Appendix 4 Ecological Impact Assessment

Howpark Solar Farm

Eurowind Energy Limited

SLR Project No.: 428.V64539.00001

Howpark Solar Farm

Ecological Impact Assessment

Eurowind Energy Limited

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1.0 Introduction

SLR Consulting was commissioned by Eurowind Energy Limited to prepare a standalone Ecological Impact Assessment (EcIA) to inform a planning application for a solar photo-voltaic (PV) generating station located near Grantshouse, in the Scottish Borders.

1.1 Site Description

The Site is situated approximately 2.3km north east of the village of Grantshouse, Berwickshire, centred on National Grid Reference (NGR) 383816 666175. The Site is largely bound by agricultural fields, scattered hamlets, and rural expanse which is dissected by the main A1 road (to the south west). Immediately north of Site is the constructed Howpark Wind Farm, which is owned and managed by Eurowind Energy Limited. The location of the Site within the wider landscape is shown on Figure 1a of the Planning Application Figures.

The topography of the Site is undulating, varying between 190m above Ordnance Datum (aOD) in the north west and 232m aOD in the south west. Elevation generally falls towards a field drain which runs through the centre of the Site (south-east to north-west) before flowing into Howpark Burn. A circular hill crest formation (Bell Hill), elevated at around 232m aOD, is also present in the south-west of the Site.

The Site consists primarily of modified grassland, with areas of acid grassland, rush pasture, and pockets of wet heath and degraded bog to the south east. Linear shelterbelts formed of mixed and coniferous woodland are present within the north west and centre of the Site. A single pond is also present within the centre of the Site, of which is surrounded by rush pasture.

1.2 Details of the Proposed Development

The proposed development involves the construction and operation of a grid-connected solar PV generating station and ancillary infrastructure. The main elements of the proposed development are anticipated to comprise: solar panels arrays, cabling and panel mounting frames; inverters; transformer stations; string combiner boxes; underground and cable tray cable routes; internal access tracks; perimeter security fencing; and landscaping solutions to provide screening and biodiversity enhancement. The proposed development would share the same grid connection (including the same substation) as the Howpark Wind Farm. There is no lighting proposed for the development as it is anticipated that the Site will only be accessed in daylight hours.

In addition to development of internal access tracks to allow for vehicular access between fields, the main access to the Site would be gained through use of existing constructed access tracks from the south west or north relating to the constructed Howpark Wind Farm, of which join with the main A1 and A1107.

The solar array would cover approximately 15.6ha across the southern extent of the Site, as shown on Figure 2 of the Planning Application Figures.

1.3 Purpose of this Report

The report seeks to:

- summarise baseline ecological conditions and identify important ecological features present (or those that could be present), where relevant;
- identify potential ecological effects associated with the proposed development and make initial recommendations to avoid potentially adverse effects on important ecological features, where possible;

- set out the mitigation and compensation measures required to ensure compliance with nature conservation legislation and/ or to address any potentially adverse ecological effects, where relevant; and
- identify opportunities for biodiversity enhancements as part of the project.

It should be noted that the proposed development does not require an Environmental Impact Assessment Report (EIAR) to support submission of a planning application to the Local Planning Authority (LPA). This document has therefore been designed as a standalone ecological assessment that does not serve as a chapter to an EIAR.

1.4 Relevant Legislation and Planning Policy

1.4.1 Relevant Legislation

This EcIA has been carried out within the context of the following relevant legislation:

- Conservation (Natural Habitats &c.) Regulations 1994 (as amended) (the 'Habitats Regulations');
- Wildlife and Countryside Act 1981 (as amended) (the 'WCA');
- Nature Conservation (Scotland) Act 2004 (as amended);
- Wildlife and Natural Environment (Scotland) Act 2011 (as amended); and
- Protection of Badgers Act 1992 (as amended).

1.4.2 Planning Policy

Planning policy of relevance to this EcIA are listed below.

1.4.2.1 National Planning Policy

National Planning Framework 4 (NPF4)

The National Planning Framework 4 (NPF4) was adopted by Scottish Ministers on 13 February 2023. In order to accord with the biodiversity provisions of NPF4, development proposals should demonstrate that they contribute to the enhancement of biodiversity. Of particular relevance to this project, NPF4 states:

3a) *Development proposals will contribute to the enhancement of biodiversity, including where relevant, restoring degraded habitats and building and strengthening nature networks and the connections between them. Proposals should also integrate nature-based solutions, where possiblle…*

c) *Proposals for local development will include appropriate measures to conserve, restore and enhance biodiversity, in accordance with national and local guidance. Measures should be proportionate to the nature and scale of development.*

d) *Any potential adverse impacts, including cumulative impacts, of development proposals on biodiversity, nature networks and the natural environment will be minimised through careful planning and design. This will take into account the need to reverse biodiversity loss, safeguard the ecosystem services that the natural environment provides, and build resilience by enhancing nature networks and maximising the potential for restoration.*

Local Planning Policy

The Scottish Borders Local Development Plan was adopted on 12 May 2016 and sets out policies on development and land use within the Scottish Borders up to 2025. Policies of

relevance to this report are defined within 'Environmental Promotion and Protection' (EP) and include:

- EP1 – International Nature Conservation Sites and Protected Species;
- EP2 – National Nature Conservation and Protected Species;
- EP3 – Local Biodiversity; and
- EP13 – Trees, Woodlands and Hedgerows.

1.4.3 Guidance

Guidance of relevance to this EcIA includes:

- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine, (CIEEM, 2022).
- Advising on peatland, carbon-rich soils and priority peatland habitats in development management (NatureScot, 2023).
- Planning for development: What to consider and include in Habitat Management Plans (SNH, 2016).
- Guidelines for Preliminary Ecological Appraisal (CIEEM, 2017).
- Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2016).
- The Scottish Biodiversity List (SBL)1.
- The Scottish Borders Local Biodiversity Action Plan (LBAP) 2018 – 20282.
- Realising the Biodiversity Potential of Solar Farms, A Practical Guide. Naturesave Insurance (2022).

2.0 Methodology

2.1 Baseline Data Collection

The baseline ecological and ornithological data was collected by Environmental Resources Management (ERM) (formerly Arcus Consultancy Services Limited), on behalf of Eurowind Energy Limited between May and September 2022. Data collated included a combination of desk-based data search and field survey. For the purpose of this report, it has been assumed that data collected by external consultants was consistent with standard methodologies and good practice guidelines.

2.1.1 Desk Study

A desk-study was carried out to obtain information relating to nature conservation designations and records of protected and/or notable habitats and species of relevance to the proposed development. The study aimed to identify:

- statutory designated Sites within 2km of the Site boundary that support habitats and/or plant species as qualifying/notified features of nature conservation importance;

[1] The Scottish Biodiversity List is available online at: https://www.nature.scot/doc/scottish-biodiversity-list

[2] The Scottish Borders LBAP is available at https://www.scotborders.gov.uk/downloads/file/928/local_biodiversity_action_plan

- non-statutory designated Sites within 2km of the Site boundary that support habitats and/or plant species of nature conservation importance; and
- records of protected and/or notable plant species (including invasive non-native species) within 2km of the Site.

Information of relevance to the desk study is detailed in Table 2-1 below.

Table 2-1: Information of Relevance to the Desk Study and Sources of Data

Feature	Description	Search Area	Data Source
Statutory designated sites of European importance	Special Protection Areas (SPAs), Special Areas of Conservation (SAC), and wetlands of international importance (Ramsar)	Within the Site and 2km radius of Site boundary	NatureScot SiteLink online mapping tool[3] and Multi Agency Geographic Information for the Countryside (MAGIC) website[4]
Statutory designated sites of national importance	Site of Special Scientific Interest (SSSI), National Nature Reserves (NNR), and Local Nature Reserves (LNR)		
Locally designated sites	Local Biodiversity Sites (LBS)		The Wildlife Information Centre (TWIC)[5]
Legally protected and notable species	Protected species listed on Schedules II and IV of the Habitats Regulations; Legally protected species listed in Schedules 1, 5 and 8 of the WCA; Habitats and species listed within the SBL as habitats of principal importance of biodiversity conservation in Scotland; and Badgers, who are afforded protection under the Protection of Badgers Act 1992.		
Legally controlled species	Species listed on Schedule 9 of the WCA		
Howpark Wind Farm, Environmental Statement, Chapters 8 and 9	Baseline studies relating to: Phase 1 habitat and National Vegetation Classification (NVC) survey; Protected species survey; Bat surveys; and Bird survey and assessment.	Various	N/A

[3] https://sitelink.nature.scot/map

[4] https://magic.defra.gov.uk/

[5] http://wildlifeinformation.co.uk/

2.1.2 Field Surveys

2.1.2.1 Extended Phase 1 Habitat Survey

Habitats

An initial ecological walkover of the Site was carried out by ERM in May 2022.

The Site and surrounding 100m buffer (i.e. the 'survey area') was surveyed to identify broad habitat types present in accordance with the Phase 1 habitat survey methodology (JNCC, 2016). The methodology was extended to include an assessment for features of interest, such as protected and/ or notable species of flora and fauna, as well as habitats with suitability for supporting such species.

In addition, any incidental sightings relating to plant species listed in Schedule 9 of the Wildlife and Countryside Act 1981 (as amended), such as Japanese knotweed *Fallopia japonica*, Himalayan balsam *Impatiens glandulifera* and giant hogweed *Heracleum mantegazzianum*, were also recorded.

Fauna

The suitability of habitats within the Site to support protected species (including badger *Meles meles*, red squirrel *Sciurus vulgaris*, otter *Lutra lutra*, water vole *Avicola amphibous*, pine marten *Martes martes*, reptiles, amphibians and breeding birds) was assessed in conjunction with the Phase 1 habitat survey. A high-level assessment of potential foraging, communing and roosting resource for bats within the Site and surrounding 100m survey buffer was also carried out.

During the extended Phase 1 survey, target notes (TNs) were recorded to provide further detail on habitats of nature conservation importance, those that were too small to map, habitats with suitability for supporting protected species, or incidental protected species observations.

2.1.2.2 Habitat Suitability Index (HSI) Survey for Great Crested Newt

The single pond identified within the centre of the Site was subject to a HSI survey in May 2022. Great crested newt (GCN) HSI scores are calculated using ten parameters: Site location; pond area; frequency of pond drying; water quality; shade; waterfowl; fish; presence of other ponds in the area; terrestrial habitat; and macrophyte communities. Each parameter scores a value of between 0.01 and 1. These scores are then multiplied and 'rooted' to produce a geometric mean score, of between 0 and 1. The following categorical scale is then used to estimate the overall suitability of the water body concerned:

HIS Score	Pont suitability for GCN
<0.5	Poor
0.5-0.59	Below average
0.6-0.69	Average
0.7-0.79	Good
>0.8	Excellent

2.1.2.3 Great Crested Newt eDNA Survey

An eDNA survey, involving collection of water samples from the single pond identified within the centre of the Site, was carried out in May 2022.

Twenty samples were collected from the pond using sterile equipment provided by SureScreen Scientifics, at points evenly spread out along its perimeter. The water at each sampling area was gently stirred using a sterile ladle before samples were taken, to mix up DNA, if present, which tends to sink, whilst ensuring that sediment on the pond bottom was not disturbed, where historical DNA can persist.

The samples were then fixed in a preserving solution, and sent to SureScreen Scientifics laboratory for analysis, using the methodology described in Appendix A. According to Biggs et al. (2014) GCN DNA can be detected within the pond water for up to 21 days after a GCN (including efts) has left the water; a 99.3 % detection rate is achieved when 80 – 90 % of the waterbody margin is sampled.

2.1.2.4 National Vegetation Classification Survey

A National Vegetation Classification (NVC) survey was conducted by Ben Averis, on behalf of ERM, in September 2022. The NVC is a detailed classification system for mapping and recording vegetation communities using plant species presence and abundance. The NVC survey was carried out in accordance with standard methodology and guidelines (Rodwell, 1991 *et seq,* 5 volumes). During the survey, NVC communities were mapped in the field by applying polygons around visible boundaries of homogenous vegetation. Where readily identifiable, stands were classified and mapped at sub-community level.

The NVC survey focused on the area of land within a damp depression to the south-east of the Site, of which was classified as wet modified bog (a habitat of nature conservation importance) during the Extended Phase 1 habitat survey in May 2022.

2.1.2.5 Breeding Bird Survey

A breeding bird survey, incorporating four visits to survey the Site and surrounding 100m buffer, was conducted by Arcus Consulting Limited on the following dates:

- 30 April 2022;
- 15 May 2022;
- 09 June 2022; and
- 19 June 2022.

On each survey visit, bird species identified were plotted on a large-scale map. The data from the four visits were then amalgamated to identify all species territories within the survey area.

2.1.3 Reporting

2.1.3.1 Non-avian Ecological Surveys

The results of the desk and field-based study were compiled into a Preliminary Ecological Appraisal Report (PEAR), of which is provided in Appendix A. The NVC survey report is provided in Appendix B.

The results of the Phase 1 habitat survey completed by ERM were also converted into UK Habitat Classification (UKHab) format by SLR in June 2023. The UKHab system enables habitats to be mapped using a hierarchical ‘Primary Habitat’ system (capturing ecosystems, broad habitats, habitats of principle importance for biodiversity conservation, and Annex 1 habitats) and non-hierarchical Secondary Codes (of which provide further detail on the environment, management, and origin of mapped features as well as complexities associated with mosaic habitats). The system also corresponds directly with Habitat Condition Assessment; a pre-requisite for measuring biodiversity value in association with

the Natural England Biodiversity Metric[6]. The Phase 1 to UKHab conversion process was thereby conducted as a precautionary measure in light of evolving requirements associated with Biodiversity Net Gain (BNG) in Scotland. However, it should be noted that at the time of writing there is no statutory requirement or prescriptive guidance from the Scottish Government for measuring biodiversity enhancement in Scotland.

The Phase 1 habitat and NVC results have been summarised in the context of UKHab within Section 3 of this report.

2.1.3.2 Ornithology

While no formal report relating to breeding bird surveys was compiled, results of the breeding bird survey were provided by ERM in a briefing note, details of which are provided in Appendix C.

2.2 Assumptions and Limitations

Baseline data utilised to inform this EcIA has been supplied by external sub-consultants. It is therefore assumed that the information provided has been gathered in accordance with best practice guidance and methodologies.

Desk study data provided by the local records centre is unlikely to be exhaustive, especially in respect of species, and is intended mainly to set a context for the study. It is therefore possible that important habitats or protected species not identified through desk study information may in fact occur within the vicinity of the Site. However, by carrying out a field survey to gather baseline information on habitats and protected species presence within the Site, this limitation has been minimised.

The results of the Phase 1 habitat survey were converted into UKHab format to allow for collection and processing of Habitat Condition Assessment data; a pre-requisite for calculating baseline and post-intervention biodiversity value of sites using a biodiversity metric. While Habitat Condition Assessment has not been carried out to date for the Site, this could easily be conducted should calculation of biodiversity values using a metric be required at a later date. Within this EcIA, the opportunities for biodiversity enhancement have therefore been evaluated and discussed according to broad UKHab categories and NVC communities recorded within the Site, and corresponding descriptions and species lists provided by ERM and Ben Averis.

The opportunities for restoration and biodiversity enhancement outlined within this report (and presented within the Landscape and Biodiversity Plan, Appendix 06) are not exhaustive, rather, they are based on recommendations that have been subject to client and landowner agreement.

2.3 Evaluation Approach

The ecological evaluation approach used in this report is based on Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland (“CIEEM guidelines”) (CIEEM, 2022).

2.3.1 Important Ecological Features

Ecological features can be important for a variety of reasons and the rationale used to identify them is explained in the text. Importance may relate, for example, to the quality or extent of the Site or habitats therein; habitat and/ or species rarity; the extent to which such habitats and/or species are threatened throughout their range, or to their rate of decline.

[6] The Natural England Biodiversity Metric is available online at: https://publications.naturalengland.org.uk/publication/6049804846366720

2.3.1.1 Determining Importance

The importance of an ecological feature should be considered within a defined geographical context. The following frame of reference has been used in this case, relying on known/ published accounts of distribution and rarity where available, and professional experience:

- International;
- National (i.e. UK/ Scotland);
- Regional (i.e. Scottish Borders);
- County (i.e. Berwickshire); and
- Local (i.e. within 2km).

The importance of various habitats has been measured against published selection criteria where available and relevant. Examples of relevant criteria include: descriptions of habitats listed on Annex 1 of the Habitats Directive[7]; habitats of principal importance for biodiversity conservation identified within the SBL; Local Biodiversity Site selection criteria; and action plans relating to habitats that are contained within Local Biodiversity Action Plans.

In assigning a level of importance to species, it is necessary to consider their distribution and status, including a consideration of trends based on available historical records. Reference has therefore been made to published lists and criteria where available. Examples of relevant lists and criteria include: species of European conservation importance (as listed in Schedules 2 and 4 of the Habitat Regulations or Annex 1 of the Birds Directive[8]); species of principal importance for biodiversity conservation identified within the SBL, and Birds of Conservation Concern (BoCC) (Stanbury *et al.,* 2021).

For the purposes of this report, ecological features of local importance or greater and/or subject to legal protection have been subject to detailed assessment. Effects on other ecological features that are considered unlikely to be significant in legal or policy terms, and of less than local significance, have been scoped out of assessment.

2.3.2 Impact Assessment

The impact assessment process involves the following steps:

- identifying and characterising potential impacts;
- incorporating measures to avoid and mitigate these impacts;
- assessing the significance of any residual effects after mitigation;
- identify appropriate compensation measures to offset significant[9] adverse residual effects (if required); and
- identifying opportunities for ecological enhancement.

[7] The Habitats Directive is the short name for European Union Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora. Habitats listed within Annex I of the Directive are of European importance and may qualify for selection as Special Areas of Conservation (SAC).

[8] Following the UK's exit from the European Union, the Scottish Parliament have passed legislation to ensure that Scotland's nature will remain protected to the same standard as before. Information relating to the Birds Directive is available online at: https://www.nature.scot/professional-advice/protected-areas-and-species/protected-species/legal-framework/birds-directive-and-wildlife-and-countryside-act-1981

[9] Whilst the methodology provides guidance for potentially significant effects, it is worth noting that the proposed development was screened as non-EIA by Scottish Borders Council as it is unlikely to give rise to significant effects.

When describing impacts, consideration has been given to the following, as appropriate:

- positive or negative;
- extent;
- magnitude;
- duration;
- timing;
- frequency; and
- reversibility.

The impact assessment process considers both direct and indirect impacts: direct ecological impacts are changes that are directly attributable to a defined action, e.g. the physical loss of habitat occupied by a species during the construction process. Indirect ecological impacts are attributable to an action, but which affect ecological resources through effects on an intermediary ecosystem, process or feature, e.g. the creation of roads which cause hydrological changes, which, in the absence of mitigation, could lead to the drying out of wet grassland.

Consideration of conservation status is important for evaluating the effects of impacts on individual habitats and species and assessing their significance:

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

2.3.3 Significant Effects

The concept of ecological significance is addressed in paragraphs 5.24 through to 5.28 of the CIEEM guidelines (2022). Significance relates to the weight that should be attached to effects when decisions are made.

In the context of EcIA, a ‘significant effect’ is an effect that either supports or undermines biodiversity conservation objectives for ‘important ecological features’ or for biodiversity in general. Conservation objectives may be specific (e.g. for a designated Site) or broad (e.g. national/ local nature conservation policy) or more wide-ranging (enhancement of biodiversity). Effects can be considered significant at a wide range of scales from international to local and the scale of significance of an effect may or may not be the same as the geographic context in which the feature is considered important.

Whilst the methodology provides guidance for potentially significant effects, it is worth noting that the proposed development was screened as non-EIA by SBC as it is unlikely to give rise to significant effects.

3.0 Summary of Results

3.1 Designated Sites

3.1.1 Statutory Designated Sites

The Site itself does not contain any statutory designated Sites of nature conservation interest. One statutory designated site is however present within 2km, as detailed in Table 3-1 and illustrated in Appendix A - Figure 1.

Table 3-1:Statutory Designated Sites within 2km of the Site Boundary

Site Name	Interest Feature	Distance and Orientation from Site Boundary
Drone Moss SSSI	This site is notified as a raised bog.	166m north east

Drone Moss SSSI is positioned a considerable distance (over 100m) from the Site itself and lacks connectivity to the main Site (separated by dense scrub habitat, as displayed on Figure 3-1). As such, this Site is unlikely to be affected by the proposed development and has therefore been scoped out of further assessment.

3.1.2 Non-statutory Designated Sites

Three non-statutory designated Sites of nature conservation interest are present within 2km of the Site, of which are detailed within Table 3-2 and Appendix A – Figure 1.

Table 3-2: Non-Statutory Designated Sites within 2km of the Site Boundary

Site Name	Interest Feature	Distance and Orientation from Site Boundary
Atton Dean LBS	Ancient Woodland with notable plant species wood melick *Melica uniflora* and badger known to be present.	1.25km south west
Eye Water – Grantshouse to Brockhole Wood LBS	Semi-natural broadleaved woodland supporting a range of species, including common raven *Corvus corax*, hedgehog *Erinaceus europaeus,* badger, and a variety of plant species including remote sedge *Carex remota*, common cudweed *Filago vulgaris*, creeping Lady's-tresses *Goodyera repens*, Bluebell *Hyacinthoides non-scripta*, brown shield-moss *Buxbaumia aphylla*, Jenner's dog-tooth *Cynodontium jenneri*, lateral Cryphaea *Cryphaea heteromalla*, yellow thread-moss *Pohlia lutescens*, Many-flowered Leskea *Pylaisia polyantha*, and Lesser yoke-moss *Zygodon conoideus.* Watercourses intersecting the Site are known to support European eel *Anguilla anguilla*, Atlantic salmon *Salmo salar*, Brown/Sea Trout *Salmo trutta*, and lamprey species *Lampetra sp.*	1.73km west

Site Name	Interest Feature	Distance and Orientation from Site Boundary
Lumsdaine Dean and Dowlaw Moss LBS	Mire, flush, grassland, rock outcrops, burnsides with diverse populations of wetland and grassland plants, bryophytes and butterflies with many locally rare species. Ponds supporting breeding birds and GCN. Site is also known to support northern brown argus *Aricia artaxerxes* and grayling.	1.50km north-north east

All three non-statutory designated sites listed within Table 3-2 lie a sufficient distance (over 750m) from the Site itself and lack habitat connectivity to the main Site. These Sites are unlikely to be affected by the proposed development and have therefore been scoped out of further assessment.

3.1.3 Ancient Woodland

There are five stands of woodland mapped within the Ancient Woodland Inventory within 2km of the Site.

Table 3-3: Ancient Woodland within 2km of the Site Boundary

Site Name	Distance and Orientation from Site Boundary
Winding Plantation	0.85km west
The Beeches	1.39km west
Atton Wood	1.25km south-west
Brockholes Wood	1.73km west
Green Wood	1.76km south

All five woodlands listed within Table 3-3 lie a sufficient distance from the Site itself and lack connectivity to the Site. These sites are unlikely to be affected by the proposed development and have therefore been scoped out of further assessment.

3.2 Habitats

The full results of the Phase 1 habitat survey are described and illustrated in detail in Appendix A. Detailed information relating to the NVC survey is provided in Appendix B.

The results of the Phase 1 habitat survey have been converted into UKHab format, for which each broad habitat type is summarised below and illustrated in Figure 3-1.

3.2.1 Grassland

3.2.1.1 Other Lowland Acid Grassland (g1d)

Semi-improved other lowland acid grassland was recorded within the south[10] of the Site during the extended Phase 1 habitat and NVC survey. This grassland had been subject to

[10] It should be noted that the results of the NVC survey indicate that the far south of the Site was comprised primarily of agriculturally improved neutral grassland species corresponding to the NVC community MG6 *Lolium perenne-Cynosaurus cristatus* pasture (Appendix B – Figure 1). Grassland of more acidic character,

grazing and was found to be interspersed with degraded bog habitat. Species recorded included sheep's fescue *Festuca ovina*, purple moor-grass *Molinia caerulea*, mat grass *Nardus stricta*, Yorkshire fog *Holcus lanatus*, tormentil *Potentilla erecta*, common bent *Agrostis capillaris*, heath rush *Juncus squarrosus*, common sedge *Carex nigra*, heath bedstraw *Galium saxatile*, springy turf-moss *Rhytidiadelphus squarrosus*, and heath plait-moss *Hypnum jutlandicum*.

The presence of purple moor grass within the sward suggests that this grassland may be slightly damp and has therefore been categorised as 'other lowland acid grassland' within the UKHab system. Other lowland acid grassland is generally of limited conservation interest due to having typically low species diversity, however the acid grassland within the Site was found to comprise a relatively diverse range of acidic indicator species (albeit some of which indicated damp conditions). This likely relates to a progressive change in habitat type following implementation of drainage and grazing in the area. As such, the other lowland acid grassland within the Site is considered of local importance and has been taken forward for further assessment.

3.2.1.2 Neutral grassland (g3c)

While neutral grassland was not identified within the Phase 1 habitat survey, it was however recorded during the NVC survey, during which several stands of damp neutral grassland (NVC community MG10a) were noted within the south of the Site (Appendix B - Figure 1). These stands comprised abundant soft rush *Juncus effusus*, accompanied by varying amounts of Yorkshire fog *Holcus lanatus*, common bent *Agrostis capillaris*, red fescue *Festuca rubra*, tufted hair grass *Deschampsia cespitosa*, creeping buttercup *Ranunculus repens*, meadow buttercup *R. acris*, common sorrel *Rumex acetosa*, and ribwort plantain *Plantago lanceolata*. Due to the heavily grazed nature of this habitat and relatively limited range of vegetative species present, the neutral grassland within the Site is considered to be of limited nature conservation value. This habitat has therefore been assessed as having less than local importance and has not been taken forward for further assessment.

3.2.1.3 Modified Grassland (g4)

The majority of the Site is formed of improved grassland, characterised by a short sward of perennial rye grass *Lolium perenne*, white clover *Trifolium repens*, and dandelion *Taraxacum officinale*.

The dominance of perennial rye grass and white clover indicates that this habitat is species-poor in character and therefore has a low intrinsic nature conservation value. This habitat has therefore been assessed as having less than local importance and has not been carried through for further assessment.

3.2.2 Woodland

3.2.2.1 Other Woodland, Mixed (w1h)

A large stand of mixed woodland, comprising Scots pine *Pinus sylvestris*, larch *Larix decidua*, pedunculate oak *Quercus robur*, rowan *Sorbus aucuparia* and beech *Fagus sylvatica*, was recorded within the north west of the Site.

Mixed woodland is listed within the Scottish Borders Local Biodiversity Action Plan (LBAP) and therefore considered a locally important habitat. Results of the extended Phase 1 habitat

corresponding to the NVC community U4 *Festuca ovina- Agrostis capillaris- Galium saxatile* grassland was however noted at lower elevations where artificial drainage channels exist.

survey also highlighted this woodland as being suitable for supporting red squirrel and breeding birds (Section 3.3). As such, mixed woodland has therefore been classified as local importance and carried through for further assessment.

3.2.2.2 Other Coniferous Woodland (w2b)

A single stand of even-aged shelterbelt coniferous plantation, comprised predominantly of Norway spruce *Picea abies* with Scots pine towards the southern end of the stand, was recorded within the central area of the Site.

Coniferous woodlands (including shelterbelts and small farmland plots) are listed within the Scottish Borders LBAP. The extended Phase 1 habitat survey results also highlighted that the stand on Site may provide suitable habitat for badger foraging and sett creation (Section 3.3). As such, coniferous woodland has been classified as local importance and carried through for further assessment.

3.2.3 Heathland and Scrub

3.2.3.1 Lowland heathland (h1a)

Three areas of lowland dry heath (h1a5) were recording immediately adjacent to the eastern boundary of the Site during the extended Phase 1 habitat survey (Figure 3-1 and Appendix A – Figure 2).

The NVC survey also identified pockets of wet heath (h1a7) corresponding to the M15d *Trichophorum germanicum – Erica tetralix* wet heath, *Vaccinium myrtillus* sub-community within the south-east of the Site (Appendix B – Figure 1).

Lowland heathland is listed under Annex I of the Council Directive 92/43/EEC on the conservation of natural habitats of wild flora and fauna (the Habitats Directive), as referenced in The Conservation (Natural Habitats & c.) Regulations 1994 (the Habitats Regulations). It and is also listed as a habitat of principle importance for biodiversity conservation within the SBL and a priority habitat within the Scottish Borders LBAP. As such, heathland has been assessed as having local ecological importance and has therefore been subject to further assessment.

3.2.3.2 Mixed scrub (h3h)

Mixed scrub, formed of European gorse *Ulex europaeus,* creeping willow *Salix repens* and hawthorn *Crategus monogyna,* was recorded immediately adjacent to the eastern boundary of the Site.

Given this habitat is situated very close to the perimeter of the Site boundary, extending into the survey area buffer, and there is no proposed infrastructure nearby, direct or indirect impacts are therefore considered unlikely. Potential effects on this habitat type have been scoped out of further assessment.

3.2.4 Wetland

3.2.4.1 Blanket bog (f1a)

To the south-east of the Site, a large area of degraded blanket bog[11] (f1a6) was recorded during the extended Phase 1 habitat survey. This habitat was characterised by the presence of hares tail cotton grass *Eriphorum vaginatum*, cross-leaved heath *Erica tetralix*, tormentil, purple moor grass, *Sphagnum* species (*S. papillosum* and *S.capillifolium*), common haircap

[11] In the absence of peat depth data, degraded blanket bog and associated NVC community M20 were characterised based on the abundance and distribution of vegetative species only.

moss *Polytrichum commune*, lousewort *Pedicularis sylvatica*, heath rush *Juncus squarrosus* and heath milkwort *Polygala vulgaris*. This area has likely been classified as 'degraded' due to the presence of multiple drainage channels intersecting the blanket bog, which in turn contributes to dewatering.

While the extended Phase 1 habitat and converted UKHab results indicate degraded blanket bog as the broad habitat type in this area, the NVC survey results illustrate a more intricate mosaic of acid grassland (U4), neutral grassland (MG5 and MG9) and rush pasture (MG10a, M23, M25), with smaller pockets of wet heath (M15) and degraded bog (M20) being present (Appendix B – Figure 1). This suggests that dewatering through implementation of artificial drainage and grazing by livestock may have resulted in a reduction in mire forming species over time and subsequent conversion to acid grassland and rush pasture.

Blanket bog is listed under Annex I of the Habitats Directive and referenced in the Habitats Regulations. It is also listed as a habitat of principle importance for biodiversity conservation within the SBL and a priority habitat within the Scottish Borders LBAP. Given the presence of key mire forming species (hares tail cotton grass and *Sphagnum* species) recorded despite the presence of drainage channels and intense grazing pressure, the degraded blanket bog NVC community M20 is considered to classify under the definition of Annex I habitat.

While there is no infrastructure proposed within this habitat, pockets of degraded blanket bog present maintain hydrological connectivity with the Site. Degraded blanket bog has therefore been assessed as having local ecological importance and has been subject to further assessment.

3.2.4.2 Purple moor grass and rush pasture (f2b)

A small stand of rush-pasture was recorded within the centre of the Site during the extended Phase 1 habitat survey (Appendix A – Figure 2), which was characterised by the presence of soft rush *Juncus effusus*, tufted hair grass *Deschampsia cespitosa*, purple moor grass, wavy hair grass *Deschampsia flexuosa*, common bent *Agrostis capillaris* and cuckoo flower *Cardamine pratensis.*

An additional stand of purple moor grass and rush pasture was also identified within the south-east of the Site during the NVC survey (Appendix B – Figure 1). Here, the heavily grazed stand was dominated by sharp-flowered rush *Juncus acutiflorus* with abundant lesser spearwort *Ranunculus flammula* meadow buttercup, creeping buttercup*,* Yorkshire fog*,* red fescue*,* marsh willowherb *Galium palustre,* and marsh thistle *Circium plasture* – species of which typically occur within the M23a *Juncus effusus/ acutiflorus – Galium* palustre rush pasture, *Juncus acutiflorus* sub-community.

Purple moor grass and rush pastures are listed as a habitat of principle importance for biodiversity conservation within the SBL and a priority habitat within Scottish Borders LBAP. This habitat is hydrologically connected to the Site, has been assessed as having local ecological importance, and has therefore been taken forward for further assessment.

3.2.5 Rivers and lakes

3.2.5.1 Standing open water (r1)

A single pond, measuring approximately 390m^2, was recorded within the centre of the Site, surrounded by rush pasture. The pond was found to support aquatic vegetation in the form of bullrush *Typha latifolia* and a high diversity of macroinvertebrates.

Ponds are considered habitats of principle importance for biodiversity conservation within the SBL and a priority habitat within Scottish Borders LBAP. This feature has been assessed as having local ecological importance, and has therefore been taken forward for further assessment.

3.2.5.2 Other rivers and streams (r2b)

A minor linear watercourse was found to intersect the south east of the Site, for which water flows into a pond within the centre of the Site. Several artificial drainage channels are also present in this area. These channels were most likely historically implemented to dewater the blanket bog and heath habitat and improve agricultural productivity.

Rivers are considered a priority habitat under the SBL and Scottish Borders LBAP. As the watercourse that intersects the Site is hydrologically connected the pond within the centre of the Site and may still be connected to the Howpark Burn via underground drainage channels, the watercourse within the Site has been assessed as local importance and has therefore been carried forward for further assessment.

3.3 Protected and Notable Species

The results of the protected species and notable survey are displayed in Figure 3-2, with target notes provided in Appendix A.

3.3.1 Plants

No Schedule 9 (invasive non-native) species were reported through the desk-based study or identified on Site during the ecological walkover. Schedule 9 species have therefore been assessed as likely absent from Site and scoped out of further assessment.

3.3.2 Mammals

3.3.2.1 Bats

The data search carried out by TWIC returned several records relating to common pipistrelle *Pipistrellus pipistrellus,* soprano pipistrelle *Pipistrellus pygmaeus,* noctule *Nyctalus noctula, Myotis* species, and brown long-eared bat *Plecotus auratus* within 2km of the Site.

While open arable habitat within the Site was considered to support low suitability for commuting and foraging bats, woodland edge habitat was classified as moderate suitability with potential to provide some connectivity to the wider landscape. As such, the Site has been assessed as local importance for commuting and foraging bats, of which have been taken forward for further assessment.

In terms of roosting potential within the Site, trees within mixed and coniferous woodland habitat were noted to support negligible suitability due to a lack of potential roost features recorded. The Site has therefore been assessed as less than local importance for roosting bats, of which have been scoped out of further assessment.

3.3.2.2 Badger

The desk study returned 21 records of badger *Meles meles* within 2km of the Site between years 2003 and 2020.

Evidence of badger, in the form of a latrine, was identified adjacent to coniferous plantation near the centre of the Site during the field survey. The presence of a latrine indicates that the Site lies within a badger territory and is therefore utilised by the species. Badger has therefore been assessed as local ecological importance and has been taken forward for further assessment.

3.3.2.3 Otter

No records of were otter *Lutra lutra* returned through the data search and no evidence pertaining to otter was identified during the field survey. Waterbodies within the Site were generally considered unsuitable for otter commuting and foraging purposes. As such, otter is

considered likely absent from the Site and has therefore been scoped out of further assessment.

3.3.2.4 Water Vole

No records of water vole *Arvicola amphibious* were returned through the data search and no evidence of water vole was identified during the field survey. Ditches on Site were considered to have low suitability for water vole due to low water level and limited banksides. The pond identified on Site was also noted to have low suitability due to a lack of wider habitat connectivity. As such, water vole is considered likely absent from the Site and has been scoped out of further assessment.

3.3.2.5 Red Squirrel

The data search returned two records of red squirrel *Sciurus vulgaris* within 2km of the Site between years 2003 and 2020.

No field signs pertaining to red squirrel were identified during the survey. The coniferous shelterbelt plantation present within the centre Site was considered unsuitable for red squirrel due to is isolation from surrounding woodland. However, mixed woodland within the north-west of the Site was noted to provide some suitability for commuting and foraging. Given that there is no infrastructure proposed within the vicinity of the stand of mixed woodland, and therefore no direct or indirect impacts on the mixed woodland are proposed, potential for indirect disturbance to red squirrel that may utilise such habitat is considered minimal. Red squirrel has therefore been scoped out of further assessment.

3.3.2.6 Other Mammal Species

The desk study returned 20 records of brown hare within 2km of the Site between years 2002 and 2015. A brown hare was also observed on Site during the field survey. Brown hare is a species of principle importance for biodiversity conservation listed within the SBL and a priority species within the Scottish Borders LBAP. As such it has been assessed as local importance and has been taken forward for further assessment.

3.3.3 Amphibians

The desk study data search carried out by TWIC returned no records of GCN within 2km of the Site. Results of the HSI assessment of the single pond and surrounding terrestrial vegetation within the centre of the Site also indicated that the waterbody was of below average suitability to support GCN. Furthermore, results of the eDNA survey indicated absence of GCN within the pond. GCN has therefore been scoped out of further assessment.

3.3.4 Reptiles

The desk study data search returned no records of reptiles within 2km of the Site. Habitats within the Site that were considered suitable for supporting reptiles were limited to pockets of marshy grassland, field drains, modified bog, and woodland edge. Two stone piles identified within the Site were also recorded as having suitability to serve as reptile hibernacula (Figure 3-2), however these are located outside of proposed solar arrays and associated infrastructure.

Overall, the Site has been assessed as having less than local importance for reptiles, however, given the legal protection afforded to reptiles, the potential impact of the proposed development upon reptiles during construction of the solar farm has been subject to further assessment.

3.3.5 Birds

The desk study data search returned records of several notable bird species within 2km of the Site, including barn owl *Tyto alba*, osprey *Pandion haliaetus*, merlin *Falco columbarius*, common crossbill *Loxia curvirostra*, goshawk *Accipiter gentilis* and peregrine *Falco peregrinus* between years 2002 and 2018. While there is negligible breeding potential for barn owl within the Site, some foraging oppertunities within grassland areas may exist. As such, this species has been considered for further assessment. With regard to common crossbill, there is limited foraging potential for this species within the conifer shelterbelt, but there will be no loss of this habitat therefore this species is scoped out of further assessment. None of the other species are likely to occur within the Site and these have been scoped out of further assessment.

During the field survey, suitable habitat for nesting birds was identified within the grassland, scattered trees and woodland habitats on Site. Sixteen BoCC species (Stanbury *et al.,* 2021) were considered breeding within the Site and survey buffer, along with another 21 non-BoCC species. Of these species, none are listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) or in Annex 1 of the EC Birds Directive. Further details are provided in Appendix C, which includes the Breeding Birds Territories Results Map.

Species nesting within the grassland include skylark *Alauda arvensis*, meadow pipit *Anthus pratensis* and reed bunting *Emberiza schoeniclus*. As there is a likelihood of direct effects on these three species (i.e., through habitat loss), they have been taken forward to further assessment.

With regard to other species within the Site using the woodland habitats, any potential effects are considered likely to be negligible providing good practice methods are employed during construction (e.g., as stated in Scottish Renewables 2019). Therefore, all other breeding bird species are scoped out of further assessment.

The data search also returned several records of wintering/ passage birds within 2km of the Site between years 2002 and 2018, including pink-footed goose *Anser brachyrhynchus*, barnacle goose *Branta leucopsis*, brent goose *Branta bernicla*, and Canada goose *Branta canadensis*. The field survey also identified potential for wintering birds to utilise improved grassland fields. It was noted in the Environmental Statement (ES) for Howpark Wind Farm (ES Chapter 9: Ornithology, Amec Foster Wheeler, 2016) that "*records of geese (pink-footed, greylag and barnacle) within the survey area for the wind farm all related to flight activity; and no geese were recorded grazing or roosting within the survey area during any of the surveys"*. Due to the availability of other field systems in the local area, wintering birds were considered unlikely to be affected by the proposed development. Wintering birds have therefore been scoped out of further assessment for the solar farm.

4.0 Summary of Important Ecological Features

Ecological features assessed as having local importance or greater, and which could potentially be affected by an unmitigated scheme are summarised in Table 4-1.

Where a feature has been omitted from detailed assessment (due to no potential impacts arising or it having less than local ecological importance), a rationale has been provided earlier within this report.

Table 4-1: Summary of Important Ecological Features Subject to Detailed Assessment

Important Ecological Receptor	Scale at which Feature is Important	Comments on Legal Status and/ or Importance
Other lowland acid grassland (g1d)	Local	While other lowland acid grassland is not considered a habitat of principal importance for biodiversity conservation within the SBL, the acid grassland present within the Site maintains a relatively good diversity of species, with several acidic indicator species noted. The presence of purple moor grass and *Sphagnum* mosses indicates a tendency for dampness within the sward which likely stems from a historical difference in habitat type prior to implementation of drainage and grazing (e.g. previously wet heath) and therefore maintains conservation importance.
Other woodland, mixed (w1h)	Local	Mixed woodland is listed within the Scottish Borders LBAP and therefore considered a locally important habitat. Results of the extended Phase 1 habitat survey also highlighted this woodland as being suitable for supporting red squirrel and breeding birds (Section 3.3) and therefore maintains conservation importance.
Other coniferous woodland (w2c)	Local	Coniferous woodlands (including shelterbelts and small farmland plots) are listed within the Scottish Borders LBAP. The extended Phase 1 habitat survey results also highlighted that the stand on Site may provide suitable habitat for badger foraging and sett creation (Section 3.3).
Lowland heathland (h1a)	Local	Lowland heathland is listed under Annex I of the Council Directive 92/43/EEC on the conservation of natural habitats of wild flora and fauna (the Habitats Directive), as referenced in The Conservation (Natural Habitats & c.) Regulations 1994 (the Habitats Regulations). It and is also listed as a habitat of principle importance for biodiversity conservation within the SBL and a priority habitat within the Scottish Borders LBAP.
Degraded blanket bog (f1a6)	Local[12]	Blanket bog is listed under Annex I of the Habitats Directive and referenced in the Habitats Regulations. It and is also listed as a habitat of principle importance for biodiversity conservation within the SBL and a priority habitat within the Scottish Borders LBAP. Given the presence of key mire forming species recorded despite artificial drainage channels and intense grazing pressure, degraded blanket bog within the Site is considered to classify under the definition of Annex I habitat[13].
Purple moor grass and rush pasture (f2b)	Local	Purple moor grass and rush pastures are listed as a habitat of principle importance for biodiversity conservation within the SBL and a priority habitat within Scottish Borders LBAP.
Standing open water (r1)	Local	The pond present on Site constitutes a habitat of principal importance for biodiversity conservation; it is of intrinsic value and supports a divers macroinvertebrate community. It is also hydrologically connected to the minor watercourse within the Site.

[12] Guidance produced by NatureScot 2023 indicates that degraded peatland communities such as M20 are unlikely to be considered as priority peatland of national interest. As such, stands of degraded blanket bog present on Site have been assessed as having as local importance in the context of the Site.

[13] Details of NVC communities corresponding to Annex I Blanket Bog habitat are provided online at: https://sac.jncc.gov.uk/habitat/H7130/

Important Ecological Receptor	Scale at which Feature is Important	Comments on Legal Status and/ or Importance
Other rivers and streams (r2b)	Local	The minor watercourse present on Site is hydrologically connected to Howpark Burn. Rivers are classified as a habitat of principal importance for conservation under the Scottish Biodiversity List.
Badger	Local	Badgers, and their places of shelter and protection (i.e. setts) are legally protected under the Protection of Badgers Act 1992.
Bats	Local	Bats and their places of shelter are legally protected under the Conservation (Natural Habitats, & c.) Regulations 1994 (the Habitat Regulations), as amended in Scotland. Bats are also listed as species of principle importance for biodiversity conservation within the SBL.
Brown hare	Local	Brown hare are listed as a species of principle importance for biodiversity conservation within the SBL.
Reptiles	Local	Marshy grassland, field drains, modified bog, woodland edge, and stone piles on Site have potential to support reptiles, however the proposed solar array area itself is considered to have limited reptile suitability. Reptiles are protected from killing and injuring under the Wildlife and Countryside Act 1981 (as amended in Scotland).
Breeding birds	Local	The grassland habitats support a small population of three ground-nesting bird species (skylark, meadow pipit and reed bunting) Only skylark occurs within the modified grassland, while the other two species occur within the less improved grassland areas. Reed bunting occurs only in wetter habitats, and meadow pipits are more common in acid grassland and heathland. Native birds, and the nests, eggs and young of native birds, are protected against killing and injury/ damage and destruction under the Wildlife and Countryside Act 1981 (as amended in Scotland).

5.0 Assessment of Effects and Embedded Mitigation

5.1 Other lowland acid grassland

Discrepancies between the extended Phase 1 habitat survey results and NVC survey results regarding the location of other lowland acid grassland habitat within the Site were noted in Section 3.2. As Phase 1 provides a high-level overview of broad habitat types present, while NVC provides a more in-depth survey and descriptions of habitat communities within the south of the Site, it is the NVC results that have been considered further in the assessment of effects of acid grassland (see Figure 1 of Appendix B).

In accordance with NVC survey results, there are no planned infrastructure or excavation works proposed within stands of acid grassland habitat on Site (NVC communities U4 and U5), and therefore direct, permanent habitat loss during of construction and operation of the proposed development is considered unlikely. However, there is some risk of both direct and indirect temporary impact to acid grassland in the absence of mitigation through the following construction activities:

- Vehicle and machinery movement across acid grassland habitat during implementation of the eastern solar array, resulting in temporary damage and fragmentation of such habitat; and

- Deterioration of acid grassland habitat caused by polluted and/or sedimented run-off associated with excavation works during the construction period.

In order to maintain the integrity of acid grassland habitat, the following mitigation measures should be employed during the construction and operational phase of the development:

- Plan and manage vehicular and machinery access within the south-eastern solar array area to avoid intersecting stands of acid grassland habitat.

- Adhere to best practice guidelines on pollution prevention (GPPs)[14] throughout the construction and operational phase of the development. A Site-specific Construction Environmental Management Plan (CEMP) would be implemented during the construction phase and secured via a planning condition.

Through effective implementation the mitigation measures described above, it is predicted that there will be no significant effect on other lowland acid grassland as a result of construction and operation of the proposed development.

5.2 Other woodland; mixed

It is understood that the stand of mixed woodland present along the northern boundary of the Site is to be retained during construction and operation of the proposed development. Therefore, no direct impact in the form of habitat loss or destruction is predicted. There may however be potential for the following indirect, permanent impact to occur during the construction phase of the development:

- Indirect, permanent impact in the form of degradation of tree health, or tree mortality, caused by intersecting tree roost systems during excavation work.

However, through effective implementation of the mitigation measures described below, negative effects on the nature conservation status of mixed woodland as a result of construction are considered unlikely:

- Establish an appropriate tree root protection area in accordance with British Standard 5837 (British Standards Institution, 2012). This involves multiplying tree diameter at breast height (DBH) (in meters) by 12 to determine the size of works exclusion zone radius required for each tree along the woodland edge.

Furthermore, through delivery of the proposed enhancement measures outlined in Section 6.0 (involving expansion of native mixed woodland habitat within the Site) there is potential for an overall net positive effect on the nature conservation status of this feature to be achieved.

5.3 Other coniferous woodland

The stand of other coniferous woodland within the Site is due to be retained during construction phase of the proposed development and therefore no direct impacts are predicted. There is however potential for an indirect, permanent negative impact to tree health caused by construction phase excavations intersecting tree root systems. However, through implementing tree root protection areas in accordance with BS 5837, this risk can be effectively mitigated.

[14] Guidelines for Pollution Prevention are available online at https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/

This woodland will also be subject to direct, permanent impacts when implementing the proposed enhancement measures described in Section 6.0 through felling of non-native conifers within the shelterbelt (and replacement with native tree species). However, causing an initial loss in habitat area, this impact will likely result in an overall net positive effect on the nature conservation status of this feature in the long-term.

5.4 Lowland heathland

The proposed security fencing associated within the most eastern solar array intersects an area of lowland heathland (NVC community M15d) within the Site. In the absence of mitigation, potential for both direct and indirect impact to lowland heathland therefore exists during the construction phase through:

- Vehicle and machinery movement across heathland habitat during implementation of the eastern solar array and associated security fencing, resulting in direct temporary and/or permanent damage and fragmentation of wet heath habitat; and

- Indirect, temporary deterioration of heathland habitat caused by polluted and/or sedimented run-off associated with excavation works.

In order to maintain the baseline integrity of blanket bog within the Site, the mitigation measures outlined in Section 5.1, of which are also applicable to lowland heathland, should be employed during the construction and operational phase of the development.

In addition to the potential impacts caused during construction, a direct, permanent impact involving the loss of 0.12ha of lowland heathland (NVC community M15d) is likely to occur during delivery of landscape and biodiversity enhancement measures outlined in Section 6.0. Compensation for loss of this area of wet heath is also discussed within Section 6.0.

Through applying the mitigation measures described above and compensation measures outlined in Section 6.0, significant effects on the conservation status of wet heath are considered unlikely.

5.5 Degraded blanket bog

There are no planned infrastructure or excavation works proposed within the area of degraded blanket bog identified during field surveys, and therefore direct habitat loss as a result of construction is considered unlikely. It should also be noted that due to the high-level overview provided within the PEA Report, the NVC survey results for this particular area are considered most accurate. The NVC results indicate that only two small pockets of degraded bog are present within this area, with the rest comprised predominantly of acid grassland, neutral grassland, rush pasture and small stands of wet heath.

While direct permanent habitat loss is considered unlikely, a small risk of risk of both direct and indirect temporary impact in the absence of mitigation remains whilst undertaking the following construction activities:

- Vehicle and machinery movement across blanket bog during implementation of the eastern solar array, resulting in temporary damage and fragmentation of such habitat; and

- Deterioration of heathland habitat caused by polluted and/or sedimented run-off associated with excavation works during the construction period.

In order to maintain the baseline integrity of blanket bog within the Site, the mitigation measures outlined Section 5.1, of which are also applicable to blanket bog, should be

employed during the construction and operational phase of the development. In doing so, it is predicted that there will be no significant effect on the integrity of blanket bog habitat within the Site.

5.6 Purple moor grass and rush pasture

There are no planned infrastructure or excavation works proposed within the small stand of purple moor grass and rush pasture, and therefore direct loss or temporary damage as a result of construction is considered unlikely.

However, a risk of both direct and indirect temporary impact in the absence of mitigation remains during the construction phase associated with:

- Vehicle and machinery movement across such habitat during implementation of the eastern solar array, resulting in temporary damage and fragmentation of purple moor grass and rush pasture; and
- Deterioration of heathland habitat caused by polluted and/or sedimented run-off associated with excavation works and vehicle movement during the construction period.

In order to maintain the baseline integrity of purple moor grass and rush pasture within the Site, the mitigation measures outlined Section 5.1. Should be employed during the construction and operational phase of the development. In doing so, it is predicted that there will be no significant effect on the integrity of purple moor grass and rush pasture within the Site.

5.7 Standing open water

No infrastructure works are proposed within 50m of the pond located within the centre of the Site, therefore impacts in the form of direct loss or temporary damage to this feature as a result of construction of the solar farm is considered unlikely. There is however some potential for indirect habitat deterioration resulting from polluted and/or sedimented run-off associated with excavation works and vehicle movement during the construction period. However, by adhering to best practice GPPs[14], this risk can be effectively managed and mitigated for, thereby promoting no significant effect to the integrity of standing open water present within the Site.

5.8 Other rivers and streams

There are no infrastructure or excavation works proposed within at least 20m of the watercourse running from the south east to the centre of the Site. Security fencing and infrastructure within this are however proposed within 20m of the culverted section of the watercourse running from the centre to the north west of the Site. However, as this section is culverted underground, potential for direct permanent or temporary degradation to this feature during the construction phase is considered unlikely.

In terms of best practice during construction, the following mitigation should however be implemented to reduce risk of an indirect pollution/ sedimentation of the watercourse, of which eventually meets the Howpark Burn:

- Adhere to best practice guidelines on pollution prevention (GPPs)[14] throughout the construction and operational phase of the development. A Site-specific Construction Environmental Management Plan (CEMP) would be implemented during the construction phase and secured via a planning condition.

5.9 Badger

The Site is considered to be located within an active badger territory, as indicated by the presence of a badger latrine. Woodland habitats within the Site were also noted to support suitability for badger foraging, commuting and sett creation, however no detailed surveys of such habitats have been carried out to date. While there is no infrastructure proposed within woodland habitats present on Site, potential impacts to this species include:

- indirect temporary disturbance and displacement of badger that utilise woodland habitat for foraging, commuting and sett creation as a result of noise, vibration, and vehicular movement during the construction phase;
- indirect temporary and/or permanent disruption or fragmentation of badger commuting and foraging routes within the Site during the construction and operational phase; and
- direct temporary and/or permanent impact in the form of injury or mortality as a result of collision with vehicles or becoming trapped in excavations during the construction phase.

Embedded mitigation in the form of a detailed pre-commencement walkover should therefore be carried out to search for freshly excavated setts and/ or further field signs pertaining to badger. In the event that such setts are found, necessary precautions/ sensitive working methods should be adhered to. Development of a Species Protection Plan would be required, which would detail requirements for pre-construction surveys and the incorporation of appropriate works exclusion buffers, where necessary. The following suite of mitigation would also be implemented to avoid causing disturbance and/ or harm to such species:

- should badger, or their setts be encountered during construction, all work within 30m (100m for high noise/ vibration activities) should cease until a suitably experienced ecologist has inspected the Site and determined the appropriate course of action;
- any exposed excavations should be provided with mammal exit ramps (i.e. wooden planks) at the end of each working day;
- any lighting used to accommodate the construction phase must be positioned to minimise light spill onto woodland edge habitats;
- in order to reduce potential for severance of badger commuting and foraging routes within the Site as a result of construction of the proposed development, a series of open mammal gates should be installed within perimeter fencing to allow free passage for badger on and off-site; and
- strict speed limits (15mph) should be followed during all phases of development.

It is understood that the development does not require installation of visible security lighting and therefore lighting-related effects on badger during operation of the proposed development is considered unlikely.

Through effective implementation of the mitigation measures described above, significant effects on the nature conservation status of badger as a result of construction and operation of the proposed development are considered unlikely.

5.10 Bats

Woodland edge habitat within the Site is considered to support suitability for foraging and commuting bat species. While direct impacts to bat species are considered unlikely, there is potential for the following indirect impact to occur during construction of the proposed development and delivery of landscape and biodiversity strategy measures:

- indirect temporary disturbance and disruption of bat commuting and foraging routes resulting from illumination of woodland edge habitat whilst working during hours of darkness during the construction phase (if required).
- Indirect temporary disturbance and disruption to bat commuting and foraging routes along the stand of other coniferous woodland within the Site, for which selective felling of non-native conifers and replacement with native tree and shrub species is proposed as part of the Landscape and Biodiversity Plan (Section 6.0).

Through effective implementation of the measures described below, significant effects on the conservation status of commuting and foraging bat species during construction of the proposed development are considered unlikely:

- construction activity should be timed to avoid works between hours of darkness (ideally 30 minutes before sunset and 30 minutes before sunrise), where possible; and
- any lighting used to accommodate construction phase delivery must be positioned to minimise light spill onto woodland edge habitats.

It is understood that the development does not require installation of visible security lighting and therefore lighting-related effects on commuting and foraging bats during operation of the proposed development is considered unlikely.

Furthermore, the proposed enhancement measures described in Section 6.0 (selective felling of non-native coniferous woodland, expansion of mixed woodland and scrub habitat, and implementation of hedgerows within the Site to improve habitat connectivity) may in turn result in a net positive effect on commuting and foraging bats overall.

5.11 Brown hare

Brown hare is a mobile species and may be present within the Site during the construction phase. Potential for direct impacts in the form of disturbance/ displacement and injury/ mortality as a result of vehicular and machinery movement during the construction phase therefore exists.

The following mitigation should therefore be implemented to reduce the risk of direct impact on brown hare during the construction phase of the proposed development.

- strict speed limits (15mph) should be followed during all phases of development.
- any exposed excavations should be provided with mammal exit ramps (i.e. wooden planks) at the end of each working day.

Through effective implementation of the measures described above, and taking into consideration that a large amount of suitable habitat for brown hare within the surrounding area is available (e.g. farmland, grassland, and woodland edge), no significant effect on the conservation status of brown hare during construction and operation of the proposed development is predicted.

5.12 Reptiles

A range of habitat types suitable for supporting reptiles have been identified within the Site. Potential impacts on reptile species are most likely to include:

- direct permanent impact in the form of injury or mortality as a result of collision with vehicles and/or machinery and crushing events.

In order to reduce the risk of negative impact on reptiles, the following mitigation measures should be employed during the construction phase of the development:

- where possible, infrastructure would be micro-sited away from suitable habitat features such as stone piles identified during the ecological survey.
- potential hibernacula sites (such as stone piles) will be dismantled by hand during the summer months, where possible. If these features are to be dismantled during the reptile hibernacula period, this will be carried out carefully under ECoW supervision. Should a reptile be found, the dismantling works will stop, the reptile will be allowed time and space to retreat to a safe place, and the Site ECoW will be consulted on how to proceed.

Through effective implementation of the measures described above significant effects on the conservation status of reptiles during construction of the proposed development is considered unlikely.

5.13 Breeding birds

5.13.1 Barn owl

Barn owl was identified through desk study as being present within 2km; however, none were located within the Site during field surveys. Potential for impacts through loss of grassland foraging habitat exist but it is not considered that this would lead to the loss of any barn owl territories. This is due to the large home range of this species which can forage between three to five kilometres from their nest site during the non-breeding season, and up to one kilometre during the breeding season. In addition, grassland enhancement measures outlined in Section 6.3.1 will potentially increase the amount of suitable foraging habitat. Significant effects on the nature conservation status of this species are therefore considered unlikely.

5.13.2 Skylark

Between three to five skylark breeding territories were located within the development footprint during the field surveys. It is therefore likely that the development would cause the loss of these territories through direct habitat loss during the construction phase. However, through implementation of mitigation measures outlined in Section 5.12.4 and habitat creation opportunities outlined in Section 6.0, significant effects on the nature conservation status of this species are considered unlikely.

5.13.3 Meadow pipit

Up to two meadow pipit breeding territories were located within the development footprint during the field surveys. It is therefore possible that the development would cause the direct loss of these territories through habitat loss during the construction phase. However, this is in the context of a large population (2.5 million in the UK (BTO[15]) which has recently shown signs of increase after previous long-term declines in Scotland (BTO), and meadow pipits are likely to be very common in the local area. In addition, grassland enhancement measures outlined in Section 6.3.1 will potentially increase the availability of suitable nesting habitat. Even in the worst case scenario of the loss of two territories, significant effects on the nature conservation status of this species are considered unlikely.

5.13.4 Reed bunting

One reed bunting territory was located within the Site but outside the proposed solar array area, adjacent to the linear watercourse running through the Site.

[15] https://www.bto.org/understanding-birds/birdfacts/meadow-pipit

Assuming that the good practice mitigation measures outlined below are implemented, this will avoid any negative construction impacts on this species.

Due to the location of the territory, it is considered unlikely that there will be any negative effects on this species during operation.

5.13.5 Mitigation measures for breeding birds

The following good practice measures should be employed to reduce the possibility of damage and destruction to occupied bird nests during the construction phase:

- Careful timing of construction activities, including restricting activities in sensitive areas as far as practicable in the early part of the breeding season until the location and breeding status of nesting birds has been established.
- If Site clearance and construction activities are required to take place during the main breeding bird season, from mid-March-August inclusive, survey work should be undertaken immediately prior to commencement of construction to ensure that nest destruction and disturbance to sensitive species are avoided. This would also apply if construction is ongoing at the start of a breeding season.
- These may need repeating if construction ceases in any given area for more than 48 hours as new breeding pairs may settle and start nesting in this time.
- A suitably qualified Environmental Clerk of Works (ECoW) should be employed for the duration of the construction period, although this may not necessarily be a full-time role throughout. Prior to the start of construction and/or the breeding bird season, the ECoW would make contractors aware of the ornithological sensitivities within the Site. The ECoW would undertake surveys for nesting birds throughout the construction period that falls within the nesting season and set up and monitor appropriate exclusion areas whilst nests of relevant species are in use.

6.0 Compensation and Enhancement

Several options for enhancing biodiversity within the Site have been identified, each of which are described below and illustrated within a Landscape and Biodiversity Plan (presented in Figure 6-1 of Appendix 06). These options have been refined following discussions with the SLR Landscape Architect, the client, and the landowner.

The opportunities presented are designed to improve the condition of existing habitats (e.g. enhancing broad habitat types of low distinctiveness to those of moderate or high distinctiveness[16]) and create new native habitats within the Site. In time, these measures will improve vegetative structure and species diversity within the Site, enhance connectivity within the Site and wider landscape, whilst also furthering the biodiversity value and habitat suitability of the Site for a variety of wildlife and protected species.

6.1 Habitats for retention

Throughout the design process, particular emphasis was placed on retaining habitats of ecological importance as far as possible by minimising the layout of infrastructure within them. With the exception of the proposed solar array area development area and associated

[16] 'Distinctiveness' is a term applied within biodiversity metric tools, whereby every habitat is automatically assigned a pre-defined distinctiveness score, ranging from very low to very high. Distinctiveness scores are assigned within metrics by taking into account parameters such as species richness, diversity, and rarity (at local, regional and national scales).

internal access routes, it is assumed that all existing habitats within the Site can be retained, and where feasible, enhanced.

Where habitat creation options are proposed, this may result in loss of some existing habitat types. However, where possible, replacement of existing habitat types with of habitats of higher distinctiveness has been prioritised (for example, native tree or hedgerow planting on species poor modified grassland).

6.2 Habitat compensation

Loss of approximately 0.12ha of wet heath (high distinctiveness) is likely to occur as a result of implementation of native mixed woodland (medium distinctiveness) around the perimeter of the most eastern solar array. It is however anticipated that the enhancement of a wetland area comprising 0.10ha of degraded blanket bog (very high distinctiveness), 0.3ha of damp neutral grassland (medium distinctiveness) and 0.04ha of rush pasture of (very high distinctiveness), would compensate for the loss of wet heath. See Section 6.3.3 for further details.

6.3 Habitat enhancement

6.3.1 Modified grassland enhancement

The proposed development will be constructed within 17.5ha of modified grassland habitat (the solar panels themselves would cover approximately 15ha of land within the security fenced development boundary). An opportunity therefore exists for enhancement of modified grassland (low distinctiveness) to a traditional lowland grazing meadow (very high distinctiveness). Achievement of such biodiversity enhancement measures would require the following steps, of which have been outlined in accordance with guidance produced by Naturesave Insurance (2022):

- All livestock to be removed from the developable area during the construction period.
- Following construction of solar array infrastructure17, existing vegetation within the security fenced area would be manually and/or mechanically broken up to expose 50% soil cover overall. Using an appropriate seed mix containing a range of perennial grasses, plantains and grazing-resistant wildflowers, the exposed ground would then be over-sown (for example, MG5 Meadow Mix by Scotia Seeds18). Vegetation would then be allowed to develop in the absence of grazing herbivores for a period of one year.
- Once the meadow has fully established (after a period of one year), it is proposed that a grazing management regime would be implemented. This management regime would involve grazing of the area by sheep between autumn (September) and spring (late March) each year. During this time, sheep stocking densities would remain low (recommended at approximately 5-6 sheep per ha). Sheep would then be removed from the area between 01 April and 30 August each year in order to allow wildflowers and grasses to flower and set seed. At the end of August each year, the Site would be mown to 10cm and sheep returned to the area for grazing through the autumn and winter.

[17] Timing to be confirmed with the construction team in accordance with proposed programmes of work. Consideration into removal of required vegetation as part of the construction phase may also be beneficial in order to avoid repeated disturbance to soil.

[18] Details pertaining to MG5 Meadow Mix are available online at https://www.scotiaseeds.co.uk/shop/mg5-meadow-mix/

- It is important to note that a grazing management regime should be agreed, in writing, between the client and landowner prior to construction works commencing, with documentation detailing the location and time period (s) for grazing, the maximum number of sheep to be grazed, sheep farmer/ landowner responsibilities (e.g. fencing and water supply), the period of agreement, and insurances.

Establishment of a traditional grazing meadow through the process described above would improve the condition of grassland habitat within security fenced areas of Site, whilst also enhancing biological diversity of a wider scale though providing a greater variety of pollen, seed and nectar sources for insects and small mammals. In addition, the removal of grazing livestock and absence of mechanical mowing between April and August each year would provide an area of land that is suitable for nesting during the bird breeding season, thereby serving as compensatory habitat for breeding birds that may otherwise have been lost as a result of construction of the proposed development (e.g. for skylark).

6.3.2 Woodland enhancement

The biodiversity value of approximately 1.18ha of coniferous shelterbelt woodland within the south of the Site (Appendix 06) would be enhanced through the following process:

- Selective felling of non-native coniferous trees (low distinctiveness) to allow increased light to woodland floor and development of ground flora.
- Replacement of felled non-native trees with native tree species such as Scots pine, rowan and birch Betula spp. Through time, this process would in turn diversity the age distribution and age class of trees, enhancing the stand from that of existing coniferous woodland of low distinctiveness to a native mixed woodland of medium distinctiveness.
- Creation of log/ brash piles to provide deadwood habitat and shelter for a range of fauna.
- Steps to improve ground flora diversity by introducing an appropriate shade-tolerant wildflower seed mix to woodland margins, such as Scotia Seeds Woodland Meadow Mix19, is also recommended.

It is important to note that as this shelterbelt woodland has been noted as suitable habitat for badger, mitigation measures relevant to such species (Section 5.9) will be required prior to, and during, implementation of the proposed enhancement measures detailed above.

6.3.3 Wetland restoration and enhancement

Two small pockets of degraded blanket bog (NVC community M20) are known to be present within the Site, of which are surrounded by neutral grassland with rushes species throughout (NVC community MG10a) and a small stand of rush pasture adjacent (M23a) (Figure 6-1 of Appendix 06). While degraded blanket bog lies outside of the proposed infrastructure footprint (areas of wetland have been avoided by design), an opportunity for restoration and enhancement of approximately 0.5ha of wetland within this area exists. An improvement in the condition of degraded blanket bog and wetland habitat could likely be achieved through the following process:

- Dam artificial drainage ditches within the wetland area (incorporating NVC communities M20, M23 and MG10a) that lie either side of the main watercourse. This process would reduce dewatering of the immediate area, thereby increasing water

[19] https://www.scotiaseeds.co.uk/shop/woodland-mix/

table levels within wetland habitat and improving conditions for blanket bog and rush pasture species to develop20.

- Once artificial drainage ditches have been dammed, fence off the wetland area from grazing livestock. Removal of grazing herbivories will allow vegetation to regenerate naturally and enhance species diversity within the blanket bog and wetland habitat over time.
- In order to monitor the effectiveness of ditch blocking and re-wetting of the area, a programme of habitat condition monitoring is recommended, with survey visits carried out at years 1, 3 and 5 post-restoration to record species distribution and abundance, sward height, and overall condition. The monitoring would in turn inform any further management measures necessary to improve the condition of restored wetland habitat.

6.4 Habitat loss and creation

Habitat creation options are summarised below and illustrated on Figure 6-1 of Appendix 06.

6.4.1 Native woodland creation

Approximately 1.28ha of native mixed woodland creation is proposed for the Site, as follows:

- A linear stand of mixed woodland would be planted along a fence line between the centre and northern boundary of the Site to extend the cover existing mixed woodland. This in turn would replace 0.3ha of modified grassland of low distinctiveness with mixed woodland of medium distinctiveness over a 5-30 year21 period.
- To the south of the Site, the stand of existing Scots pine within shelterbelt woodland would be extended to the Site boundary, thereby replacing 0.22ha of modified grassland of low distinctiveness with native Scots pine woodland of medium distinctiveness over a 10-30 year period.
- A stretch of new native mixed woodland plantation, measuring approximately 0.7ha, would also be developed around the security fencing associated with solar arrays within the south east of the Site. This would replace 0.41ha of modified grassland (MG6a) of low distinctiveness, 0.12ha of wet heath habitat (M15d) of high distinctiveness, 0.09ha of damp neutral grassland (MG10a) of medium distinctiveness, and 0.08ha of transitional acid-neutral grassland habitat (U4 – MG5) of medium distinctiveness.

The following measures are recommended for areas of woodland creation:

6.4.1.1 Planting

- All stock should be of British origin and of local provenance, where possible. Table 6-1 details the recommended proportions of each tree species within areas of new woodland.
- New trees should be planted in planting pits large enough to take the full spread of roots, with the sides of the pits loosened as necessary to ensure adequate drainage and to allow normal root growth. The pits should be backfilled with an equal mixture

[20] In order for key blanket bog species to establish successfully, the water table must remain very close to the ground surface for most of the year.

[21] Note 30 years is considered to be the time period required to reach maturity

of topsoil and mulching compost. Approximately 2m spacing is recommended for woodland tree planting.

- When planted, the top of the root collar should be level with the surrounding soil surface and the ground around the plant should be firmed in by treading, taking care to avoid scuffing or damage. The completed planting pit should be either at ground level or slightly domed to prevent water-logging. The roots shall not be left exposed (to prevent desiccation) or bent.
- Trees should be watered thoroughly immediately after planting.
- In order to achieve good rates of establishment, planting should be carried out in early spring (March) or the autumn (October or November); planting may also take place within the mid-winter period, if it is mild, but planting should not take place if the ground is frozen or water-logged.

6.4.1.2 Protection

- Planted trees should be supported by tree stakes, and attached with adjustable tree ties.
- Planting should be protected by tube guards / shrub shelters supported by a cane / stake, to protect from browsing during establishment.
- The area encompassing the plantation should be fenced to prevent livestock from entering and browsing young trees.

6.4.1.3 Establishment

- The area around the base of planting shall be kept weed free during the establishment phase, in years 1-5, for example by using a biodegradable mulch mat.
- Any planting that has died or become seriously damaged or diseased should be replaced annually in years 1 to 5.
- Planting should be watered in any periods of dry weather in years 1 – 5.
- Fertiliser should only be applied if deemed necessary.
- Pruning may take place in the dormant season, as required, to remove dead or dying and diseased wood from new trees and shrubs, to promote healthy growth. Any pruning should be carried out in accordance with good horticultural practices.
- At approximately year 5, all stakes, ties and guards should be removed and disposed of at a suitable facility.

6.4.1.4 Long-term management

After the establishment phase, no long-term management of trees and shrubs within the woodland blocks is expected to be required. A review of possible thinning requirements can be undertaken in year 5, as required.

Table 6-1: Proposed Tree Species and Corresponding Proportions

Tree Species	Proportion (%)
Sessile oak *Quercus petraea*	20
Aspen *Populus tremula*	10
Alder *Alnus glutinosa*	20
Crab apple *Malus sylvestris*	5

Tree Species	Proportion (%)
Holly *Ilex aquifolium*	2
Scots pine	10
Rowan	15
Wild cherry *Prunus avium*	8
Beech	5
Wych elm *Ulmus glabra*	5

The extension of native mixed woodland would serve to improve habitat connectivity within the Site and wider landscape and enhance commuting, foraging, and sheltering opportunities for a range of protected species as the woodland develops.

6.4.2 Native hedgerow creation

Approximately 390m of new hedgerow planting is proposed along a fence line within the east of the Site, as illustrated in Figure 6-1 of Appendix 06. A selection of native species would be incorporated into the hedgerow, with proportions of each outlined in Table 6-2.

Table 6-2: Proposed Hedgerow Species and Corresponding Proportions

Hedgerow Species	Proportion (%)
Hawthorn	60
Hazel *Corylus avellana*	15
Dogrose *Rosa canina*	5
Holly	5
Crab apple	15

The following management measures are recommended for areas of hedgerow creation:

- Immediately following planting, the hedgerow would be fenced on either side to reduce impact from grazing livestock.
- Once fully established, hedgerows should be cut in February, on alternating sides on a three-year rotation, such that no more than one side of the hedgerow is cut in any one year.
- Allow hedgerows to become tall and thick with a dense bushy structure, aiming for a final height of 5m, and final width of 3-5m (depending on operational constraints), to occur gradually over several years (in order to maintain a bushy structure).

The implementation of the native, species rich hedgerow would serve to extend habitat corridors within the Site and enhance connectivity within the wider landscape. As the hedgerow develops, it would provide additional habitat for passerine bird species that utilise the Site, as well as shelter for small mammals. It would also serve as a linear commuting feature for bat species and likely provide additional foraging opportunities through an increase in the abundance and diversity of invertebrates.

6.4.3 Scrub creation

Two areas of scrub creation are proposed for the Site:

- Establishment of approximately 0.46ha of scrub habitat to serve as an ‘ecotone edge’ between the existing linear shelterbelt plantation and grassland habitat within the south of the Site. The ecotone edge would in time act as transitional vegetation that

better connects and integrates the two habitat types within the landscape. This would be achieved though planting a range of native scrub/ shrub species such as hawthorn, blackthorn and rowan within the open space between the shelterbelt woodland edge and adjacent field boundary.

- Establishment of 0.48ha of scrub immediately west of the existing Howpark Wind Farm access route that intersects the Site. Species within these stands would incorporate hawthorn and rowan. This in turn would replace 0.48ha of modified grassland of low distinctiveness with native scrub of medium distinctiveness.

7.0 Summary of Ecological Impacts

The overall net impact of the proposed development upon features of ecological importance after application of mitigation, compensation and enhancement measures outlined in Sections 5.0 and 6.0 are summarised in Table 7-1.

Table 7-1: Net Impact Upon Important Ecological Features

Important Ecological Feature	Scale at which Feature is Important	Overall Net Impact
Other lowland acid grassland	Local	No significant negative impact predicted.
Other woodland; mixed	Local	Positive impact at a local level - Existing mixed woodland habitat will remain unaffected during construction and operation of the proposed development. Planting 1.76ha of new native woodland to provide screening whilst enhancing species diversity and habitat corridors within the Site and wider area.
Other coniferous woodland	Local	Positive impact at a local level - Existing coniferous woodland habitat will remain unaffected during construction of the proposed development. Felling of coniferous trees and replacement with native species will enhance species diversity and age structure and improve woodland connectivity in the long term.
Lowland heathland	Local	No significant impact predicted - Loss of approximately 0.12ha of wet heath and replacement with woodland habitat during implementation of the Landscape and Biodiversity Plan for the Site will result in an overall negative impact. However, implementation of proposed wetland restoration measures would in turn compensate for this loss.
Degraded blanket bog	Local	Positive impact at a local level – Ditch blocking and fencing off this area of wetland and surrounding habitat will allow for rewetting and mire forming species to regenerate in the absence of grazing.
Purple moor grass and rush pasture	Local	No significant negative impact predicted.
Standing open water	Local	No significant negative impact predicted.
Other rivers and streams	Local	No significant negative impact predicted.

Important Ecological Feature	Scale at which Feature is Important	Overall Net Impact
Badger	Local	No significant negative impact predicted.
Bats	Local	No significant negative impact predicted.
Brown hare	Local	No significant negative impact predicted.
Reptiles	Local	No significant negative impact predicted.
Breeding birds	Local	No significant negative impacts during construction. Net positive impact through implementation of traditional grazing meadow – serving as both compensatory habitat for loss of suitable grassland habitat during construction phase and enhancement of modified grassland. Implementation of new native woodland and hedgerows will further improve habitat suitability for breeding birds within the Site.

In addition to overall net impacts on features of ecological importance, delivery of the landscape and biodiversity plan will provide overall positive net impacts on following ecological features deemed to be of less than ecological importance (previously scoped out of assessment):

- Modified grassland – enhancement of approximately 17.5ha of modified grassland through creation of a traditional grazing meadow within the security fenced solar array area; and
- Red squirrel – creation of new stands of native mixed woodland will in time improve the suitability of the Site for supporting commuting, foraging, and potentially sheltering populations of red squirrel.

8.0 Summary and Conclusion

This report incorporates a standalone Ecological Impact Assessment for a proposed solar photo-voltaic (PV) generating station located near Grantshouse, in the Scottish Borders.

An extended Phase 1 habitat survey, NVC survey and breeding bird surveys were conducted within the Site by external consultants during 2022. The results have been reviewed by SLR to provide a summary of baseline ecological and ornithological conditions within the Site, and evaluated within the context of legislation, policy and guidance to identify important ecological features.

Important ecological features identified within the Site that may be impacted by the development in the absence of mitigation, relate to:

- Habitats - lowland acid grassland, mixed woodland, coniferous woodland, lowland heathland, blanket bog, purple moor grass and rush pasture, standing open water, and other rivers and streams; and
- Protected species - badger, bats, brown hare, reptiles and breeding birds.

In the absence of mitigation, the main risks to habitats during the construction phase relate to direct and indirect temporary damage/ fragmentation as a result of vehicle and machinery movement across sensitive habitats, and deterioration of vegetation communities caused by polluted or sedimented run-off during excavation works. The main risks to protected species relate primarily to indirect, temporary disturbance and displacement as a result of noise, vibration and vehicular movement. There is also a risk of a direct effect in the form of injury/mortality associated with collision with vehicles and/or machinery. For breeding birds,

direct habitat loss and temporary displacement during construction period is likely. However, through implementation of appropriate mitigation measures, no significant effects on any important ecological features identified are anticipated.

In terms of landscape and biodiversity enhancement opportunities associated with the project, a qualitative approach has been applied within this report. Key habitat enhancement and creation opportunities identified include:

- enhancement of modified grassland within the proposed development area to traditional grazing meadow;
- enhancement of existing shelterbelt plantation through removal of non-native coniferous trees and replacement with native tree species to improve age structure and species diversity;
- wetland restoration and enhancement;
- creation of new native woodland habitat and hedgerows along field boundaries that serve to extend existing habitat corridors and improve connectivity within the Site and wider landscape; and
- creation of native scrub habitat to improve connectivity between existing woodland and open fields, and to provide a screening measure for the proposed development from nearby developments.

The proposed Landscape and Biodiversity Plan (Figure 6-1 of Appendix 06) presented within this report is considered to satisfy the requirements outlined within NPF4, as well as ambitions set out in the Scottish Borders LDP, through delivery of a design that would enhance the condition of existing habitats and create new native habitats to improve species diversity, connectivity within the Site and wider landscape, and provide benefits for a variety wildlife in doing so.

9.0 References

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Appendix A Howpark Solar PV Preliminary Ecological Appraisal Report

Howpark Solar Farm

Ecological Impact Assessment

Eurowind Energy Limited

SLR Project No.: 428.V64539.00001

Preliminary Ecological Appraisal: Howpark Solar

This document summarises the findings of the initial Extended Phase 1 Habitat Survey with reference to potentially sensitive ecological features and makes recommendations for further actions and/or surveys where these may be required to support an application for consent.

Extended Phase 1 Habitat Survey Methods

An Extended Phase 1 Habitat Survey was conducted on 10th May 2022. The survey covered the entirety of the Site and a 100 m buffer (shown on Figure 1, Appendix B) and were carried out by a suitably experienced Ecologist.

The aim of the surveys was to classify and map habitats according to standard methods[1] and to assess their potential to support notable and protected species. Target Notes (TN) were recorded for notable features. The survey was carried out following the Guidelines for Preliminary Ecological Appraisal[2].

Bat Suitability Assessment

During the Extended Phase 1 Habitat Survey, a preliminary assessment of on-Site features was assessed for their potential to support roosting bats. An assessment was also undertaken to evaluate the quality of habitats to support commuting or foraging bats. The bat assessment work and recommendations followed guidelines produced by the Bat Conservation Trust (BCT)[3]. This initial bat assessment informed whether or not further surveys were required to assess the potential effects of the Development on bats.

Trees

A ground-level inspection of trees was undertaken to identify Potential Roost Features ('PRFs') suitable for roosting bats such as woodpecker holes, split limbs and peeling bark. Based on these observations, trees were assigned a level of suitability (negligible, low, moderate or high). Should evidence of bats have been recorded or the features assessed to provide suitability for bats, then further surveys may have been required.

Habitat

A visual assessment of habitats was undertaken to determine their potential to support commuting, foraging or swarming bats, such as good habitat connectivity and linear features. Based on these observations, the Site was assigned a level of suitability.

[1] JNCC (2010) *Handbook for Phase 1 habitat survey: a technique for environmental audit*. Nature Conservancy Council.
[2] CIEEM (2017) *Guidelines for Preliminary Ecological Appraisal, 2nd Edition*. Chartered Institute of Ecology and Environmental Management, Winchester.
[3] Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd ed.). The Bat Conservation Trust, London.

Recommendations

The tables below provide generic recommendations and advice about the Development design, summarised as follows:

Design recommendations:

- Focus development on land currently used as intensive arable farming/pasture.
- Avoid development in field margins, drain banks and woodland edges.
- Avoid development activity within tree root protection areas and within 10 m of woodland.
- Avoid loss of mature trees and hedgerows and avoid development within 15 m of trees (or as specified by an arboriculturist) and within 5 m of hedgerows.
- Avoid impacts on waterbodies/watercourses and immediately surrounding habitats (banks and 10 m buffer).
- Avoid development activity and building access tracks on modified bog
- Block established manmade ditches to allow re-establishment of vegetation and water retention within bog habitat
- Avoid development within 100 m of known badger setts.

Survey recommendations if the above are adopted:

- Badger survey within 100 m of Development (Can be done at any time of year but February to April optimal).
- National Vegetation Classification (NVC) Survey on area of modified bog (August to September 2022).

* Conservation and legal status defined as: [1] Strictly legally protected by nature conservation legislation; and [2] A conservation priority.
** Necessary further surveys are in **bold**. Contingent surveys (determined by development design or other surveys) are <u>underlined.</u>

Feature & Status*	Survey Notes (May 2022)	Desk Study (SiteLink)	Recommendations**	Timing
Designated Sites				
Statutory Designated Sites[1,2]	SSSI won't be affected by Development.	Drone Moss, SSSI 166 m NE.	Exclude from developable area and buffer according to sensitivity of features.	N/A
Non-statutory Designated Sites[2]	Ancient woodland won't be affected by Development.	Winding Plantation, AWI, 0.85 km west; The Beeches, AWI, 1.39 km W; Brockholes Wood AWI, 1.73 km W; Atton Dean AWI, 1.25 km SW; Green Wood, AWI, 1.76 km S.	Exclude from developable area and buffer according to sensitivity of features.	N/A
Habitats and Plants				
Acid grassland—semi-improved	There was an extensive patch of semi-improved acid grassland towards the south of the Site, interspersed with modified bog. There was low sward heights of vegetation highlighting grazing within the area. Species recorded: sheep's fescue (*Festuca ovina*), purple moor-grass (*Molinia caerulea*), mat grass (*Nardus stricta*), Yorkshire fog (*Holcus lanatus*), tormentil (*Potentilla erecta*), common bent (*Agrostis capillaris*), heath rush (*Juncus squarrosus*), common sedge (*Carex nigra*), heath bedstraw (*Galium saxatile*), springy turf-moss (*Rhytidiadelphus squarrosus*), heath plait-moss (*Hypnum jutlandicum*).	N/A	• Where possible, avoid development and access tracks within these habitats	N/A

Feature & Status*	Survey Notes (May 2022)	Desk Study (SiteLink)	Recommendations**	Timing
Coniferous Parkland/Scattered Trees	Scattered coniferous trees were present adjacent to the south-east of the Site, with Scots pine (*Pinus sylvestris*) being the dominant tree species, with a dense blanket of bracken (*Pteridium aquilinum*) underneath. Scattered birch (*Betula sp.*) were also present.	N/A	• This area is out with the Site Boundary therefore no further action is necessary	N/A
Coniferous woodland—plantation	There was an isolated patch of even aged coniferous plantation within the central area of the Site, with the dominant species being Norway spruce (*Picea abies*). There is a shift from Norway spruce to Scots Pine at the southern end of the plantation.	N/A	• Where possible, avoid development and access tracks within these habitats	N/A
Cultivated land—arable	Fields of cultivated arable land were present to the south of the Site, planted with an unidentified vegetable crop.	N/A	• Low value/insensitive habitat, no recommendations necessary	N/A
Ditches	There were several ditches within the Site, in the central area adjacent to the pond, and in the south-east of the Site.	N/A	• Where possible, avoid development and access tracks within these habitats.	N/A

Feature & Status*	Survey Notes (May 2022)	Desk Study (SiteLink)	Recommendations**	Timing
Wet modified bog[1,2]	Wet modified bog existing in conjunction with semi-improved acid grassland, in the south of the Site. Species present: hare's-tail cotton-grass (*Eriophorum vaginatum*), tormentil, purple moor-grass, papillose peatmoss (*Sphagnum papillosum*), small red peatmoss (*Sphagnum capillifolium*), common haircap moss (*Polytrichum commune*) lousewort (*Pedicularis sylvatica*), heath rush, heather (*Calluna vulgaris*), cross-leaved heath *(Erica tetralix*), carnation sedge (*Carex panicea*) and milkwort (*Polygala vulgaris*), springy turf-moss, sharp-flowered rush (*Juncus acutifloris*)..	N/A	• Avoid development and access tracks within these habitats • Install dams to block established manmade ditches to allow re-establishment of bog vegetation — a variety of techniques are available depending on type and scale of feature including: reprofiling, peat and plastic dams, stone dams, coir rolls, heather bales • **Undertake NVC survey to further characterise habitat for assessment**	**April to September**
Improved Grassland	The majority of the Site consists of improved grassland characterised with short swards of perennial rye-grass (*Lolium perenne*); white clover (*Trifolium repens*); and dandelion (*Taraxacum officinale*). Other species present: Yorkshire fog, common bent, crested dog's-tail (*Cynosurus cristatus*), sorrel (*Rumex acetosa*), creeping buttercup (*Ranunculus repens*) and creeping thistle (*Cirsium arvense*).	N/A	• Low value/insensitive habitat, no recommendations necessary • It is recommended that grassland areas are supplemented with a native wildflower seed mix to enhance the biodiversity of the Site, and encourage the development of suitable habitat features and nectar for pollinator species	N/A
Marshy Grassland[2]	There is a strip of marshy grassland present within the central area of the Site, adjacent to the pond and ditch. Species present: tufted hair-grass (*Deschampsia cespitosa*), purple moor-grass, red fescue (*Festuca rubra*), common bent, wavy hair-grass (*Avenella flexuosa*) tormentil, heath bedstraw, cuckoo flower (*Cardamine pratensis*) and soft rush (*Juncus effusus*).	N/A	• Where possible, avoid development and access tracks within these habitats to support waterbody as buffer strip	N/A

Feature & Status*	Survey Notes (May 2022)	Desk Study (SiteLink)	Recommendations**	Timing
Mixed Woodland—semi-natural[2]	Mixed woodland was present to the north-west of the Site. Species included Scots pine, larch (*Larix decidua*), pedunculate oak (*Quercus robur*), sycamore (*Acer pseudoplatanus*), rowan (*Sorbus aucuparia*), and beech (*Fagus sylvatica*).	N/A	• Where possible, avoid development and access tracks within these habitats • If working in close proximity to the woodland adjacent to the Site, root protection areas should be implemented and avoided. Should works be taking place close to woodland, the use of exclusion buffer fencing (e.g., heras fencing) should be considered following the advice of a qualified arboriculturist.	N/A
Scrub—continuous	There was a large area of continuous scrub to the east and south-east area of the Site, consisting of common gorse (*Ulex europaeus*), creeping willow (*Salix repens*), and hawthorn (*Crataegus laevigata*).	N/A	• Where it is necessary to remove scrub along the Site perimeter, it is recommended that healthy field margins of 7-10 m[4] be established to compensate loss of bird, reptile, and small mammal habitat	N/A
Standing Water—pond	There was a pond central within the Site, with a high diversity of macroinvertebrates, with bulrush (*Typha latifolia*) and surrounded by marshy grassland.	N/A	• Due to its potential significance for invertebrates in the local vicinity, avoid development within this habitat • Ensure hydrological links to nearby ditches are maintained • Maintain buffer strips of marshy grassland around pond	N/A

[4] BRE (2014) Biodiversity Guidance for Solar Developments. Eds G E Parker and L Greene. [Online]. Available at: https://www.bre.co.uk/filelibrary/pdf/Brochures/NSC-Biodiversity-Guidance.pdf (Accessed June 2022)

Feature & Status*	Survey Notes (May 2022)	Desk Study (SiteLink)	Recommendations**	Timing
Birds				
Breeding Birds[1,2]	The improved grassland fields and arable fields that make up the majority of the Site provide limited habitat for nesting birds; as surface vegetation and soils are subject to regular disruption from farming activities. Scattered trees within the Site could be utilised by tree-dwelling species. Woodland areas around the north-west of the Site could provide suitable nesting habitat for woodland species. There is potential for nesting birds to present a constraint to the Development. Removal or trees, and grassland areas during the breeding season could result in the loss of active nests. In addition, construction activities during the breeding season could result in disturbance to nesting birds in adjoining habitats.	TWIC: the desk study has confirmed the presence of several notable species within the Desk Study Area including: barn owl, 4 records, (2011-2018); osprey, 1 record (2002); merlin, 3 records (2002-2009); crossbill, 16 records (2002-2011); goshawk, 1 record (2010); peregrine, 7 records (2002-2010).	A four-visit breeding bird survey of Site and 100 m buffer has been completed.	April to June 2022
Wintering/Passage Birds[1,2]	There is potential for wintering birds (including geese) to utilise improved grassland fields during the winter period. Due to the availability of similar arable fields in the surrounding area, which will not be affected by the Development, wintering birds (including geese) are not likely to be affected by the Development.	TWIC: pink-footed goose, 96 records (2002-2018); barnacle goose, 17 records (2003-2015); brent goose,1 record (2002); Canada goose, 4 records (2002-2004);	No further pre-application bird survey is recommended.	N/A

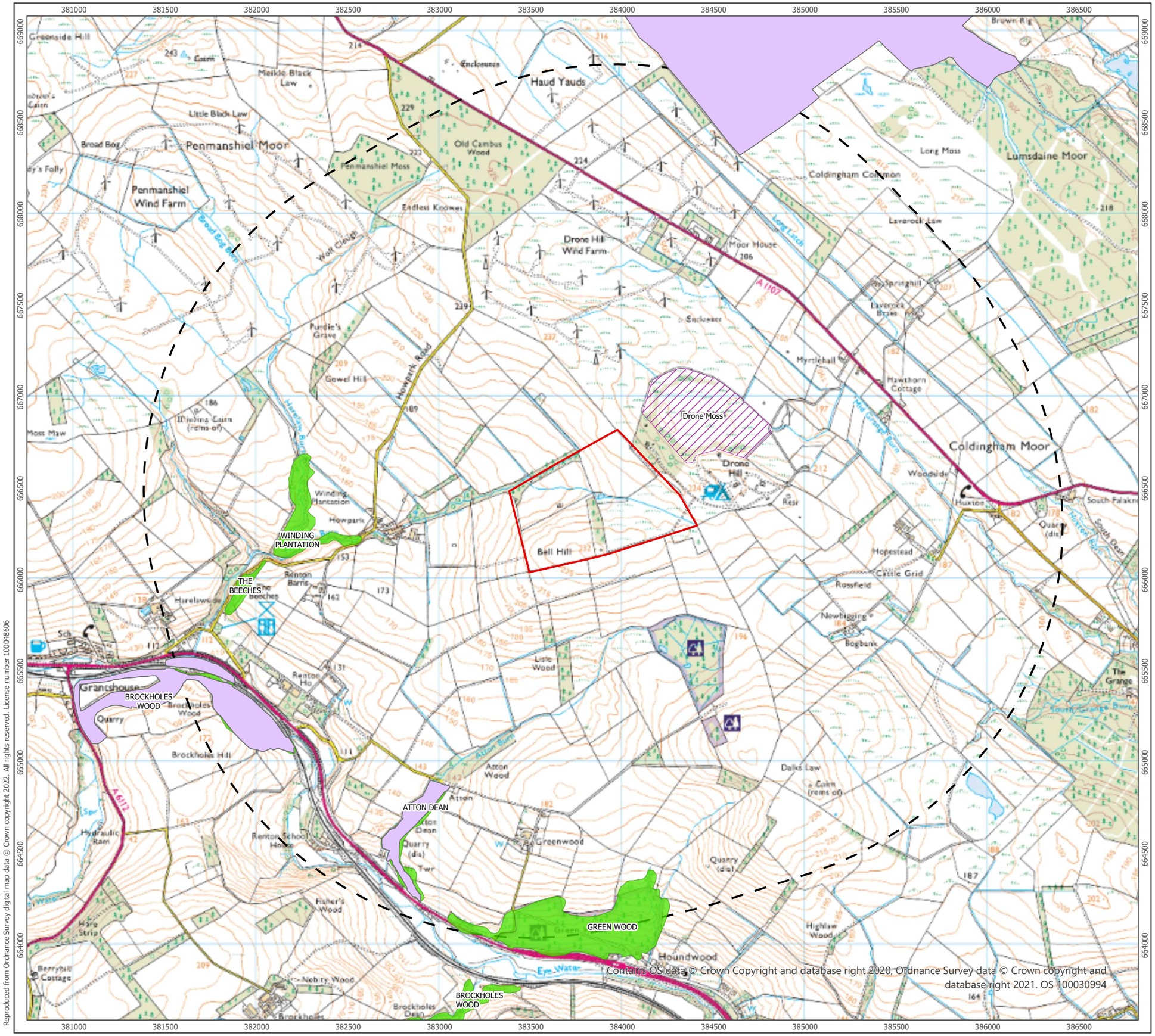
Feature & Status*	Survey Notes (May 2022)	Desk Study (SiteLink)	Recommendations**	Timing
Protected and Priority Species				
Badger[1]	A badger latrine was recorded during the Field Survey, within the centre of the Site near the conifer plantation. The mixed woodland and conifer plantation were not surveyed in detail. Scattered trees within the Site are considered limited suitability for sett creation due to the openness of the area and on relative flat ground. The mixed woodland area and conifer plantation have better potential for sett creation as they have more suitable cover, and are adjacent to open fields, which are good for foraging.	TWIC: There are 21 records of badger present within the Desk Study Area (2003-2020).	Exclude development from within 100 m of setts. This distance may be reduced depending on context of the sett and the planned works. Inclusion of mammal gates within the development design. **Detailed survey of adjacent woodland and field margins within 100 m to determine location of badger setts.**	**Year-round**
Bats[1,2]	Habitat Assessment Habitat suitability for bats was generally low across the Site. Open arable habitats are generally of low suitability, but woodland edges provide moderate to high value and connect to the wider landscape. Roosts (initial screening) All trees within the Site were assessed for their potential to support bat roosts. The mixed woodland areas were dominated by Scot's pine with some sycamore, rowan, and larch, and was assessed to be negligible for roosting potential due to lack of PRF features.	TWIC: *Myotis* sp, 13 records (2011); common pipistrelle, (*Pipistrellus pipistrellus*) 13 records (2011); soprano pipistrelle (*Pipistrellus pygmaeus*), 13 records (2011-2012); noctule (*Nyctalus noctula*), 3 records (2011); brown long eared (*Plecotus auritus*), 4 records (2011-2012); are present within the Desk Study Area.	Habitat No further surveys required unless extensive areas of woodland are to be removed. Roosts No further survey or assessment is required as trees within the Site were assessed to have negligible suitability for roosting bats.	N/A

Feature & Status*	Survey Notes (May 2022)	Desk Study (SiteLink)	Recommendations**	Timing
Red Squirrel[1,2]	No red squirrel signs were found during the Field Survey. The conifer plantation, which red squirrels favour, would generally be unsuitable for red squirrel due to its isolation from surrounding woodland. The mixed woodland has greater potential for red squirrel commuting/foraging as it's better connected to surrounding woodland, and has a greater diversity of seed food.	TWIC: two records of red squirrel (2006;2007) have been recorded within the Desk Study Area, in the south at Green Wood.	No further surveys required unless areas of woodland are to be removed.	N/A
Otter[1,2]	No otter signs were observed during the Field Survey. The waterbodies surveyed were generally unsuitable for otter commuting/foraging.	TWIC: No otter records identified within Desk Study Area.	No further surveys are required.	N/A
Water vole[1,2]	The ditches on site had low potential to support water vole, due to low water level and limited banksides. The pond also had limited potential due to lack of connectivity with wider suitability habitats.	TWIC: No water vole records identified within Desk Study Area.	No further surveys are required.	N/A
Great Crested Newt (GCN) [1,2]	One waterbody (NT 83879 66450) within the Site was accessible and assessed as having below average suitability to support GCN (See Appendix C). Drains and ditches were also considered unsuitable. Terrestrial habitat quality within the Site and surrounds is generally unsuitable. Although woodland and grassland habitats all have the potential to support GCN, there is no connectivity to suitable waterbodies. A GCN eDNA Survey was carried out on the pond at NT 83879 66450 and confirmed the absence of GCN (See Appendix D).	TWIC: No GCN records identified within Desk Study Area.	No further surveys are required.	N/A

Feature & Status*	Survey Notes (May 2022)	Desk Study (SiteLink)	Recommendations**	Timing
Reptiles[1,2]	No reptiles were observed on Site. Suitable habitat is limited throughout most of Site; restricted to small pockets such as marshy grassland; scrub; field drains, modified bog and woodland edges	TWIC: no reptiles known to be present within the area.	Exclude high-value habitats from developable area if possible. Clearance of relatively small areas of reptile habitat can be carried out using Reasonable Avoidance Measures (RAMs) without the need for further survey.	N/A
Other[2]	A brown hare was observed on the Site, in addition to roe deer prints.	TWIC: 20 records of brown hare (2002-2015).	No further surveys required. Good practice mitigation within the development design will be sufficient to address these species requirements.	N/A

Appendix A: Figures

Figure 1 Desk Study Area and Designated Sites
Figure 2: Phase 1 Habitat Survey Results



ARCUS
An ERM Group Company

- Site Boundary
- Desk Study Area (2 km Buffer of Site Boundary)
- Ancient Woodland Inventory
- Sites of Special Scientific Interest (SSSI)

1:20,000 Scale @ A3

0 0.3 0.6 km

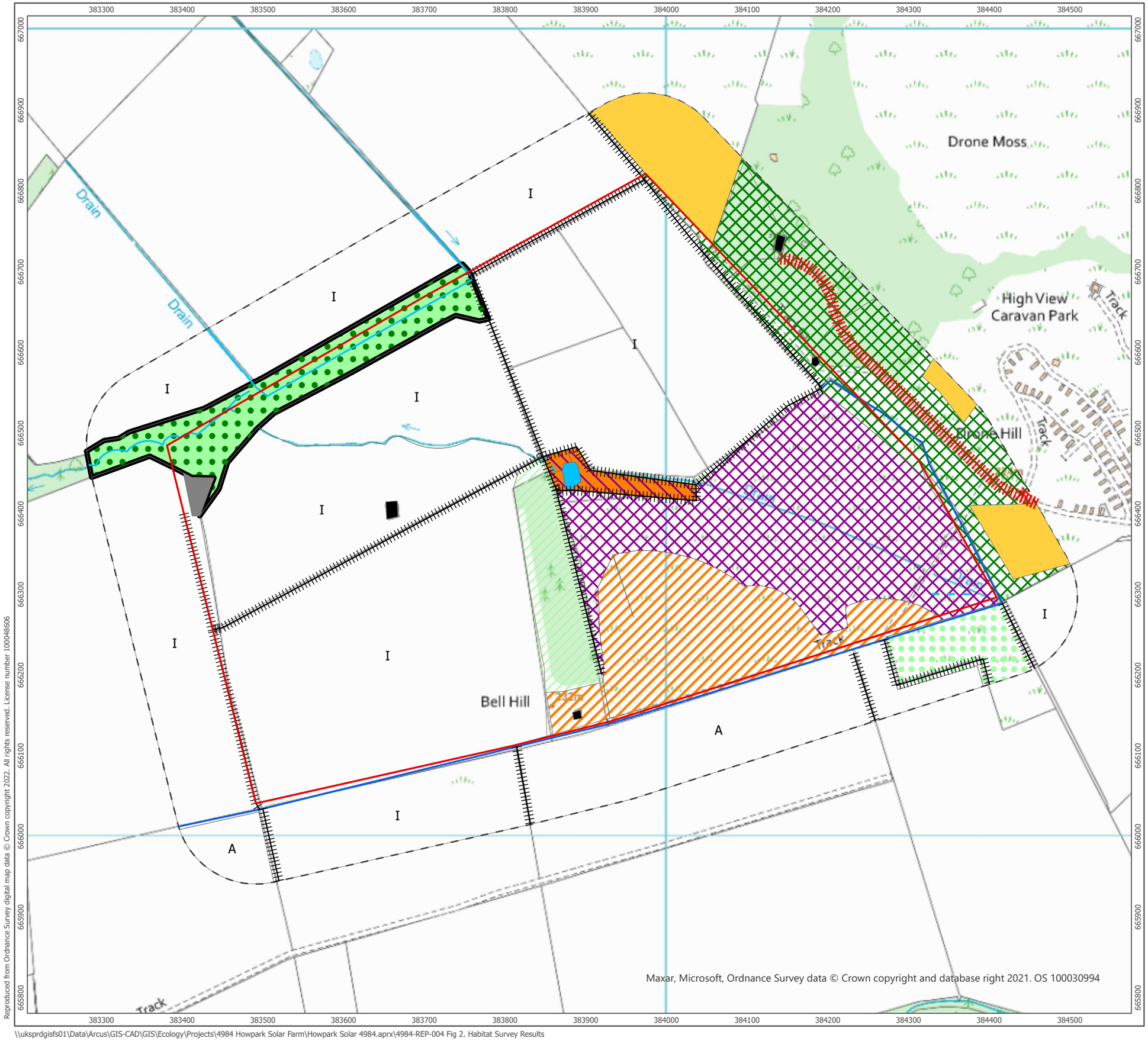
NORTH

Produced By: AM	Ref: 4984-REP-003
Checked By:	Date: 27/06/2022

Desk Study Area and Designated Sites
Figure 1

Howpark Solar Farm
Preliminary Ecological Appraisal

\\uksprdgisfs01\Data\Arcus\GIS-CAD\GIS\Ecology\Projects\4984 Howpark Solar Farm\Howpark Solar 4984.aprx\4984-REP-003 Fig 1. Desk Study Area and Designated Sites



ARCUS
An ERM Group Company

- Site Boundary
- Habitat Survey Area (100 m of Site Boundary)

Habitat Survey Results

- Running water
- Track
- Wall
- Fence
- Dry ditch
- Mixed woodland - semi-natural
- Coniferous woodland - plantation
- Scrub - dense/continuous
- Coniferous Parkland/scattered trees
- Acid grassland - semi-improved
- I — Improved grassland
- Wet modified bog
- Marsh/marshy grassland
- Dry dwarf shrub heath - acid
- Standing water
- A — Cultivated/disturbed land - arable
- Built-up areas
- Buildings

1:4,500 Scale @ A3

0 0.06 0.12 km

NORTH

Produced By: AM	Ref: 4984-REP-004
Checked By:	Date: 13/07/2022

Habitat Survey Results
Figure 2

Howpark Solar Farm
Preliminary Ecological Appraisal

\\uksprdgisfs01\Data\Arcus\GIS-CAD\GIS\Ecology\Projects\4984 Howpark Solar Farm\Howpark Solar 4984.aprx\4984-REP-004 Fig 2. Habitat Survey Results

Appendix B: Target Notes

Target Note	Grid Reference	Description
1	NT 83837 66473	Badger latrine by fenceline
2	NT 83672 66587	Pile of stones suitable for reptile hibernacula
3	NT 83879 66450	Pond with high invertebrate abundance (confirmed no GCN via eDNA survey)
4	NT 84029 66357	Pile of stones suitable for reptile hibernacula
5	NT 83357 66434	Brown hare sighting

Appendix C: Great Crested Newt Habitat Suitability Index

Methods

All waterbodies within the Site and within a 250 m buffer of the Site were identified during walkover surveys and from OS 1:10,000 maps and aerial photographs. Any ponds identified were subject to a Habitat Suitability Index (HSI) assessment during the Extended Phase 1 Habitat Survey.

Great crested newt (*Triturus cristatus*; GCN) may utilise suitable terrestrial habitat up to 500 m from their natal or breeding ponds; however, they are largely found within 100 m of their breeding pond, this coupled with the low impact nature of solar developments means 250 m is an appropriate buffer for waterbody surveys. If they are present in any of the ponds in the Survey Area or surrounds, GCN could be present within suitable terrestrial habitat within the Site.

One waterbody was identified during the Extended Phase 1 Habitat Survey and review of maps and aerial imagery, which were accessible at the time of survey. The pond is shown in Figure 1, Appendix A. HSI assessment was undertaken on the pond to determine its potential to support GCN.

The HSI assessment considers a range of features that affect the suitability of waterbodies to support GCN; e.g. size of waterbody, extent of shading, abundance of aquatic plants, presence of fish and quality of surrounding habitat. The assessment results in a score that helps to determine the suitability of waterbodies and the need for further, more detailed surveys.

The HSI scores are inserted into a table to calculate a score for each waterbody, with suitability for GCN assessed on the scale shown below in Table C.1.

Table C.1: Categorisation of HSI Scores

HSI score	Waterbody suitability
< 0.5	Poor
0.5 – 0.59	Below average
0.6 – 0.69	Average
0.7 – 0.79	Good
> 0.8	Excellent

Results

Table C.2 Habitat Suitability Index (HSI) Scores for Waterbodies

HSI Parameter	HSI Number	HSI Scores
		P1
Location	S1	0.5
Pond Area	S2	0.8
Pond Drying	S3	0.9
Water Quality	S4	0.67
Shade	S5	1
Fowl	S6	0.67
Fish	S7	0.67
Ponds	S8	0.1
Terrestrial	S9	0.33
Macrophytes	S10	0.5
Total HSI Score		**0.53**

Appendix D: Great Crested Newt eDNA Survey

During the Extended Phase 1 Survey, an environmental DNA (eDNA) survey was carried out on the pond within the Site.

Methods

Water samples were collected following technical guidance[5] in order to determine the presence/ likely absence of the species in the waterbody. The eDNA kit was then sent to a laboratory for analysis. A positive result is indicative of GCN presence, GCN DNA given off into the water can persist for a number of weeks. A negative result suggests there are no GCN within the sample area. For inconclusive results, it is recommended that analysis is repeated.

Results

A negative result was received from the laboratory as shown below, indicating absence of GCN.

[5] Biggs J, Ewald N, Valentini A, Gaboriaud C, Griffiths RA, Foster J, Wilkinson J, Arnett A, Williams P and Dunn F 2014. *Analytical and methodological development for improved surveillance of the Great Crested Newt. Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (Triturus cristatus) environmental DNA*. Freshwater Habitats Trust, Oxford.

SureScreen Scientifics

Folio No: E13518
Report No: 1
Purchase Order: 4984/AM
Client: ARCUS CONSULTANCY SERVICES LTD
Contact: Aaron Martin

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS (TRITURUS CRISTATUS)

SUMMARY

When great crested newts (GCN), *Triturus cristatus*, inhabit a pond, they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm GCN habitation or establish GCN absence.

RESULTS

Date sample received at Laboratory: 12/05/2022
Date Reported: 13/05/2022
Matters Affecting Results: None

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
3171	Pond A Howpark Solar	NT 83854 66406	Pass	Pass	Pass	Negative	0

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: Chris Troth **Approved by:** Chelsea Warner

METHODOLOGY

The samples detailed above have been analysed for the presence of GCN eDNA following the protocol stated in DEFRA WC1067 'Analytical and methodological development for improved surveillance of the Great Crested Newt, Appendix 5.' (Biggs et al. 2014). Each of the 6 sub-sample tubes are first centrifuged and pooled together into a single sample which then undergoes DNA extraction. The extracted sample is then analysed using real time PCR (qPCR), which uses species-specific molecular markers to amplify GCN DNA within a sample. These markers are unique to GCN DNA, meaning that there should be no detection of closely related species.

If GCN DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If GCN DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

SureScreen Scientifics Ltd is ISO9001 accredited and participate in Natural England's proficiency testing scheme for GCN eDNA testing. We also carry out regular inter-laboratory checks on accuracy of results as part of our quality control procedures.

INTERPRETATION OF RESULTS

SIC: **Sample Integrity Check** [Pass/Fail]
When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.

DC: **Degradation Check** [Pass/Fail]
Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample between the date it was made to the date of analysis. Degradation of the spiked DNA marker may lead indicate a risk of false negative results.

IC: **Inhibition Check** [Pass/Fail]
The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result: **Presence of GCN eDNA** [Positive/Negative/Inconclusive]
Positive: GCN DNA was identified within the sample, indicative of GCN presence within the sampling location at the time the sample was taken or within the recent past at the sampling location.
Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for GCN presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. In accordance with Natural England protocol, even a score of 1/12 is declared positive. 0/12 indicates negative GCN presence.
Negative: GCN eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of GCN absence, however, does not exclude the potential for GCN presence below the limit of detection.

Appendix B Howpark Solar PV Vegetation Survey Report

Howpark Solar Farm

Ecological Impact Assessment

Eurowind Energy Limited

SLR Project No.: 428.V64539.00001

VEGETATION SURVEY OF LAND AT HOWPARK, COLDINGHAM, SCOTTISH BORDERS, IN SEPTEMBER 2022

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September 2022

Report for Arcus Consultancy Services Limited
www.arcusconsulting.co.uk

CONTENTS

1 INTRODUCTION

This survey was commissioned by Arcus Consultancy Services Ltd in order to map and describe the National Vegetation Classification (NVC) communities present in an area of land at Howpark, near Coldingham in the Scottish Borders. This information is required in relation to a proposed solar farm here.

The site consists of two fields rising on both sides of a wetter depression. The slopes are gentle. The area is stock-grazed (though no livestock were present at the time of survey) except for a small area in the west which has been fenced and not grazed by stock (though deer presumably still have access).

The altitudinal range of the survey area is 210-230 metres above sea level. The Ordnance Survey grid reference of the approximate centre of the site is NT 841 665.

More than half of the area is agriculturally improved grassland of low botanical interest. The main focus of the survey was on the wetter depression, which is mainly in the southern half of the site and has a mixture of grassland, rushy wetland, wet heath and bog.

According to the Geology of Britain online map viewer tool (http://www.bgs.ac.uk) the bedrock here is sedimentary rock (Gala Group – Wacke) of Silurian age, mostly overlain by superficial deposits of Quaternary age.

2 SURVEY METHODS

The fieldwork for this survey was carried out by Ben Averis on 23rd September 2022.

The habitats were mapped using the National Vegetation Classification (NVC; Rodwell 1991 *et seq.*).

Some of the vegetation here does not fit into any NVC community and was therefore mapped and described, for the purpose of this survey, under a non-NVC code:

- U4b-MG5 = grassland floristically intermediate between these two NVC types.
- U4>MG7 = grassland that appears to have been U4 until recent reseeding with strips of *Lolium perenne*; therefore set to develop toward or into MG7.
- Je = *Juncus effusus* vegetation with an 'acid grassland' type of lower layer.
- MG10Ja = rushy vegetation with an MG10-type flora but with *Juncus acutiflorus* as the main rush.

Nomenclature in this report follows Stace (2019) for vascular plants and Blockeel *et al*. (2021) for bryophytes.

3 DESCRIPTIONS OF PLANT COMMUNITIES

The vegetation types found in this survey are described below. Site photographs are provided in Appendix 1. The vegetation map is shown on Figure 1, Appendix 2; and accompanying polygon data is presented in Appendix 3.

U4a *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland, Typical sub-community

This is short acid grassland in which *Festuca ovina, Molinia caerulea, Nardus stricta* and *Potentilla erecta* are all abundant, along with frequent *Agrostis capillaris, Juncus squarrosus, Carex nigra, Galium saxatile* and the mosses *Pleurozium schreberi, Hypnum jutlandicum, Rhytidiadelphus squarrosus* and *Sphagnum capillifolium*, and generally smaller amounts of *Pedicularis sylvatica, Carex panicea, Succisa pratensis, Juncus acutiflorus, Trichophorum germanicum, Calluna vulgaris* and the mosses *Dicranum scoparium, Aulacomnium palustre, Sphagnum fallax, S. papillosum* and *Polytrichum commune*.

U4a is widespread in the southern half of this site, occupying ground that is level to very gently sloping. It is all heavily grazed, and it appears that some of it would be M25 *Molinia*-dominated vegetation if grazing were significantly reduced; this is evident from the occurrence of tall M25 within the fenced strip in the west and short U4a immediately adjacent on heavily grazed ground just outside the fenced area (see photo 8). In the heavily grazed state the *Molinia* is reduced to small plants with relatively low cover. The occurrence of MG9 in the fenced strip also suggests that some of the current U4 might once have been, or has the potential to become, MG9 if less grazed (*Deschampsia cespitosa* currently kept in check by heavy grazing outside that strip). The occurrence of Sphagnum mosses in some of the U4a at this site suggests that the vegetation might have been of a different type (e.g. wet heath) at some time in the past and that grazing and drainage have converted it to U4.

U4b *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland, *Holcus lanatus-Trifolium repens* sub-community

This short semi-improved acid grassland consists of swards of the grasses *Agrostis capillaris, Festuca ovina, Nardus stricta* and *Holcus lanatus* mixed with the herbs *Trifolium repens, Potentilla erecta, Plantago lanceolata, Prunella vulgaris, Scorzoneroides autumnalis, Lotus corniculatus* and *Viola palustris*, and a patchy cover of the moss *Rhytidiadelphus squarrosus*. Some of it is on damp ground and contains *Juncus effusus, Sphagnum fallax* and *S. papillosum* (but with these species not in sufficient quantity for the vegetation to be classed as a wetland community such as M6).

U4b is scattered widely through the southern half of the site, mostly some distance out from the wet channel running from WNW to ESE; U4a is mostly closer to that wet channel, suggesting that the U4b owes its existence partly to nutrient enrichment from adjacent MG6 improved grassland to the south and, more locally, the north.

U4b-MG5: grassland intermediate between U4b *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland, *Holcus lanatus-Trifolium repens* sub-community and MG5 *Cynosurus cristatus-Centaurea nigra* meadow and pasture

This short grassland (example shown in photo 9) has swards of *Agrostis capillaris, Festuca ovina, Nardus stricta, Cynosurus cristatus, Anthoxanthum odoratum* and *Holcus lanatus*, and a well-developed assemblage of herbs including *Trifolium repens, Potentilla erecta, Plantago lanceolata, Prunella vulgaris, Scorzoneroides autumnalis, Lotus corniculatus, Hypochaeris radicata* and *Euphrasia* agg. It has much in common with MG5, but *Nardus, Festuca ovina* and *Potentilla erecta* mark an affinity with the more acidic U4 community.

U4b-MG5 is locally quite extensive on gently sloping, well drained ground in the southern half of the site, well away from the central line of the wet channel running WNW to ESE.

U5a *Nardus stricta-Galium saxatile* grassland, Species-poor sub-community

This is similar to the U4a acid grassland described above but with a greater abundance of *Nardus stricta*, whose low-grown tussocks are abundant to dominant here. Also abundant are *Potentilla erecta, Galium saxatile* and *Carex nigra*. Other species seen in U5 here were *Avenella flexuosa, Molinia caerulea, Juncus squarrosus, Carex panicea, Erica tetralix, Calluna vulgaris, Pedicularis sylvatica* and the mosses *Dicranum scoparium, Rhytidiadelphus squarrosus, Polytrichum commune, Sphagnum capillifolium, S. papillosum* and *Leucobryum glaucum*.

Small patches of U5a are scattered among the U4a grassland on level ground in the south of the site.

U6d *Juncus squarrosus-Festuca ovina* grassland, *Agrostis capillaris-Luzula multiflora* sub-community

Juncus squarrosus is very abundant in this vegetation, along with a typical acid grassland flora including *Festuca ovina, Agrostis capillaris, Nardus stricta, Molinia caerulea, Potentilla erecta* and the mosses *Rhytidiadelphus squarrosus, Polytrichum commune* and *Sphagnum papillosum*. Small patches of U6d are scattered among U4a grassland in one area in the south, on more or less level ground to the south of the WNW-ESE-orientated wet channel.

MG6a *Lolium perenne-Cynosurus cristatus* pasture, Typical sub-community

This is agriculturally-improved grassland containing abundant *Lolium perenne, Agrostis capillaris, Cynosurus cristatus* and *Trifolium repens*, and varied amounts of *Holcus lanatus, Rumex acetosa, Festuca rubra, Plantago lanceolata, Ranunculus repens, Cerastium fontanum, Cirsium arvense, Bellis perennis, Jacobaea vulgaris* and, locally, *Hypochaeris radicata* and *Euphrasia* agg.

MG6 occupies most of the northern half of the site and a large part of the south; it occupies well-drained and mostly gently sloping ground to the north and south of the lower, wetter and more varied zone of mixed grassland and wetland communities running WNW-ESE across the site.

MG7 *Lolium perenne* leys and related grasslands

This grassland has a recently sown sward of *Lolium perenne*, the plants of which are still small and are in parallel strips among ground that is partly or largely bare soil. There is a patchy cover of other species including *Bellis perennis, Plantago lanceolata, P. major,*

Aphanes arvensis, Holcus lanatus, Rumex acetosella, Trifolium repens, Hypochaeris radicata and, in the area labelled U4>MG7 (appears to be previous U4 in which surface ploughing and sowing of *Lolium* is leading to a change to MG7 – see photo 10), *Potentilla erecta*.

MG7 and U4>MG7 occupy a narrow strip along the eastern edge of the southern half of the site. The ground here is gently sloping and well-drained.

MG9a *Holcus lanatus-Deschampsia cespitosa* grassland, *Poa trivialis* sub-community

Tall tussocks of *Deschampsia cespitosa* are abundant here and coalesce in places to become dominant. They are accompanied by a 'neutral to slightly acid grassland' flora including *Holcus lanatus, Festuca rubra, Molinia caerulea, Juncus effusus, J. conglomeratus, Plantago lanceolata, Cirsium arvense, Anthoxanthum odoratum, Agrostis capillaris, Epilobium obscurum, Potentilla erecta* and the moss *Rhytidiadelphus squarrosus*.

Patches of MG9 are scattered within the fenced strip in the west of the site, where the *Deschampsia cespitosa* has been able to grow taller and more extensively in the absence of stock grazing.

MG10a *Holcus lanatus-Juncus effusus* rush-pasture, Typical sub-community

This is rushy vegetation (example shown in photo 6) in which tussocks of *Juncus effusus* are abundant and accompanied by *Holcus lanatus, Agrostis capillaris, Festuca rubra, Deschampsia cespitosa, Ranunculus repens, R. acris, Rumex acetosa, Plantago lanceolata, Poa pratensis, Achillea ptarmica, Juncus articulatus, J. acutiflorus* (these two rushes only sparse) and the mosses *Kindbergia praelonga* and *Plagiomnium undulatum*.

MG10 is common on damp, level to gently sloping ground in the southern half of this site.

MG10Ja = *Holcus lanatus-Juncus effusus* rush-pasture, form with *Juncus acutiflorus* as the main rush

This is similar to the MG10a just described but with *Juncus acutiflorus* abundant (and *J. effusus* correspondingly sparse). The *J. acutiflorus* here has been grazed short, so the vegetation looks much like short grassland from a distance.

Small areas of MG10Ja are scattered among MG10a and U4 grassland on damp, level to very gently sloping ground in the southern half of this site.

M6c *Carex echinata-Sphagnum fallax/denticulatum* mire, *Juncus effusus* sub-community

This is a type of acidic rush mire in which tussocks of *Juncus effusus* growing abundantly among carpets of the mosses *Sphagnum fallax* and *S. palustre.* Other species include *Agrostis canina, Holcus lanatus, Rumex acetosa, Galium saxatile, Succisa pratensis, Luzula multiflora, Viola palustris, Dryopteris dilatata* and the moss *Kindbergia praelonga*.

There are small patches of M6c scattered among U4 grassland and MG10 rushy vegetation on damp to wet, level to very gently sloping ground in the south of the site.

M6d *Carex echinata-Sphagnum fallax/denticulatum* mire, *Juncus acutiflorus* sub-community

This is similar to the above-described M6c but with abundant *Juncus acutiflorus* and much less *J. effusus*. It also includes some *Ranunculus flammula*, marking a floristic link with the M23a at this site.

M6d was found only very locally in this survey, on wet, very gently sloping ground in the SW, among U4b-MG5 grassland and M23a and MG10a rushy vegetation.

M15d *Trichophorum cespitosum-Erica tetralix* wet heath, *Vaccinium myrtillus* sub-community

This is wet heath in which *Trichophorum germanicum, Molinia caerulea, Festuca ovina, Potentilla erecta, Polygala serpyillifolia* and the moss *Rhytidiadelphus squarrosus* are all abundant. *Nardus stricta, Carex panicea, Succisa pratensis, Pedicularis sylvatica* and the moss *Sphagnum capillifolium* are frequent. Other species include *Calluna vulgaris, Erica tetralix, Juncus squarrosus, J. acutiflorus, Narthecium ossifragum, Agrostis capillaris* and the mosses *Hypnum jutlandicum, Aulacomnium palustre, Sphagnum papillosum, Pleurozium schreberi, Dicranum scoparium* and *Campylopus flexuosus*. The vegetation is relatively short and grassy by general wet heath standards; this is clearly the result of stock-grazing and the widespread signs of grazing on such unpalatable species as *Trichophorum* and *Nardus* (and browsing on *Erica tetralix*) shows that the intensity of grazing here has been very high.

There are patches of M15d of varying size on level to very gently sloping peaty ground in the south-eastern quarter of this site. Their edges are mostly well defined from adjacent grassland and rushy vegetation.

Photo 1 shows a general view of some of this M15d wet heath, and photo 2 shows a close-up of one of the many heavily grazed tussocks of *Trichophorum germanicum* here.

M20 *Eriophorum vaginatum* blanket/raised mire

This is bog vegetation in which tussocks of *Eriophorum vaginatum* grow abundantly on the level surface of deep peat. The tussocks of this species are short and grazed. The fact that there is so much grazing of *E. vaginatum* is an indication of heavy grazing pressure and is consistent with the absence of palatable dwarf shrubs species such as *Calluna* and *Vaccinium myrtillus* that are typical of so many bogs. Other species seen here are *Potentilla erecta*, the mosses *Polytrichum commune, Sphagnum papillosum* and *Aulacomnium palustre* (all abundant), *S. fallax, Hypnum jutlandicum, Rhytidiadelphus squarrosus, Carex nigra, Molinia caerulea* (all frequent), *Juncus acutiflorus, Galium saxatile, Carex panicea, Avenella flexuosa* and *Luzula multiflora* (all rare to occasional).

There are a few small patches of M20 among U4 grassland and MG10/M6 rushy vegetation on level ground in the south-eastern part of this site. The vegetation looks very much like U4 grassland from a distance because the *E. vaginatum* tussocks are grazed so short that their tussocky structure is less apparent than in the more commonly seen taller, less heavily grazed plants of this species. Photo 3 shows a general view of some of this M20, and photo 4 shows a close-up of a heavily grazed tussock of *Eriophorum vaginatum*.

M23a *Juncus effusus/acutiflorus-Galium palustre* rush-pasture, *Juncus acutiflorus* sub-community

Juncus acutiflorus is abundant in this wetland of what appear to be more or less neutral soils, The abundance of this rush is not obvious at first glance because the plants are so short and grazed. Other species include *Ranunculus flammula* (abundant), *R. acris, R. repens, Holcus lanatus, Festuca rubra, Agrostis stolonifera, Epilobium palustre, Scorzoneroides autumnalis, Cirsium palustre* and (abundant) the moss *Calliergonella cuspidata*.

Small patches of M23a are locally common on wet, level to very gently sloping ground in the southern half of this site. The *J. acutiflorus* plants are generally grazed short, so the vegetation looks like a rather dark-toned and muddy short grassland from a distance (see example in photo 5). This is in contrast to the tall upright swards of *J. acutiflorus* that are more typical of M23a in Britain generally.

M23b *Juncus effusus/acutiflorus-Galium palustre* rush-pasture, *Juncus effusus* sub-community

This sub-community at this site contains abundant tall tussocks of *Juncus effusus* mixed with *Viola palustris, Stellaria uliginosa, S. media, Rumex acetosa, Epilobium montanum, Deschampsia cespitosa, Festuca rubra, J. acutiflorus* and the mosses *Brachythecium rivulare, Calliergonella cuspidata* and *Oxyrrhynchium hians*.

M23b occurs locally on damp to wet, more or less level ground in the southern part of this site.

M25 *Molinia caerulea-Potentilla erecta* mire

This vegetation (example shown in photo 7) is distinctive in being made up largely of tall, long-leaved tussocks of *Molinia caerulea*. This grass is accompanied here by a sparse flora including *Potentilla erecta (abundant), Festuca rubra, Galium saxatile, Agrostis capillaris, Deschampsia cespitosa, Avenella flexuosa, Juncus effusus, J. conglomeratus* and the moss *Rhytidiadelphus squarrosus*.

M25 is common within the fenced strip in the west of the site, where there is no stock grazing.

S10a *Equisetum fluviatile* swamp, *Equisetum fluviatile* sub-community

This is a species-poor sward of *Equisetum fluviatile* growing in shallow water at the edge of the pond in the west of the site.

S12 *Typha latifolia* reedbed

Typha latifolia forms a tall, dense sward in this vegetation around the edges of the pond in the west of the site. Other species in S12 here are generally sparse and include *Eleocharis palustris, Potamogeton natans, Epilobium obscurum, Stellaria uliginosa* and the mosses *Calliergonella cuspidata* and *Calliergon cordifolium*.

S14a *Sparganium erectum* swamp, *Sparganium erectum* sub-community

This is a species-poor sward of *Sparganium erectum* at the edge of the pond in the west of the site.

S19 *Eleocharis palustris* swamp

Eleocharis palustris forms lush, quite dense swards in this vegetation around parts of the margins of the pond in the west of the site. The S19 here also contains *Ranunculus flammula, Myosotis scorpioides, Potamogeton natans, Juncus acutiflorus* and the mosses *Bryum pseudotriquetrum* and *Calliergonella cuspidata*.

A9 *Potamogeton natans* community

This is a sparse to quite dense cover of *Potamogeton natans* in the pond in the west of the site.

W7 *Alnus glutinosa-Fraxinus excelsior-Lysimachia nemorum* woodland

This is a small patch of planted *Fraxinus excelsior* (4), *Sorbus intermedia* (3), *Quercus robur* (1) and *Sambucus nigra* (1) among MG9/10 damp neutral grassland/rush vegetation in the fenced strip in the west of the site.

Je = *Juncus effusus* vegetation with an acid grassland associated flora

Tussocks of *Juncus effusus* grow abundantly here among a shorter assemblage including *Agrostis capillaris, Holcus lanatus, Rumex acetosa, Nardus stricta, Potentilla erecta, Galium saxatile* and the moss *Rhytidiadelphus squarrosus*. This resembles MG10a but species such as *Nardus, P. erecta* and *G. saxatile* mean that the flora associated with the rush is of an acid grassland type instead of a neutral grassland type.

Small patches of Je occur among U4 acid grassland in a few places in the southern half of the site.

4 EVALUATION OF BOTANICAL INTEREST

The mix of plant communities at this site is broadly typical of the margins of the eastern Southern Uplands of Scotland.

The occurrence of wet heath is of interest because this is a scarce habitat this far east in southern Scotland, though this habitat is very locally common around here with a good extent of it just north of the Howpark survey area (Averis 2004).

The areas of bog at Howpark are small but all examples of this habitat are of interest because Britain, together with Ireland, is an important part of the world for both blanket and raised bog.

This site has clearly been heavily grazed by livestock including cattle. Much of the vegetation is short, with clear signs of grazing and with abundant dung and, locally, poached ground. As well as the short vegetation height the heavy grazing is evident from the condition of certain plant species that are typically quite unpalatable to large herbivores: these include deergrass *Trichophorum germanicum* (see photo 2), hare's-tail cottongrass *Eriophorum vaginatum* (see photo 4), mat grass *Nardus stricta*, heath rush *Juncus squarrosus* and cross-leaved heath *Erica tetralix*. The ericoid dwarf shrubs *Calluna vulgaris* and *Vaccinium myrtillus* might be expected to be common and conspicuous on the peaty soils here but are reduced to a very sparse growth of very short and obviously heavily browsed plants. Hence the wet heath and bog habitat here look greener and more grassy than most examples of these habitat types in Britain and in terms of their appearance have much in common with the nearby U4 acid grasslands.

The wet heath at this site is classed as M15d, while that to the north was mostly classed as M16d (Averis 2004). These two NVC types can be floristically very similar to each other, so in NVC terms the difference in classification locally is not significant, though it is noticeable that the wet heath to the north is less intensively grazed and much more heathy (with abundant *Calluna*).

Sharp-flowered rush *Juncus acutiflorus* at this site has mostly been grazed down to about 15 cm in height or less; in Britain generally it typically forms tall, conspicuous swards and does not appear to be very palatable to large herbivores. Soft rush *Juncus effusus* here is less grazed and grows to a more normal height well above that of most other plant species in the heavily grazed parts of the site.

A reduction in stock-grazing intensity would be ecologically desirable because it would allow natural processes to take places with less suppression, leading to a greater diversity of vegetation structure, increased flowering (likely to be beneficial to many insects), an increased growth of *Calluna vulgaris* and *Vaccinium myrtillus* in bog and wet heath (where these dwarf shrubs are normally expected to be more abundant) and a greater overall degree of naturalness.

With reduced grazing it is possible that in some of the U4a acid grassland *Molinia caerulea*, currently grazed to a sparse cover of short plants, would increase in height and cover to such a degree that the vegetation would develop towards, or into, M25 *Molinia*-dominated vegetation. The fenceline effect in the west, with tall M25 in the strip of land without any

stock-grazing contrasting with short U4 on the heavily grazed side of the fence, suggests such a change if the currently high grazing pressure in the southern field is reduced.

A strip along the SE edge of the site has been converted (or is in the process of conversion) to MG7 *Lolium perenne* grassland as result of ploughing and reseeding. In at least some of this strip the previous vegetation appears to have been U4 acid grassland. It would be ecologically undesirable to do any more of this: ploughing and/or conversion of semi-natural grassland (especially agriculturally unimproved grassland) to reseeded swards or arable crops constitutes an unfortunate loss of habitat of ecological value. The abundance of *Potentilla erecta* among ploughed and reseeded ground in polygon 32 suggests that the vegetation previously present was U4a unimproved acid grassland, as in the adjacent polygon 34.

Table 1 (below) lists all of the vegetation and habitat types found in this survey and gives their equivalent Phase One (JNCC 2010) and UK Biodiversity Action Plan Priority Habitat (www.jncc.defra.gov.uk) habitat types, and their potential Groundwater Dependent Terrestrial Ecosystem (GWDTE) status (see SEPA 2017).

The GWDTE column in Table 1 refers to potential status only. Not all examples of these NVC types are actually GWDTE habitats. Ideally, a survey by a hydrologist or hydrogeologist will clarify their GWDTE status. From general observations of these habitats during this vegetation survey I think it is likely that these NVC types at this site are not GWDTE habitats (e.g. no obvious signs of water emergence from ground aquifers seen), though of course I cannot be completely certain about this because I am not a hydrologist.

Although the swamp communities belong within UK BAP priority habitats the examples here appear to represent relatively recent colonisation (or planting?) of vegetation around the artificially-created pond, so they are less natural than occurrences of these same plant communities around more natural water bodies.

NVC W7 can be considered to belong to the wet woodland UK BAP priority habitat and to be a potential GWDTE habitat, but the small patch labelled W7 here (polygon 4) consists of young planted trees and is therefore not regarded here as belonging to the above UK BAP habitat type, and it appears best not to regard it as a potential GWDTE habitat.

Table 1 – Vegetation types recorded by Ben Averis at Howpark, Scottish Borders (NT 841 665), on 23rd September 2022, showing equivalent Phase 1 and UK Biodiversity Action Plan Priority Habitat types, and potential Groundwater Dependent Terrestrial Ecosystem (GWDTE) status

NVC type	Phase 1 habitat type	UK Biodiversity Action Plan Priority Habitat?	Potential GWDTE status
MG6	B4 Improved grassland		
MG7	B4 Improved grassland		
MG9	B2.1 Unimproved neutral grassland		Moderate
MG10 (incl. MG10Ja)	B5 Marsh/marshy grassland		Moderate
M6	E2.1 Acid/neutral flush	Lowland fen * / Upland Flush, fen & swamp **	High
M15	B2 Wet heath	Lowland heathland * / Upland heathland **	Moderate
M20	E1.7 Wet modified bog	Blanket bog	
M23	B5 Marsh/marshy grassland	Purple moor-grass & rush-pasture * / Upland Flush, fen & swamp (M23a only) **	High
M25	B5 Marsh/marshy grassland	Purple moor-grass & rush-pasture *	Moderate
U4a	B1.1 Unimproved acid grassland	Lowland dry acid grassland *	
U4b	B1.2 Semi-improved acid grassland	Lowland dry acid grassland *	
U4b-MG5	B2.2 Semi-improved neutral grassland	Lowland meadow *	
U4>MG7	B4 Improved grassland		
U5a	B1.1 Unimproved acid grassland	Lowland dry acid grassland *	
U6d	B1.1 Unimproved acid grassland	Lowland dry acid grassland *	
S10	F1 Swamp	Lowland fen * / Upland Flush, fen & swamp **	
S12	F1 Swamp	Lowland fen * / Upland Flush, fen & swamp **	
S14	F1 Swamp	Lowland fen * / Upland Flush, fen & swamp **	
S19	F1 Swamp	Lowland fen * / Upland Flush, fen & swamp **	
A9	G1 Standing water		
Je (not described in NVC)	B5 Marsh/marshy grassland		
W7	A1.1.2 Broadleaved plantation		

* = if considered to be within a lowland landscape setting
** = if considered to be within an upland landscape setting

There are some upland affinities here but this is quite a borderline case in terms of location, land use and climate.

Although the swamp communities belong within UK BAP priority habitats the examples here appear to represent relatively recent colonisation (or planting?) of vegetation around the artificially-created pond, so they are less natural than occurrences of these same plant communities around more natural water bodies.

5 ACKNOWLEDGMENTS

This contract was commissioned by Arcus Consultancy Services Ltd. James Allison (Arcus Consultancy Services Limited) arranged for me to do the work. I thank James for accompanying me during the fieldwork for this survey.

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Appendix 1 – Photographs taken during vegetation survey at Howpark, Scottish Borders, NT 841 665, on 23rd September 2022

Photograph 1: M15d wet heath at Howpark, Scottish Borders, 23-09-2022

Photograph 2: grazed *Trichophorum germanicum* in M15d wet heath at Howpark, Scottish Borders, 23-09-2022

Photograph 3: M20 bog at Howpark, Scottish Borders, 23-09-2022

Photograph 4: grazed *Eriophorum vaginatum* in M20 bog at Howpark, Scottish Borders, 23-09-2022

Photograph 5: M23a rush mire at Howpark, Scottish Borders, 23-09-2022

Photograph 6: MG10a rush-pasture at Howpark, Scottish Borders, 23-09-2022

Photograph 7: M25 *Molinia*-dominated vegetation within fenced-off strip at Howpark, Scottish Borders, 23-09-2022

Photograph 8: Fenceline effect at Howpark, Scottish Borders, 23-09-2022: tall M25 *Molinia* vegetation on left (in area with no stock-grazing) and short U4 acid grassland on right (heavily grazed by livestock)

Photograph 9: U4b-MG5 grassland at Howpark, Scottish Borders, 23-09-2022

Photograph 10: U4>MG7. Grassland that appears to have previously been U4 (*Potentilla erecta* still plentiful and flowering) but which has been ploughed and sown with strips of *Lolium perenne* and therefore transitional to MG7. Howpark, Scottish Borders, 23-09-2022.

Appendix 2: NVC polygons mapped by Ben Averis at Howpark, Scottish Borders, NT 841 665, on 23rd September 2022

The polygon data are in Appendix 3.

ARCUS
An ERM Group Company

- Site Boundary
- NVC Survey Area

NVC Habitat Survey Results

- Scrub - dense/continuous
- Broadleaved Parkland/scattered trees
- Acid grassland - semi-improved
- SI — Neutral grassland - semi-improved
- I — Improved grassland
- Wet modified bog
- Marsh/marshy grassland
- Wet dwarf shrub heath
- Standing water

1:2,800 Scale @ A3

0 50 100 m

NORTH

Produced By: ST	Ref: 4984-REP-007
Checked By: SC	Date: 12/9/2022

NVC Habitat Survey Results
Figure 1

Howpark Solar Farm

Y:\GIS\Ecology\Projects\4984 Howpark Solar Farm\Howpark Solar 4984.aprx\4984-REP-007 Fig 1. NVC Habitat Survey Results

Appendix 3: NVC polygon data mapped by Ben Averis at Howpark, Scottish Borders, NT 841 665, on 23rd September 2022

The map of polygon boundaries is in Appendix 2.

Polygon no.	NVC 1	% 1	NVC 2	% 2	NVC 3	% 3	NVC 4	% 4	NVC 5	% 5	NVC 6	% 6
1	MG6a	100										
2	MG9a	50	MG10a	50								
3	A9	35	S12	35	MG10	15	S19	10	S10a	3	S14a	2
4	W7	100										
5	M25	100										
6	MG10a	34	MG9a	33	U4a	33						
7	M25	95	MG9a	5								
8	U4b	100										
9	MG10a	34	M6c	33	U4b	33						
10	MG10a	100										
11	W23	100										
12	MG10a	100										
13	U4a	70	MG10a	25	U4b	5						
14	U4b-MG5	49	M23a	30	MG10a	20	M6d	1				
15	U4a	90	U4b	8	Je	2						
16	MG10a	85	MG10Ja	15								
17	U4b-MG5	50	MG10a	50								
18	W23	100										
19	MG7	100										
20	W23	100										
21	W23	100										
22	W23	100										
23	U4b-MG5	100										
24	U4a	95	U5a	5								
25	W23	100										
26	U4b	100										
27	MG10a	70	MG10Ja	20	U4b	10						

Polygon no.	NVC 1	% 1	NVC 2	% 2	NVC 3	% 3	NVC 4	% 4	NVC 5	% 5	NVC 6	% 6
28	MG10a	100										
29	U4a	100										
30	U4b	100										
31	W23	100										
32	U4>MG7	100										
33	M15d	100										
34	U4a	50	U5a	50								
35	U4b	50	MG10a	50								
36	M15d	100										
37	U4a	99	Je	1								
38	U4b-MG5	90	MG10Ja	7	MG10a	3						
39	U4a	60	U4b	10	U6d	10	MG10a	10	Je	10		
40	MG10a	98	M6c	1	M23a	1						
41	M15d	100										
42	U4b	50	MG10a	50								
43	MG10a	90	U4b	10								
44	M20	100										
45	MG10a	34	M6c	33	U4b	33						
46	M20	80	MG10a	10	U4b	10						
47	M15d	100										
48	U4a	50	U4b	50								
49	MG10a	60	U4b	40								
50	M23a	100										
51	MG6a	100										

Appendix C Breeding Bird Survey Summary

Howpark Solar Farm

Ecological Impact Assessment

Eurowind Energy Limited

SLR Project No.: 428.V64539.00001

Howpark Solar Breeding Bird Survey Summary (provided to SLR by ERM in August 2022)

Surveys completed by David Douglas on the following dates:

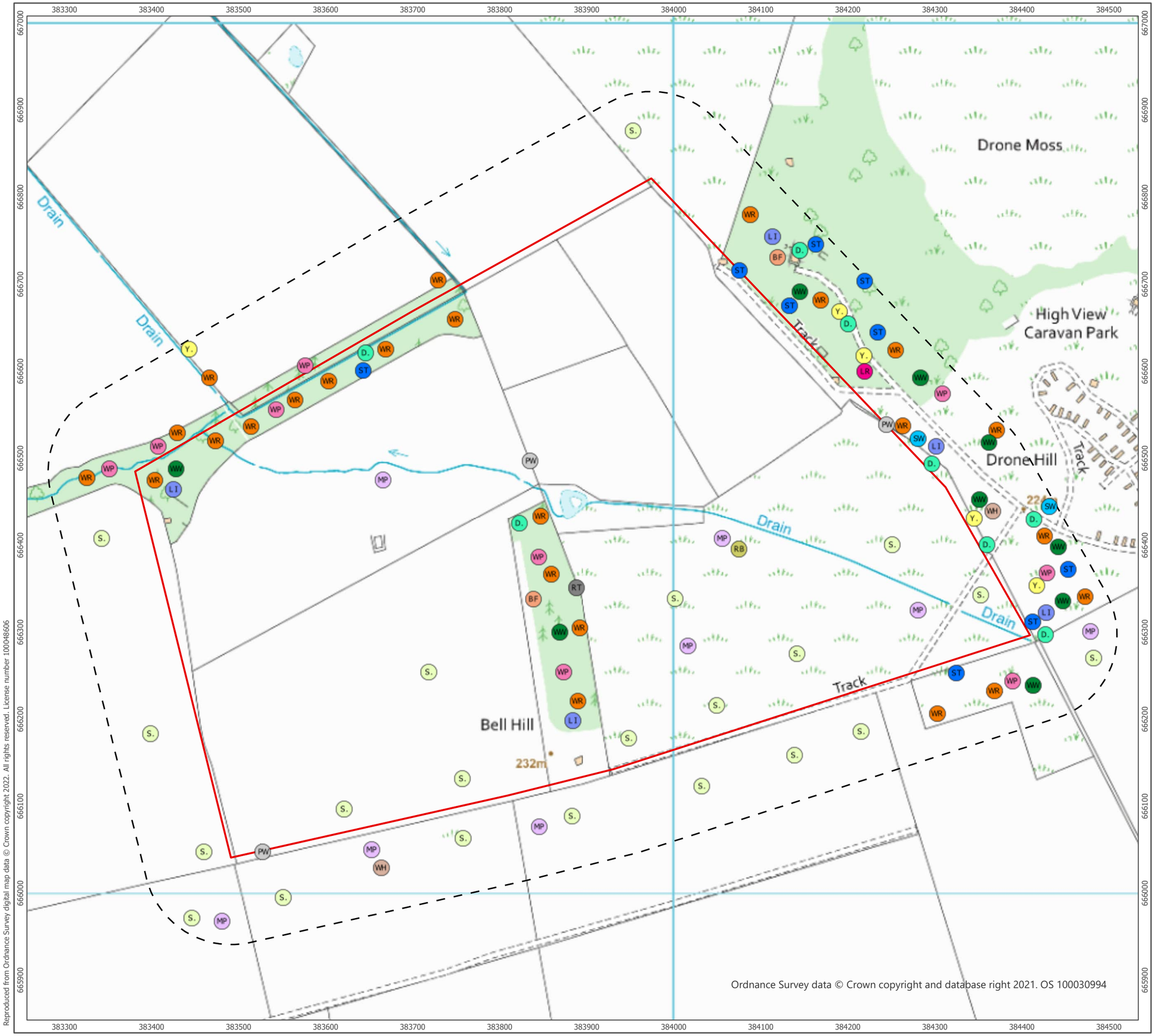
- 30/04/22
- 15/05/22
- 09/06/22
- 19/06/22

BoCC species red or amber listed species recorded and considered to be breeding were bullfinch *Pyrrhula pyrrhula*, dunnock *Prunella modularis*, lesser redpoll *Acanthis cabaret*, linnet *Linaria cannabina*, meadow pipit, pied wagtail *Motacilla alba*, redstart *Phoenicurus phoenicurus*, reed bunting, sedge warbler *Acrocephalus schoenobaenus*, song thrush *Turdus philomelos*, skylark, whitethroat *Sylvia communis*, willow warbler *Phylloscopus trochilus*, woodpigeon *Columba palumbus*, wren *Troglodytes troglodytes* and yellowhammer *Emberiza citrinella*. These are displayed on the Breeding Bird Territories Results Map.

Other BoCC species recorded but not considered to be breeding were mallard *Anas platyrhynchos*, redshank *Tringa totanus*, herring gull *Larus argentatus*, rook *Corvus frugilegus*, starling *Sturnus vulgaris*, spotted flycatcher *Muscicapa striata*, wheatear *Oenanthe oenanthe*, tree sparrow *Passer montanus*, yellow wagtail *Motacilla flava* and siskin *Spinus spinus*.

Non-BoCC species recorded onsite that were breeding or may have bred were common pheasant *Phasianus colchicus*, feral pigeon *Columbia livia*, buzzard *Buteo buteo*, great spotted woodpecker *Dendrocopos major*, jay *Garrulus glandarius*, magpie *Pica pica*, jackdaw *Coloeus monedula*, carrion crow *Corvus corone*, raven *Corvus corax*, coal tit *Periparus ater*, blue tit *Cyanistes caeruleus*, great tit *Parus major*, swallow *Hirundo rustica*, blackcap *Sylvia atricapilla*, goldcrest *Regulus regulus*, treecreeper *Certhia familiaris*, blackbird *Turdus merula*, robin *Erithacus rubecula*, stonechat *Saxicola rubicola*, chaffinch *Fingilla coelebs* and goldfinch *Carduelis carduelis*.

Other non-BoCC species recorded on Site that were not considered breeding were Canada goose *Branta canadensis*.



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Site Boundary

BBS Area (100 m of Site Boundary)

Breeding Bird Territories

- BF Bullfinch
- D. Dunnock
- LR Lesser Redpoll
- LI Linnet
- MP Meadow Pipit
- PW Pied Wagtail
- RT Redstart
- RB Reed Bunting
- SW Sedge Warbler
- ST Song Thrush
- S. Skylark
- WH Whitethroat
- WW Willow Warbler
- WP Woodpigeon
- WR Wren
- Y. Yellowhammer

Only territories of breeding birds listed on the Birds of Conservation Concern 5 (BoCC) Red and Amber lists have been displayed. Territories of breeding birds listed on the BoCC Green List or non-native species are not displayed.

1:4,200 Scale @ A3

0 0.1 0.2 km

NORTH

Produced By: ST	Ref: 4984-PUB-002
Checked By: SC	Date: 19/08/2022

Breeding Bird Territories

Howpark Solar

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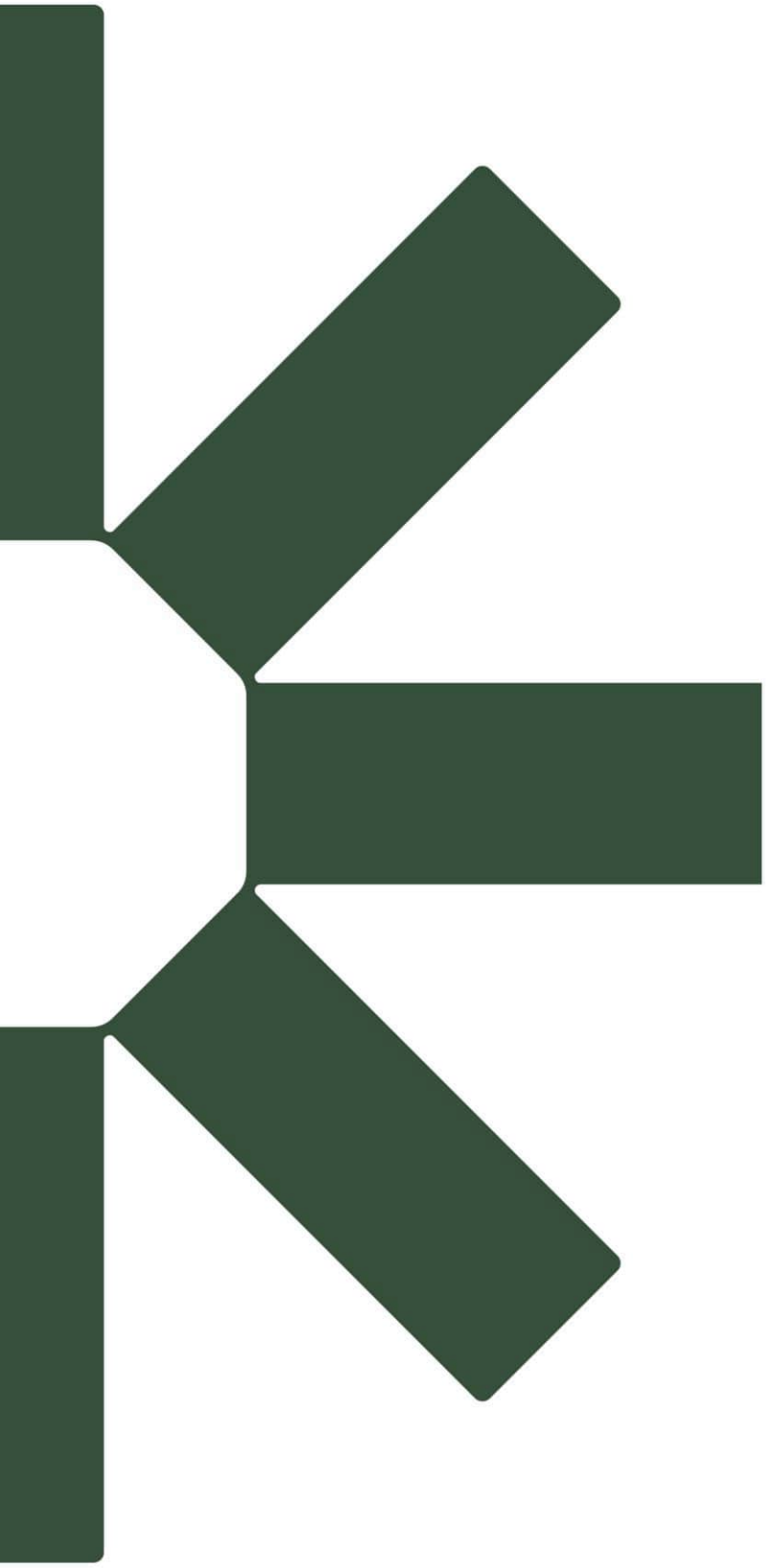

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