible.</p>	<p>Buffer around any holts, potential holts and lie-ups that are discovered during pre construction checks;</p> <p>Minimise watercourse crossings;</p> <p>Implementation of strict pollution prevention measures;</p> <p>All staff to be briefed on Otter structures;</p> <p>Cap culverts/pipes if stored overnight on site; and</p> <p>Cover excavations >0.5m deep or provide ramp, also temporary exclusion fencing.</p>	<p>Therefore negligible magnitude and not significant.</p>
Badgers	<p>No significant loss of habitat</p> <p>Disturbance during construction considered to be of low magnitude, temporary and of minor significance.</p>	<p>Pre-construction surveys.</p> <p>Buffer around any setts that are discovered during pre construction checks;</p> <p>All staff to be briefed on Badger structures;</p> <p>Cap culverts/pipes if stored overnight on site; and</p> <p>Cover excavations >0.5m deep or provide ramp, also temporary exclusion fencing.</p>	<p>Extremely unlikely to have a significant negative impact.</p>
Brown Hare	<p>Loss of habitat negligible.</p> <p>Construction and operational impacts negligible.</p>	<p>Ground clearance out with bird breeding season, or nest checks, this will include checks for hares.</p>	<p>Negligible magnitude and not significant.</p>
Roe Deer	<p>All impacts considered to be of a low magnitude, temporary and of a minor significance.</p>	<p>Ground clearance out with bird breeding season, or nest checks, this will include checks for fawns.</p>	<p>Negligible magnitude and not significant</p>

Herds Hill Wind Farm

Common Lizard	All impacts considered to be negligible	Checks for animals if ground clearance takes place in spring and summer. Hibernation checks	Negligible magnitude and not significant
Amphibians	Effects of construction low magnitude of minor significance. The effects of the operational wind farm are considered negligible.	Ground clearance out with breeding season, ponds created for amphibians	Impacts considered negligible with some positive effects.
Migratory salmonids	Impacts of construction could potentially be of medium magnitude, long term and of moderate significance.	Robust surface water management measures Checks by ECoW Checks of watercourses for potential breeding fish	Impacts considered negligible
Cumulative effects			
Habitats and species	There will be a small cumulative loss of habitats and species with the NHZ. Considered to be negligible	Good practice and mitigation and habitat enhancement measures	Impacts considered negligible
Decommissioning Impacts			
Habitats and species	Slight negative cumulative impacts could occur at the local level	Site will be assessed at the time of decommissioning and relevant mitigation put in place	Insignificant negative impacts