Chapter 7 Ecology

Contents

7.1. Introduction 1
7.2. Legislation Policy and Guidance 2
7.3. Method of Assessment 3
7.4. Consultation 13
7.5. Baseline 16
7.6. Assessment of Potential Effects 27
7.7. Impact Assessment 49
7.8. Mitigation and Residual Effects 57
7.9. Summary of effects 59
7.10. Biodiversity Enhancement 67
7.11. Cumulative Impact Assessment 68
7.12. Appropriate Assessment (River Tweed SAC) 69
7.13. Statement of Significance 73
7.14. Statement of Competence 73

List of Abbreviations

Abbreviation	Description
AA	Appropriate Assessment
ARG	Amphibian and Reptile Groups
AWS	Ancient Woodland Sites
BAI	Bat Activity Index
BESS	Battery Energy Storage System
CEMP	Construction Environment Management Plan
CIA	Cumulative Impact Assessment
CIEEM	Chartered Institute of Ecology and Environmental Management
CMS	Construction Method Statement
ECoW	Environmental Clerk of Works
EIA	Environmental Impact Assessment
EIAR	Ecological Impact Assessment Report
FMMP	Fish and Macro-invertebrate Monitoring Programme
FORL	Fred. Olsen Renewables Limited
GIS	Geographic Information System
GWDTE	Ground Water Dependant Terrestrial Ecosystems
ha	hectare
IEFs	Important Ecological Features
JNCC	Joint Nature Conservation Committee
Km	Kilometres
LBAP	Local Biodiversity Action Plan
LBS	Local Biodiversity Site
LNR	Local Nature Reserve
LPA	Local Planning Authority
LSE	Likely Significant Effect
LWSs	Local Wildlife Sites
m	metres
MAGIC	Multi-Agency Geographic Information for the Countryside

MSS	Marine Scotland Science
NHZ	Natural Heritage Zone
NPF4	National Planning Framework 4
NVC	National Vegetation Classification
OEMP	Operational Environmental Management Plan
PAN	Planning Advice Note
PRA	Preliminary Roost Assessment
PV	Photovoltaic
RSPB	Royal Society for the Protection of Birds
SAC	Special Areas of Conservation
SBL	Scottish Biodiversity List
SEPA	Scottish Environment Protection Agency
SFCC	Scottish Fisheries Coordination Centre
SM4	Song Meter 4
SNCI	Site of Nature Conservation Interest
SPP	Species Protection Plan
SSSI	Site of Special Scientific Interest
SINC	Site of Important Nature Conservation
SWT	Scottish Wildlife Trust
TN	Target Note
TWIC	The Wildlife Information Centre
UNESCO	United Nations Educational Scientific and Cultural Organisation
WCA	Wildlife and Countryside Act
ZoI	Zone of Influence

Glossary

Abbreviation	Definition
The Applicant	Fred. Olsen Renewables Limited
Baseline	The existing conditions that prevail against which the effects of the Proposed Development are compared.
EIA Regulations	The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017.
Environmental Impact Assessment	Environmental Impact Assessment (EIA) is a means of drawing together by the developer, in a systematic way, a description of the development and information relating to of the likely significant environmental effects arising from a proposed development.
Environmental Impact Assessment Report	Environmental Impact Assessment (EIA) is a means of drawing together by the developer, in a systematic way, a description of the development and information relating to of the likely significant environmental effects arising from a proposed development.
Local Biodiversity Site (LBS)	Local Biodiversity Sites (also known as Wildlife Sites) are non-statutory sites of nature conservation value that are designated locally on biological and/or geological grounds.
Mitigation	Measures, including any process, activity or design to avoid, reduce, remedy or compensate for potential negative effects of a development.
Natural Power	The lead consultant EIA co-ordinator is: Natural Power Consultants Limited
Proposed Development	The proposed Lees Hill Renewable Energy Park as described in Chapter 4, Volume 2,of this EIAR.
Proposed Development Site	The project development area within the site boundary as shown in Figure 1.2, Volume 3a.
Protected Species	Animals or plants protected by European and/or domestic legislation.
Site boundary	Proposed application boundary for the Proposed Development Site.
Site of Special Scientific Interest (SSSI)	Sites of Special Scientific Interest are protected areas that represent the UK's most important wildlife and/or geological sites.
Special Area of Conservation (SAC)	Special Areas of Conservation are sites of international importance that have been adopted by the European Commission and formally designated by the UK government.
Survey Area	The area within which ecological baseline surveys were carried out. This generally refers to the Proposed Development plus a surrounding buffer, the size of which is determined by the specific survey being described. Details of the area covered are described in the methodology provided for each field survey (See Section 6.2);

Zone of Influence	This is “the area over which ecological features may be subject to significant effects as a result of the proposed project or associated activities” (CIEEM2).

7. Ecology

7.1. Introduction

Summary of the chapter

7.1.1. This ecological chapter of the Ecological Impact Assessment Report (EIAR) has been prepared by Natural Power Consultants Limited (Natural Power) on behalf of Fred. Olsen Renewables Limited (FORL) in respect of the proposed Lees Hill Renewable Energy Park (hereafter referred to as the 'Proposed Development'). The Proposed Development lies approximately 5 km west of Duns, in the Scottish Borders (central grid reference NT723531) and includes up to six wind turbines, solar photovoltaic panels, battery energy storage system (BESS) and associated access and infrastructure. The Proposed Development lies within the Scottish Borders Council (SBC) Local Planning Authority (LPA) area. The chapter evaluates both habitats and non-avian animal species and assesses the potential impacts on habitats and species as well as the proposed benefits to biodiversity in line with the National Planning Framework 4 (NPF4).

7.1.2. In order to inform the preparation of the EIAR, a desk study and baseline ecology surveys were undertaken between 2020 - 2023. All surveys were undertaken following the most relevant industry guidelines and incorporated relevant scoping responses. As shown in Figure 7.2, Volume 3a, the Proposed Development Site includes a portion of the Langtonlees Cleugh Nationally designated Site of Special Scientific Interest (SSSI) designated for geological and ecological interests.

7.1.3. The results of these surveys are used to identify important ecological features (IEFs) that could sustain positive or negative impacts as a result of the Proposed Development. An assessment has been made of the predicted significance of effects of the Proposed Development on all IEFs, and predicted no likely significant effects (LSEs) on all IEFs recorded and no significant cumulative effects.

7.1.4. Controls will be put in place during construction through creation of a site-specific Construction Environment Management Plan (CEMP), incorporating a Construction Method Statement (CMS), and Species Protection Plan (SPP) and appointing an Environmental Clerk of Works (ECoW) to monitor adherence to such plans. An Outline Operational Environmental Management Plan (OEMP) to further minimise effects and impacts on bats and fish is included within Technical Appendix 7.3: Operational Environmental Management Plan, Volume 4. It is considered that implementation of these mitigation and habitat enhancement measures will reduce the likelihood of impacts on IEFs at the appropriate biogeographical scale. The OEMP also includes compensatory measures to restore retained habitats, and provide long term biodiversity enhancements through creation of new wetland features and planting new broadleaved woodland.

Contents of Chapter

7.1.5. This chapter provides details of the baseline ecological conditions within the red line boundary of the Proposed Development (hereafter referred to as the Proposed Development Site) and the immediate surrounding environment established through field surveys, in addition to a desk-based review to obtain additional relevant ecological data. The identified habitats and species comprising the ecological baseline are described and assessed using recognised criteria, in

accordance with industry guidelines (e.g. that produced by the Chartered Institute of Ecology and Environmental Management: CIEEM, 2018[1]).

7.1.6. This EIAR chapter has been prepared following a scoping process which led to a Scoping Report (see Technical Appendix 1.1, Volume 4) issued to consultees in July 2022 and Scoping Opinion (see Technical Appendix 1.2, Volume 4) received in October 2022.

7.1.7. In line with the principles of a proportionate approach to the preparation of an EIAR, embedded mitigation is considered at the outset of the assessment (see Section 7.6 of this chapter). Furthermore, to ensure proportionality based on the likelihood of potential effects, only ecological features for which it is considered there may be significant effects in the absence of mitigation are identified as IEFs and are taken forward for a full EIA.

7.1.8. Several elements of this chapter relating to the identification and assessment of IEFs make reference to and are supported by the findings of the ornithological and hydrological assessments, reported in Chapter 8: Ornithology, Volume 2 and Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2.

7.1.9. All scientific names for species recorded at the Proposed Development are given in Technical Appendix 7.1: Ecology, Volume 4 which also includes summaries of survey times and dates. Full survey data, including details of survey dates, times and weather conditions, plus results data, can be provided on request.

7.2. Legislation Policy and Guidance

7.2.1. The following framework of international, national and local legislation and planning policy guidance, which exists to protect habitats and specific species, has been considered as part of the assessment. See also Chapter 5: Statutory and Policy Framework, Volume 2.

Legislation

- The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) (the Habitats Regulations), which transposes the Habitats Directive into UK law[2;]
- The Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2012;
- The Conservation of Habitats and Species (Amendment) Regulations 2017, relating to reserved matters in Scotland;
- Wildlife and Countryside Act (WCA) 1981 (as amended);
- The Nature Conservation (Scotland) Act 2004;
- The Wildlife and Natural Environment (Scotland) Act 2011;
- Protection of Badgers Act 1992 (as amended); and
- Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, which transpose the EIA Directive into Scottish law.

Policy Guidance

7.2.2. Particular attention has also been given to the guidance documents listed below that are applicable to assessing the effects of wind farm developments on ecology. Reference has also been made to guidance documents through the report where relevant:

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

[2] *Wildlife and Countryside Act (WCA) 1981 (as amended).*

- National Planning Policy Framework 4 (NPF4) – particularly Policy 3;
- Planning Advice Note (PAN) 51: Planning, Environmental Protection and Regulation (revised 2006);
- PAN 60: Planning for Natural Heritage (Scottish Government 2000);
- PAN 1/2013 – Environmental Impact Assessment (Scottish Government 2013);
- Nature Conservation: Implementation in Scotland of the Habitats and Birds Directives: Scottish Executive Circular 6/1995 as amended (June 2000); and
- European Protected Species, Development Sites and the Planning System: Interim guidance for local authorities on licensing arrangements[3];
- Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM 2018)[1];
- Land Use Planning System Scottish Environment Protection Agency (SEPA) Guidance Note 4: Planning Guidance on Windfarm Developments[4];
- Good Practice during Wind Farm Construction[5];
- Bats and Onshore Wind Turbines – survey, assessment and mitigation (2019[6] and subsequent revised version 2021[7]);
- General pre-application and scoping advice for solar farms[8];
- Scottish Biodiversity List (SBL)[9]; and
- Scottish Border Council Local Biodiversity Action Plan (LBAP).

7.3. Method of Assessment

Desk Study

Statutory, National and Locally Designated Sites of Nature Conservation

7.3.1. A web-based search was undertaken to identify and provide information on statutory sites with an international or national designation for ecological interests, located within 10 km of the Proposed Development. The NatureScot online tool Sitelink[10] and the online Geographic Information System (GIS) tool MAGIC (Multi-Agency Geographic Information for the Countryside)[11] were used.

7.3.2. Data were sought for the following:

---

[3] *Scottish Executive, 2001 (updated 2006). European protected species, development sites and the planning system: Interim guidance for local authorities on licensing arrangements. Scottish Executive, Edinburgh.*

[4] *SEPA, 2012. Land Use Planning System Guidance Note 4: Planning guidance on windfarm developments. Appendix 2. Version 7: 14 May 2014*

[5] *Scottish Renewables, SNH, SEPA, Forestry Commission Scotland, 2015. Good practice during windfarm construction. Version 3*

[6] *SNH. 2019. Bats and onshore wind turbines: survey, assessment and mitigation.*

[7] *SNH. 2019. Bats and onshore wind turbines: survey, assessment and mitigation. Version August 2021*

[8] *NatureScot, August 2022, General pre-application and scoping advice for solar farms available: https://www.nature.scot/doc/general-pre-application-and-scoping-advice-solar-farms*

[9] *The SBL forms a list of species and habitats of importance for biodiversity conservation in Scotland, produced by the Scottish Government*

[10] *https://sitelink.nature.scot/home Accessed 07/09/2023*

[11] *https://magic.defra.gov.uk/MagicMap.aspx Accessed 07/09/2023*

- Special Areas of Conservation (SACs) – within 10 km of the Proposed Development Site;
- Sites of Special Scientific Interest (SSSIs) – within 5 km of the Proposed Development Site;
- Locally designated sites such as Sites of Important Nature Conservation (SINCs) and Sites of Nature Conservation Interest (SNCIs) – within 2 km of the Proposed Development Site; and
- Local and National Nature Reserves (including Royal Society for the Protection of Birds (RSPB) and Wildlife Trust Reserves) – within 2 km of the Proposed Development Site.

7.3.3. Sites designated solely for ornithological interests and of relevance to the Proposed Development are considered separately in Chapter 8: Ornithology, Volume 2.

Data Search

7.3.4. To provide additional background information on the Proposed Development Site, historic survey data from 2012 was provided by the applicant in November 2020 for an area within the footprint of the Proposed Development[12]. This included a Phase 1 Habitat Survey extended to include protected species.

7.3.5. The Wildlife Information Centre (TWIC) data search was undertaken, which requested records of all ecological (non-avian) species of conservation interest recorded within the last ten years (2013-2023) within 2 km of the Proposed Development Site extended to a 10 km search buffer for bats, as well as known protected habitats and other priority areas, such as Ancient Woodland Sites (AWS) or Local Nature Reserves (LNRs).

Baseline surveys

7.3.6. A summary of the baseline ecology surveys undertaken at the Proposed Development (dates and extent of the area surveyed) is provided in Table 7.1. Details of survey extents including areas where access was available can be found in Figure 7.1, Volume 3a. Where access was not available visual surveys were conducted from the nearest location within the Proposed Development Site. Surveys were undertaken following standard guidance, unless further details have been provided (see Limitations Section 7.3).

7.3.7. Further survey method details, along with dates of survey visits and analysis methods are provided in Technical Appendix 7.1: Ecology, Volume 4. Full survey details including survey timings and weather conditions can be provided on request.

[12] *WSP, August 2012, Preliminary Ecological Surveys: Langton Lees, Dumfries and Galloway. RES UK & Ireland*

Table 7.1: Summary of baseline ecological surveys undertaken at the Proposed Development Site

Survey	Date	Survey Area	Notes
Extended Phase 1 Habitat survey[13]	2019, updated September 2023	Proposed Development Site	The survey was 'extended' to search for and record signs of legally protected or other notable species, and to assess the potential for the habitats to support such species. Target notes (TN) were made to record features of interest. The survey was updated to identify any changes between the initial survey and the preparation of the report and allow for any changes within the Proposed Development Site to be appropriately recorded.
National Vegetation Classification (NVC) survey[14]	2021	Proposed Development Site	Where areas were considered to comprise mosaics or complexes of different habitat communities, the proportion of each was estimated in percentage terms. NVC surveys define the vegetation of selected areas more precisely and identify key sensitive areas such as potential Ground Water Dependant Terrestrial Ecosystems (GWDTE). The NVC survey also included the recording of TN to provide further details, where necessary, and to record any features of ecological interest.
Bat activity survey: static detectors[6]	2020 and 2021	Proposed Development Site	NatureScot guidance on solar developments[8] states that it is not necessary to undertake bat surveys on proposed solar farms, and as such bat activity surveys were undertaken in the area proposed to support wind turbines only. Following wind farm guidance[6] seven full spectrum Wildlife Acoustic Song Meter 4 (SM4) static detectors were deployed in 2020, based on the 2019 survey guidance. The survey guidance was updated in 2021 however the updated guidance did not change the survey methodology. Where possible, detectors were placed within 200 m of each proposed turbine. The chosen 2020 deployment locations represented the original turbine layout. As the original turbine layout was subsequently altered, an additional detector was deployed in 2021, as shown in Figure 7.3, Volume 3a; this was the only detector deployed in 2021, as agreed with NatureScot.
Preliminary bat roost assessment[15]	April - August 2020	Proposed Development Site	Occupied and unoccupied buildings or ruins, structures such as bridges, quarries and forested areas with mature or dead trees all have the potential to provide suitable locations for roosting or

[13] *JNCC. (2010) Handbook for Phase 1 habitat survey – a technique for environmental audit. JNCC, Peterborough.*

[14] *Rodwell J. S. (2006). National Vegetation Classification: Users' handbook. JNCC, Peterborough.*

[15] *Collins, J. (ed.) (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). Bat Conservation Trust, London*

Survey	Date	Survey Area	Notes
			hibernating bats. Within the original development area, any such features were surveyed, and their suitability to support roosting bats determined, along with any evidence of occupation.
Protected mammal surveys[16,17,18,19,18,19,20,21,22 23]	April - August 2020 as well as July 2021	Proposed Development Site	To determine the presence of and suitability for mammal species for which there is legal protection.
Fish: Habitat Suitability Surveys[24,25]	April - August 2020	Proposed Development Site	This methodology approximates in-stream habitat availability for fish as a percentage (%) within a known length of the watercourse (50 m lengths). Locations of the surveyed areas are shown in Figure 7.4, Volume 3a. Although these surveys do not identify the presence of fish, they do highlight key habitat where certain species may be present based on known habitat preferences.

[16] *Harris S. Cresswell P & Jefferies D., (1989). Surveying Badgers. The Mammal Society, London.*

[17] *Neal, E. and Cheeseman, C. (1996). Badgers. T & A D Poyser, London, pp.271.*

[18] *Sargent G. & Morris P. (2003). How to Find and Identify Mammals. The Mammal Society, London.*

[19] *Bang, P. & Dahlstrøm, P. (2001). Animal Tracks and Signs. Oxford University Press, Oxford.*

[20] *Chanin, P. (2003b). Monitoring the Otter Lutra lutra. Conserving Natura 2000 Rivers: Monitoring Series No. 10. English Nature, Peterborough.*

[21] *Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016). The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series). Eds Fiona Mathews and Paul Chanin. The Mammal Society, London.*

[22] *Strachan, R., Moorhouse, T. & Gelling, M. (2011). The Water Vole Conservation Handbook. Third Edition, Wildlife Conservation Research Unit, University of Oxford, Abingdon.*

[23] *Amphibian and Reptile Groups (ARG) UK (2010) ARG UK Advice Note 5: Great crested newt habitat suitability index.*

[24] *Restoration of Riverine Salmon Habitats: A Guidance Manual (Hendry & Cragg-Hine, 1997)*

[25] *SFCC, (2007). Habitat Surveys: Training Course Manual. Scottish Fisheries Co-ordination Centre, Pitlochry.*

Modelling parameters: Habitat Loss Calculations

7.3.8. The construction of the Proposed Development would result in some permanent habitat loss by the infrastructure footprint (e.g. access road/tracks, turbine bases, crane hardstanding's, substation etc.), and habitat loss calculations are used to quantify the extent of this loss. Some construction areas will be reinstated following construction (for example the construction compound) and therefore only represent temporary loss. Permanent and temporary habitat loss have been differentiated within these calculations.

7.3.9. Habitat loss calculations are provided for all Phase 1 habitats (see Table 7.11) and are included in the impact assessment. The methods used and detailed results are provided in Technical Appendix 7: Ecology, Volume 4.

Modelling parameters: Static Bat Detector Parameters and Acoustic Analysis

7.3.10. Static bat detectors were programmed to commence recording from half an hour before sunset and continue until half an hour after sunrise, to cover the active period for all species potentially encountered within Proposed Development Site. Detectors recorded data to a memory card which was downloaded and later analysed to identify species present. Activity levels can also be established from this data, based on the number of 'bat passes' recorded.

7.3.11. Analysis was undertaken at species level using Kaleidoscope Pro automatic identification software. *Myotis* sp. were not identified further than genus due to the overlap between species frequency calls. Pipistrelle and *Nyctalus sp,* bats were classified to species, when possible, but were otherwise classified as species groups when it was not possible to distinguish call types to species level. Signal parameters were 16-120 kHz, 2-500 ms, 500 ms maximum inter-syllable gap and with a minimum of two pulses.

7.3.12. Quality assurance checks were performed on each group of manually identified species or noise, whereby all records were checked in groups of 200 records or less, and 10% of records were checked for larger groups.

7.3.13. A bat pass was defined as a sequence of bat pulses captured on a 15 second sound file. An individual bat can pass a particular feature on several occasions while foraging. It is therefore important to acknowledge that a bat pass is a bat activity index (BAI) that describes the amount of use bats make of an area rather than a measure of the number of individuals in a population.

7.3.14. The relative bat activity has been calculated based on the BAI recorded for each species across the Proposed Development Site. The criteria in Table 7.2 are based on the results of the spring Ecobat[26], professional judgement, relative abundance and difficulty in detecting different species e.g. long-eared bats (*Plecotus sp,*) are notably difficult to detect. This is considered in accordance with NatureScot guidelines[6] which states that method of calculating relative activity must be clear.

[26] *Results shown in Scoping Report (see Technical Appendix 1.1, Volume 4)*

Table 7.2: Relative BAI criteria by genus

Genus	Low	Low - Moderate	Moderate	Moderate - High	High
Myotis sp.	< 10	11 – 20	21 - 30	31 - 40	> 41
Pipistrellus sp.	< 20	21 - 40	41 - 60	61 – 100	> 100
Nyctalus sp.	< 10	11 – 20	21 - 30	31 - 40	> 41
Plecotus sp.	< 3	4 - 8	9-12	13 - 16	> 17

Survey Limitations

7.3.15. There were limiting factors to survey methodologies, the details of which are provided in this section. As a whole, it is not considered that these limitations would result in an incorrect assessment of effect or impact on the feature, the reasoning for this is provided below. The following survey limitations were experienced.

7.3.16. The Proposed Development design changed during the 2020 survey season (from seven wind turbines to eight) as such an additional bat detector was deployed in 2021, in the vicinity of the additional turbine which was adjacent to coniferous plantation. This methodology was agreed with NatureScot in advance of the 2021 deployment. Following Storm Arwen in November 2021, the majority of this block of plantation had to be felled due to wind blow. Following the submission of the Scoping Report in July 2022 the scheme was reduced to six turbines. However, due to the presence of some remaining coniferous blocks within the Proposed Development Site the 2021 data has been retained and presented within this report as representative of habitats within the Proposed Development Site. In addition, seven other bat detectors were deployed in the habitats representative of the proposed turbine locations (more than one per turbine specified within guidance[7]) and so the change of habitat at this detector location is not considered a significant limitation.

7.3.17. Across the bat survey period eight nights were removed from analysis in 2020 and four in 2021 due to unsuitable weather conditions (high winds). The spring detector deployments were cold in both years with only two nights above 8 ºC during the 2020 spring deployment. However, bats were recorded in temperatures as low as 5.2 ºC and as both years were similarly cold, the survey findings remain comparable and reflective of the conditions during the survey period. As such, no survey nights have been removed from the analysis due to temperature. Full details of which nights were removed are presented within Technical Appendix 7.1: Ecology, Volume 4.

7.3.18. During the autumn bat detector survey period detector 7 malfunctioned and did not record at all, while detectors 1, 2 and 6 experienced technical faults and stopped recording after four, three and nine nights respectively, one night of effort was removed from detectors 1 and 6 due to the high winds. All the detectors that experienced failure recorded for the entirety of the other survey seasons. As such, this is unlikely to have any overall impact on the assessment of bat species within the Proposed Development.

7.3.19. Guidance requires that static bat activity results should be uploaded to the online analysis tool Ecobat[27], which will allow a comparison of activity levels from this Proposed Development with others in a definable area, providing a level of relative activity. This was undertaken following the Spring 2020 deployment with these results provided in the scoping report (see Technical Appendix 1.1, Volume 4). However, Ecobat is currently offline (since November 2022) for essential maintenance, and there is no defined date when the service will be back online. As such it has not been possible to provide an updated Ecobat analysis including all surveyed

[27] *Mammal Society Ecobat [Online] Available from - Ecobat – Within Night – The Mammal Society Last Accessed 13/03/2024*

year's bat data. Instead, a Bat Activity Index (BAI) has been calculated by Natural Power as the median of bat passes per night, based on the number of calls per night of a given species and on the number of hours between sunset and sunrise[28]. This allows for a comparison of activity levels across the Proposed Development Site and professional judgement has been used to assess whether the activity levels calculated are considered to be low, moderate or high for the local area. Additional information on bats in the local area was gained through a review of local sites in the public domain. Professional judgement has been based on Natural Powers considerable experience in writing EIARs for wind farm applications for more than 25 years.

7.3.20. Whilst completing this chapter, the re-analysis of the spring Ecobat results that were provided in the scoping report has identified issues with the results presented at that time, partly due to lack of clarity in which results were provided and also due to issues that have subsequently been identified within the Ecobat programme. As the EIA is based on the correct data, bats were not scoped out of the assessment previously and additional detectors were used (eight instead of six per the turbine number) this is not considered a significant limitation.

7.3.21. Following scheme redesign in 2021, access to the southern portion of the Proposed Development Site was restricted by lambing. This area was subsequently resurveyed in 2023, however a field to the east (away from the proposed infrastructure) was surveyed using binoculars only due to the presence of young bullocks within the field. This field, (see Figure 7.1, Volume 3a) though within the Proposed Development Site is outside the zone of influence (ZoI) of the proposed infrastructure and so the restricted access is not considered a significant limitation as it will not be directly affected by the Proposed Development.

7.3.22. There are two small ponds and two ponded sections of burn within the Proposed Development Site which could provide habitat for amphibians including common frog, as well as an assortment of burns. Following changes to the design, all ponds will be retained, with the track passing at closest 5 m from one of the ponds (shown on Figure 7.5, Volume 3a as TN 25). No targeted great crested newt surveys were undertaken due to the distance to any known records (over 2 km) and likely absence of great crested newts within the local area. In addition, this pond was not recorded during the 2020 – 2021 surveys and is considered ephemeral, recorded only during the September 2023 survey, with aquatic and marginal vegetation limited to pedunculate water-starwort.

Approach to Impact Assessment

7.3.23. This section presents the approach taken to the EIA and provides an overview of how the potential for impact has been determined and the method by which impact significance has been ascertained. The approach to the EIA adopted within this assessment follows the CIEEM guidelines[1], and in line with these guidelines professional judgement has been applied where appropriate. The criteria used and the underlying rationale are described further within the following sections.

Determining Important Ecological Features (IEFs)

7.3.24. The Assessment process involves identifying IEFs in accordance with CIEEM guidelines[1]. These ecological features and their values are determined by the criteria defined in Table 7.3.

[28] *Lintott, P.R., Mathews, F. 2018. Basic mathematical errors may make ecological assessments unreliable. Biodivers Conserv* ***27,*** *265–267. https://doi.org/10.1007/s10531-017-1418-5*

Table 7.3: Geographical context relating to the evaluation of an IEF.

Level of value	Example of IEF
International	An internationally designated site (e.g. SAC), or site meeting criteria for international designations such as a World Heritage Site or United Nations Educational Scientific and Cultural Organisation (UNESCO) Biosphere Reserve. Species populations/habitat areas present with sufficient conservation importance to meet criteria for SAC selection.
National	A nationally designated site such as an SSSI or an NNR, or sites meeting the criteria for national designation (such as the JNCC guidelines). Species populations/habitat areas present with sufficient conservation importance to meet criteria for SSSI selection.
Regional	Sites designated as local nature reserves or Local Biodiversity Sites, including SINCs or Local Wildlife Sites (LWSs). Species populations/habitat areas that meet the criteria for SINC or LWS classification.
Local	Areas of semi-natural ancient woodland smaller than 0.25 ha. Areas of habitat or species populations considered to appreciably enrich the ecological resource within the local context, e.g. species-rich flushes or evidence of regular otter activity.
Negligible	Widespread and/or common habitats and species. Features falling below Local Importance are not normally considered in detail in the assessment process.

7.3.25. The Proposed Development Site is located within Natural Heritage Zone (NHZ) 16 (Eastern Lowlands) though it is approximately 880 m from NHZ 20 (Border Hills). NHZ 16 comprises both boundary hills and flat coastal lowlands. Landcover is dominated by arable farming with improved grassland and a mosaic of woodland, rough grassland, heath and montane. NHZ 20 comprises smooth and rounded mountain ranges, hill slopes and summits, vegetated by montane, moorland and grassland habitats[29]. Given the similarities between the Proposed Development Site and NHZ 20 as well as proximity to NHZ 20, NHZ 20 has been used in this assessment, however in the interest of clarity NHZ16 is also provided in Technical Appendix 7.1: Ecology, Volume 4.

7.3.26. Attributing geographical value to a feature is generally straightforward in the case of designated sites, as the designations themselves are normally indicative of level of value. For example, a SAC designated under the Habitats Directive is explicitly of European (International) importance. However occasionally a default level of value may not be appropriate in the specific context of the Proposed Development. Where this is the case, professional judgement has been applied and rationale for decreasing or increasing the geographical level of value of a feature is given. An example of this might be bats, all of which are of international importance due to their protection under Annex IV of the Habitats Directive. However, if only very few foraging/commuting records of common and widespread bat species were made at a site, attributing international importance to the population present at the Proposed Development would be disproportionate and the importance would be reduced accordingly (noting that this does not change the protection level from a legislative standpoint).

7.3.27. Certain ecological features may be assessed as not being subject to significant effects by a Proposed Development, but due to their high legal protection they must still be considered in

[29] *SNH. (2002). Natural Heritage Zones: A National Assessment of Scotland's Landscapes. SNH, Edinburgh*.

the EIA within the context of legal and policy implications (for example otter, for which their resting places are legally protected from destruction or obstruction).

7.3.28. Part of the process of attributing importance to a species involves defining the population to be valued and requires professional judgment to identify an ecologically coherent population against which effects on integrity[30] can be assessed (see 'Determining Significance of Ecological Effects'). For example, for wide-ranging species such as otter, it may be more appropriate to consider the otter population in a whole catchment, whereas for more localised species, such as water vole, importance may be attributed to groups of related colonies which function as a meta-population.

7.3.29. In line with the principles of proportionate EIA, embedded mitigation is considered at the outset of the assessment. IEF status has only been assigned where there is still considered to be the potential for significant effects to the integrity of the feature at the assigned value level arising from the Proposed Development, after the application of embedded measures.

Valuing bats

7.3.30. For the purposes of this assessment and of assigning value to bats, the guidance set out by NatureScot[6] has been followed. Table 2 in this guidance identifies the population vulnerability of bat species based on the collision risk posed for individual bat species by wind turbines as determined by behavioural characteristics, and by bat population sensitivity based upon species rarity (adapted from Wray *et al.* (2010)[31]). Table 7.4 summarises the risk of turbine impact to bat species and the sensitivity of bat populations.

Table 7.4: Level of potential vulnerability of populations of Scottish bat species[32]

Species	Low collision risk	Medium collision risk	High collision risk
Common species	n/a	n/a	Common pipistrelle Soprano pipistrelle
Rare species	Brown long-eared bat Daubenton's bat Natterer's bat	n/a	n/a
Rarest species	Whiskered bat Brandt's bat	n/a	Nathusius' pipistrelle Noctule bat Leisler's bat

Source: NatureScot[32]

7.3.31. The guidance provided by Wray *et al*.[31] includes a framework for identifying the importance of bats in the landscapes through the evaluation of bat roosts and habitats. Applying this framework, bat roosts can be valued according to species rarity and roost status.

[30] *Note that integrity in this context refers to ecological integrity of a habitat type or population of a species at a defined value level, i.e. the maintenance of the conservation status of a population of a species at a specific location or geographic scale. This should not be confused with the specific term 'Site Integrity' used in Appropriate Assessment for Natura 2000 sites.*

[31] *Wray, S., Wells, D., Long, E. & Mitchell-Jones, T. (2010) Valuing Bats in Ecological Impact Assessment. IEEM In-Practice p. 23-25.*

[32] *Only those species which are known to occur in Scotland are included. Bat Conservation Trust (2019). Find out more about Bats in Scotland. Available at: https://cdn.bats.org.uk/pdf/Scottish-bats-2019.pdf?mtime=20190412121246&focal=none*

Characterising Potential Effects on Features

7.3.32. Impacts on IEFs are judged in terms of magnitude and duration. Magnitude refers to the size of an impact and is determined on a quantitative basis where possible. This may relate to the area of habitat lost to the development footprint in the case of a habitat feature or predicted loss of individuals in the case of a population of a particular species. Within this EIA, magnitude is assessed within six levels, as detailed in Table 7.5.

Table 7.5: Criteria used within this EIA to determine the magnitude of ecological impacts

Impact magnitude	Description
Very highly negative	Total or almost complete loss of an ecological feature resulting in a permanent adverse effect on the integrity of the feature. The conservation status of the feature would be permanently affected.
Highly negative	Large-scale, permanent changes in an ecological feature, likely to change its ecological integrity. These impacts are therefore likely to result in overall changes in the conservation status of an ecological feature.
Moderately negative	This includes moderate-scale long-term changes in an ecological feature, or larger-scale temporary changes; however, the integrity of the ecological feature is not likely to be affected. This may result in temporary changes in the conservation status of the ecological feature, but these are reversible and unlikely to be permanent.
Minor negative	This includes small magnitude, long-term impacts, or moderate-scale temporary changes, and where integrity of the ecological feature is not affected. These effects are unlikely to result in overall changes in the conservation status of an ecological feature.
Negligible	No perceptible change in the ecological feature.
Positive	The changes in the ecological feature are considered to be beneficial to its ecological integrity and/or nature conservation status.

7.3.33. The assessment also considers whether the impact is positive or negative, short-term (for example only during construction) or long-term (throughout the lifetime of the Proposed Development), reversible or permanent as detailed in Table 7.6.

Table 7.6: Criteria for describing duration

Duration	Definition
Permanent	Effects continuing indefinitely beyond the span of one human generation (taken as approximately 25 years), except where there is likely to be substantial improvement after this period (e.g., the replacement of mature trees by young trees which need > 25 years to reach maturity, or restoration of ground after removal of a development. Such exceptions are termed “very long-term effects”).
Temporary	Long-term (15 – 25 years or longer; see above) Medium term (5 – 15 years) Short-term (up to 5 years)

7.3.34. When characterising ecological impacts, it is essential to consider the likelihood that a change/activity will occur as predicted, with a degree of confidence in the impact assessment (in relation to the impact on ecological structure and function). Where possible, the degree of confidence should be predicted quantitatively. However, where this is not possible, a more qualitative approach is taken; particularly where the confidence level can only be based on expert judgement.

Determining Significance of Potential Ecological Effects

7.3.35. Only features for which there is considered to be the potential for significant effects are identified as IEFs and taken forward for full impact assessment. Having followed the process of identifying an IEF, and characterising potential impacts, the significance of the effect is then determined. The CIEEM guidelines[1] use only two categories to classify effects: 'significant' or 'not significant'. A significant effect is defined in ecological terms as an effect on the integrity or conservation status of a defined site, habitat or species. The significance of an effect is determined by considering the value level of the feature and the magnitude of the impact and applying professional judgement as to whether the integrity/conservation status of the feature will be affected at the given value level. This concept can be applied to both designated and undesignated sites and to defined populations.

7.3.36. In this assessment, an effect that threatens the integrity of a feature is considered to be significant. It should be noted that, alongside the criteria provided, professional judgement is applied in determining the significance of a potential effect.

7.3.37. Where appropriate, mitigation measures and/or compensation measures, where necessary, including within the design process, are identified in order to avoid and reduce potentially significant effects. It is also good practice to propose mitigation measures to reduce negative effects that are not significant. The significance of residual effects on features after the effects of mitigation have been considered can then be determined, along with any monitoring requirements.

Cumulative Impact Assessment and Residual Impacts

7.3.38. The Cumulative Impact Assessment (CIA) identifies any other projects which, in combination with effects from the Proposed Development could give rise to a significant cumulative impacts on ecological features. Cumulative effects are particularly important as ecological features may be already exposed to background levels of threat or pressure and may be close to critical thresholds where further impacts could cause irreversible decline. Cumulative effects can also make habitats and species more vulnerable or sensitive to change.

7.3.39. Cumulative effects can either be additive / incremental (i.e. multiple activities/projects may give rise to a significant effect due to their proximity in time and space) or connected (i.e. different aspects of the same project which may be authorised under different consent processes).

Trends and Predicted Future Baseline

7.3.40. Current habitat use within the Proposed Development Site is agricultural with the addition of a motocross track and quarry. In the absence of development, it is assumed that the habitat use at Proposed Development would remain the same for the foreseeable future.

7.3.41. It is more difficult to predict changes that may occur in the longer-term (i.e. up to 50 years). Climate change and the shift in species and habitat distributions that this may cause, as well as potential land management changes that this may bring about, cannot be predicted at this time. Baseline surveys carried out for the Proposed Development represent a snapshot of the ecology community present at the time and cannot be extrapolated to predict future population trends in the event of climate change, or a future change in land use at the Proposed Development Site.

7.4. Consultation

7.4.1. A Scoping Report (see Technical Appendix 1.1, Volume 4) for the Proposed Development was issued to consultees in July 2022. This document contained details of the proposed assessment methodology and ecological features proposed for full EIA and those to be scoped out of the EIA, following the baseline surveys. Features were proposed to be scoped out on the basis that construction and operation of the Proposed Development would not be likely to result in

significant effects. Following consultee responses, the following ecological features were scoped out and are not considered any further in this assessment:

- Pine marten; and
- Red squirrel.

7.4.2. All consultation considered to be relevant to this chapter is summarised in Table 7.7. The table does not repeat scoping responses listed in Table 8.6 in Chapter 8: Ornithology, Volume 2, of the EIAR.

Table 7.7: Consultation responses relating to ecology.

Consultee	Comments/ issues raised/ recommendations	Addressed responses/outcomes
NatureScot 19 February 2021 Response to 2020 summary report which outlined the changes in survey methodology to reflect the amended design.	18 March 2021 Agreed with the conclusions and recommendations of the summary report and highlighted the need to include the changes to design and the implications on the survey work in the EIA Report in due course.	These changes in survey work have been explained within the limitations section (paragraphs 7.3.15 - 7.3.22).
NatureScot 6 April 2020 Letter outlining survey methodology and historic information.	10 April 2020 NatureScot agreed with the approach to refer to the Black Rig Wind Farm scoping application from 2014 and recommended that reference is made to NatureScot survey guidance.	The guidance has been referred to throughout and the historic survey information has been included within the baseline information section
NatureScot September 2022 Response to Scoping Report	Highlighted the potential for connectivity with the River Tweed SAC/SSSI and need to consider the potential effects of construction, operation and decommissioning of the development (including access tracks).	Potential impacts on designated sites including the River Tweed SAC/SSSI is included in Section 7.6 Assessment of Potential Effects. Adherence to best practice guidance is included within the embedded mitigation.
	Agreed with the features and impacts to be assessed within the EIA Report”	The species scoped in within the scoping report have been further assessed within Table 7.17.
	Included the need for the HMP to provide positive management and enhancement of habitats within the development site to benefit biodiversity in line with NPF4. An outline HMP that sets out broad measures to achieve this was requested.	The habitat enhancements proposed within the outline Operational Ecological Management Plan (OEMP) (Technical Appendix 7.3: Operational Environmental Management Plan, Volume 4 and Figure 7.7, Volume 3a) are designed to provide long term biodiversity benefits and increased habitat connectivity in line with NPF4.

Consultee	Comments/ issues raised/ recommendations	Addressed responses/outcomes
SBC September 2022 Response to Scoping Report	SBC highlighted that they adopt a no-net-loss of biodiversity policy; losses of biodiversity are required to be compensated for and biodiversity enhancements to be provided through a Habitat Management Plan. SBC requested that the legislation chapter make specific reference to the NPF4 policies.	Technical Appendix 7.1: Outline Operational Environment Management Plan, Volume 4 and Figure 7.7, Volume 3a includes an outline Operational OEMP. A full OEMP is anticipated to be a planning condition for provision following consent. The OEMP includes habitat management measures to mitigate and further compensate for the impacts within the Proposed Development Site, while additional biodiversity enhancements are also included to provide net biodiversity benefits in line with NPF4. NPF4 is included within the policy and legislation section.
SEPA October 2022 Response to Scoping Report	Map and assessment of impacts upon Groundwater Dependent Terrestrial Ecosystems and buffers must be included.	Potential GWDTE were identified within the NVC surveys, the maps and assessments of impacts are included within Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2.
RSPB August 2022 Response to Scoping Report	Highlighted that the disturbance of Annex 1 habitats and deep peats should be mitigated through design.”	The scheme has gone through an extensive design phase to avoid and then mitigate the impacts on Annex 1 habitats in so far as possible through design.
Marine Scotland Science October 2022 Response to Scoping Report	Outlined the potential for impacts on Atlantic salmon, sea trout and brown trout spawning grounds. Requesting specific discussion and assessment of potential impacts and appropriate mitigation measures associated with the designated area. Identified that the presence of a large density of watercourses; and the presence of large areas of deep peat deposits as raising the potential for acidification problems and/or other pressures on fish populations including resulting from proposed felling operations. As well as requesting the inclusion of any proposed site specific mitigation and monitoring measures with map showing proposed sampling and control sites. A decommissioning and restoration plan for water quality was also requested.	Fish habitat surveys were undertaken within the Proposed Development Site. Fish were then assessed for potential to be IEFs after the embedded mitigation (including adherence to best practice) was included in Section 7.6. No deep peat is present within the Proposed Development Site. Impacts on water quality and peat are included within Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2.

Consultee	Comments/ issues raised/ recommendations	Addressed responses/outcomes
NatureScot 5 April 2023 Natural Power consultation in relation to the lifespan of bat survey data.	7 April 2023 Content with the approach proposed for bat survey methods.	Addressed within the limitations (Para 7.3.17) and baseline sections (Section 7.5, Table 7.14 to Table 7.16).

Source: Natural Power

7.5. Baseline

7.5.1. This section presents the baseline environment from desk-based review and field surveys which we use as basis for assessing the effects from the Proposed Development.

Desk Study

Statutory, National and Locally Designated Sites of Nature Conservation

7.5.2. As shown within Figure 7.2, Volume 3a two sites of international importance (SACs) designated for ecology are within 10 km of the Proposed Development. There are also another four ecologically designated SSSIs within 5 km of the Proposed Development. All the sites are listed in Table 7.8. Designated sites of ornithological interest are discussed in Chapter 8: Ornithology, Volume 2.

Table 7.8: Internationally and Nationally designated sites within relevant buffers of the Proposed Development.

Site Name	Designation	Approx. distance to Proposed Development Site	Designation criteria
Dogden Moss	SAC	3.2 km	Upland raised bog which supports the scarce bog-moss *Sphagnum imbricatum*.
River Tweed	SAC	3.6 km	Sections of the river with floating vegetation often dominated by water-crowfoot, used by river lamprey, brook lamprey, sea lamprey, Atlantic salmon and otters.
Langtonlees Cleugh	SSSI	0 km	Mixed deciduous woodland in a steep, relatively undisturbed sandstone gorge. The northern arm of the SSSI has the greater structural and species diversity, with areas of indicative ancient woodland. There are also small areas of neutral grassland, flushed marshy grassland and swamps.
Greenlaw Moor	SSSI	0.01 km	Raised bog with heather moor to the east and a variety of woodland habitats immediately south across the B5646 from the Proposed Development.
River Tweed	SSSI	3.6 km	A clean river system, which in turn supports other notified features including Atlantic salmon, otter, rare plants, rare fish and assemblages of invertebrates.
Crook Burn, Dyeshaugh	SSSI	4.8 km	Fen meadow, with a variety of wetter and meadow habitats which holds several nationally declining species.

Source: SiteLink

7.5.3. As shown in Table 7.9, the TWIC records search identified one locally designated site and three additional sites to be adopted, within 2 km of the Proposed Development.

Table 7.9: Locally designated sites within 2 km of the Proposed Development.

Site Name	Designation	Approx. distance to Proposed Development Site	Reason for Designation
Dunter Lee Cleughs – Hells Cleugh and White Burn	Scottish Borders Local Biodiversity Site (LBS) to be adopted	0 km	Base-rich flushes, cleughs, burnsides with locally rare plants.
Cleckinshaw, Kettelshiel & Bogpark Burns	LBS to be adopted	0.96 km	Burns, wetland and flushes including locally rare plants, used by brown/sea trout and small heath butterfly. waved fork-moss and Austin's bog-moss are also present.
Sale & Shining Pool Mosses	Scottish Wildlife Trust (SWT) Wildlife Site	1.05 km	No information provided by TWIC or available on the SWT website.
Langton Wood Scottish Borders	LBS to be adopted	1.83 km	Coniferous plantation, broadleaved semi-natural woodland and rivers and burns used by palmate newts.

Data Search

Summary of Historical Survey Data

7.5.4. The Proposed Development is the same location as that of the proposed Black Rig Wind Farm, which progressed as far as the scoping stage in January 2014. Survey works to support a potential EIA were conducted between 2012-2014 however no EIA was submitted. Historical ecological survey work was carried out on the proposed wind farm, between 2012 and 2014, by a different developer (RES). The survey work included the following:

- Phase 1 Habitat survey in 2012;
- Bat surveys 2014; and
- Badger, otter and water vole surveys 2014.

7.5.5. The 2012-2013 surveys categorised the bulk of the habitats as “dry modified bog” with areas of “wet heath / acid grassland” while arable and improved grasslands were present along the eastern and southern portions of the site. Patches of broadleaved woodland and coniferous plantation were also present as were the quarry, motor cross track and watercourses.

7.5.6. The survey identified two badger setts, common lizard and adder[33], however no further information is publicly available. Evidence of water voles, suitability for otters and suitability for use by foraging and commuting bats was identified in the 2012 report[34] with data indicating a bat roost at the Langtonlees Farm, though no information on the type of roost was specified. The 2012 report also draws attention to a record of red squirrel from within 1 km of the Proposed Development, however information on the location or age of this record is not provided.

TWIC Records Search Summary

7.5.7. The TWIC data of priority and protected species within 2 km (10 km for bats) of Proposed Development Site provided records of nine bat species / species groups (common and soprano pipistrelle, brown long-eared, Daubenton's, whiskered/Brandt's, Natterer's, *Pipistrellus* and

[33] *Res, Black Rig Wind Farm, Environmental Impact Assessment Scoping Report. November 2013.*

[34] *WSP Environment & Energy– Preliminary Ecological Surveys: Langton Lees, Dumfries and Galloway – RES UK & Ireland. August 2012*

Myotis species). Of the 248 bat records from within the last 10 years within 10 km of the Proposed Development, seven pertain to roosting all of which are common pipistrelles with the largest suspected roost being three individuals. However not all of the records returned from the TWIC search include comments regarding the bats behaviour/activity.

7.5.8. Records were also provided for adder, hedgehog, badger. mountain hare, 14 different invertebrate species, including one butterfly and 13 different moth species and an assortment of flowering plants. There were no records within 10 years or 2 km for amphibians (including great crested newt). Additional details are provided in Technical Appendix 7.1: Ecology, Table A7.1.3, Volume 4.

Baseline Surveys

Habitats

7.5.9. The Proposed Development Site consists of a mix of marshy grassland, acid grassland, and heathland habitats to the north/west with improved pasture and arable land to the south/east. An area of blanket bog with sphagnum is present within the centre of the Proposed Development Site and a quarry is present in the northwest corner. Woodland is present within the Proposed Development Site in the form of blocks of conifer plantation, including recently felled (or windblown) plantations, and broadleaved woodland along the eastern edge (which is part of the Langtonlees Cleugh SSSI).

7.5.10. As part of the extended Phase 1 habitat survey, habitats were assessed for their suitability for protected species, including red squirrel, pine marten, badger, otter and water vole. Habitats within the survey area were considered to be suitable for badger, otters and water voles so further species-specific surveys were undertaken. Fish habitat surveys were also undertaken.

7.5.11. Habitats found during Phase 1 habitat/NVC surveys at Lees Hill are described below in Table 7.10. Full NVC community and subcommunity names are provided in Technical Appendix 7.1: Ecology, Volume 4. The results of the Phase 1 habitat survey are shown in Figure 7.5, Volume 3a and the NVC survey shown in Figure 7.6, Volume 3a. TNs are provided in Technical Appendix 7.1: Ecology, Volume 4. Table 7.11 includes the extent to which the different habitats will be directly impacted by the Proposed Development.

7.5.12. Permanent loss identified in Table 7.11 refers to habitat lost as a result of construction for infrastructure including turbines with hardstands, access tracks and the quarry route (with 2 m verges and 1.5 m shoulders), substation, battery storage and other hardstandings associated with compounds.

7.5.13. Permanent change identified in Table 7.11 refers to the habitats present within the solar PV area. These habitats are likely to be subject to some change as a result of being bound with a perimeter fence and subject to different management than historically undertaken, as well as the impacts associated with construction/operation of the solar panels. The solar array will not cover the entirety of the solar developable area and so though subject to impacts the habitat it is not considered permanently lost.

7.5.14. Temporary loss identified in Table 7.11 refers to construction phase temporary impacts only which will be restored following construction e.g. cable routes or construction buffers.

Table 7.10 Summary of protected habitats with potential for impact during development

Phase 1 Habitat	NVC community	Conservation Status
Semi-natural broadleaved woodland	W11	Annex 1; SBL
Acid grassland	H9/H12c/M15d/U2a/U2b/U4/U4a/U4b/U5/U5a/U20	SBL

Acid grassland	M23/M23a/M23b	Potential GWDTE (High); SBL
Acid grassland	MG10/MG10a/M15d/U6/U6d	Potential GWDTE (Moderate); SBL
Marshy grassland	MG5//OV28/OV32/U2a/U2b/U4a/U20	SBL
Marshy grassland	M6d/M23a/M23b/	Potential GWDTE (High); SBL
Marshy grassland	M25a/M25b/MG9/MG10/MG10a	Potential GWDTE (Moderate); SBL
Neutral grassland	MG5/MG6b/U4b	SBL
Neutral grassland	M23a/M23b	Potential GWDTE (High)
Neutral grassland	MG9/MG10	Potential GWDTE (Moderate)
Dry dwarf shrub heath	H9/U2a	Annex 1; SBL
Dry dwarf shrub heath	M15b/U6	Potential GWDTE (Moderate); Annex 1; SBL
Wet dwarf shrub heath	M15/M15b/M15d/M25a/M25b	Potential GWDTE (Moderate); Annex 1; SBL
Wet dwarf shrub heath	U2a/U2b	SBL
Wet dwarf shrub heath	H12	Annex 1; SBL
Swamp	S10	Annex 1; SBL;
Wet modified bog	M20a	Annex 1; SBL
Flush and spring - acid/neutral flush	M6	Potential GWDTE (High); Annex 1; SBL

GWDTE – Ground water dependent terrestrial ecosystem; Annex 1 – Listed on Annex 1 of EU Habitats Directive; SBL – Listed on Scottish Biodiversity List.

Table 7.11: Phase 1 habitats present within the Proposed Development Site and proportion directly impacted.

Phase 1 Habitat Type	Conservation Designation	Habitat in Proposed Development Site (ha)	Permanent habitat loss to the Proposed Development		Permanent habitat change – solar PV area		Temporary habitat loss to the Proposed Development**	
			Area (ha)	%*	Area (ha)	%*	Area (ha)	%*
A1.1.1 Broadleaved woodland – semi-natural	Annex 1, SBL, LBAP	2.24	-	-	-	-	-	-
A1.1.2 Broadleaved woodland – plantation	LBAP	2.52	-	-	-	-	-	-
A1.2.2 - Coniferous woodland - plantation	-	12.57	-	-	0.25	1.99	-	-
A2.1 - Scrub - dense/continuous	-	0.27	-	-	-	-	-	-
A4.2 - Coniferous woodland - recently felled	-	9.74	<0.01	<0.01	0.75	7.74	<0.01	<0.01
B1.1 - Acid grassland - unimproved	Annex 1, SBL, LBAP	17.29	-	-	2.46	14.20	-	-
B1.2 - Acid grassland - semi-improved	SBL	10.61	-	-	4.71	44.45	-	-
B2.1 - Neutral grassland - unimproved	SBL, LBAP	3.26	<0.01	<0.01	-	-	<0.01	<0.01
B2.2 - Neutral grassland - semi-improved	SBL	19.47	0.26	1.31	0.80	4.10	0.04	0.18
B4 - Improved grassland	-	147.32	2.05	1.39	0.08	0.06	1.21	0.82
B5 - Marsh/marshy grassland	SBL, LBAP	67.63	1.18	1.75	18.89	27.93	0.82	1.21
C1.1 - Bracken - continuous	-	0.96	-	-	-	-	-	-
D1.1 - Dry dwarf shrub heath - acid	Annex 1, SBL, LBAP	17.11	1.04	6.05	0.90	5.27	0.44	2.59
D2 - Wet dwarf shrub heath	Annex 1, SBL, LBAP	35.62	1.18	3.31	20.13	56.52	0.15	0.42
D5 - Dry heath/acid grassland	LBAP	29.12	0.88	3.01	3.47	11.91	0.22	0.76
D6 - Wet heath/acid grassland	SBL, LBAP	27.74	1.34	4.81	17.09	61.61	0.47	1.71

Phase 1 Habitat Type	Conservation Designation	Habitat in Proposed Development Site (ha)	Permanent habitat loss to the Proposed Development		Permanent habitat change – solar PV area		Temporary habitat loss to the Proposed Development**	
			Area (ha)	%*	Area (ha)	%*	Area (ha)	%*
E1.6.1 - Blanket sphagnum bog	Annex 1, SBL, LBAP	3.13	-	-	-	-	-	-
E2.1 - Flush and spring - acid/neutral flush	Annex 1, SBL, LBAP	0.92	0.02	2.00	-	-	0.06	6.20
G1.1 - Standing water - eutrophic	LBAP	0.62	-	-	-	-	-	-
I2.1 - Quarry	-	2.91	-	-	-	-	0.03	0.88
J1.1 - Cultivated/disturbed land - arable	-	105.90	1.34	1.27	0.23	0.22	0.88	0.83
J4 - Bare ground	-	1.09	-	-	-	-	-	-
J5 - Other	-	14.58	-	-	-	-	-	-

Annex 1 – Listed on Annex 1 of EU Habitats Directive; SBL – Listed on Scottish Biodiversity List and UK Biodiversity Action Plan.

*All values in this table have been rounded to two decimal places. However, percentages are based on full area values and therefore calculations using area values shown may not entirely match those shown above.

**The temporary loss includes the optional borrow pits (shown in Figures 7.1 as 1 and 2, Volume 3a) as well as borrow pit 5 which is the prefered source of material.

Bat Surveys

7.5.15. Full details of bat roost and bat activity surveys, including photographs are presented in Technical Appendix 7.1: Ecology, Volume 4.

Roost Survey

7.5.16. No potential roost features were identified within 200 m of the turbine locations or 50 m of the proposed tracks (see Confidential Technical Appendix 7.2: Ecology, Figure A7.1, Volume 4).

Bat Acoustic Surveys

7.5.17. Static detectors were deployed in spring, early summer and autumn for 10-17 nights each deployment, however as outlined in the limitation section not all detectors recorded for the duration of these deployments. Only nights on which suitable weather conditions (medium temperature of 8°C or above at 8 pm; ground wind speed 6.5 m/s or less; little to no rain) were recorded have been used as "effort", excepting for spring which was exceptionally cold with only two nights meeting the above criteria and so all nights were used as effort. In 2021 wind up to 7.3 m/s were included, the weather plots are included in Technical Appendix 7.1: Ecology, Volume 4. Dates of the deployments are provided in Table 7.12 below.

Table 7.12: Static bat detector deployment and survey effort

Survey season	Total nights deployed - 7 detectors 2020	Total nights survey effort - 7 detectors 2020	Total nights deployed detector 8 2021	Total nights survey effort - detector 8 2021
Spring	98	80	19	18
Summer	147	119	22	20
Autumn	91	45	28	26

Source: Natural Power

7.5.18. Static detectors deployment locations, with habitat and distance from proposed turbines is provided in Table 7.13.The detectors in bold are within habitats that most represent the turbines within the Proposed Development. A map of the deployed locations is present in Figure 7.3, Volume 3a.

Table 7.13: Static bat detector deployment locations – Shown in Figure 7.3, Volume 3a

Detector	Grid reference	Habitat	Closest turbines (distance)
1	NT 71572 53692	Dry dwarf heath & neutral grassland	Turbine 4 (408 m)
2	**NT 71698 53252**	**Dry heath & acid grassland mosaic, with wet flush**	**Turbine 4 (135.7 m)**
3	**NT 71807 52635**	**Wet heath & acid grassland mosaic near marshy grassland**	**Turbine 3 (108.5 m)**
4	NT 72200 52523	Semi-improved and improved grassland with patches of marshy grassland	Turbines 2 (233.3 m)
5	NT 72275 53085	improved grassland and marshy grassland near to the conifer woodland	Turbines 6 (296.4 m)
6	**NT 72380 53538**	**Within marshy grassland near dry heath**	**Turbines 6 (255.1 m)**
7	NT 72037 54014	In area of semi improved neutral grassland near dry heath/acid grassland mosaic and the quarry.	Turbine 5 (491.6 m)
8	NT 72751 52019	At the edge of the conifer woodland adjacent the improved grassland	Turbine 1 (235.6 m)

Source: Natural Power

7.5.19. As shown in Table 7.14, 52.21 % of bat passes were recorded during summer, however *Myotis sp.* passes appear relatively constant across the survey period while noctule peaked in autumn and *Pipistrellus sp.* passes increased significantly in summer which accounted for the majority of passes. Detector 7 did not record at all during the autumn deployment, while detectors 1 and 2 experienced technical faults and recorded for four and five nights respectively which may account for the lower levels of calls during this deployment. Bats were recorded at detector 1 on three nights and one night at detector 2. Other detectors recorded bats on between seven and nine nights.

Table 7.14: Total number of bat passes recorded during the static detector survey by season (2020 and 2021)

Species	Spring	Summer	Autumn*	Total
Common pipistrelle	236	1282	602	2120
Soprano pipistrelle	336	1004	495	1835
Pipistrellus sp.	9	18	14	41
Myotis sp.	96	85	84	265
Noctule	48	64	338	450
Nyctalus sp.	0	4	3	7
Brown long-eared bat	3	17	1	21
Total	728	2474	1537	4739
Percentage	15.36%	52.21%	32.43%	

**Detector 7 did not record at all during the autumn deployment*

7.5.20. Passes by species at each detector are shown in Technical Appendix 7.1: Ecology, Volume 4. In 2020, a total of c. 1,329 bat passes were recorded, across detectors 1 – 7 of six species / species groups. The highest number of calls was associated with soprano pipistrelle (566) followed by common pipistrelle (488) and *Myotis sp,* (147). In 2020, detector 5, along Foul Burn south of Turbine 6 had the highest number of passes (396) of which 200 were common pipistrelle and 143 were soprano pipistrelle.

7.5.21. In 2021 a single detector was deployed at the detector 8 location to account for the amended turbine locations, at the edge of a conifer plantation north of proposed Turbine 1, which has subsequently been mostly felled following storm damage in November 2021. This detector location no longer reflects the habitat available within that area, though is the closest detector to Turbine 1 (235 m) and reflective of remaining coniferous plantation habitats within the Proposed Development Site as such the data has been retained. This detector recorded a total of c. 3,410 bat passes (71.96% of the bat passes recorded within the Proposed Development Site), consisting of the same species recorded in 2020 and *Nyctalus sp,*. This detector recorded more passes than all the detectors in 2020 combined. In 2021 common pipistrelle was the most frequently recorded species (1632 passes) followed by soprano pipistrelle (1269 passes) and then noctule (350 passes).

7.5.22. The results in BAI by species and detector across all the survey periods is provided in Technical Appendix 7.1: Ecology, Volume 4.

7.5.23. The detector with the highest levels of activity was detector 8; none of the other detectors recorded a median bat activity rate of more than 1 bat pass a night. Detector 8 was also deployed for the longest, as shown in Table 7.12 recording for 64 nights overall. Detector malfunctions in 2020 meant that not all detectors recorded on all nights, particularly during

autumn when detector 7 did not record at all. This reduces comparability between detectors and partially accounts for the differences in total number of passes per species by detector, however the use of averages reduces the impacts of this difference in deployment duration. As previously discussed, detector 8 is the least comparable with the Proposed Development due to changes in habitat at the deployment location. Detector 5 had the second highest maximum BAI with 145 common pipistrelle passes in a single night. Detector 5 was along Foul Burn, 296 m from proposed Turbine 6, and the detector recorded for the full 10 nights in autumn. Given there were 200 common pipistrelle passes recorded at detector 5, it is possible that a low number of common pipistrelle bats were foraging along the Foul Burn on the night of high activity, accounting for the high number of passes.

7.5.24. To determine patterns of bat activity throughout the night and across the seasons the percentage of bat calls recorded around sunrise and sunset are shown in Technical Appendix 7.1: Ecology, Volume 4. In 2020 detectors 1 – 6 all had calls within 30 minutes of sunset in at least one season (highest was detector 5 which had 14 calls within 30 minutes of sunset, 13 during autumn and one in spring). Additionally, a single noctule bat pass was recorded before sunset on 14 October 2020 at detector 6: No detectors recorded bat passes within 30 minutes of sunrise. In 2021 detector 8 had 45 calls within 30 minutes of sunset, three during summer and 45 during autumn, 22 of which were all soprano pipistrelles recorded between 19:37 – 19:48 on 18 September 2021.

7.5.25. Analysis was also undertaken in relation to bat activity at different wind speeds, as shown in Images 7.1 – 7.4. Further details on the number of calls at different wind speeds are provided in Technical Appendix 7.1: Ecology, Volume 4. The number of calls show a clear cluster when temperatures are above 10°C and when winds are below 5 m/s, excepting for noctules and *Myotis sp.* calls, for which wind speed is shown to have more impact than temperature and numbers of calls were recorded below 10 ^{o}C.

Overall Risk Assessment (Bat activity Index)

7.5.26. In lieu of a full Ecobat assessment, BAI were calculated for all of the survey data gathered from the Proposed Development in 2020 and 2021, which has allowed for a comparison of activity levels across detectors at the Proposed Development Site and a comparison with information available within other local sites that are in the public domain. In addition, professional judgement has been used to assess whether the activity levels calculated are considered to be low, moderate or high for the local area.

7.5.27. The most comparable information available in the public domain has been obtained from Dunside Wind Farm[35] (surveys conducted 2022) approximately 11 km north-west and Crystal Rig IV Wind Farm[36], approximately 13 km north-east from the Proposed Development (surveys conducted in 2013). Using data from both EIAR chapters, the BAI were calculated as 1.99 for Dunside and 22.09 at Crystal for all surveys conducted. The overall BAI for the Proposed Development is 11.70, which superficially suggests that levels of bat activity at the Proposed Development are higher than at Dunside, but lower than at Crystal Rig IV.

7.5.28. Using the criteria outlined in Table 7.2: Relative BAI criteria by genus, a summary of the relative BAI as Low to High per species is provided in Table 7.15. The median nightly activity was at most nine for soprano pipistrelles, six common pipistrelle, one Myotis sp., and one noctule pass at detector 8. At all other detector locations, and for all other recorded species the

[35] *Land Use Consultant Ltd, June 2023. EDF Energy Renewable Ltd, Appendix 6.4: Bat Survey Report – Dunside Wind Farm.*

[36] *Natural Power Ltd, 2014. Fred Olsen Renewable Ltd. Environmental Impact Assessment Report – Chapter 6 Ecology, Volume 2: Crystal Rig IV.*

median BAI was less than one pass per night. Full details per species and detector is provided in Technical Appendix 7.1: Ecology, Volume 4.

Table 7.15: Median and Maximum BAI (peak number of nightly passes) assessment for species recorded within the Proposed Development Site

Species	Assessment (Median BAI)	Assessment (Maximum BAI)
Common pipistrelle	Low	Low – High (196 passes)
Soprano pipistrelle	Low	Low – High (128 passes)
Pipistrellus sp.	Low	Low (5 passes)
Myotis sp.	Low	Low – Moderate (15 passes)
Noctule	Low	Low – High (67 passes)
Nyctalus sp.	Low	Low (3 passes)
Brown long-eared	Low	Low (3 passes)

7.5.29. Using information provided within Tables 3a and 3b of NatureScot guidance[7], an overall risk assessment can be made in relation to the site. Based on NatureScot[7] guidance, a six turbine development is considered a small sized project; however due to the size of the turbines (over 100 m at tip height) and presence of other nearby developments, a medium risk was applied. The Proposed Development was considered to offer moderate quality habitat to support bats in that the habitat may be used by foraging bats; site connected to the wider landscape by linear features; trees or structures with moderate to high potential as roost sites[7]. The overall risk assessment for each species or species group is provided in Table 7.16 below. Risk has been classified according to guidance, with low assessed as between 0-4 (green), medium as 5-12 (amber) and high as 15-25 (red).

7.5.30. Across the three survey periods and based on the maximum BAI, common pipistrelle, soprano pipistrelle and noctule had high levels of activity and these species have been identified as high risk of turbine impact using the maximum range activity assessment[7].

Table 7.16: Overall risk assessment for Median and Maximum species values (risk score)

Species	Assessment (Median)	Assessment (Maximum)
Common pipistrelle	Low (3)	High (15)
Soprano pipistrelle	Low (3)	High (15)
Pipistrellus sp.	Low (3)	Low (3)
Myotis sp.	Low (3)	Low – Moderate (6)
Noctule	Low (3)	High (15)
Nyctalus sp.	Low (3)	Low (3)
Brown long-eared	Low (3)	Low (3)

Source: SNH 2019

7.5.31. Species most at risk are pipistrelle species and noctule (high).

Other Protected Mammal Surveys

Otter

7.5.32. All suitable habitat within the Proposed Development Site was surveyed for signs of otter August 2020, several signs of presence were recorded and the results of which are presented in Confidential Technical Appendix 7.2, Figure A7.1, Volume 4. Signs included feeding remains, spraints, scat and two possible couches.

Water Vole

7.5.33. All suitable habitat within the Proposed Development Site was surveyed for signs of water vole in August 2020. No definitive signs of water vole were detected within the Proposed Development Site; however suitable habitat for water vole was recorded along Foul Burn and Wellcleugh Burn. In addition, possible feeding signs and burrows were noted within the Proposed Development Site, along Foul Burn. the results of which are presented in Confidential Technical Appendix 7.2: Ecology, Figure A7.1, Volume 4. No evidence of water voles was recorded within 50 m of the proposed infrastructure.

Badger

7.5.34. All suitable habitat within the Proposed Development Site was surveyed for signs of badger in 2020 and in 2021, survey findings are presented within Confidential Technical Appendix 7.2 (Volume 4). Badger setts were found in 2020/2021 and evidence of foraging was recorded in 2023 during the updated habitat survey.

Reptiles and amphibians

7.5.35. No targeted reptile or amphibian surveys were undertaken as part of the Proposed Development. However, the Proposed Development Site includes a variety of habitats such as felled woodland and heathland with potential for reptiles including adders, slow worms and common lizards. All of which have historically been recorded in the area (see paragraph 7.5.6).

7.5.36. There are two ponds and two ponded sections of burns within the Proposed Development Site which could provide habitat for amphibians including common frog, as well as an assortment of burns. One further pond is located adjacent the Proposed Development Site (outwith the boundary to the east) at TN 28. No targeted great crested newt surveys were undertaken due to the lack of great crested newts within the local area. The pond at TN 25 (see Figure 7.5, Volume 3a) is an ephemeral pond that held water during the September 2023 survey however the presence of pedunculate water-starwort around the edges of the pond suggests the presence of water on a semi-regular basis and is reflected by the presence on aerial imagery. During the design process, the track layout has been altered to avoid direct impacts on the pond at TN 25, moved so that the access track now 5 m from the pond at its closest point. While the remaining pond (TN 29) is elsewhere within the Proposed Development Site, more than 250 m from any infrastructure works.

Fish Habitat Surveys

7.5.37. The surveyed section of the waterways within the Proposed Development Site included portions of Wellcleugh Burn, Raecleugh Head Burn and Foul Burn. Young fish were identified within three of the four surveyed sections of Foul Burn suggesting highly suitable habitat for fish along its entire length.

7.5.38. Wellcleugh Burn was dry at the first survey location and then had low flow throughout the surveyed areas, Raecleugh Burn was similar in that it had a low flow while Foul Burn was a more medium to high flowing watercourse. Further details on the differences between the watercourses is provided within Technical Appendix 7.1: Ecology, Volume 4.

7.5.39. Suitable spawning habitat for both salmon and lamprey species incorporating riffle with gravel and pebble was evident within all three surveyed watercourses. In addition, areas of silt sufficient for lamprey larvae were also available. Boulder and cobble areas providing good juvenile salmon habitat can be found within Raecleugh Burn and Foul Burn.

7.5.40. Additional cover for fish was provided by low branches and fallen trees. Instream vegetation was present in 60 % of the surveyed Wellcleugh Burn, and 73 % of Foul Burn; however, no instream vegetation was recorded within Raecleugh Burn. Bankside vegetation covered 94 %

of the banks at Wellcleugh Burn, 75 % of the banks at Raecleugh Burn and 69 % of the banks at Foul Burn, providing stabilisation, preventing bank erosion and giving additional cover for fish species.

7.6. Assessment of Potential Effects

7.6.1. The main ways in which the Proposed Development may affect ecological receptors are via:

- The potential to have an adverse effect on the integrity of a statutory site designated for its ecological features, particularly those with an international designation such as SACs, either as a direct result of the Proposed Development or in combination with other projects;
- The potential to adversely affect defined sensitive habitats. Such an effect may arise directly through habitat loss, or indirectly through cumulative effects; and
- The potential to adversely affect defined populations of protected species. Such an effect may arise directly through habitat loss, disturbance or displacement or death during construction or operation, or collisions with turbines, or indirectly through cumulative effects.

7.6.2. In line with the principles of a proportionate approach to the preparation of the EIAR, embedded mitigation is considered from the outset and is presented in the following section. Features have only been taken on for further impact assessment if no significant effect cannot be concluded following the implementation of this embedded mitigation.

Embedded Mitigation

7.6.3. Embedded mitigation measures are proposed as part of the Proposed Development, to reduce impacts associated with construction, operation and decommissioning, and are outlined as follows.

7.6.4. A minimum distance of 50 m has been maintained between the Proposed Development and watercourses, with the exception for locations where tracks cross watercourses. See Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2 for further information regarding watercourse crossings.

7.6.5. The layout of the Proposed Development has avoided impacts to hydrologically sensitive habitats where possible (e.g. blanket bog and GWDTEs), taking into account other constraints, as such no solar arrays or access tracks will be constructed over the blanket bog. Where avoidance has not been possible, the infrastructure will be constructed in such a way as to maintain the integrity and connectivity of the hydrology of hydrologically sensitive habitats. New access tracks would be designed in keeping with NatureScot good practice guidance[7]. Further detail on hydrology is provided in Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2. From the phase 1 peat survey and detailed site survey it is known that the majority of the site (94% of surveyed points) is underlain by shallow soils of <0.5 m peat depth. Chapter 9, Table 9.10 and Figure 9.4, Volume 3a shows that all turbines have been located only on soils that have <0.5 m peat depth.

7.6.6. All proposed turbine locations are over 100 m from key habitat features for bats (such as areas of woodland or scrub), which gives more than the 86 m buffer as set out in current NatureScot guidance[7]. This calculation is based on assumed candidate turbine dimensions set out in Chapter 4: Project Description, Volume 2. Should micrositing of turbine location be required, this distance will be maintained and overseen at the construction stage by the ECoW. The required buffer distance of 86 m is estimated by the equation:

$$\sqrt{(\mathbf{50} + \boldsymbol{bl})^2 - (\boldsymbol{hh} - \boldsymbol{fh})^2}$$

7.6.7. Where *bl* = blade length (81 m); *hh* = hub height (119 m); and *fh* = feature (tree) height, estimated here as 20 m.

7.6.8. The solar array has been designed with the option of grazing and the leading edge (lowest edge) of the panels will be 0.8 m above the ground, allowing enough space for maintenance of the vegetation and minimal shading of the grassland below the panels. The perimeter fencing is 6 ft deer fencing with wooden posts, it will not be concreted in at the base enabling medium-small mammals to continue to move through and within the area to maintain habitat connectivity.

Construction Phase

7.6.9. Prior to commencement of works at the Proposed Development, pre-construction ecology walkover surveys will be carried out, including surveys for potential bat roosts, badger, otter and water vole. This will enable any refinements to be made if necessary, to mitigation, micrositing and/or the construction programme to take into account any updated distribution or presence of protected species, with a suitable mitigation plan adopted on a case by case basis;

7.6.10. In line with the Scoping Report and as agreed by NatureScot, a CEMP incorporating a CMS will be produced prior to construction works commencing in consultation with the LPA. The document will be a live document and will be updated throughout the pre-construction and construction and will include:

- Risk assessment of potentially damaging construction activities;
- Identification of “biodiversity protection zones” (buffers around protected species or key habitat areas which will be protected throughout the works);
- Practical measures (both physical measures and sensitive working practices) to avoid or reduce impacts during construction (may be provided as a set of method statements);
- The location and timing of sensitive works to avoid harm to biodiversity features;
- The times during construction when specialist ecologists need to be present on site to oversee works;
- Responsible persons and lines of communication;
- The role and responsibilities on site of an ecological clerk of works (ECoW) or similarly competent person; and
- Use of protective fences, exclusion barriers and warning signs.

7.6.11. An ECoW will be present during enabling works and throughout the construction period of the Proposed Development. They will be a suitably experienced individual, whose role would be to provide advice so that that works are carried out in accordance with environmental measures detailed in the CEMP, and to monitor compliance with relevant legislation and good practice (see Section 7.3 of this chapter). The ECoW would contribute to all relevant CEMP documents. Once work has commenced, their role will be to provide ecological and pollution control advice and monitor compliance of all relevant mitigation measures and legislation (see also Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2). The ECoW will also give regular toolbox talks to make site personnel aware of the ecological sensitivities on site. The ECoW would have the authority to stop any construction activity that is having or likely to have a significant environmental impact or be in breach of legislation.

Construction Phase: Habitats

7.6.12. Detailed mitigation measures will be provided in the CEMP for the protection of sensitive habitats during the pre-construction, construction and post-construction phases and will consist of:

- Toolbox talks to inform contractors of the sensitive habitats at the Proposed Development;
- Marking of sensitive areas of habitat close to construction areas, to prevent accidental encroachment;
- No storage of materials or machinery permitted within exclusion zones;

- Supervised vegetation clearance by the ECoW in sensitive areas prior to construction; and
- Construction phase control measures will continue during the operational phase, through the operational management plan, where potential effects exist.

7.6.13. Where possible (and where other constraints allow) an allowance of 50 m micrositing of infrastructure will be undertaken to ensure construction does not impact on the most sensitive habitats and any other identified ecological constraints and will be completed in consultation with the ECoW. This is particularly important when working in close proximity to waterbodies and sensitive habitats. Where micrositing cannot avoid areas of sensitive habitats or features, noting that micrositing may be required for other (potentially conflicting) reasons, the ECoW would discuss and agree the required mitigation to ensure impacts are appropriately minimised.

7.6.14. Any land degraded by construction and not required for the operation of the Proposed Development, such as the construction compound and around areas of tracks, would be restored as soon as possible after construction is completed. Turves would be carefully removed during construction as far as practicable and stored following good practice for re-use in the restoration of areas not required for the operation of the Proposed Development. As such, any vegetation removed for the construction phase would be reinstated within the area of the Proposed Development, facilitating natural re-colonisation of vegetation communities. Permanent habitat loss would be limited to that required for the footprint of infrastructure and good site management practices would be implemented to minimise the risk of encroachment of the construction corridor into adjacent habitats. As far as is reasonably practicable, any notable floral species encountered will be marked with an exclusion zone or translocated to other suitable areas of habitat or stored for reuse in reinstatement of temporary infrastructure. The implementation of these measures will reduce the potential for impacts on sensitive habitats.

7.6.15. Pollution incidents may occur during construction as well as within the operational phase during maintenance works. Pollution prevention measures will be detailed in the CEMP and overseen by the ECoW. Pollution with regards to waterbodies is further discussed in Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2. Measures to control the impact of dust on sensitive habitats would be implemented during the preparation and construction phase. These measures will be adopted, when necessary, in dry weather, in areas of active development, and will most likely involve the controlled dampening of tracks and B6456 when utilised by construction vehicles. Material for construction will be imported from local quarry sources, which will have similar chemical properties to stone found within the area of the Proposed Development to ensure no alteration in soil chemistry. Further detail on the mitigation of potential dust impacts will be detailed within the CEMP.

Construction Phase: Watercourses and GWDTE

7.6.16. The pre-construction quality of watercourses would be maintained during construction (see Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2). Watercourse protection measures would be adopted within the CEMP and include protection against siltation and sedimentation, and pollution incidents such as the implementation of a pollution response plan and the safe storage of chemicals in bunded containers. Robust mitigation measures will be installed prior to works commencing to ensure the impacts on watercourses are minimised. Mitigation throughout the Proposed Development will be regularly monitored and maintained/replaced as required. Refuelling of vehicles and machinery will be carried out at a central designated area, on an impermeable surface, located at least 50 m away from any watercourse. Monitoring of water quality would be carried out before and during construction. The implementation of these measures would ensure impacts on protected species, such as otter and fish species, are minimised.

7.6.17. Details of how impacts upon groundwater flow are minimised and mitigated are detailed in Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2.

Construction Phase: Protected Species

7.6.18. A Species Protection Plan (SPP) will be produced as part of the CEMP and agreed by consultees prior to the commencement of development, detailing measures to be implemented before and during construction to protect species present in the area of the Proposed Development. This will include good practice measures to prevent accidental mortality of protected species during construction, such as:

- A suitable vehicle speed limit to be enforced within the Proposed Development;
- Warning signs installed, where appropriate, to reduce risk of collision with protected species;
- Covering of deep excavations, foundations and pipe openings (or a ramp suitable to allow a mammal to escape installed) when not active to prevent entrapment of animals;
- Pre-construction surveys undertaken for protected species, including bats and badger within set buffer areas of the Proposed Development;
- If a potential resting place (e.g. bat roost) of a protected species is found within set buffer areas of construction then work will cease within appropriate (species-specific) buffers until it can be established whether it is in active use by a protected animal. If presence is confirmed, then NatureScot will be consulted to discuss possible mitigation measures and/or seek an appropriate licence;
- Lighting design will ensure watercourses and woodland remain unlit at night. Security lighting and lighting associated with the temporary compound will be low lux[37] and directed away from watercourses and woodland to reduce disturbance; and
- All site personnel will be made aware of the presence of protected species through toolbox talks.

7.6.19. In line with the request from Marine Scotland Science (MSS) mitigation and monitoring measures for fish, with map showing proposed sampling and control sites, will be included within the SPP. A decommissioning and restoration plan for water quality was also requested and is addressed within Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2.

Operational Phase

7.6.20. With the exception of the operation of the wind turbines and solar array, general maintenance of the turbines/PV array, there will be little on-site activity during the operational phase, and therefore levels of disturbance will be considerably reduced relative to the construction period.

7.6.21. Where potential effects exist, control measures will be incorporated into an Outline Operational Environmental Management Plan (OEMP) (see Technical Appendix 7.3, Volume 4). In particular, the potential for pollution incidents during routine maintenance activities will be minimised by adoption of SEPA good practice guidance[38]. The OEMP will also include management prescriptions and monitoring of the retained/enhanced habitats to achieve biodiversity benefits. Policy 3 of NPF4 advises the provision of enhancement measures, but at the date of this EIAR finalisation the Scottish Biodiversity Strategy and the creation of a Scottish biodiversity metric are still awaited. It is anticipated that planning conditions will enable the OEMP to evolve to reflect future advice.

---

[37] *A standardised unit of measurement of light level intensity (illuminance).*

[38] *SEPA, (2010). Engineering in the water environment: good practice guide - river crossings (2nd Edition). SEPA.*

7.6.22. Any routine maintenance works will take place during the day where practicable to minimise the potential for disturbance to protected species within the Proposed Development (since these are mostly nocturnal/crepuscular) and a speed limit of 15 mph will be enforced for any vehicles going onto the Proposed Development, in order to reduce the risk of collision with protected species.

7.6.23. The OEMP will detail mitigation measures required during the operational phase relating to protected species to ensure ongoing compliance with relevant environmental legislation.

Decommissioning

7.6.24. Embedded mitigation of decommissioning activities will follow that proposed for the embedded mitigation of construction activities, including pre-decommissioning surveys and ecological supervision of activities.

Feature Assessment

7.6.25. On the basis of the description of the ecological baseline, together with the legislation and guidance, a summary of the habitats and species within the Proposed Development Site is provided in Table 7.17 below.

7.6.26. In identification of designated sites as IEFs, consideration has been given to the existence of pathways for effects to occur. This includes direct effects resulting from impacts on habitats and indirect effects resulting from impacts occurring on habitats that possess downstream hydrological connectivity. Where habitat mosaics have been identified by the baseline survey, the constituent Phase 1 habitat types are taken to be the relevant IEFs. Where no significant effects are likely with the application of embedded mitigation this is specified, and the feature is not considered an IEF requiring EIA and will therefore not be discussed further in the chapter.

7.6.27. The River Tweed SAC/SSSI is downstream from the Proposed Development and hydrologically connected so have been included within the impact assessment.

7.6.28. At its closest point Dogden Moss SAC is 3.2 km south-west of the Proposed Development. As the SAC is designated for terrestrial habitats (upland raised bog) and not hydrologically connected there is no route to impact. For this reason, no direct or indirect impacts on Dogden Moss SAC are anticipated and Dogden Moss has been scoped out of this assessment.

7.6.29. Langtonlees Cleugh SSSI is within the site and Greenlaw Moor SSSI is adjacent the site (immediately south of the access road) and are therefore likely to be affected by the proposed works. Crook Burn SSSI, designated for terrestrial habitats (fen meadow), is not connected with the Proposed Development by significant habitat corridors such as hedgerow networks or waterways and is sufficiently far (4.8 km north of the Proposed Development) that it is not anticipated to be impacted directly or indirectly by the Proposed Development.

7.6.30. Dunter Lee Cleughs – Hells Cleugh and White Burn LBS is immediately north of the Proposed Development Site, though the northern section of the Proposed Development Site will be used principally for habitat enhancements, impacts on the locally designated sites have been assessed based on its proximity. Cleckinshaw, Kettelshiel & Bogpark Burns LBS (to be adopted) included burns and wetland flushes that support brown/sea trout and are hydrologically linked to the Proposed Development Site, as such impacts have been assessed. The remaining locally designated sites are sufficiently far that they have not been assessed.

7.6.31. The following habitats, shown in Figure 7.5, Volume 3a, of negligible ecological value have not been assessed due to the low ecological significance and limited extent of direct impacts:

- Coniferous woodland – plantation (0.25 ha lost);
- Recently felled wind blow, coniferous woodland (0.75 ha lost);
- Bracken (no direct loss);

- Quarry (no direct loss);
- Cultivated / disturbed land – arable (2.45 ha lost/changed);
- Bare ground (no direct loss); and
- Other Habitats (no direct loss).

7.6.32. Pine marten and red squirrel were scoped out of assessment by agreement with consultees as part of the scoping process and are therefore not discussed further. Additionally, dormouse have been scoped out due to the lack of local records returned within the TWIC search, absence of suitable habitat and lack of hedgerow removal associated with the Proposed Development.

7.6.33. Where no significant effects are likely with the application of embedded mitigation as outlined in Sections 7.3 above this is specified, and the feature is not considered an IEF requiring EIA.

Table 7.17: Summary of designated sites, habitats and species and their conservation importance.

Feature	Covering legislation and guidance/conservation designation*	Geographical level of value	IEF	Justification
River Tweed SAC	SACs are statutory European protected sites designated under the Habitats Regulations. The listed habitat types and species are those considered to be most in need of conservation at a European level (excluding birds that are covered under Special Protected Areas and assessed in Chapter 8: Ornithology, Volume 2).	International	**Yes**	The River Tweed SAC and SSSI includes sections of the River Tweed designated for riparian vegetation, lamprey, salmonids and otters. The watercourses on site are upstream of the designated areas. There is potential for a likely significant effect (LSE) on the features of this site, through accidental pollution during construction works or nutrient enrichment from clear felling of forestry at the Proposed Development Site. Therefore, the SAC is considered to be an IEF and will be taken forward for Screening for Appropriate Assessment (AA).
River Tweed SSSI	A SSSI is an area that has been notified as being of special interest due to its flora, fauna or geological or physiographical features under the Wildlife and Countryside Act 1981 (as amended).	National	No	The River Tweed SSSI includes multiple designated sections along the River Tweed, the closest of which is Blackadder Water which is hydrologically connected to the Proposed Development Site. Embedded mitigation measures will be implemented in order to minimise the potential for impacts on the water environment, and therefore the River Tweed SSSI, such as; a minimum distance of 50 m between the proposed infrastructure and watercourses (the number of watercourse crossing has been minimised throughout the schemes design to avoid impacts wherever possible), watercourse crossings designed in keeping with SEPA good practice, and to ensure that there are no restrictions to movement of otter or fish species, site water management, including drainage and watercourse crossing design would be included in a CEMP which will also include the appointment of ECoW and the requirement of a Fish and Macro-invertebrate Monitoring Programme (FMMP) during construction and operation.

Feature	Covering legislation and guidance/conservation designation*	Geographical level of value	IEF	Justification
				As a result of the embedded mitigation no impacts on the SSSI, are anticipated as a result of the Proposed Development. This SSSI is therefore not considered to be an IEF.
Langtonlees Cleugh SSSI	A SSSI is an area that has been notified as being of special interest due to its flora, fauna or geological or physiographical features under the Wildlife and Countryside Act 1981 (as amended).	National	No	The area of semi-natural woodland at the eastern edge of the Proposed Development Site is part of the Langtonlees Cleugh SSSI and as such of National Importance. The woodland will be retained throughout the Proposed Development and enhanced through additional planting as detailed within the outline OEMP (Confidential Technical Appendix 7.2: Ecology, Volume 4). This will include planting of native species associated with the SSSI increasing habitat extent along both Leescleugh Burn and Wellcleugh Burn. There is potential for an indirect LSE on the features of this site, from dust blow or accidental pollution during construction. However, the distance from the SSSI and the infrastructure is more than the Zone of Influence (ZoI) for dust (250 m) and embedded mitigation including a CEMP, ECoW and standard good practice will further prevent the increase in dust and pollution incidences reaching this area. As a result of the embedded mitigation no impacts on the SSSI, are anticipated as a result of the Proposed Development. This SSSI is therefore not considered to be an IEF.
Greenlaw Moor SSSI	A SSSI is an area that has been notified as being of special interest due to its flora, fauna or geological or physiographical features under the WAC1981 (as amended).	National	No	Greenlaw Moor is nationally designated for raised bog with heather moor and is adjacent to the Proposed Development. There is potential for a LSE on the features of this site, through indirect impacts from dust blow or accidental pollution during construction works or nutrient enrichment from clear felling of forestry at the Proposed Development Site. However, embedded mitigation includes a pollution prevention plan and measures to control dust, which will be included in the CEMP and monitored by the ECoW, It is therefore considered that this embedded mitigation is sufficient to prevent negative

Feature	Covering legislation and guidance/conservation designation*	Geographical level of value	IEF	Justification
				effects to the habitats for which the site was classified. This site is therefore not considered to be an IEF.
Dunter Lee Cleughs – Hells Cleugh and White Burn LBS	LBSs represent important places for wildlife outside legally designated sites, and their importance and significance is in the linkages they provide in a local context, supporting and re-enforcing the features of statutory designated sites or features of local importance.	Regional	No	Dunter Lee Cleughs – Hells Cleugh and White Burn LBS is immediately north of the Proposed Development Site. No infrastructure is proposed within the northern section of the Proposed Development Site. Instead, habitat enhancements will be undertaken through ditch bocking and continued conservation management. Though adjacent to the Proposed Development Site, the LBS is not hydrologically linked to the area of works, and the enhancements within Figure 7.7, Volume 3a will benefit the locally rare plants within the adjacent LBS. Given that the LBS is not hydrologically connected to the area of works and the embedded mitigation measures, no LSE are anticipated on the LBS which is not considered to be an IEF.
Cleckinshaw, Kettelshiel & Bogpark Burns LBS (to be adopted)	LBSs represent important places for wildlife outside legally designated sites, and their importance and significance is in the linkages they provide in a local context, supporting and re-enforcing the features of statutory designated sites or features of local importance.	Regional	No	Cleckinshaw, Kettelshiel & Bogpark Burns LBS (to be adopted) is hydrologically connected the Proposed Development. It is located 0.96 km southwest at its closest point, in a straight line, this distance would be longer if following the watercourses. Given the distance between the Proposed Development and the LBS (to be adopted) the opportunities for pollution are limited. Embedded mitigation including a pollution prevention plan and measures to control dust, will be included in the CEMP and monitored by the ECoW. It is considered that this embedded mitigation is sufficient to prevent negative effects to the habitats for which the site was classified. This site is therefore not considered to be an IEF.
Broadleaved woodland – semi-natural	Annex 1 of Habitat Directive; SBL; GWDTE	National	No	The area of semi-natural woodland is part of the Langtonlees Cleugh SSSI and as such of National Importance. The woodland will be retained throughout the Proposed Development and enhanced through additional planting as detailed within the outline OEMP (Confidential Technical Appendix 7.2: Ecology, Volume 4 and Figure 7.7,

Feature	Covering legislation and guidance/conservation designation*	Geographical level of value	IEF	Justification
				Volume 3a). This will include planting of native species associated with the SSSI and increase the habitat extent along both Leescleugh Burn and Wellcleugh Burn. There is potential for an indirect impact from dust created during construction works, or from accidental pollution, however the woodland is more than 250 m from the proposed infrastructure and therefore outside the ZoI for dust (250 m). A pollution prevention plan and measures to control dust will be included in the CEMP and monitored by the ECoW, and so it is considered that embedded mitigation is sufficient to prevent adverse effects to this habitat. None of the broadleaved woodland will be lost to the Proposed Development and embedded mitigation measures have been included to protect the retained woodland. As such this habitat is not considered to be an IEF.
Broadleaved woodland – plantation	LBAP habitat	Local	No	All broadleaved woodland is a priority habitat on the Scottish Borders LBAP. It is therefore considered that the plantation broadleaved woodland within the Proposed Development Site is locally important. The three areas of broadleaved plantation woodland within the Proposed Development Site are small and fragmented, totalling 2.52 ha. The woodlands will be retained and protected throughout the construction phase with additional woodland planted to the west of the Proposed Development Site, as shown in Figure 7.7, Volume 3a, thereby leading to an increase in broadleaved woodland. As such, no significant effects on the integrity of this feature are likely as a result of the Proposed Development. Therefore, this habitat is not considered to be an IEF.
Scrub – dense/continuous	High GWDTE potential	Negligible	No	The area of scrub with a mix of rush pasture and gorse (M23a; W23) has high potential to be a GWDTE. This area will not be directly affected by the proposals. Further discussion of GWDTEs is presented in Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2.

Feature	Covering legislation and guidance/conservation designation*	Geographical level of value	IEF	Justification
				The remaining scrub habitat in the Proposed Development Site holds little to no conservation interest and is widespread throughout Scotland. No areas of scrub will be lost through the Proposed Development. This habitat is therefore not considered to be an IEF.
Acid grassland - unimproved	SBL, LBAP, some areas with moderate GWDTE potential	Regional	No	The unimproved acid grassland is to the far north of the Proposed Development Site adjacent to the Dunter Lee Cleughs – Hells Cleugh and White Burn LBS, which therefore increases its geographical value. None of this area will be lost to the Proposed Development and will be enhanced through continuation of conservation grazing. However, 2.46 ha of the existing 17.29 ha (14.20%) of unimproved acid grassland will be within the solar developable area. The solar developable area includes the area within the 6 ft deer-proof fence around the solar development, including the areas between the strings of panels and outside the array. Not all of this area will be directly lost, though during construction there will be bare areas created and potential soil compaction by vehicles piling in the frames and delivering materials. Once operational the grassland within the array will be managed for both energy production and conservation, as detailed within the outline OEMP in Technical Appendix 7.3, Volume 4, with the array designed to a minimum height of 0.8 m which will allow for suitable management of the vegetation. Portions of this habitat (NVC U6) have moderate potential to be a GWDTE however these areas will not be directly affected by the proposals. Further discussion of GWDTEs is presented in Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2. There is also potential for an indirect impact from dust created during construction works, or from accidental pollution. A pollution prevention plan and measures to control dust will be included in the CEMP and monitored by the ECoW, and so it is considered that embedded mitigation is sufficient to prevent adverse effects to this habitat.

Feature	Covering legislation and guidance/conservation designation*	Geographical level of value	IEF	Justification
				As the only direct impact is associated with the solar development whereby the habitat will be temporarily lost during construction, with the grassland reestablishing through conservation grazing and seeding during operation, the impact is considered temporary and not significant. Therefore, unimproved acid grassland is not considered to be an IEF.
Acid grassland – semi-improved	SBL some areas with high/moderate GWDTE potential	Local	No	The solar PV area covers 4.71 ha (44.45%) of the 10.61 ha semi-improved acid grassland. The solar PV area includes the area within the 6 ft deer-proof fence around the solar development, including the areas between the strings of panels and outside the array. Not all of this area will be directly lost, though during construction there will be bare areas created and potential for soil compaction by vehicles piling in the frames and delivering materials. The solar development will temporarily reduce the condition of the grassland during construction. Once constructed reseeding of any bare areas as prescribed in the outline OEMP (Technical Appendix 7.3, Volume 4 and Figure 7.7, Volume 3a) will promote reestablishment. Once operational the grassland within the array will be managed for both energy production and conservation, with the array designed to a minimum height of 0.8 m which will allow for suitable management of the vegetation. As the grassland is considered likely to establish well and be appropriately managed within the array and this impact is considered temporary, it is not considered significant for an already agriculturally semi-improved habitat. Portions of this habitat (NVC M23) have high potential to be a GWDTE however these areas will not be directly affected by the proposals. Further discussion of GWDTEs is presented in Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2. Given the temporary impacts and the embedded mitigation (including design of the array and reseeding) no LSE are anticipated, as such this habitat is not considered an IEF and is not considered further in this chapter.

Feature	Covering legislation and guidance/conservation designation*	Geographical level of value	IEF	Justification
Neutral grassland - unimproved	SBL, LBAP some areas with high GWDTE potential	Local	No	In total less than 0.01 ha (<0.01%) of this habitat will be lost to the Proposed Development through the creation of hardstanding. However, there is potential for an indirect impact from dust created during construction works, or from accidental pollution. A pollution prevention plan and measures to control dust will be included in the CEMP and monitored by the ECoW, and so it is considered that embedded mitigation is sufficient to prevent significant adverse effects to this habitat. Given that less than 0.01 ha / % of the habitat will be lost to the Proposed Development, the low conservation value and embedded mitigation measures, this habitat is not considered to be an IEF.
Neutral grassland - semi-improved	SBL, some areas with moderate GWDTE potential	Local	No	A small area (0.26 ha / 1.31%) of this habitat will be lost to create the quarry track which will also temporarily impact 0.04 ha (0.18%) and an additional 0.80 ha (4.10%) will be within the solar developable area. Leaving 18.37 ha / 94.35% of the semi-improved neutral grassland unaffected by the Proposed Development. However, there is potential for an indirect impact from dust created during construction works, or from accidental pollution. A pollution prevention plan and measures to control dust will be included in the CEMP and monitored by the ECoW, and so it is considered that embedded mitigation is sufficient to prevent significant adverse effects to this habitat. Some areas of this habitat (NVC MG10) have a moderate potential to be a GWDTE however these areas will not be directly affected by the proposals. Further discussion of GWDTEs is presented in Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2. Given the low conservation value of this habitat and retention of over 94%, this habitat is not considered to be an IEF.
Improved grassland	Some areas with high GWDTE potential	Negligible	No	This habitat holds little to no conservation interest and is widespread throughout Scotland. A small area, 3.34 ha (2.27%) of the 147.32 ha will be affected (2.05 ha

Feature	Covering legislation and guidance/conservation designation*	Geographical level of value	IEF	Justification
				permanent loss, 1.21 ha temporary and 0.08 ha will be within the solar PV area) as part of the Proposed Development. There are areas within the improved grassland that have potential as GWDTE (areas of M23 mosaics) however these are not directly impacted by the Proposed Development. This habitat is therefore not considered to be an IEF.
Marsh / Marshy grassland	SBL, LBAP all with moderate or high GWDTE potential	Local	**Yes**	A small area 1.18 ha (1.75%) of the 67.63 ha of marshy grassland within the Proposed Development Site will be permanently lost and an additional 0.82 ha (1.21%) will be temporarily lost through the Proposed Development. In addition, 18.89 ha (27.93%) will be within the solar array area. Given that some infrastructure will be located within these habitats including areas with high potential to be GWDTE, the Proposed Development could have an impact on the hydrology of this habitat. Further discussion of GWDTEs is presented in Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2. It is considered likely that construction and operation of the Proposed Development has the potential impact on the habitat and therefore **marshy grassland is considered an IEF and has been taken forward for assessment.**
Dry dwarf shrub heath - acid	Annex 1 of Habitat Directive, SBL, LBAP, some areas with moderate GWDTE potential	Regional	**Yes**	An area, 1.04 ha (6.05%) of the 17.11 ha of dry heath will be permanently lost through the Proposed Development and 0.44 ha (2.59%) would be temporarily lost through the construction phase. An additional 0.9 ha (5.27%) will be within the solar PV area and subject to potential habitat change. It is considered likely that construction and operation of the Proposed Development has the potential impact on the habitat and therefore given the conservation significance of this Annex 1 priority habitat and the direct impacts to 2.38 ha (13.91%), **dry heath is considered an IEF and has been taken forward for assessment.**

Feature	Covering legislation and guidance/conservation designation*	Geographical level of value	IEF	Justification
Wet dwarf shrub heath	Annex 1 of Habitat Directive, SBL, LBAP with moderate GWDTE potential	Regional	**Yes**	1.18 ha (3.31%) of the 35.62 ha of wet heath will be permanently lost through the Proposed Development and 0.15 ha (0.42%) would be temporarily lost through the construction phase. In addition, 20.13 ha (56.52%) of wet heath will be within the solar PV area and subject to potential habitat change. Given that some infrastructure will be located within these habitats (NVC M15) including areas with moderate potential to be GWDTE, the Proposed Development could have an impact on the hydrology of this habitat. Further discussion of GWDTEs is presented in Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2. It is considered likely that construction and operation of the Proposed Development has the potential impact on the habitat and therefore given the conservation significance of this Annex 1 priority habitat and the impacts to 21.46 ha (60.25%), **wet heath is considered an IEF and has been taken forward for assessment.**
Dry heath/acid grassland	LBAP with moderate GWDTE potential	Local	**Yes**	0.88 ha (3.01%) of the 29.12 ha of dry heath/acid grassland will be permanently lost through the Proposed Development and 0.22 ha (0.76%) would be temporarily lost through the construction phase. In addition, 3.47 ha (11.91%) of the dry heath/acid grassland will be within the solar PV area and subject to potential habitat change. The areas of dry heath/acid grassland with GWDTE potential (U6) are retained within the proposals, however further discussion of GWDTEs is presented in Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2. Overall 4.57 ha / 15.69% of the dry heath/acid grassland will be affected by the proposals, of which 3.69 ha (12.67% of the dry heath/acid grassland habitat within the Proposed Development Site) will be subject to temporary impacts or change only. Due to the proportion of this habitat being affected **dry heath/acid grassland is considered an IEF and has been taken forward for assessment.**

Feature	Covering legislation and guidance/conservation designation*	Geographical level of value	IEF	Justification
Wet heath/acid grassland	SBL, LBAP with moderate GWDTE potential	Regional	**Yes**	An area, 1.34 ha (4.81%) of the wet heath/acid grassland will be permanently lost to wind farm infrastructure, with 0.47 ha (1.71%) temporary loss. In addition, 17.09 ha (61.61%) of wet heath/acid grassland will be within the solar PV area and subject to potential habitat change. In total 18.90 ha / 68.13% of the wet heath/acid grassland will be directly affected by the Proposed Development. Given that some infrastructure will be located within these habitats including areas with moderate potential to be GWDTE (M15), the Proposed Development could have an impact on the hydrology of this habitat. Further discussion of GWDTEs is presented in Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2. Considering the regional status of wet heath/acid grassland the loss or changes to 18.90 ha/ 68.13%, **wet heath/acid grassland is considered an IEF and has been taken forward for assessment.**
Blanket sphagnum bog	Annex 1 of Habitat Directive, SBL, LBAP	Regional	No	Blanket bog is an Annex 1 priority habitat and though small in extent (3.13 ha), will be retained throughout the development, with the scheme designed to avoid the need for tracks or other infrastructure within the blanket bog. As such, no significant effects on the integrity of this feature are likely as a result of the Proposed Development. Additional changes to the design have been undertaken to avoid the need for an access track over the bog and further ensure the retention of this habitat throughout the Proposed Developments lifetime. There is also the potential for an indirect impact from dust, or from accidental pollution. A pollution prevention plan and measures to control dust will be included in the CEMP and monitored by the ECoW. It is therefore considered that embedded mitigation is sufficient to prevent adverse effects to this habitat and as such no significant effects of the Proposed Development on the integrity of this feature are likely. Therefore, this habitat is not considered to be an IEF.

Feature	Covering legislation and guidance/conservation designation*	Geographical level of value	IEF	Justification
Flush and spring - acid/neutral flush	Annex 1 of Habitat Directive, SBL, LBAP with high GWDTE potential	Regional	No	A small area of flush habitat (0.92 ha) is present within the Proposed Development Boundary, of this a small area will be directly impacted as part of the Proposed Development (<0.02 ha / 2.00% of habitat within Proposed Development Site permanently lost; and up to 0.06 ha / 6.20% of habitat within Proposed Development Site temporarily lost) through the creation of the access track or temporary areas of hardstanding (including the areas of earthworks which accounts for 0.03 ha). Acid/neutral flush habitats within the site are on the SBL as a watching brief only. This means that the habitat has only low conservation value despite the LBAP and Annex 1 status. Sensitive areas will be marked out by the ECoW and where possible infrastructure or earthworks (such as locations of spoil) will be microsited to avoid the most sensitive areas. Working methods to minimise damage in this area such as the use of low-pressure tires or high visibility protective fencing will be outlined in the CEMP. Areas subject to unavoidable temporary impacts will be monitored for restoration as soon as practicable following completion of construction. The habitat (NVC M6) also has a high potential to be a GWDTE. Given that some infrastructure will be located within 250 m of these habitats, the Proposed Development could have an impact on the hydrology of this habitat. Further discussion of GWDTEs is presented in Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2. There is also the potential for an indirect impact from dust created during construction works, or from accidental pollution. A pollution prevention plan and measures to control dust will be included in the CEMP and monitored by the ECoW. As areas of this habitat lost to the Proposed Development are very small, and the low conservation significance of this habitat it is considered that embedded mitigation is sufficient to prevent long-term adverse effects and as such no significant effects on the integrity of this feature are likely as a result of the Proposed Development. Therefore, this habitat is not considered to be an IEF.

Feature	Covering legislation and guidance/conservation designation*	Geographical level of value	IEF	Justification
Standing water - eutrophic	LBAP	Local	No	Two small ponds and widened sections of the burns are present within the Proposed Development Site. Of these, one pond will be 5 m (at the closet point) from the proposed access track. Construction works within 50 m of the pond will require the presence of an ECoW, which will be prescribed within the CEMP. The CEMP will also include measures to protect the pond during construction such as through the provision of a silt fence or splash guard, sensitive use of spoil/drainage and high visibility barriers to minimise the potential impacts on the pond. Additional wetland features will be created in the western edge of the Proposed Development to increase the extent of this habitat and provide valuable benefits to biodiversity as included in the outline OEMP (Technical Appendix 7.3, Volume 4). There is also the potential for an indirect impact from dust created during construction works, or from accidental pollution on the Well Cleugh Burn during the woodland planting. A pollution prevention plan and measures to control dust will be included in the CEMP and monitored by the ECoW. It is therefore considered that embedded mitigation is sufficient to prevent adverse effects to this habitat and as such no significant effects on the integrity of this feature are likely as a result of the Proposed Development. Therefore, this habitat is not considered to be an IEF.
Common and soprano pipistrelle bats	Conservation Regulations; Wildlife and Countryside Act; SBL and LBAP	Local	**Yes**	Both species are common and widespread and known to occur throughout Scotland. The Proposed Development is therefore considered of local conservation importance for all occurring species of bats. Due to the high levels of activity of common and soprano pipistrelle bat species within the Proposed Development Site the Proposed Development has potential to cause a significant effect on bats. **Therefore, common and soprano pipistrelle bats are considered to be an IEF and have been taken forward for assessment.**

Feature	Covering legislation and guidance/conservation designation*	Geographical level of value	IEF	Justification
Noctule and *Nyctalus sp,* bats	Conservation Regulations; Wildlife and Countryside Act; SBL and LBAP	Local	**Yes**	Noctule bats are relatively common and widespread and known to occur throughout Scotland. The maximum collision risk for noctule bats at the Proposed Development Site was found to be high risk, with low relative activity at all locations excepting detector 8 which was high. The Proposed Development is considered of local conservation importance for noctule bats and has the potential to cause a significant effect on bats. **Therefore, noctule and *Nyctalus* sp. bats are considered to be an IEF and have been taken forward for assessment.**
Other bat species – *Myotis sp.* and brown long-eared.	Conservation Regulations; Wildlife and Countryside Act; SBL and LBAP	Local	No	Low levels of activity were recorded for brown long-eared bat, *Myotis and* 21 passes of brown long-eared bat recorded across the whole survey period. 265 *Myotis sp*. passes were recorded during the survey period and the species was assessed as having low to moderate relative maximum activity levels at the Proposed Development. *Myotis sp.* are considered to have a low risk for turbine collisions[6]. The Proposed Development is therefore considered of local conservation importance for all species of bats listed. Due to the low levels of relative activity of listed bat species within the Proposed Development Site and the low collision risk of *Myotis* and long-eared bats, the Proposed Development is unlikely to cause a significant effect on these species. Therefore, these species are not considered to be an IEF.
Otter	Habitat Regulations; Wildlife and Countryside Act; SBL and LBAP	Local	No	Surveys identified signs of otter on water courses within the Proposed Development Site. No otter activity was recorded within 50 m of the proposed infrastructure. Embedded mitigation includes pre-works surveys which will be included within the CEMP. Micrositing of the infrastructure will allow for avoidance of impacts. Works will not be carried out within species specific buffers of protected mammal resting places unless done so under licence from NatureScot.

Feature	Covering legislation and guidance/conservation designation*	Geographical level of value	IEF	Justification
				Water crossings will also be built to ensure safe access for otters up and down stream of the track. All potential impacts to otters will be mitigated under embedded mitigation, including embedded mitigation to avoid indirect impacts such as pollution of watercourses. Therefore, a significant effect on the integrity of the local population is considered unlikely and otters are not considered to be an IEF.
Water vole	Habitat Regulations; Wildlife and Countryside Act; SBL and LBAP	Local	No	Possible water vole burrows were identified within the Proposed Development Site. No water vole activity was identified within 50 m of the proposed infrastructure. The embedded mitigation includes pre-works surveys which will be included within the CEMP. Micrositing of the infrastructure will allow for avoidance of impacts. Works will not be carried out within species specific buffers of protected mammal resting places unless done so under licence from NatureScot. Water crossings will also be built to ensure safe access for water voles up and down stream of the track. All potential impacts to water voles will be mitigated under embedded mitigation, including embedded mitigation to avoid indirect impacts such as pollution of watercourses. Therefore, a significant effect on the integrity of the local population is considered unlikely and water voles are not considered to be an IEF.
Badger	WCA, SBL, LBAP and Protection of Badgers Act,	Local	No	Badgers are widespread across Scotland and in the local area of the Proposed Development. The levels of activity recorded indicate that while they are present at the Proposed Development, this is unlikely to be in sufficient numbers to consider the population of greater than Local value. No badger setts were identified within 100 m of the proposed infrastructure. The embedded mitigation includes pre-works surveys which will be included within the CEMP. Micrositing of the infrastructure will allow for avoidance of impacts. Works

Feature	Covering legislation and guidance/conservation designation*	Geographical level of value	IEF	Justification
				will not be carried out within species specific buffers of protected mammal resting places unless done so under licence from NatureScot. Therefore, a significant effect on the integrity of the local population is considered unlikely and badgers are not considered to be an IEF.
Reptiles and amphibians	Wildlife and Countryside Act (protected against trade); SBL and LBAP	Local	No	No reptiles or amphibians were identified within the Proposed Development Site. However suitable habitat for a variety of common and widespread species exists within the Proposed Development Site. All species present within the local area are widespread and common throughout Scotland and therefore if present within the Proposed Development are considered to be of Local value. Through the embedded mitigation, adherence to a SPP and presence of an ECoW a significant effect on the integrity of the local populations is considered unlikely. Therefore, a significant effect on the integrity of the local population is considered unlikely and reptiles and amphibians are not considered to be an IEF.
Fish	Atlantic salmon and river lamprey are listed on Appendix III of the Bern Convention and Annex II and V of the EC Habitats & Species Directive. Sea Lamprey are listed on Annex II of the EU Habitats Directive and Appendix III of the Bern Convention. Atlantic salmon, brown trout, river lamprey and sea lamprey species are listed on the SBL. The watercourses present across the site form tributaries	National	No	Atlantic salmon and brown trout are widely distributed throughout Scotland while river and sea lamprey are considered threatened in Scotland. The fish habitat suitability survey suggests suitable habitat is present along all three burns on site, including suitable spawning habitat for both salmon and lamprey. However, the Proposed Development has been designed to minimise crossings of waterways and ensure appropriate buffers of waterways. Further discussion of waterways is presented in Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2. In accordance with the MSS scoping response, pre-construction, construction and operational phase monitoring will be incorporated within the SPP and is considered embedded mitigation. Embedded mitigation including a pollution prevention plan and measures to control dust will be included in the CEMP to be monitored by the ECoW. It is therefore

Feature	Covering legislation and guidance/conservation designation*	Geographical level of value	IEF	Justification
	of the River Tweed SAC which is designated for brown trout, river lamprey, sea lamprey and Atlantic salmon.			considered that embedded mitigation is sufficient to prevent adverse effects to the habitat suitable for these fish species and as such no significant effects on the integrity of this feature are likely as a result of the Proposed Development. Therefore, a significant effect on the integrity of the national population is considered unlikely and fish are not considered to be an IEF.

Source: Natural Power

7.7. Impact Assessment

7.7.1. Seven features have been identified as IEFs, requiring EIA following the application of embedded mitigation (see Paragraphs 7.6.4 to 7.6.24). These are:

- River Tweed SAC;
- Habitats:
  - Marshy grassland;
  - Dry dwarf shrub heath – acid;
  - Dry heath/acid grassland
  - Wet dwarf shrub heath;
  - Wet heath/acid grassland;
- Bats:
  - Common pipistrelle, soprano pipistrelle; and noctule bats.

7.7.2. Screening for AA for the River Tweed SAC is provided in Section 7.12. An impact assessment for the remainder of these ecological features is provided below for the construction and operation periods. For all IEFs, decommissioning effects are predicted to be of similar or lower magnitude to the effects during construction.

Habitats

Construction

7.7.3. During construction the principal impact from the Proposed Development to IEF habitats is via permanent habitat loss for construction of the wind turbines and infrastructure or habitat change within the solar PV area. The amounts of each habitat directly impacted are outlined in Table 7.11. As outlined in Table 7.17 the following habitats are considered IEF due to the effect of these impacts which are further detailed in regional context in Table 7.18:

- Marshy grassland;
- Dry dwarf shrub heath – acid;
- Dry heath/acid grassland
- Wet dwarf shrub heath; and
- Wet heath/acid grassland.

7.7.4. The marshy communities within the Proposed Development Site included M23, M25 and MG10 subcommunities. Notes from the NVC include that the marshy grassland habitat varied between overgrazed and relatively species rich adjacent to burns, with drier areas already considered similar to neutral grassland.

7.7.5. Due to the mosaic of habitats within the Proposed Development Site and relative importance of heath compared to acid grassland, the proportions of the heath/acid grassland that is heath has been calculated using the proportions recorded during the NVC survey.

7.7.6. The majority of the area recorded as dry heath/acid grassland mosaic was described as transitional habitat between U2 acid grassland and dry heath. These areas included up to 80% acid grassland, with an average of 24.57% dry heath across the mosaic habitat to be impacted. Based on these calculations, shown in Technical Appendix 7.1: Ecology, Volume 4, the total area of dry heath within the Proposed Development Site is 24.26 ha, including both the areas mapped as dry heath and the dry heath proportion of the mosaic habitat. Dry heath communities that will be lost to the Proposed Development are H9 and H12. Notes from the NVC include transitional changes due to recent reduction in grazing and species-poor areas on higher ground indicating a past history of burning.

7.7.7. The majority of the area recorded as wet heath/acid grassland mosaic was described as wet heath of varying condition with different quantities of wavy hairgrass or Molinia dominated grassland. These areas included between 60 – 75% wet heath, averaging 65.80% across the habitat mosaic impacted. Based on these calculations, shown in Table 7.18, the total area of wet heath within the Proposed Development is 53.88 ha, including both the areas mapped as wet heath and the wet heath proportion of the mosaic habitat. Wet heath communities that will be lost to the Proposed Development are M15 with M25 and U2 mosaics. Notes from the NVC include wetter areas and areas of particular species poorness or dominance of Molinia or wavy hair grass. Also noted by the NVC surveyor was the lack of sphagnum mosses.

7.7.8. NHZ habitat estimates given in SNH (2001)[39] are for NVC communities and not Phase 1 habitat types. Therefore, NHZ estimates used in Table 7.18 represent the sum of the NHZ estimates for NVC communities found within the site that correspond with each Phase 1 habitat type.

[39] *SNH. (2001). Natural Heritage Zones: A National Assessment of Biodiversity (Habitats). SNH, Edinburgh*.

Table 7.18: Comparison of areas of IEF habitats within the Proposed Development Site with NHZ 20, showing area of habitat directly impacted by the Proposed Development as total area and percentage of Proposed Development Site and NHZ habitat estimates.

Phase 1 Habitat	Habitat in Proposed Development Site (ha)	Area permanently lost (ha)	Total otherwise impacted (ha) – includes temporary loss and change	Estimated area in NHZ 20 (ha)[29]	% habitat in NHZ 20 permanently lost	% habitat in NHZ 20 otherwise impacted
B5 – Marsh/marshy grassland*	67.63	1.18	19.71	1596.90	0.07	1.23
D1.1 – Dry dwarf shrub heath – acid	17.11	1.04	1.34	8514.90	0.01	0.02
D5 – dry heath mosaic component#	7.15	0.22	0.91	8514.90	<0.01	0.01
D2 – Wet dwarf shrub heath	35.62	1.18	20.28	997.50	0.12	2.03
D6 – Wet heath mosaic component#	18.26	0.88	11.56	997.50	0.09	1.16

*. *highlights where the percentage of the estimated habitat impacted is over 100% due to the low estimated area within the NHZ emphasising why NHZ20 is considered more reflective of the habitats present within the Proposed Development Site.# mosaic calculations, shown in Technical Appendix 7.1: Ecology, Volume 4*

7.7.9. The habitat to be permanently lost has been kept to a minimum throughout the design, with assessment of temporary impacts and habitat change anticipated within the solar PV area taking a precautionary approach. This precautionary approach accounts for all areas within the proposed solar PV area, which is taken to be the area within the proposed 6 ft perimeter deer fence, and thereby includes the areas that will be between and around the strings of panels as well as the area directly below then (approximately 30 % of this area). This precautionary approach was taken on the basis of frequent tracking over the area within the fence line during construction leading to bare areas and compaction.

7.7.10. While grassland typically restores well around solar panels, wet or heath habitats are more sensitive and at increased risk of impacts during construction with repetitive tracking over areas considered more likely to result in compaction and bare areas. This will be minimised through the use of low-pressure construction vehicles with turf tyres or rubber tracks to minimise soil compaction and rutting is recommended and will be prescribed within the CEMP.

7.7.11. Reseeding of bare areas following construction is common practice to restore the habitats, encourage additional diversity (through the addition of locally appropriate seed mixes) and reduce injurious weeds.

7.7.12. Furthermore, construction activities have the potential to degrade or destroy habitats directly through excavation, compaction, or modification (e.g. vegetation removal) and indirectly as a result of dewatering or from the accidental release of fuels, lubricants or other chemicals. In addition, dust particles have the potential to interfere with sensitive plants. However, any of these described impacts would be temporary and reversible. Additionally, embedded mitigation measures such as a pollution prevention plan and measures to control dust will be included in the CEMP and monitored by the ECoW. Overall, the extent of the IEF habitats permanently lost as a result of the Proposed Development are a small proportion of that available within the region (NHZ20). The areas of habitat that will be permanently lost are all below 1% of the regional habitat and thereby **not significant**.

7.7.13. However above 1% of the estimated regional marshy grassland (1.23 %) and wet heath (3.40 %) will be affected by the proposals. 18.89 ha of the marshy grassland (1.18 % of the estimated regional marshy grassland) and 31.38 ha of wet heath/wet heath mosaic affected by the proposals (3.15 % of the estimated regional wet heath) will be habitat change due to the solar development. The solar PV area is worst-case to allow for the temporary impacts during construction (which is anticipated to take 4-6 months) of the entire area within the perimeter fence. Once constructed the solar farm will be over approximately 30% of this area, with the strings of panels spaced to prevent shading and space around the outside of the array (between the edge of the strings and the perimeter fence) to allow for access and vegetation will continue to grow under, between and outside the panels. Following construction all bare areas of grassland will be reseeded with a locally appropriate seed mixes, to encourage quick restoration of the habitat while the heathland will be monitored to assess reestablishment, as specified within the OEMP. This restoration and appropriate management will mitigate this impact.

7.7.14. Permanent loss through the proposed development would affect 0.07 % of the regional estimated marshy grassland and 0.21 % of the regional estimated wet heath.

7.7.15. It is considered that embedded mitigation outlined in Embedded Mitigation section are sufficient to prevent adverse effects to these habitats arising from construction activities and through reestablishment reduce the duration of impacts to medium term. It is therefore considered that construction activities will have a **minor negative** impact on habitats, resulting in an effect that is **not significant**.

Operation

7.7.16. As outlined in Table 7.18, 19.71 ha of the marshy grassland, 1.34 ha of dry heath, 0.91 ha of dry heath within a mosaic, 20.28 ha of wet heath as well as 11.56 ha of wet heath within a mosaic will be either temporarily lost during construction or otherwise changed by being with the solar PV area. While these are large portions of the habitats present within the Proposed Development Site (ranging from 7.86% of the dry heath to 63.32% of the wet heath) this includes all areas within the solar PV area.

7.7.17. Once constructed the solar arrays will cover approximately 30% of the proposed solar PV area with the areas outside/between the strings being found to return to grassland relatively well (following careful management)[40] and grassland reestablishing well below the strings. However wet and heath habitats are less well studied, with less literature available on the reestablishment of marshy grassland or heathland within the arrays. The changes in microclimates associated with the areas directly below the panels through shading and reduction in direct rainfall typically mean these areas are drier and milder with less variable temperatures, though some research suggests that soils under panels stay wetter in summer[41]. Overall, these microclimatic changes can benefit some plant species above others and lead to variance in the sward[42] though the variety of habitats it creates can benefit pollinators. As the impacts on these habitats associated with the ongoing management of solar farms remains poorly understood monitoring of the habitat condition is recommended and is included within the OEMP. However, if appropriately managed it is assumed these habitats will continue to grow within the array though a more diverse mosaic structure may be present owing to the differences in conditions across the area.

7.7.18. The solar arrays have a minimum height of 0.8 m at the leading/lowest edge to allow for conservation management within the array interior, either through grazing or cutting and reseeding of any areas damaged during construction. This is above the recommended minimum height (0.7 m high leading edge[43]) to allow for additional vegetation growth below the panels and reduce the extent of management intervention. This design choice and the conservation management of the solar PV area are to minimise and mitigate the changes to this area.

7.7.19. The OEMP also includes compensatory measures to 4.25 ha of marshy grassland and 16.98 ha of heath / acid grassland mosaic, to the north (shown in Figure 7.7, Volume 3a) through blocking of existing drains and continuation of conservation grazing. The northern edge of the Proposed Development Site, was chosen for this compensation, as recent changes in management have allowed areas of dry heath to establish adjacent to the LBS. This area will be allowed to create a heath/acid grassland mosaic and further compensate for the area permanently impacted by the Proposed Development including the 3.92 ha of heath habitats permanently lost and the changes to the 33.14 ha within the solar PV area.

7.7.20. Once operational the wind turbines will not directly impact any retained or enhanced habitats. Additional operational impacts for the Proposed Development will be limited to a low risk of minor pollution through vehicular activity and turbine maintenance. Vehicle movements will be

---

[40] *H. Montag, G Parker & T. Clarkson. 2016. The Effects of Solar Farms on Local Biodiversity; A Comparative Study. Clarkson and Woods and Wychwood Biodiversity.*

[41] *Hassanpour Adeh E, Selker JS, Higgins CW, 2018. Remarkable agrivoltaic influence on soil moisture, micrometeorology and water-use efficiency. PLoS ONE 13(11): e0203256. https://doi.org/10.1371/journal.pone.0203256*

[42] *Armstrong, A, Ostle, N and Whitaker, J. 2016. Solar park microclimate and vegetation management effects on grassland carbon cycling. Environ. Res. Lett. 11 074016*

[43] *Solar Energy UK, 2022. Natural Capital Best Practice Guidance - Increasing biodiversity at all stages of a solar farm's lifecycle.*

restricted to the tracks in so far as possible and monitoring of the habitat reestablishment will be undertaken in line with the OEMP.

7.7.21. It is proposed that an OEMP as detailed in Paragraphs 7.6.25 will be finalised and an approved OEMP will be implemented throughout the life of the Proposed Development. An initial draft OEMP is provided in Technical Appendix 7.3, Volume 4, with areas of habitat management shown in Figure 7.7, Volume 3a. This includes, conservation management of the semi-improved acid grassland to the north, bordering the Dunter Lee Cleughs – Hell's Cleugh and White Burn LBS, to create dry heath/acid grassland mosaic as compensation for the changes within the solar array and permeant losses through the Proposed Development. This has already begun in the northern edge, as was noted in the NVC survey. The establishment time of this habitat and restoration period within the solar PV area is anticipated to reduce the duration of effect associated with habitat loss/change to medium term.

7.7.22. Embedded mitigation measures such as the design choices (high leading edge of the solar panels), implementation of a OEMP including pollution prevention and control measures as well as a habitat management measures, and monitoring are proposed. These will reduce the duration and extent of the habitat change to medium term (allowing for the reestablishment and enhancement time of heath habitats) with habitats anticipated to have been restored within 10 years following construction. It is therefore considered that operational activities will have a **minor negative** impact on habitats, resulting in an effect that is **not significant**.

Protected Species – bats

Construction

7.7.23. No roosting features were identified within 200 m of the infrastructure and therefore no impacts on roosts are anticipated due to the construction works.

7.7.24. Static detector surveys identified low – high activity between the different bat species across the different detectors, with the highest activity recorded at detector 8 in 2021, where the highest BAI and total passes were recorded. After detector 8, detector 5 had the highest BAI with a peak count of 145 common pipistrelle passes in a single night.

7.7.25. Detectors 1 – 6 all had calls within 30 minutes of sunset in at least one season (highest was detector 5 which had 14 calls within 30 minutes of sunset, 13 during autumn and one in spring). Additionally, a single noctule bat pass was recorded before sunset on 14 October 2020 at detector 6: No locations recorded bat passes within 30 minutes of sunrise, which combined with the low numbers of calls within 30 minutes of sunrise/sunset indicates that there are no significant roost locations nearby. In 2021 detector 8 had 45 calls within 30 minutes of sunset, three soprano pipistrelle calls during summer and 42 mixed calls during autumn, 31 of which were soprano pipistrelles including 22 calls recorded between 19:37 – 19:48 on 18 September 2021. Therefore, it is considered unlikely that there are any significant roost locations nearby, though there was potential for an autumn soprano pipistrelle roost near to detector 8, which was approximately 235 m from the proposed Turbine 1. The woodland around detector 8 was mostly felled after storms in November 2021. Pre-construction surveys of potential bat roosts will be carried out on any trees or structures, including those identified during the protected species surveys (full details provided in Technical Appendix 7.1: Ecology, Volume 4) with potential to support roosting bats within 50 m of working areas, as part of the SPP.

7.7.26. The loss of habitat to the infrastructure for Proposed Development will not significantly reduce the foraging opportunities within the Proposed Development Site. However, some foraging and commuting behaviour may be altered as a result of construction, but this is likely to be of short-term temporal magnitude only. Furthermore, the implementation of lighting mitigation as included within CEMP and outlined within embedded mitigation (see paragraph 7.6.11 and

7.6.18) means that any disruption caused by construction works will be minimised. Thus, the likelihood of significant effects of displacement or disturbance to foraging or commuting bats during construction is considered negligible.

7.7.27. Bats are considered to be of Local nature conservation importance and after application of embedded mitigation during construction, impacts are considered to be **negligible and not significant.**

Operation

7.7.28. During the operational phase, rotating turbines present a risk to flying bats resulting in potential collision[44] when flying in close proximity to turbines. Research work by Exeter University (DEFRA 2016[45]) found that most bat fatalities at UK wind farms were common pipistrelle, soprano pipistrelle and noctule bats.

7.7.29. The Proposed Development Site includes foraging and commuting corridors along the burns and small areas of plantation, these will be retained throughout the Proposed Development. The woodland created as part of the OEMP, shown in Figure 7.7, Volume 3a, will increase habitat connectivity between the designated sites and existing broad-leaved woodland blocks at the eastern edge of the Proposed Development Site, providing a long-term enhancement to foraging and commuting bats.

7.7.30. There are no potential roost sites found within 200 m of the location of turbines within the Proposed Development during field surveys (see Confidential Technical Appendix 7.1, Volume 4, Figure A7.1). The overall bat activity level (BAI) within the Proposed Development is considered to be low (median) to high (maximum). The site is therefore considered of Local conservation importance for all occurring species of bats.

7.7.31. An operational bat monitoring plan has been included within the OEMP and includes measures to monitor bat activity on site during operation, with potential mitigation included.

7.7.32. Bat activity levels are classified according to Table 7.2 and relative activity levels can be found in Technical Appendix 7.1: Ecology, Volume 4.

Common and Soprano Pipistrelle

7.7.33. Common and soprano pipistrelle bats were the most frequently recorded species at the Proposed Development, with *Pipistrellus sp,* calls accounting for 84.32 % of all passes. Though these were recorded in low numbers in spring, potentially due to the cold weather (of all *Pipistrellus sp.* passes 14.54% were recorded in spring compared to 57.66 % in summer and 27.80 % in autumn). Both common and soprano species are assessed as having a high collision risk with wind turbines. Due to both species being common and widespread across Scotland they have a medium population vulnerability to wind turbines.

7.7.34. Detectors 2, 3 and 6 are the most comparable locations regarding habitat for much of the Proposed Development as they are located along ridge lines and away from the areas of plantation. Overall, low activity levels of common and soprano pipistrelle were recorded at all locations in spring, detectors 2 and 3 each recorded one common pipistrelle pass while detector

---

[44] *Observations showed that most bat deaths occurred at low wind speeds near 5 m/s, when bats are the most active. Fatalities at higher wind speeds (> 5 m/s) are less common, likely because fewer bats are flying in these conditions. Most bat fatalities are a result of blade strikes. See Lawson et al. 2018 Estimating the Likelihood of Bat Barotrauma using Computational Simulations and Analytical Calculations. NREL poster presentation to the AWEA siting meeting in March 2018.*

[45] *DEFRA (2016). Understanding the Risk to European Protected Species (bats) at Onshore Wind Turbine Sites to inform Risk Management. University of Exeter.*

6 had one common pipistrelle pass. Detector 5 had the most *Pipistrellus sp*, activity in spring 2020 with four passes. Activity in summer was moderate with detector 5 having the most recordings (319 *Pipistrellus sp,* passes) followed by detector 3 (256 *Pipistrellus sp,* passes). Detectors 1, 2, 4, 6 and 7 had fewer calls, with less than 100 total for both species. None of the 2020 detectors recorded over 100 pipistrellus sp passes in autumn, with detector 1 (which recorded bats on two nights) recording the most (64) *Pipistrellus sp,* passes of the 2020 autumn deployment. Detector 8 in 2021 recorded over 500 Pipistrellus sp, passes during each deployment.

7.7.35. Of all the 2020 recordings detectors 2, 3 and 6 represent 9.56 %, 24.30 % and 10.99 % of the total passes (by all species) recorded throughout the 2020 surveys. Compared to detector 5 where 29.81 % of all bat passes were recorded in 2020. If looking at all the detectors however, including detector 8 from 2021, detectors 2, 3 and 6 represent 2.68 %, 6.82 % and 3.06 % of all passes and account for 12.39 % of recorded *Pipistrellus sp,* passes. Detector 8 recorded 73.10% of all *Pipistrellus sp,* passes and 71.9 % of all passes.

7.7.36. Due to the high risk assessment within the Proposed Development in the absence of mitigation there is the potential for a **moderately negative** impact on common and soprano pipistrelle bats.

7.7.37. As outlined in 7.6.6 all proposed turbine locations are over 100 m from key habitat features for bats (such as areas of woodland or scrub), which gives more than the 86 m buffer as set out in current NatureScot guidance[6]. Additionally in line with CIEEM 2023 Bat Mitigation Guidelines[46], blades will be “feathered” as standard, to reduce rotation speeds below 2 rpm when idling in order to reduce bat collisions.

7.7.38. As the overall population vulnerability of these two species to wind turbines is medium it is considered that operational effects of the Proposed Development on common and soprano pipistrelle due to collisions would not affect the integrity of the local populations of these species and therefore considered to be **minor negative** and **not significant**.

Noctule bat, *Nyctalus* sp.

7.7.39. Noctule / *Nyctalus* sp. bats are assessed as having high population sensitivity in NatureScot guidance[7]. For the periods during which these species were active, they were assessed as high collision risk at the Proposed Development. Noctules were recorded occasionally throughout the survey period in 2020 (65 records in 2020), and more frequently in 2021 with 350 recorded at detector 8 (293 of which were in autumn). Detector 8 was located adjacent an area of conifer plantation which has subsequently been removed following windfall during Storm Arwen. Given the 2020 surveys included more detectors than turbines (with seven detectors deployed and six turbines now proposed) the results from detector 8 have been included to reflect the variety of bat activity within the Proposed Development Site and highlight the potential for higher levels of activity around the retained woodland.

7.7.40. Detectors 2, 3 and 6 are the most comparable locations regarding habitat for much of the Proposed Development as they are located along ridge lines and away from the areas of plantation. Records of noctule / *Nyctalus* sp. were broadly spread across the detectors in 2020.

7.7.41. Overall, the activity levels and collision risk assessment (see Table 7.16) indicates that the Proposed Development Site is frequently used by noctule bats during autumn when activity peaked (with 75.11% of noctule passes recorded in autumn). Overall, noctule bats accounted

[46] *Reason, P.F. and Wray, S. (2023). UK Bat Mitigation Guidelines: a guide to impact assessment, mitigation and compensation for developments affecting bats. Chartered Institute of Ecology and Environmental Management, Ampfield*.

for 7.52% of all bat passes recorded in 2020 and 10.26% of the 2021 activity, with autumn peaks shown in both years. The seven *Nyctalus sp.* passes were recorded in 2021 on detector 8, with four passes in summer and three in autumn.

7.7.42. Due to the high-risk assessment within the Proposed Development in the absence of mitigation there is the potential for a **moderately negative** impact on *Nyctalus sp.* bats.

7.7.43. As outlined in 7.6.6 all proposed turbine locations are over 100 m from key habitat features for bats (such as areas of woodland or scrub), which gives more than the 86 m buffer as set out in current NatureScot guidance[6]. Additionally in line with CIEEM 2023 Bat Mitigation Guidelines[47], blades will be "feathered" as standard, to reduce rotation speeds below 2 rpm when idling in order to reduce bat collisions.

7.7.44. It is therefore considered that operational effects of the Proposed Development on *Nyctalus sp,* bats due to collisions would not affect the integrity of the local populations of these species, and therefore considered to be **minor negative** and **not significant**.

Conclusions

7.7.45. Avoidance of impacts has been included throughout the design of the Proposed Development, such as through minimising the number of watercourse crossings and avoiding direct impacts to the sphagnum bog. Further design choices have been made to minimise the impacts of the Proposed Development including opting for a higher leading edge on the solar panels.

7.7.46. Following embedded mitigation incorporated within the schemes design and the adherence to a CEMP it is predicted that the Proposed Development would have no significant effects on any IEFs other than a minor negative (not significant) effect on common pipistrelle, soprano pipistrelle bats and noctule/*Nyctalus sp,* bats as well as a minor negative (not significant) effect on other bat species. A minor negative effect is also anticipated on marshy grassland, dry and wet heath habitats which is not significant.

7.7.47. Despite the absence of significant effects, monitoring measures are proposed for bats and an OEMP is proposed, with the aim of restoring areas within the solar PV area, providing compensatory wetland, heathland and marshy grassland as well as providing enhancement areas of broad-leaved woodland within the site and in proximity to it as shown in Figure 7.7, Volume 3a. The planting of 14.15 ha of broad-leaved woodland is considered a significant biodiversity enhancement in line with NPF4. The habitat compensation (4.25 ha of marshy grassland and 16.98 ha of heath/acid mosaic) and enhancement broad-leaved planting has been chosen to provide maximum benefit to the biodiversity on site and within the surrounding area. These have been designed to connect designated sites and retained habitats, including established woodland, as well as tying the changes in with the existing biodiversity works being undertaken by the landowner. It is considered that this will reduce the magnitude of the residual impacts to habitats in the local area to low beneficial, not significant.

7.8. Mitigation and Residual Effects

7.8.1. The magnitude of pre-mitigation effects and the magnitude and significance of residual effects on each IEF which has been scoped in during the construction phase and operation before and after mitigation is detailed in Table 7.19 below.

[47] *Reason, P.F. and Wray, S. (2023). UK Bat Mitigation Guidelines: a guide to impact assessment, mitigation and compensation for developments affecting bats. Chartered Institute of Ecology and Environmental Management, Ampfield*.

7.8.2. For all IEFs, although no species-specific mitigation is required, various embedded measures (described in Section 7.6:hydrology Assessment of Potential Effects) will be implemented to ensure compliance with legislation, and to follow good practice guidance with regard to breeding birds. In addition, an outline OEMP has been prepared which includes measures for habitat enhancements and is provided as Technical Appendix 7.3, Volume 4 and Figure 7.7, Volume 3a.

7.8.3. Despite the absence of significant effects, an OEMP is proposed, and an outline is included within Technical Appendix 7.3, Volume 4. The OEMP includes prescriptions with the aim of achieving the following changes in habitats:

- Marshy grassland – 19.71 ha restored through mitigation, 4.25 ha compensation;
- Heath/heath mosaics – 34.10 ha restored through mitigation, 16.98 ha compensation;
- Wetland created 0.6 ha as enhancement; and
- Broad-leaved woodland - 14.15 ha planted as enhancement.

7.8.4. The OEMP also includes measures for monitoring as well as reducing potential collision impacts on bats. It is considered that this will reduce the magnitude of the residual impacts to marshy grassland and heath habitats to minor negative, bats to minor negative. No significant effects are predicted.

7.9. Summary of effects

Table 7.19: Summary of pre-mitigation impacts and residual effects on each IEF, and the residual significance

IEF	Conservation importance	Nature of potential pre-mitigation impact	Magnitude of pre-mitigation impact	Significance of pre-mitigation effect	Specific mitigation/ compensation measure	Magnitude of residual impact	Residual significance	Level of certainty
Construction / Decommissioning								
River Tweed SAC	International	Hydrological effects via the upper tributaries; risk of water pollution incidents, run-off and erosion affecting watercourses downstream.	Moderate	Not significant	Pre-construction and construction fish and macro-invertebrate monitoring programme and water quality monitoring (see Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2). Embedded mitigation, including: • Minimum buffer of 50 m between proposed infrastructure and watercourses where possible, with exception of construction and upgrade of five watercourse crossings; • Watercourse crossings avoided where possible and the one required crossing to	Negligible	Not significant	Certain

IEF	Conservation importance	Nature of potential pre-mitigation impact	Magnitude of pre-mitigation impact	Significance of pre-mitigation effect	Specific mitigation/ compensation measure	Magnitude of residual impact	Residual significance	Level of certainty
					be designed in keeping with SEPA good practice[48]. Embedded mitigation implemented via construction phase plans such as the CEMP. For further detail on mitigation of impacts on watercourses see Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2.			
Marshy grassland	Local	Permanent and temporary habitat loss. Possible degradation or destruction of habitats through excavation, compaction, or modification. Damage from the accidental release	Minor negative	Not significant	An OEMP is proposed which will restore 19.71 ha of marshy grassland habitat adjacent to the Proposed Development Site as well as provide 4.25 ha compensation. Embedded mitigation implemented via construction phase plans such as the CEMP.	Minor negative	Not significant	Probable

[48] SEPA, 2010. Engineering in the water environment: good practice guide - river crossings (2nd Edition), SEPA.

IEF	Conservation importance	Nature of potential pre-mitigation impact	Magnitude of pre-mitigation impact	Significance of pre-mitigation effect	Specific mitigation/ compensation measure	Magnitude of residual impact	Residual significance	Level of certainty
		of fuels, lubricants or other chemicals. Pollution from dust particles.						
Dry dwarf shrub heath - acid	Regional	Permanent and temporary habitat loss. Possible degradation or destruction of habitats through excavation, compaction, or modification. Damage from the accidental release of fuels, lubricants or other chemicals. Pollution from dust particles.	Minor negative	Not significant	An OEMP is proposed which will restore the 1.34 ha of dry heath habitat within the solar PV area or otherwise temporarily impacted, the permanent loss of 1.04 ha of dry heath will be compensated for within the reduced management area to the north (33.68 ha) which through continued conservation management will develop into a heath/grassland mosaic. Embedded mitigation implemented via construction phase plans such as the CEMP.	Minor negative	Not significant	Probable
Dry heath – acid grassland	Regional	Permanent and temporary habitat loss.	Minor negative	Not significant	An OEMP is proposed which will restore the 0.91 ha of dry heath habitat within the solar PV area	Minor negative	Not significant	Probable

IEF	Conservation importance	Nature of potential pre-mitigation impact	Magnitude of pre-mitigation impact	Significance of pre-mitigation effect	Specific mitigation/ compensation measure	Magnitude of residual impact	Residual significance	Level of certainty
		Possible degradation or destruction of habitats through excavation, compaction, or modification. Damage from the accidental release of fuels, lubricants or other chemicals. Pollution from dust particles.			or temporarily impacted during construction, the permanent loss of 0.22 ha of dry heath will be compensated for within the reduced management area to the north (33.68 ha) which through continued conservation management will develop into a heath/grassland mosaic. Embedded mitigation implemented via construction phase plans such as the CEMP.			
Wet dwarf shrub heath	Regional	Permanent and temporary habitat loss. Possible degradation or destruction of habitats through excavation, compaction, or modification	Minor negative	Not significant	An OEMP is proposed which will restore 31.84 ha of wet heath/heath mosaic habitat within the solar PV area or temporarily lost during construction. The permanent loss of 1.18 ha of wet heath will be compensated for within the reduced management area to the north (33.68 ha) which through continued conservation	Minor negative	Not significant	Probable

IEF	Conservation importance	Nature of potential pre-mitigation impact	Magnitude of pre-mitigation impact	Significance of pre-mitigation effect	Specific mitigation/ compensation measure	Magnitude of residual impact	Residual significance	Level of certainty
		Dewatering or from the accidental release of fuels, lubricants or other chemicals. Pollution from dust particles.			management will develop into a heath/grassland mosaic. Embedded mitigation implemented via construction phase plans such as the CEMP.			
Wet heath/acid grassland	Regional	Permanent and temporary habitat loss. Possible degradation or destruction of habitats through excavation, compaction, or modification. Dewatering or from the accidental release of fuels, lubricants or other chemicals.	Minor negative	Not significant	An OEMP is proposed which will restore 31.84 ha of wet heath/grassland mosaic habitat within the solar PV area or temporarily lost during construction. The permanent loss of 0.88 ha of wet heath/acid grassland mosaic, will be compensated for within the reduced management area to the north (33.68 ha) which through continued conservation management will develop into a heath/grassland mosaic. Embedded mitigation	Minor beneficial	Not significant	Probable

IEF	Conservation importance	Nature of potential pre-mitigation impact	Magnitude of pre-mitigation impact	Significance of pre-mitigation effect	Specific mitigation/ compensation measure	Magnitude of residual impact	Residual significance	Level of certainty
		Pollution from dust particles.			Embedded mitigation implemented via construction phase plans such as the CEMP.			
Bats	Local	Displacement or disturbance to roosting, foraging or commuting bats from construction activity and/or through habitat loss.	Negligible	Not significant	Embedded mitigation implemented via construction phase plans such as the CEMP.	Negligible	Not significant	Certain
Operation								
River Tweed SAC	International	Hydrological effects via the watercourses within the Proposed Development Site.	Low	Not significant	The potential for pollution incidents during routine maintenance activities will be minimised by adoption of good practice guidance.	Negligible	Not significant	Certain
Marsh/ marshy grassland	Local	Accidental pollution incident leading to contamination of retained/enhanced habitats.	Minor negative	Not significant	The potential for pollution incidents during routine maintenance activities will be minimised by adoption of good practice guidance. The OEMP	Minor	Not significant	Probable

IEF	Conservation importance	Nature of potential pre-mitigation impact	Magnitude of pre-mitigation impact	Significance of pre-mitigation effect	Specific mitigation/ compensation measure	Magnitude of residual impact	Residual significance	Level of certainty
		Disturbance or additional damage to habitats by mismanagement during operation.			will include management of the sensitive habitats within the solar PV area.			
Dry dwarf shrub heath - acid	Regional	Accidental pollution incident leading to contamination of retained/enhanced habitats. Disturbance or additional damage to habitats by mismanagement during operation.	Minor negative	Not significant	The potential for pollution incidents during routine maintenance activities will be minimised by adoption of good practice guidance. The OEMP will include management of the sensitive habitats within the solar PV area.	Minor	Not significant	Probable
Wet dwarf shrub heath	Regional	Accidental pollution incident leading to contamination of retained habitats. Disturbance or additional damage to habitats by mismanagement during operation.	Minor negative	Not significant	The potential for pollution incidents during routine maintenance activities will be minimised by adoption of good practice guidance. The OEMP will include management of the sensitive habitats within the solar PV area.	Minor	Not significant	Probable

IEF	Conservation importance	Nature of potential pre-mitigation impact	Magnitude of pre-mitigation impact	Significance of pre-mitigation effect	Specific mitigation/ compensation measure	Magnitude of residual impact	Residual significance	Level of certainty
Wet heath/ acid grassland	Regional	Accidental pollution incident leading to contamination of retained habitats. Disturbance or additional damage to habitats by mismanagement during operation.	Minor negative	Not significant	The potential for pollution incidents during routine maintenance activities will be minimised by adoption of good practice guidance. The OEMP P will include management of the sensitive habitats within the solar PV area.	Negligible	Not significant	Probable
Common pipistrelle, soprano pipistrelle, and noctule bats	Local	Collision risk.	Moderate negative	Not significant	Embedded mitigation included within the schemes design to maintain appropriate buffers from core bat habitats. Additionally, blades will be “feathered” to reduce rotation speeds below 2 rpm when idling in order to reduce bat collisions.	Minor negative	Not significant	Probable

Source: Natural Powe

7.1.1 The mitigation measures are expected to reduce the magnitude of residual effects for all IEFs to which they apply, in the short and long term, and as such no significant residual effects are predicted as a result of the construction and operation of Proposed Development.

7.10. Biodiversity Enhancement

7.10.1. The following section summarises how the Proposed Development has accounted for NPF4 and the Scottish Government: Draft Planning Guidance: Biodiversity[49]. At the time of writing this EIA chapter, policy changes relating to biodiversity are open to consultation by the Scottish Government, it is therefore, acknowledged that guidance may change.

7.10.2. Habitat management including restoration of habitats within the solar PV area and native broadleaved planting are included within the Proposed Development. For full details see the outline OEMP (Technical Appendix 7.3: Ecology, Volume 4). Proposed habitat management works will provide mitigation for marshy grassland, acid grassland and heathland mosaics that will be lost and otherwise impacted as part of the Proposed Development, as well as additional net habitat enhancements as required under NPF4.

7.10.3. The net habitat enhancements have not been calculated using a biodiversity metric (such as the Natural England Biodiversity Net Gain metric) as at the time of writing there is not a metric available for use in Scotland. This is reflective of the Draft Biodiversity Guidance[49] which references the difficulties in using established metrics in Scotland, due to the habitats present within the Proposed Development and comparative abundance of those upland habitats in Scotland compared to England, as such Natural England's Biodiversity Metric 4.0 was not considered applicable. Instead, the proportions of habitats created compared to those lost have been calculated in Table 7.20 to ensure overall biodiversity net benefit.

7.10.4. Additionally, the Proposed Development is based on an understanding of the existing characteristics of the Proposed Development Site and the baseline local, regional and national ecological context.

7.10.5. The Proposed Development has been designed in accordance with the mitigation hierarchy. For instance due to the presence of an irreplaceable habitat (blanket sphagnum bog) the Proposed Development was redesigned to retain the bog out with the areas of direct impact, in line with the rarity and value of the habitat as well as the Draft Biodiversity Guidance[49].

Table 7.20: Amount of habitat enhancement compared with habitat loss

Habitat Type	Permanent loss (ha)	Habitat temporarily affected (ha)*	Habitat creation (ha)	Net habitat creation (ha)	Habitat within Proposed Development Site (ha)	% habitat gain (from baseline)
Marshy grassland	1.18	19.71	4.25	2.95	67.63	4.36
Heath /heath mosaics	3.31	34.10	16.98	13.67	78.14	17.49
Wetland enhancements	0.00	0.60	0.60	0.60	0.62	96.77
Broad-leaved woodland	0	0	14.15	14.15	4.77	296.65

[49] *Scottish Government (2023) Scottish Government Draft Planning Guidance: Biodiversity. November 2023 available: Scottish Government Draft Planning Guidance: Biodiversity (www.gov.scot)*

**The temporarily affected includes the habitats within the solar PV area which will be restored through the outline OEMP, however due to the variety of different acid grassland/heathland habitats present and the time taken to restore these habitats, additional compensation has been provided that target these habitats, to allow for the acknowledge the difficulties of restoration within the solar array.*

7.10.6. The proposed compensation and enhancement measures have been designed to provide maximum ecological benefit. For instance, the broadleaved woodland planting will connect the Langtonlees Cleugh SSSI with the offsite woodland at Hardens Hill and Dunter Lee Cleughs – Hells Cleugh and White Burn LBS. This will provide increased connectivity between two designated sites, strengthening habitat connectivity beyond the Proposed Development.

7.10.7. Through minimising the loss of existing habitats of conservation interest, whilst also creating new habitats that will be more favourable to a wide range of ecological interests with increased habitat connectivity, the proposed development will result in biodiversity net benefit. In addition, the outline OEMP (Technical Appendix 7.3: Ecology, Volume 4) includes long-term management and monitoring of the compensation and enhancements habitats to provide long-term biodiversity enhancement in line with the Draft Biodiversity Guidance[49].

7.11. Cumulative Impact Assessment

7.11.1. The following section assesses the predicted cumulative impacts and potential effects on IEFs from the Proposed Development along with all other plans or projects within an appropriate ZoI following guidance[50].

7.11.2. Cumulative effects have been considered only for wind developments of more than three turbines within 10 km of the Proposed Development. Projects of three or less turbines were excluded due to the lack of publicly available data for developments of this size. Only IEFs for which a greater than negligible residual impact is predicted are considered, as negligible impacts will not result in a detectable increase in cumulative impacts.

7.11.3. Within this search area there are no wind developments for inclusion within the CIA. The only wind development within 10 km of the Proposed Development is Black Hill Wind Farm – 22 turbines with the Environmental Statement dated 2001, approximately 1.76 km from the Proposed Development. The Environmental Statement for Black Hill Wind Farm available on the SBC planning portal (planning ref 01/00058/FUL) is restricted to the non-technical summary[51] and a brief protected species report. The non-technical summary, from 2001, does not detail the habitats present or include an EIA beyond stating "*it is considered unlikely that there will be any significant effects as a result of the proposed work upon the ecology of the site…*". The protected species report, submitted to discharge a planning condition, identified signs of water voles along two watercourses, no evidence of badgers, red squirrels, otters or great crested newts. No bat roosts were identified and no activity surveys were undertaken. As Black Hill Wind Farm, for which surveys were undertaken in 2005, did not identify any impacts on the identified IEFs no further assessment can be made.

7.11.4. Meikle Harelaw Farm (two turbine development) was not required to undergo EIA and are therefore not included in the CIA. The developments at the scoping (Rumbletonrig) or pre-scoping stage have also not been included as impacts have not yet been assessed and the projects have yet to go through planning.

7.11.5. In addition to the above wind farms there are two applications for overhead lines within 10 km of the Proposed Development Site, neither of which have publicly available EIAs on the SBC

[50] *SNH (2012). Assessing the cumulative impact of onshore wind energy developments. SNH, Scotland.*

[51] *Renewable Energy Systems Ltd, 2001. Non-Technical Summary of the Environmental Statement (ES) for a planning application for a wind farm consisting of 22 turbines and associated infrastructure at Black Hill near Duns in the Scottish Borders.*

planning. One of which is 13.6 km long, 6.3 km east of the Proposed Development Site, between Todrig Farm Eccles and Station Road Industrial Estate, which the application form considers to be a non-sensitive area (SBC Planning portal reference: 22/00429/S37). Publicly available consultation from NatureScot (dated 31 March 2022) states that providing "no machinery operates in the watercourse / on the riverbanks, it is our view that the proposal is unlikely to affect the qualifying interests of the designated sites above." Referring to the River Tweed SSSI and SAC. The other overhead line application is for a 10.3 km length between Ladywell Farm Manderston and Caldra Farm, 2.76 km east of the Proposed Development Site, which the application form considers to be a non-sensitive area (SBC Planning portal reference 16/00931/S37). No comments are available from NatureScot however a CEMP was conditioned as part of the planning consent.

7.11.6. Other developments within 10 km of the Proposed Development include a battery storage facility, individual houses, conversions, extensions and agricultural buildings. None of which were considered significant under the NatureScot CIA guidance[50]. The proposed battery storage facility is at screening stage, (SBC Planning portal reference 23/01114/SCR) for a 300 MW storage system, across 9 ha, approximately 8.31 km south of the Proposed Development Site. The screening application makes no reference to the River Tweed SAC/SSSI and states that the proposals are over 5 km from the nearest "sensitive area" which consist of "a number of SSSIs".

7.11.7. No significant cumulative effects are predicted to result from the Proposed Development along with other projects and plans due to the lack of reasonably likely additional impacts of the other cumulative developments within 10 km.

7.12. Appropriate Assessment (River Tweed SAC)

7.12.1. Under the Conservation (Natural Habitats, *&c*.) Regulations 1994, as amended (the Habitats Regulations) any development that may have a LSE on an SPA and SAC, either alone or in combination with other projects, requires an AA to be carried out by the relevant competent authority, in this case the Scottish Ministers, to determine whether or not the development would have an adverse effect on the integrity of the SAC.

7.12.2. Before an AA is initiated a screening process is undertaken to determine whether any of the predicted impacts of the development will result in a LSE. This screening assessment is presented here to provide information to the competent authority to allow them to reach a decision on whether or not the development will have a LSE on an SAC and therefore whether an AA is required. Where LSE cannot be ruled out, a shadow AA is provided (Stage 2).

7.12.3. For the purposes of all assessments required, reasoned argument and professional judgement of biological significance are used to determine whether no adverse effect on the integrity of the designated site can be concluded.

Stage 1: Screening for LSE

7.12.4. Stage 1: Screening for LSE is undertaken to remove any proposals, or components of proposals, which do not require consideration under AA (Stage 2: Shadow AA). Screening should largely consider identifying connectivity and route to impact between the Proposed Development and the Natura site, and whether any of the predicted impacts of the Proposed Development will result in a LSE. This screening assessment is presented here to provide information to the competent authority to allow them to reach a decision on whether or not the development will have a LSE on any SAC and therefore whether an AA is required. If there is any doubt that no LSE can be concluded in Stage 1, the process should move on to Stage 2.

7.12.5. Firstly, any Natura sites with potential connectivity to the Proposed Development are identified, as those designated sites without potential connectivity will have no route to impact and no

adverse effect. As identified in Table 7.8, there are two SACs present within 10 km of the boundary of the Proposed Development, one of which has been identified as requiring further consideration following details provided in Table 7.17, River Tweed SAC.

7.12.6. The River Tweed SAC is designated for Annex I habitats in the north-eastern part of its range: water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. JNCC[52] state that "*it is the most species-rich example, by far, of a river with Ranunculus in Scotland, and is the only site selected for this habitat in Scotland. The river has a high ecological diversity which reflects the mixed geology of the catchment*". The River Tweed SAC designation also lists the following Annex II species; Atlantic salmon and otter with sea lamprey, brook lamprey and river lamprey, as qualifying features. The following high potential threats and pressures are identified within the River Tweed SAC standard data form[53] as within or outside of the SAC:

- H02 Pollution to groundwater (point sources and diffuse sources);
- I01 invasive non-native species, and
- J02 Human induced changes in hydraulic conditions.

7.12.7. While the following activities were identified as having high potential for positive impacts:

- A06 Annual and perennial non-timber crop;
- A02 Modification of cultivation practices; and
- A04 Grazing.

7.12.8. In the absence of mitigation there is a route to impact on the River Tweed SAC through pollution, siltation or contamination of watercourses that flow into the tributaries of the River Tweed, or through potential impacts on the qualifying interests of the site (i.e. habitats, otter or fish species). Therefore, due to the potential impacts identified, and the connection between the Proposed Development and River Tweed SAC, LSE cannot be excluded and so the assessment has been progressed to Stage 2: Shadow Appropriate Assessment.

Stage 2: Shadow Appropriate Assessment

7.12.9. As identified in Stage 1: Screening and in the absence of suitable mitigation, there are impacts associated with the construction and operation of the Proposed Development that may have a significant effect on the qualifying features of River Tweed SAC (Annex 1 habitats, salmon, otter and lamprey species). The impacts identified in relation to the Proposed Development are;

- Hydrological impacts during construction and operation;
- Pollution impacts during construction and operation; and
- Habitat loss, disturbance or displacement or death of qualifying feature species.

7.12.10. There are no works proposed as part of the Proposed Development that will be undertaken within the boundaries of River Tweed SAC. The locations of proposed infrastructure including turbines and tracks as well as the habitats present are provided in Figure 7.5, Volume 3a.

Reasoning and mitigation

7.12.11. In order to reduce the likely significant effects of the Proposed Development on River Tweed SAC to negligible, the Proposed Development has been designed in such a way as to minimise potential impacts as identified within the EIAR. In addition, embedded and additional mitigation has been outlined. With the exception of the operation and general maintenance of the energy

[52] *Available online: River Tweed - Special Areas of Conservation (jncc.gov.uk) accessed 11/10/2023*

[53] *Natura 2000 - standard data form - Site UK0012691 Sitename River Tweed. Updated December 2015.*

park, there will be little on-site activity during the operational phase of the Proposed Development. As operation traffic levels will be lower than the construction traffic, no further consideration is given to effects on the River Tweed SAC during the operational phase.

7.12.12. Impacts in relation to qualifying features are outlined in the following sections.

Annex 1 habitats (primary feature)

7.12.13. There is the potential for pollution impacts as a result of the Proposed Development to affect the integrity of River Tweed SAC as a result of negatively impacting groundwater quality and quantity which may result in diffusion towards the SAC This has the potential to impact on Annex 1 habitats (3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation).

7.12.14. Aerial pollution deposition (dust) could be produced during the construction stage of the Proposed Development as a result of excavations on site and due to vehicular movements on temporary dusty surfaces. A pollution prevention plan and measures to control dust will be included in the CEMP and OEMP (see paragraphs 7.6.10 and 7.6.16 above for further detail) and monitored by the ECoW. The ECoW would be suitably qualified and appointed prior to the commencement of construction in order to implement the agreed CEMP in relation to water protection measures, designated sites and protected species. Dust suppression measures will be adopted when necessary and will involve the controlled dampening of tracks utilised by construction vehicles.

7.12.15. In order to reduce any negative hydrological impacts on River Tweed SAC, the Proposed Development has been designed with a minimum distance of 50 m between infrastructure and watercourses where possible. A site water management, including drainage and watercourse crossing design would be included in a CEMP (see paragraphs 7.6.10 and 7.6.16 above for further detail), to be agreed in consultation with NatureScot, SEPA and the local planning authority. This would include water protection measures as described in Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2 which will aim specifically to address the avoidance of impacts on the River Tweed SAC. Potential impacts on ground water are addressed in Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2.

7.12.16. Following mitigation, the potential for disturbance to Annex 1 habitats will be minimised **and as such no LSE is predicted.**

Fish species; Atlantic salmon (primary feature) and sea, brook and river lamprey (qualifying feature)

7.12.17. Watercourse crossings would be designed in keeping with SEPA good practice and will ensure that barriers to fish migration are minimised. Site water management would be included in a CEMP, and an ECoW would be appointed to oversee the implementation of the agreed CEMP in relation to water protection measures and designated sites.

7.12.18. Any risk of water pollution incidents, run-off, sedimentation and erosion will be mitigated through implementation of good practice during construction, ECoW presence during construction and implementation of water protection measures as detailed in Section 7.7 above and Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2.

7.12.19. In addition, a comprehensive Fish and Macro-invertebrate Monitoring Programme (FMMP) will be produced in consultation with NatureScot and local fishery boards to monitor the watercourses and the species that depend on them (see Section 7.7 above). The monitoring will commence during the pre-construction phase and continue during the period of construction of the Proposed Development. The requirement for operational monitoring will be determined following completion of the pre-construction and construction monitoring. Ongoing water quality

monitoring during construction will allow measures to be implemented should a pollution incident occur (see Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2).

7.12.20. Following mitigation, the potential for disturbance to fish species will be minimised **and as such no LSE is predicted.**

Otter (primary feature)

7.12.21. Otter activity was recorded within the Proposed Development Site as detailed in 7.5.32, signs included feeding remains, spraints, scat and two possible couches.

7.12.22. A minimum distance of 50 m has been maintained between infrastructure and watercourses, with the exception a single watercourse crossing between T2 and T3. Watercourse crossings will be designed in keeping with SEPA good practice[38] and to allow movement of otter through use of dry culverts or mammal ledges. To further mitigate the potential for direct impacts on protected species associated with the SAC, pre-construction protected mammal surveys would be undertaken in accordance with best practice.

7.12.23. Risk of water pollution incidents, run-off, sedimentation and erosion has the potential to result in a loss of prey abundance for otter species. Through implementation of good practice during construction, ECoW presence during construction and implementation of water protection measures as detailed in paragraphs 7.6.15 - 7.6.17 above and Chapter 9: Hydrology, Geology and Hydrogeology, Volume 2 impacts on water quality will be minimised.

7.12.24. Good practice measures during construction, such as covering deep excavations and pipe opening when not active to avoid entrapment, keeping within clearly defined construction areas, and 15 mph speed limit for vehicles to reduce risk of collision with protected species, will minimise potential impacts on the local otter population (see Section 7.7 above).

7.12.25. Following mitigation, the potential for disturbance to otter will be minimised **and as such no LSE is predicted.**

In combination with other plans and projects

7.12.26. It is a requirement of the AA process that LSE be determined for a project both alone and in combination with other projects. In relation to potential cumulative impacts, Quixwood Moor Wind Farm was the only wind development identified as being within 10 km of the Blackadder Water section of the River Tweed SAC (the closest designated portion to the Proposed Development Site) with a publicly available EIAs. The Quixwood Moor Wind Farm did not undertake a detailed assessment of the River Tweed prior to submission of the Environmental Statement[54] in 2011 and is approximately 8.8 km north of the Blackadder Water section though is at closest 500 m from a designated portion of the River Tweed SAC. Due to the lack of available assessment, no combination effects are anticipated. A screening request for extending the operational life of the Quixwood Moor Wind Farm has been submitted (SBC Planning reference 21/01897/SCR) though no ecological information is provided and no reference to the River Tweed SAC is made within the screening request. The application is to extend the lifespan of the operational wind farm for 10 additional years and does not include changes to the existing infrastructure. The screening opinion confirmed that no EIA was required.

[54] *Banks Renewables, Quixwood Moor Wind Farm – Environmental Statement submitted to Scottish Border Planning Portal in December 2011*

7.12.27. The potential effect of negative impacts on habitats and species associated with the River Tweed SAC has been described for the Proposed Development alone and no additional impacts are considered likely in combination with other plans or projects.

Conclusion

7.12.28. Following the above, and providing that the mitigation measures are adopted and implemented, it is considered that the Proposed Development will not adversely affect the integrity of the River Tweed SAC.

7.13. Statement of Significance

7.13.1. An assessment has been made of the potential for significant effects of the Proposed Development on habitats and non-avian species. The Proposed Development is not expected to impact upon the qualifying interests of the River Tweed SAC therefore no likely significant effect can be concluded. The Proposed Development is considered likely to have a minor negative and not significant effect on marshy grassland, dry heath and wet heath. In relation to bats, following the implementation of embedded mitigation the effects as a result of the Proposed Development are assessed as being minor negative but not significant.

7.13.2. By applying the proposed mitigation measures, mainly through the design process, and following good practice guidelines during construction including production of a CEMP and implementation of the proposed OEMP, as well as looking at the enhancement measures separately, the magnitude of residual effects of the Proposed Development are assessed as being reduced to negligible/minor in terms of magnitude, and thus not significant.

7.14. Statement of Competence

7.14.1. The writer of the ecology chapter has 11 years of experience in ecological consultancy including nine years' experience in EcIA and Ecological Chapter compilation (as part of Environmental Statements of EIARs). During this time, she has been involved with design, implementation and management of ecological assessments, production of EIAR chapters, scoping reports, technical baseline reports and operational monitoring reports as well as client and consultee liaison. They are experienced in conducting various ecology surveys, including botanical monitoring of solar farms, bat roost assessments, otter and water vole surveys as well as other protected species surveys.