WLC 23021 – Barvick Burn Woodland Creation Project

Ecological Survey Report

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Tables

1 Introduction

1.1 Background

Wildlife Consulting Ltd (WLC) and Whytock Ecology Ltd (WEL) was commissioned by Edinburgh University to undertake a bird, habitat and protected species survey and assessment in respect of a site on the Glenturret Estate, near Crieff in Perth and Kinross in 2023 and 2024.

The majority of the site lies within the Loch Lomond, The Trossachs and Breadalbane Natural Heritage Zone (NHZ 15)[1], with the southern edge of the site falling within the Eastern Lowlands NHZ (NHZ 16), approximately 2km north of Crieff and the A85 carriageway. The central Ordnance Survey Grid Reference for the site is located at NN 84047 26215.

There are plans to undertake a woodland creation project at the site. The final woodland species assemblage is yet to be determined but it is understood planting will largely comprise native broadleaf woodland. The original boundary of the site is illustrated on Figure 7, with the redefined (reduced) 2024 area presented on Figure 8 onwards. The original site has an area of approximately 856 hectares (ha) which was reduced to 429ha following the reduction of the site in 2024.

This report describes the methods and results of the ecological surveys undertaken in 2023 and 2024. It also discusses potential impacts on birds, habitats and protected species within the site boundary and surrounding area and makes recommendations to mitigate potential impacts on these receptors.

For birds names used in this report follow the British List[2], which is maintained by the British Ornithologists' Union (BOU), with all species referred to by their British vernacular name. For botanical species, the report follows that of Stace, 2019[3]

1.2 Site Description

The land within the majority of the survey area boundary comprises an area of recently managed grouse moor, which encompasses the north and centre of the survey area, while the southern section of the survey area is dominated by sheep grazed pasture. There are small areas of coniferous and mixed plantation woodland present and several watercourses that tribute through the site largely in a southerly direction into the Turret Burn and the River Earn, the most substantial of which is the Barvick Burn which forms the eastern boundary of the redefined site. To the north and west of the survey area lies Loch Turret Reservoir and further areas of upland moorland and grouse moor habitats. There is farmland to the south of the survey area, and a large area of conifer plantation (Wester Knockbae) lies to the west of the survey area.

[1] SNH has identified 21 Natural Heritage Zones which cover the Scottish mainland and the islands, with the aim of developing an integrated approach to the management and sustainable use of the natural heritage in each zone, which take into consideration local, social and economic aspirations.

[2] British Ornithologists' Union. (2017). The British List: A Checklist of Birds of Britain (9th edition). Ibis 160: 190-240.

[3] Stace, C. (2019) New Flora of the British Isles. 4th ed. Cambridge University Press. UK.

2 Ornithology

2.1 Legislation And Conservation Status

As reference is made in this report to legislation protecting bird species, as well as conservation status, a brief overview of the relevant legislation and conservation lists is provided below.

2.1.1 The Birds Directive

Annex I of Directive 2009/147/EC on the conservation of wild birds[4] (known as the 'Birds Directive') lists bird species that are of conservation importance at a European level. Bird species listed on Annex I are protected from deliberate disturbance, particularly during the period of breeding and rearing young. This refers specifically to disturbance levels that would affect delivery of the objectives of the Birds Directive, which means that the impact of disturbance must not adversely affect a species' conservation status. One of the main provisions of the Directive is the identification and classification of SPAs for rare or vulnerable Annex I bird species, as well as for all regularly occurring migratory species.

2.1.2 The Wildlife and Countryside Act 1981 (as amended)

The Wildlife and Countryside Act 1981 (as amended)[5] (hereinafter referred to as WCA) is the primary legislation protecting animals, plants, and certain habitats in the UK, including all wild birds and their nests, eggs and chicks. Under this legislation, it is an offence to intentionally or recklessly kill, injure or take any wild bird or their eggs, or to take, damage, destroy, obstruct or otherwise interfere with the nest of any wild bird while it is in use or being built.

Additional protection of birds at or around their nests is afforded to rare breeding species in the UK, and/or species under threat of human persecution. These species are listed on Schedule 1 of the Act, which have additional legal protection from disturbance while breeding. Further protection to some Schedule 1 species is afforded under Schedule 1A, which protects birds from intentional or reckless harassment at any time (i.e. all year round), and Schedule A1 which protects birds nest sites/eyries from harm on a year round basis.

2.1.3 Nature Conservation Scotland Act

The Act sets out a series of measures which are designed to conserve biodiversity and to protect and enhance the natural heritage of Scotland. In doing so, the Act provides the principal legislative components of a new, integrated, system for nature conservation within Scotland. The measures in the Act also have relevance beyond Scotland and provide for the conservation of Scotland's natural environment within a wider British, European and global context.

The Act also locates the conservation of biodiversity and of Scotland's natural environment within a wider British, European and global context. In relation to biodiversity in particular, it requires public bodies and office-holders to consider the effect of their actions at a local, regional, national and international level. Measures relating to the protection of species and habitats also recognise the importance of the wider international context.

2.1.4 UK Birds of Conservation Concern

The UK Birds of Conservation Concern (BoCC) is a periodic national review (currently in its fifth iteration) assessing the population and trends for UK breeding bird species. It uses a traffic light system to indicate an increasing level of conservation concern. Species that have a declining range and/or population, or that

[4] https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:020:0007:0025:EN:PDF
[5] http://www.legislation.gov.uk/ukpga/1981/69

are vulnerable to population effects due to their small population size, are Red-listed or Amber-listed, depending on the extent of the decline or vulnerability, while those which are stable, increasing, or experiencing only small declines are Green-listed[6].

The UK Biodiversity Action Plan (UK BAP) was published in 1994, and was the UK Government's response to the Convention on Biological Diversity (CBD), which the UK signed up to in 1992 in Rio de Janeiro. The CBD called for the development and enforcement of national strategies and associated action plans to identify, conserve and protect existing biological diversity, and to enhance it wherever possible.

2.1.5 UK Biodiversity Framework

The 'UK Post-2010 Biodiversity Framework', published in July 2012, succeeds the UK BAP and 'Conserving Biodiversity – the UK Approach', and is the result of a change in strategic thinking following the publication of the CBD's 'Strategic Plan for Biodiversity 2011–2020' and its 20 'Aichi Targets', at Nagoya, Japan in October 2010, and the launch of the EU Biodiversity Strategy (EUBS) in May 2011. The Framework demonstrates how the work of the four countries and the UK contributes to achieving the Aichi Targets, and identifies the activities required to complement the country biodiversity strategies in achieving the Targets. The UK Biodiversity Framework lists 59 priority bird species (referred to in this report as UKBF species).

2.2 Ornithology - Methods

2.2.1 Desk Study

A desk study was carried out at the start of the commission and ahead of the field survey. Information sources used for this study are described below:

- Google Earth (http://earth.google.co.uk) - aerial imagery was obtained and used to inform the field survey;
- Nature Scot Sitelink (https://sitelink.nature.scot/home) - sitelink was used to determine the location of any statutory sites designated for nature conservation and their qualifying features; and
- Multi Agency Geographical Information Centre (MAGIC) (https://magic.defra.gov.uk/magicmap.aspx) interactive mapping tool.

Statutory sites designated for nature conservation were searched for within 5 km of the site and focused on the following designations:

- Special Protection Areas (SPAs);
- Special Areas of Conservation (SACs);
- Ramsar sites;
- Sites of Special Scientific Interest (SSSIs);

[6] Stanbury, A.J., Eaton, M.A., Aebischer, N.J., Balmer, D., Brown, A.F., Douse, A., Lindley, P., McCulloch, N., Noble, D.G. & Win, I. (2021). The status of our bird populations: the fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. British Birds Volume: 114.

- Local Nature Reserves (LNRs); and
- RSPB reserves.

In addition to the above background records were requested from Tayside Raptor Study Group (TRSG) and the RSPB.

2.2.2 Breeding Bird Survey

A three-visit breeding bird survey was completed between April, May and June 2023 to identify breeding bird territories within the survey area, based on the Brown and Shepherd method[7] as summarised in Gilbert et al., 1998[8].

Following the site boundaries being redefined, two further visits were undertaken in 2024 focusing on the deemed main sensitive receptors which, in terms of breeding birds, included waders and ring ouzel as well as black grouse and raptors (as described in Sections 2.2.3 and 2.2.4 below).

The surveyor walked a predetermined route ensuring that all points within the survey area were approached to within 100 m. 20-25 minutes were spent surveying each 500 m × 500 m of the survey area.

All birds seen and heard were recorded on large-scale maps using standard BTO species codes and symbology to denote behaviour[8], particularly where this related to breeding (e.g. singing, alarm calling, gathering nest material or food, feeding newly fledged young, etc.). If a singing or displaying bird was recorded at a particular location within the survey area on at least one of the visits, it was assumed to be holding a territory and/or breeding.

Breeding bird surveys were undertaken on the following dates:

- 26th-28th April, 2023;
- 22nd -24th May, 2023;
- 16th – 18th June, 2023;
- 14th - 15th May, 2024; and
- 6th – 7th June, 2024.

The timings and weather conditions for each survey are summarised in Appendix 1.

2.2.3 Black Grouse Survey

Black grouse *Lyrurus tetrix* lek surveys were carried out within suitable habitat within the survey area during spring 2023 and 2024, following methodology detailed in Gilbert et al. (1998). In both years, black grouse surveys were undertaken prior to the breeding bird surveys in April and May and commenced at sunrise, lasting for approximately two hours. All surveys were undertaken in favourable weather conditions (sunny and little to no wind).

7 A. F. Brown & K. B. Shepherd (1993) A method for censusing upland breeding waders, Bird Study, 40:3, 189-195, DOI
8 Gilbert, G., Gibbons, D.W. & Evans, J. (1998) Bird Monitoring Methods. RSPB.

2.2.4 Breeding Raptor Survey

Searches for breeding raptors were undertaken on the same days as the breeding bird survey visits based on methods set out in Hardey et al. (2013)[9]. A combination of walkover surveys and short vantage point (VP) watches of suitable areas of breeding habitat were undertaken to detect the presence of target raptor species (including owls) within the survey area. Raptor surveys were undertaken under Schedule 1 licence.

Following the redesign of the site boundaries, two further visits were undertaken in 2024.

Weather conditions were logged at hourly intervals. Full details of survey timings and hourly weather conditions are provided in Appendix 1.

2.2.5 Golden Eagle Vantage Point Survey

Golden Eagle Vantage Point surveys were undertaken over the winter period 2023 / 2024. The vantage point location was selected to ensure maximum view of the site, with the point selected just north of the northern boundary at NN 83130 27110.

The VP survey methods were based on those set out in the SNH publication 'Recommended bird survey methods to inform impact assessment of onshore wind farms'[10]. In this instance golden eagle were the only target species.

Vantage point watches lasted for three hours at a time, with a 30-minute break after three hours, prior to any subsequent viewing. No more than six hours of viewing were undertaken on a given day. For each watch the following parameters were recorded:

- Number of golden eagles in each flight;
- Age of birds;
- Gender of birds; and
- Height of birds as estimated to the nearest 15m each fifteen seconds of a given flight.

A total of 36 hours of survey was completed between October 2023 and March 2024 on the following dates:

- 31st October 2023;
- 28th November 2023;
- 29th December 2023;
- 29th January 2024;
- 22nd February 2024; and
- 11th March 2024.

[9] Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. & Thompson, D. (2013). Raptors: a field guide to survey and monitoring (3rd Edition).
[10] SNH (2017) Recommended bird survey methods to inform impact assessment of onshore wind farms. SNH. Battleby.

2.2.6 Territory Mapping

Upon completion of visits in both 2023 and 2024, territory mapping was undertaken for all bird species. The results of the territory mapping are illustrated on Figure 7 (2023) and Figure 8 (2024).

2.2.7 Survey Limitations

Surveys were carried out in suitable weather conditions, (good visibility, low wind speeds and little or no rain). As such, it is considered that the conditions allowed for the collection of a robust dataset during the survey visits.

2.3 Ornithology results

2.3.1 Desk Study

2.3.1.1 Statutory Designated Sites

Statutory designated sites located within 5km of the development site are considered in this assessment. There are four ecologically designated sites that lie with the 5km area of search, which are summarised in Table 2-1 below.

Table 2-1: Sites Designated for Ornithological Interest

Site	Designation(s)	Distance from Survey Area	Qualifying Features
River Tay	SAC	4km North	The SAC is designated for its Atlantic salmon *Salmo salar*, otter *Lutra lutra*, freshwater habitats and its lamprey *Lampetra* Spp. populations.
Monzie Wood	SSSI	1.6km East	Notified on account of its upland oak woodland habitat.
Ben Chonzie	SSSI	3km Northwest	Notified on account of its breeding bird, upland and vascular plant assemblages. Bird species mentioned on the SSSI citation comprise, golden eagle, peregrine, ptarmigan, buzzard, raven, ring ouzel, dunlin, snipe and golden plover.
Connachan Marsh	SSSI	3.2km East	Notified on account of its raised bog habitat.

TRSG provided data on golden eagle and areas historically favoured by hen harrier near to the site. These records are contained within Annex CA1 which accompanies this report and are illustrated on Figure CA1.

The RSPB provided a record of a red kite roost within a 2km area around the site and observational records of common sandpiper and jack snipe. The location of the red kite roost is contained within Annex CA1 and illustrated on Figure CA1.

2.3.2 Survey Results - 2023

46 species of bird were considered to be holding territory within the survey area during the three survey visits. Summaries for species for which territory mapping was undertaken (excluding meadow pipit, which was abundant, but excluded from territory mapping due to its very common local and regional nature) are presented in Table 2-2 below and illustrated on Figure 7 and Figure CA1.

Table 2-2: 2023 Breeding Bird Survey Results

Species	Scientific Name	Conservation Status	Territories within 2023 Survey Area
Red Grouse	*Lagopus lagopus scotica*	Amber	Abundant with 24 territories recorded throughout the grouse moor within the survey area.
Black grouse	*Lyrurus tetrix*	Red	A single black grouse lek comprising four males was recorded in the survey area. A lone male and a grey hen were also observed during the surveys.

Species	Scientific Name	Conservation Status	Territories within 2023 Survey Area
			Locations provided in Confidential Annex and Figure CA1.
Cuckoo	*Cuculus canorus*	Red	Five territories throughout the survey area.
Woodpigeon	*Columba palumbus*	Amber	Two territories in woods in the south of the survey area.
Oystercatcher	*Haematopus ostralegus*	Amber	Two territories in the survey area.
Lapwing	*Vanellus vanellus*	Red	Three territories in the survey area.
Golden Plover	*Pluvialis apricaria*	Annex 1	A single territory at the northern extent of the survey area.
Curlew	*Numenius arquata*	Red	Seven territories recorded. Six in the survey area and one to the north of the survey area.
Snipe	*Gallinago gallinago*	Amber	Eight territories throughout the survey area.
Common Sandpiper	*Actitis hypoleucos*	Amber	A single territory along the Barvick Burn in the centre of the survey area.
Common Gull	*Larus canus*	Amber	A single territory in the survey area.
Goshawk	*Accipiter gentilis*	Schedule 1	A single territory, approximately 500m west of the survey area. Location provided in Confidential Annex and Figure CA1.
Buzzard	*Buteo buteo*	-	A single territory within the survey area.
Short-eared Owl	*Asio flammeus*	Annex 1, Amber	A single territory in the survey area. Location provided in Confidential Annex and Figure CA1.
Golden eagle	*Aquila chrysaetos*	Annex 1, Schedules 1, 1A and A1	A single eyrie, almost 3km from the survey area. Location provided in Confidential Annex and Figure CA1.
Merlin	*Falco columbarius*	Annex 1, Schedule 1, Red	A single territory in the survey area.
Coal Tit	*Periparus ater*	-	Two territories within the survey area.
Blue Tit	*Cyanistes caeruleus*	-	Two territories within the survey area.
Great Tit	*Parus major*	-	Six territories within the survey area.
Skylark	*Alauda arvensis*	Red	14 territories within the survey area.
Swallow	*Hirundo rustica*	-	Two clusters associated with farm buildings in the south of the survey area.
Willow Warbler	*Phylloscopus trochilus*	Amber	11 territories within the survey area.
Chiffchaff	*Phylloscopus collybita*	-	Two territories within the survey area.
Sedge Warbler	*Acrocephalus schoenobaenus*	Amber	A single territory within the survey area.
Blackcap	*Sylvia atricapilla*	-	Two territories within the survey area.

Species	Scientific Name	Conservation Status	Territories within 2023 Survey Area
Wren	*Troglodytes troglodytes*	Amber	Five territories within the survey area.
Treecreeper	*Certhia familiaris*	-	A single territory within the survey area.
Song Thrush	*Turdus philomelos*	Amber	A single territory within the survey area.
Mistle Thrush	*Turdus viscivorus*	Red	Three territories within the survey area.
Blackbird	*Turdus merula*	-	A single territory within the survey area.
Ring Ouzel	*Turdus torquatus*	Red	Two territories within the survey area.
Robin	*Erithacus rubecula*	-	Four territories within the survey area.
Stonechat	*Saxicola rubicola*	-	Seven territories within the survey area.
Wheatear	*Oenanthe oenanthe*	Amber	Five territories within the survey area.
Dipper	*Cinclus cinclus*	Amber	A single territory within the survey area.
House Sparrow	*Passer domesticus*	Red	A single territory within the survey area.
Dunnock	*Prunella modularis*	Amber	Five territories within the survey area.
Grey Wagtail	*Motacilla cinerea*	Amber	Two territories within the survey area.
Pied Wagtail	*Motacilla alba yarellii*	Amber	A single territory within the survey area.
Chaffinch	*Fringilla coelebs*	-	Six territories within the survey area.
Bullfinch	*Pyrrhula pyrrhula*	Amber	A single territory within the survey area.
Linnet	*Linaria cannabina*	Red	A single territory within the survey area.
Lesser Redpoll	*Acanthis cabaret*	Red	Four territories within the survey area.
Goldfinch	*Carduelis carduelis*	-	A single territory within the survey area.
Siskin	*Spinus spinus*	-	A single territory within the survey area.
Reed Bunting	*Emberiza schoeniclus*	Amber	A single territory within the survey area.

The following species were also recorded during the surveys but were not considered to be breeding within the survey area; raven *Corvus corax*, red kite *Milvus milvus* (regularly hunting over the survey area), black-headed gull *Chroicocephalus ridibundus*, herring gull *Larus Argentatus* and lesser black-backed gull *Larus fuscus*. The gulls are largely associated with Loch Turret Reservoir to the northeast of the site. There is also a returning ring-billed gull *Larus delawarensis* at the reservoir.

2.3.3 Survey Results - 2024

The update breeding bird survey in 2024 was designed to focus on the key ornithological receptors identified in 2023 namely waders, raptors, ring ouzel and black grouse. The results of the 2024 breeding

bird surveys are summarised in Table 2-3 below and illustrated on Figure 8, or on Confidential Figure CA1 for sensitive species.

Table 2-3: 2024 Breeding Bird Survey Results

Species	Scientific Name	Conservation Status	Territories within 2024 Survey Area
Black grouse	*Lyrurus tetrix*	Red	A single black grouse lek comprising four males was recorded offsite, in the wider survey area. The location is provided in Confidential Annex and Figure CA1 and is in the same area as that found in 2023.
Oystercatcher	*Haematopus ostralegus*	Amber	There is a single territory in the survey area.
Lapwing	*Vanellus vanellus*	Red	Two territories in the survey area.
Golden Plover	*Pluvialis apricaria*	Annex 1	A single territory at the northern extent of the survey area.
Curlew	*Numenius arquata*	Red	Two territories recorded within the survey area.
Snipe	*Gallinago gallinago*	Amber	Eight territories throughout the survey area.
Ring Ouzel	*Turdus torquatus*	Red	Two territories within the survey area.

During the golden eagle vantage point surveys, there were two golden eagle flights (Figure 9) over the site in winter 2023/2024 and three hen harrier flights during the same period.

2.4 Ornithology - Appraisal And Recommendations

2.4.1 Designated Sites

Ben Chonzie SSSI is the only designation within the 5km search area, which is notified (in part) on account of its ornithological interest. This SSSI lies 3km from the woodland creation site at its closest point. This lies beyond the core foraging ranges of all species mentioned in the SSSI citation, save for golden eagle, which has a core foraging range of 6km. As such, any listed species recorded in the breeding bird survey area (excluding golden eagle) are not considered to be part of the SSSI population. Further detail on golden eagle is provided in Section 2.4.2 below.

2.4.2 Golden Eagle

Golden eagle have been observed in the survey area during the spring summer 2023 on two occasions (a single adult in April and a pair in June) and will almost certainly hunt within the site. During the winter vantage point surveys there were two separate flights by individuals.

It is understood from communications with Tayside Raptor Study Group relating to another site, that there is a new golden eagle eyrie located almost 3km from the site used in 2023. The sightings on site likely relate to this pair. A new eyrie used in 2024 is located around 3.5km from the site.

Golden eagle is listed on Annex 1 of the Birds Directive and Schedules 1, 1A and A1 of the WCA and is therefore of high conservation value. It is green-listed due its current favourable conservation status at

the national level. The latest population estimate in the UK was of 508 occupied nesting ranges in Scotland[11].

At a regional level, the Scottish Raptor Monitoring Scheme (SRMS) Report from 2020[13] shows that 21 known breeding territories in Perth and Kinross were checked for occupancy in 2020, of which 14 were occupied by pairs and a minimum of 12 young fledged. The NHZ15 golden eagle population estimate is 12 pairs and the NHZ16 estimate is a single pair[12].

A recent study noted that population decline in golden eagles which was attributed to blanket afforestation in Kintyre is now being reversed, and concurrently during a period of slightly increased afforestation. The same source also notes evidence from recent satellite tracking studies has indicated that golden eagles use restructured forests more than previously understood. Haworth and Fielding (2013) note golden eagles are primarily birds of open mountain country but they can use open woodland habitats and may benefit from prey species (such as roe deer) which use woodlands[13]. It is considered that the creation of areas of open woodland habitat within the woodland planting project will have the potential to increase the golden eagle foraging resource in this area, and, once trees reach maturity, the open woodland would also provide additional nesting opportunities for this species.

Golden Eagle Territory (GET) modelling has been undertaken at the site separately by Edinburgh University, as part of NatureScot's expected assessment protocol for proposed woodland creation sites where this species is a consideration. This modelling will be used to help inform evolution of the planting design for the site.

2.4.3 Hen Harrier

Hen harrier is listed on Annex 1 of the Birds Directive and Schedule 1 of the Wildlife and Countryside Act and is red listed for historical decline in the UK. It is therefore considered to be of high nature conservation value. The Scottish breeding population is estimated to be 460 pairs with a UK population of around 690 pairs.

At a regional level the SRMS Report from 2020 shows that seven of the 23 home ranges checked showed signs of occupancy with three home ranges occupied by single birds in the Perth and Kinross region. Out of the seven pair monitored all were shown to fledge young with a minimum of 19 fledglings in total.

Baseline surveys recorded occasional observations of hen harrier during the spring summer surveys of 2023 and 2024, but no evidence of breeding was recorded. Three hen harrier flights were recorded during the golden eagle vantage point surveys with a male and female recorded separately in February 2024 and a single female flight in March 2024.

Tayside Raptor Study Group confirmed that three 1km grid squares located to the northeast of the site (see Figure CA1) have previously been favoured by hen harrier.

With the proposed creation of woodland areas within the site there is a potential loss of some areas of potential foraging habitat in the long term. During the early establishment years it is possible that the foraging habitat may in fact improve for the species with greater areas of cover for potential prey species

[11] Challis, A., Eaton, M.,Wilson, M.W., Holling, M., Stevenson, A. & Stirling-Aird, P. (2020). Scottish Raptor Monitoring Scheme Report 2020. BTO Scotland, Stirling.

[12] Wilson, M. W., Austin, G. E., Gillings S. and Wernham, C. V. (2015). Natural Heritage Zone Bird Population Estimates. SWBSG Commissioned report number SWBSG_1504. pp72-79.

[13] Haworth, P and Fielding, A. (2013). Expanding woodlands in Special Protection Areas for golden eagles. Forestry Commission Scotland.

and it is known for hen harrier to nest on the ground within new plantations. However, these areas become unsuitable for nesting hen harrier once a canopy forms. As part of the 2023 review following the results of the breeding bird surveys undertaken the revised site boundary has been reduced, removing a large portion to the east of the site from the proposed planting scheme. It is also understood that land management to favour ground nesting birds will also be a priority for the neighbouring ground, which is now under the ownership of the Kith Trust, and this would provide nesting and foraging opportunities for hen harrier.

2.4.4 Merlin

Merlin is listed on Annex 1 of the Birds Directive and Schedule 1 of the Wildlife and Countryside Act and is red listed for historical decline in the UK. It is therefore considered to be of high nature conservation value. The Scottish breeding population is estimated to be approximately 800 pairs, with a winter population estimate of over 3,000 birds[10].

At a regional level, the latest SRMS Report from 2020 shows that nine out of 21 home ranges checked showed signs of occupancy in the Perth and Kinross region and out of nine pairs monitored in 2020, a minimum of 26 young fledged. This would indicate that the regional population is relatively high compared to other NHZs in Scotland.

Baseline surveys recorded a single merlin territory within the survey area In 2023. During 2024 no Merlin were recorded during the surveys, but only two visits were undertaken in 2024. Following the 2024 site boundary reduction, the merlin territory is now located on the eastern boundary of the revised area. A review of displacement distances suggests that disturbance distances for nesting merlin range from 300 m to 500 m**Error! Bookmark not defined.** and therefore the previous territory is still located within a potential d isturbance distance to the proposed scheme.

Accordingly, it is advised that any planting within 500 m of the merlin territory is undertaken outwith the breeding season for this species (defined as March to August inclusive) and that the land within 300 m of the merlin territory is either restricted from planting or restricted to low density planting only.

With the implementation of the above measures, it is considered effects on this species from the woodland planting project are likely to be negligible in terms of the NHZ populations. It is also possible that, similarly to golden eagle, that new and alternative nesting and foraging opportunities would develop, once new woodland planting matures.

2.4.5 Goshawk

Goshawk is a Schedule 1 species and has a green listed conservation status. One probable territory was recorded (a displaying male) approximately 500m west of the survey area during the April 2023 field survey (no confirmed breeding).

At the regional level NHZ estimates have been estimated at zero pairs in NHZ15 and 14 pairs in NHZ16. However, given the secretive nature of this species, numbers are likely to be higher.

A recent view of bird disturbance distances showed goshawk can be susceptible to disturbance at distances of between 300-500m[14]. Accordingly, there is no adverse effect predicted on goshawk. Conversely, woodland planting is likely to further benefit this species.

[14] Goodship, N. M. and Furness, R. W. (2022). NatureScot Research Report 1283 - Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species. NatureScot. Battleby.

2.4.6 Short-eared owl

Short-eared owl is listed on Annex 1 of the Birds Directive and is amber listed for historical decline in the UK. It is therefore considered to be of moderate nature conservation value. The Scottish breeding population is estimated to be approximately 780-2,700 pairs[15]

The NHZ15 and NHZ16 regional short-eared owl populations are estimated to be 109 and 58 breeding pairs respectively.

Baseline surveys showed that a single pair of short-eared owl attempted to breed within the site in 2023. A review of displacement distances suggests that disturbance distances for nesting short-eared owl range from 300 m to 500 m[16].

Similarly, to merlin above it is advised that planting within 500 m of the short-eared owl territories is undertaken outwith the breeding season for this species (defined as March to August inclusive) and that the land within 300 m of the short-eared owl territories are either restricted from planting or restricted to low density planting only.

With the implementation of the above measures, it is considered effects on this species from the woodland planting project are likely to be negligible in terms of the NHZ populations for this species.

2.4.7 Black Grouse

Black grouse is a UKBAP priority species and is red-listed due to long-term historical population decline in the UK, including a severe decline over the last 25 years. It is also listed in the Tayside Local Biodiversity Action Plan and is therefore considered to be of medium nature conservation value. The British population was estimated at 5,078 males in 2005[17], of which 66% were found in Scotland. This represented a decline of 22% in the British population since 1995/96.

At the regional level the NHZ15 and NHZ16 populations have been estimated as 844 and 167 lekking males respectively with NHZ15 being a stronghold for this species.

A four male lek was identified within the original site boundary in 2023 and reconfirmed in 2024. As part of the redesign of the site boundary this area has been removed from the planting scheme taking into account the recommendations made in the 2023 original report.

Young black grouse feed almost entirely on invertebrates for the first three weeks of their lives, after that gradually moving onto a herbivorous diet[18]. Low density tree and shrub planting would provide suitable foraging and breeding habitat for black grouse. The creation of wetter areas by digging small scrapes in adjacent open habitats would provide suitable niches for invertebrate communities, thus providing an essential food source for young birds dependent on a higher protein intake. Additionally, the incorporation of irregularly shaped 'feathered' edges to areas of woodland planting would provide suitable nesting opportunities for female black grouse (grey hens).

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[15] https://www.scottishraptorstudygroup.org/raptors/short-eared-owl/#:~:text=An%20estimate%20of%20the%20Scottish%20population%20suggested%20780,raptor%20or%20owl%20species%20%28Greenwood%20et%20al.%202003%29.

[16] Loc. Cit.

[17] Sim, I.M.W., Eaton, M.A., Setchfield, R.P., Warren, P.K. and Lindley, P. (2008). Abundance of male black grouse *Tetrao tetrix* in Britain in 2005, and change since 1995-96. Bird Study 55, 304-313.

[18] http://www.snh.gov.uk/protecting-scotlands-nature/species-action-framework/species-action-list/black-grouse/

Further it is recommended that any required fencing within the scheme should be demarcated to make visible and minimise the collision risk with black grouse.

It is recommended details of measures to safeguard black grouse and enhance habitats for this species are set out in a Breeding Bird Protection Plan (BBPP), as part of any future design phase for the project.

2.4.8 Curlew

The curlew is a UKBF priority species and is red-listed due to moderate long-term historical population decline in the UK, including a severe decline over the last 25 years. The UK breeding population was estimated at 105,000 pairs[19]. The British Trust for Ornithology's (BTO) Breeding Bird Survey indicates that the decline has been most severe in Scotland.

At the regional level, the NHZ15 and NHZ16 populations are estimated as being 1,434 and 3,253 birds respectively, but due to historical and recent declines, are considered to be in unfavourable conservation status.

In 2023 at the site level six curlew territories were recorded within the survey area and a seventh territory was located to the north of the survey area. Most of the curlew territories, however, were located within the eastern half of the site and, as part of this site redesign, the area to the east of the Barvick Burn was removed from the proposed planting scheme. The 2024 update survey confirmed the presence of two curlew territories within the 2024 survey area, one within the site and one outwith, but near to the northwestern site boundary. The displacement of two pairs of curlew to neighbouring ground that will continue to be managed for the benefit of ground nesting birds is not considered to represent a significant effect in terms of the wider NHZ curlew populations.

An area for the extent of the potential effects of predator shadow is not specified in Scottish guidance, but in England The Forestry Commission advises the effects of predator shadow can range up to 500m from areas of woodland >0.5ha[20]. Territories within 500m of the new planting area would therefore potentially be at greater risk of predator shadow effects once canopy forms. Based on the results of the 2023 survey, this could represent the displacement of up to three pairs of curlew, which, as above, is unlikely to be significant at the regional NHZ level. Having said that, it is advised that of open planting is incorporated into the scheme near to curlew territories within 500m of the extent of the final planting design.

Additionally, the creation of shallow wet scrapes for the benefit of wading birds, such as the curlew (and black grouse) will provide improvements for this species. In addition, increased generalist predator (crows, foxes etc) control and changes in farming practices in the land in the south of the site, such as a less intensive cutting regime and a reduction in sheep, may help benefit the local curlew population.

2.4.9 Lapwing

Lapwing is a UKBF priority species and is red-listed due to severe long-term historical population decline in the UK, including a severe decline over the last 25 years. The UK breeding population was estimated at 154,000 pairs[21]. Despite their UK population trend, recent surveys in Scotland suggest that numbers of breeding lapwing on 'farmed' land are relatively stable. Repeat surveys between 1992 and 1993 (O'Brien

[19]Baker, H., Stroud, D.A., Aebischer, N.J., Cranswick, P.A., Gregory, R.D., McSorley, C.A., Noble, D.G. and Rehfisch, M.M. (2006). Population estimates of birds in Great Britain and the United Kingdom. British Birds 99, 25-44.

[20] Forestry Commission (2023) Guidance to help inform when an upland breeding wader survey is needed and when woodland creation is likely to be appropriate.

[21]http://blx1.bto.org/birdfacts/results/bob4930.htm

1996) and 1997/1998/2000 (O'Brien et al. 2002) recorded a non-significant population decline of 8 %. The Scottish population has been recently estimated at about 87,000 pairs[22].

At the regional level, data are not available for the NHZ15 and NHZ16. The BTO Breeding Bird Survey map[23] indicates that the area supports a high population density for this species. Based on the national breeding population, the regional populations are therefore likely to number > 500 pairs, but due to historical and recent declines, are considered to be in unfavourable conservation status.

Three lapwing territories were recorded within the 2023 survey area with two located in the revised 2024 survey area. The amount of habitat lost to potential woodland creation is negligible in relation to the overall size of suitable breeding habitat available, either in the local area within the NHZ15 and NHZ16. It is predicted that sufficient suitable habitat will remain to maintain the local lapwing population. As such, effects on this species are predicted to be negligible at the regional level.

The recommendations made for curlew above, namely the creation of shallow scrapes and the adoption of less intensive farming, would also be a benefit to lapwing at the site.

2.4.10 Snipe

The snipe is amber-listed because it is listed as a species of European Conservation Concern. The UK breeding population was estimated at 59,300 pairs with over 100,000 birds present during the winter[22] The trend in the upland and moorland strongholds of the species is not fully known, but the BTO Breeding Atlas (1988-91) documented range loss widely in Wales, Northern Ireland and Scotland[23]. However, the BTO Breeding Bird Survey indicates that the breeding population has increased in Scotland in recent years.

At the regional level, NHZ15 and NHZ16 are estimated to hold 795 and 582 pairs respectively. As the population has increased in Scotland and nationally in recent years, the regional populations are considered likely to be in favourable conservation status.

Eight snipe territories were recorded within the 2023 survey area. The survey of the revised scheme boundary in 2024 identified three territories significantly reducing the potential impact on the species as a result of the proposed planting scheme. It is considered that the low numbers of snipe being locally displaced from the site, could be readily accommodated in the local area.

Similarly for lapwing, the recommendations made for curlew above, namely the creation of shallow scrapes and the adoption of less intensive farming, would also be a benefit to snipe at the site.

2.4.11 Ring Ouzel

Ring Ouzel is Red-Listed meaning it is listed in Birds of Conservation Concern 5[6].

It qualifies as a red listed species on account of having a greater than 50% decline in its breeding population over the last 25 years (72% in the case of this species). Stanbury et al. also note a contraction in the breeding range for ring ouzel of 43% over the last 25 years.

Ring Ouzel is listed as a priority species on the Scottish Biodiversity List, due to a greater than 25% decline in Scotland over the last 25 years or more.

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[22]Sheldon, R., Bolton, M., Gillings, S. & Wilson, A. (2004).Conservation Management of Lapwing *Vanellus vanellus* on Lowland Arable Farmland in the UK. British Ornithologists' Union, Ibis, 146 (Suppl. 2), 41–49

[23] www.bto.org

A recent estimate of the national of the Scottish ring ouzel population estimated a range of between 4,300 – 5,500 pairs[24].

A regional NHZ population figure is not available, but the NHZ15 and NHZ16 regions are considered to be ring ouzel strongholds in Scotland and within those areas the Angus Glens, Upper Deeside, Wester Ross and north-west Sutherland are considered to support the greatest numbers of this species, with densities of over 5 pairs per km recorded in Glen Esk and Glen Cluanie[24]. On this basis, 1,000-1,200 pairs is considered to be a reasonable estimate for the NHZ populations.

Ring Ouzel is subject to, either directly or indirectly, to conservation priorities within the Tayside Local Biodiversity Action Plan, which sets out a species 'Action' for the creation of montane and juniper scrub to benefit this species[25].

For a recent proposed woodland scheme in Glencotho in the Scottish Borders it has previously been suggested by the RSPB that ring ouzel territories should be buffered by at least 200m from the woodland edge[26]. The 200m buffer mentioned by the RSPB is thought to be derived from the likely foraging range of breeding ring ouzel adults at one site in Glen Esk, Angus. This was based on 90 hours of observations (Burfield, 2002). In this study, 96.4% of foraging sites were within 450m of the nest site with a mean distance of 197m.

As such, it is advised any planting within 200m of ring ouzel territories comprises scattered fruit bearing species only in areas which are devoid of existing and favoured forage resources such NVC communities containing blaeberry and crowberry, or rowan. Planting within 200m of ring ouzel territories should also be undertaken outwith the breeding season defined in this case as mid-March to August inclusive.

Two ring ouzel territories were recorded within the survey area (both at its northern extent) in both the 2023 and 2024 surveys. Given the abundance of suitable ring ouzel habitat present within the wider area to the north, it is likely sufficient suitable habitat will remain to accommodate the displaced birds.

Following implementation of the recommended mitigation measures, it is considered that the risk of any adverse effect to the NHZ regional populations would be negligible and there may also be positive effects resulting from increased foraging resources.

2.4.12 Golden plover, oystercatcher and common sandpiper

Of the three remaining wader species present, only a single golden plover territory was present, which was at the northern extent of the survey area in 2023, and outwith the 2024 survey area some 400m north and could readily be accommodated in the abundant suitable neighbouring habitat.

Oystercatcher are very tolerant of disturbance and are known to be very opportunistic in their nesting habitats, successfully breeding on roundabouts and on busy university campuses, even directly outside well used buildings (Colin Nisbet pers. Obs.).

The single common sandpiper territory was confined to the banks of the Barvick Burn and it is likely sufficient suitable habitat will remain following any planting to accommodate this pair.

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[24] Forrester, R.W., Andrews, I.J., McInerny, C.J., Murray, R.D, McGowan, R.Y, Zonfrillo, B., Betts, M.W., Jardine, D.C., & Grundy, D.S. (eds) (2007) The Birds of Scotland. The Scottish Ornithologists Club, Aberlady.

[25] Tayside Local Biodiversity Action Plan: 2nd Edition 2016-2026. Tayside Biodiversity Partnership.

[26] Gallacher, J (2020). Draft for Discussion Glencotho: Proposed Woodland Creation and Ring Ouzel Impacts and Mitigation Measures.

As such, the regional populations of these species are unlikely to be adversely affected by the woodland creation project.

2.4.13 Remaining Birds Of Conservation Concern

No further species with enhanced statutory protection were recorded during the surveys. The breeding bird species of conservation concern recorded are not considered to be very sensitive to disturbance effects. Remaining red-listed BOCC were limited to small numbers of cuckoo, skylark, mistle thrush, house sparrow, linnet and lesser redpoll. Remaining amber-listed species were limited to abundant red grouse and meadow pipit, moderate numbers of willow warbler, and small numbers of woodpigeon, common gull, sedge warbler, song thrush, wheatear, dipper, dunnock, grey wagtail, pied wagtail, bullfinch and reed bunting.

2.4.14 Other Species

The localised displacement of a small number of common species into neighbouring land is predicted to have no detectable effect on their local or regional populations in the long-term.

2.4.15 General Mitigation Measures for Birds

In order to avoid the potential for risk of harm to nesting birds, it is recommended that works are timed to either avoid the breeding season altogether or scheduled to start before the breeding season starts (ideally before mid-March), so that birds returning to the area to breed can choose a territory/nest location away from potentially disturbing activities. In the event this is not possible, prior to the commencement of works, all suitable nesting habitat should first be checked by an experienced ecological clerk of works (ECoW). All active bird nests and dependent young are protected under the WCA. If an active nest is confirmed to be present, an exclusion zone should be erected around the nest until all dependent young have fledged, or if the ECoW confirms that the nest is no longer active.

3 Habitats And Flora

3.1 Introduction

Barvick Burn is located to the northwest of Crieff, Perthshire (Central grid reference: NN8325) The site is approximately 429ha in size and has a mixture of heathland, blanket bog, grassland and mire communities. This report details the results of a habitat survey carried out June 2024 by Whytock Ecology Ltd. The purpose of the survey is to provide information in relation to a potential woodland creation scheme. The site and the survey boundaries can be found in Figure 1 below.

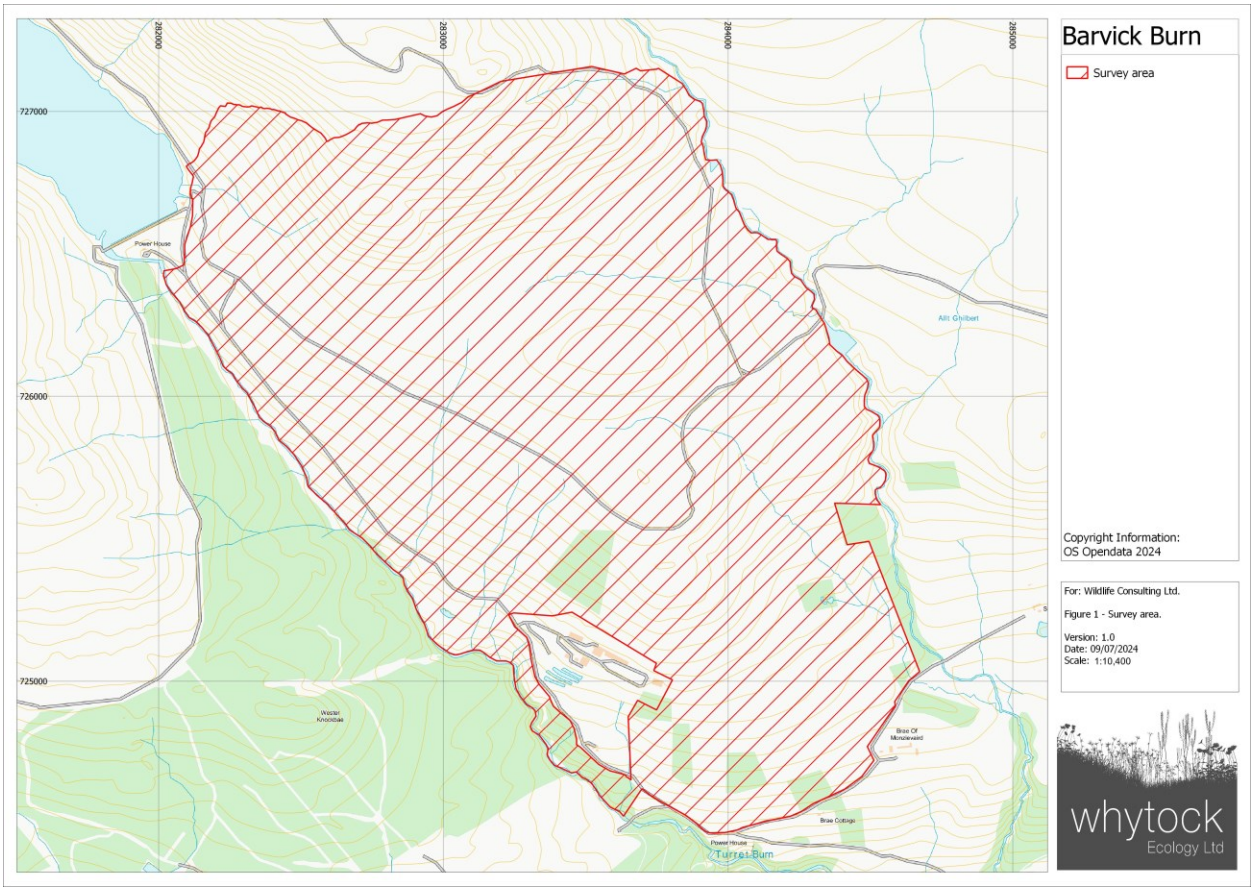

Figure 1: Map showing survey area

3.2 Scope of services

In order to identify any potentially sensitive ecological receptors on site that may be adversely impacted by any potential woodland planting scheme, a range of surveys have been carried out. These included:

- Phase 1 habitat survey
- National Vegetation Classification (NVC) survey
- Groundwater Dependent Terrestrial Ecosystem (GWDTE) survey
- EUNIS habitat survey classification

3.3 Habitat survey methods

3.3.1 Phase 1 habitat survey

The site was surveyed in accordance with the Phase 1 habitat survey methods described by Joint Nature Conservation Committee (2010). The survey consisted of recording all Phase 1 habitats within the boundary line (See Figure 1). The field maps and habitat compartments have been digitised using Quantum Geographical Information System (QGIS) and can be found in Appendix A. Target notes were taken of any relevant ecological features which can be found in Appendix D.

3.3.2 National Vegetation Classification (NVC) survey

The NVC survey was carried from the 3rd to the 6th of June 2024 by Rory Whytock ACIEEM.

The NVC survey area included surveying all communities within a pre-defined area identified by the client for potential woodland creation.

The NVC communities within the survey area were mapped by eye and classified according to Rodwell (1998a, 1998b, 2003). Where required, five 2 x 2m quadrats were set up for each habitat type where detailed floristic samples were recorded to allow the habitat to be categorised later into the appropriate NVC classification. Phase 1 categories have also been assigned to NVC communities.

Small areas of interest and general descriptions of features were made using target notes as per Phase 1 survey methodology (JNCC, 2010). The NVC survey area was mapped in the field then digitised using GIS to produce a detailed map of dominant and sub-dominant community composition.

Higher plant nomenclature follows that of Stace (2019), bryophyte nomenclature follows that of the Blockeel *et al*. (2020) and lichens follow Coppins (2002).

3.3.3 EUNIS habitat classification

All NVC communities were translated into their respective EUNIS habitat categories. The EUNIS habitat classification system has several different levels which define habitats to the most accurate possible definition. EUNIS habitat codes used to classify the habitat into their respective category in this report takes the most accurate level possible.

A summary of the EUNIS habitat categories can be found in the Habitats survey results summary section. A map showing the EUNIS habitat categories and locations can be found in Appendix E

3.3.4 Groundwater Dependent Terrestrial Ecosystems (GWDTEs) survey

In order to establish whether any of the identified communities are considered groundwater dependent, an evaluation was carried out. In the first instance, this involved identifying whether there was an obvious groundwater feature (i.e. a springhead). If this was not apparent, plant species that required base-rich conditions were checked for. If these were located, further investigations took place to check whether the community was associated with an obvious rain-fed surface water feature. Obvious surface water features include:

- Watercourses (drains/streams/valleys)
- Waterbodies
- Floodplains
- Downslope of a rain-fed community

- Adjacent to ponding locations such as marshes or swamps

If any of these features are present, they are followed upstream to establish whether the source of the feature is groundwater dependent or not. If a groundwater source is found, the community is determined to be groundwater dependent.

The GWDTE survey area is the same as the NVC survey area (see Figure 1). As described above, the NVC habitats were mapped according to their dominant NVC community, though many of these habitats were made up of mosaics of NVC communities. Hence when determining whether a particular habitat was potentially groundwater dependent, the composition of the mosaic was considered.

Areas supporting communities which are potentially dependent on groundwater sources were also classified according to guidance issued by SEPA (2017).

3.4 Assessment of Conservation Importance

The botanical baseline established by the surveys will be assessed against legislation, policy and biodiversity objectives in order to identify priorities for protection, mitigation and conservation at the European and national (Scottish) scale. The assessment will be undertaken according to Chartered Institute of Ecology and Environmental Management (CIEEM) guidance, which recommends a geographical context to the assessment of 'ecological importance'.

3.5 Limitations

The surveys were carried out at the optimal time of year, as such there were no limitations.

3.6 Habitat survey results

The NVC survey recorded a total of 24 different communities. Where these communities were floristically distinct, they were assigned into corresponding sub-communities. The communities recorded during the survey were:

- Mires and flushes: M4, M6, M15, M19, M23 & M25
- Heaths: H10, H12 & H18
- Grasslands: MG6, MG7, MG9, MG10, U4, U5 & U6
- Springs: M10, M11, M32 & M35
- Woodland and scrub: W11
- Tall herb communities: U20
- Swamp: S19 & S27

A number of semi-natural habitats were not recorded as they are not included in the NVC system. The habitats that did not fit into any of the NVC communities are:

- Plantation woodland
- Buildings/places of residence

- Bare ground/tracks
- Rock exposures/quarries/spoil heaps
- Open water

The following section categorises Phase 1 habitats and the NVC communities which fall within them. Details regarding the flora recorded, structure and condition of each of the habitats are given. Maps of the survey results can be found in Appendix A with target notes describing notable species or features found during the survey in Appendix D.

3.6.1 Phase 1 habitat: Unimproved acid grassland (B1.1)

3.6.1.1 U4 Festuca ovina - Agrostis capillaris - Galium saxatile grassland

This is a regionally and nationally widespread community with no conservation designations associated with it. Three of the five described U4 sub-communities were recorded within the survey area fall into the unimproved acid grassland habitat type. U4a is the typical sub-community and has few distinguishing features. Though species such as *Achillea millefolium, Trifolium repens, Plantago lanceolata* and *Cerastium fontanum* can be frequent. and The U4c *Lathyrus montanus-Stachys betonica* communities occur on slightly thinner soils and can be quite species rich in their composition with harebell *Campanula rotundifolia*, yarrow *Achillea millefolium* and *Galium verum* locally frequent. The U4d *Luzula multiflora-Rhytidiadelphus loreus* sub-community is distinctive in having a thick sward of common bryophytes such as *Hylocomium splendens, Pleurozium schreberi* and *Pseudoscleropodium purum* in the sward and a higher frequency of species associated with heath such as tormentil *Potentilla erecta*.

3.6.1.2 U5 Nardus stricta – Galium saxatile grassland

This community is found on rather moist, acidic soils often with a mix of shallow peat and mineral substrates. *Nardus stricta* is the most frequent grass and often grows in thick wiry clumps. Other species recorded within the community include *Juncus squarrosus*, *Agrostis capillaris, Festuca ovina*, *Avenella flexuosa* and *Anthoxanthum odoratum*. *Galium saxatile* can form intricate patches in places and is generally widespread throughout. A familiar suite of mosses including *Hylocomium splendens, Pleurozium schreberi, Hypnum jutlandicum* and *Rhytidiadelphus squarrosus* are frequent throughout the community.

Three of the five described U5 sub-communities were recorded within the survey area. The U5b *Agrostis canina-Polytrichum commune* community has a patchy distribution within the survey area but can occur as moderate sized stands. The U5b sub-community assemblage is more varied than some of the other described sub-communities and contains species such as *Agrostis capillaris, Juncus squarrosus, Luzula multiflora, Molinia caerulea, Potentilla erecta, Carex binervis* and *Vaccinium myrtillus*, however these were patchy in their distribution and generally scarce within the habitat.

The U5c *Carex panicea – Viola riviniana* sub-community is the most species rich sub-community and is quite frequent where base-rich water flushes the community.

The U5d Calluna vulgaris-Danthonia decumbens sub-community has a grassy and heathy assemblage. Frequently recorded species include *Nardus stricta, Festuca ovina, Festuca vivipara, Anthoxanthum odoratum, Avenella flexuosa, Danthonia decumbens* and *Calluna vulgaris*.

Some U5c sub-communities are species rich and can be linked to GWDTEs, these are not suitable for planting trees upon. Those which are not suitable for woodland creation have been identified and categorised accordingly in the constraints section of this report. All other sub-communities have no restrictions in relation to woodland creation.

3.6.2 B1.2 – Semi-improved acid grassland

3.6.2.1 U4 Festuca ovina - Agrostis capillaris - Galium saxatile grassland

The U4b *Holcus lanatus – Trifolium repens* sub-community is the only U4 grassland to fall within the semi-improved category. It is distinguished from the other sub-communities by more nutrient demanding species (through grazing or fertiliser input) such as *Holcus lanatus* and *Trifolium repens* and *Achillea millefolium*. This is a regionally and nationally widespread community with no conservation designations associated with it.

There are no restrictions to planting upon this community.

3.6.3 Neutral grassland (B2)

3.6.3.1 MG9 Holcus Lanatus – Deschampsia cespitosa grassland

This habitat was recorded in several locations within the site. The community is dominated by tussocks of tufted hair-grass *Deschampsia cespitosa* with frequent Yorkshire fog *Holcus lanatus*, rough meadowgrass *Poa trivialis* and common sorrel *Rumex acetosa*. The MG9a *Poa trivialis* sub-community was the only one of its type to be recorded within the survey area. This is a habitat which is uniform in nature and offers little floristic diversity.

There are no restrictions to planting upon this community.

3.6.4 Improved grassland (B4)

3.6.4.1 MG6 Lolium perenne – Cynosurus cristatus grassland

This habitat was recorded as small to medium sized stands, mainly in the east of the survey area. It is a habitat that is indicative of agricultural improvement, characterised by nutrient demanding species like *Lolium perenne* and *Cynosurus cristatus*, *Bellis perennis* and *Trifolium repens*. Two sub-communities were recorded within the survey area. The MG6a typical sub-community is a habitat which is of high value for grazing but low in biodiversity and of limited conservation value. The MG6b sub-community is less improved and has slightly more floristic diversity. However, both are dominated by common species and are low in conservation value. As such, there are no restrictions to planting upon this community.

3.6.4.2 MG7 Lolium perenne – Cynosurus cristatus grassland

This is a species poor grassland that is dominated by *Lolium perenne.* Other species such as *Plantago major, Bellis perennis* and *Poa annua* were recorded within this habitat though they were often found in low frequency. *Trifolium repens* was one of the few species other than *Lolium perenne* that was found to be relatively frequent within the community. All MG7 grasslands corresponded with the MG7a *Lolium perenne – Trifolium repens* leys sub-community. Similar to MG6 communities, MG7 is of high value for grazing but low in biodiversity and of limited conservation value.

There are no restrictions to planting upon this community.

3.6.5 Marshy grassland (B5)

3.6.5.1 M23 Juncus effusus/acutiflorus – Galium palustre rush pasture

M23 communities are widespread throughout the survey area and are found mainly in valley bottoms and gently sloping ground with slow, constant water movement. The habitat is dominated by rush species which gives it a conspicuous dark green colour which can be seen from a distance. This habitat is closely associated with M6 *Carex echinata – Sphagnum fallax* mires and is often found adjacent to them but M23 differs in having a greater diversity of rushes and a lesser amount of *Sphagnum* species.

Two sub-communities are described for the M23 community, both of which were recorded within the survey area. M23a is dominated by *Juncus acutiflorus* and is the more floristically diverse of the two.

Juncus effusus can still occur in stands of M23a but is never dominant or co-dominant. Other species recorded within M23a includes *Viola palustris, Galium palustre, Cirsium palustre, Ranunculus acris* and *Ranunculus repens*. M23b contains a similar range of species, though they are often found in much lesser frequency. *Juncus effusus* is the dominant rush species within M23b as opposed to *Juncus acutiflorus* in M23a. Species such as *Cirsium palustre*, *Rumex acetosa* and *Anthoxanthum odoratum* are more frequently found within M23b.

M23a communities are the botanically richer of the two sub-communities, though the composition of species varied throughout the survey area. Some species rich stands of this community were found within the survey area, these have been identified and coded as red in the constraints maps (See Appendix C). There are no restrictions to planting trees on species poor stands of M23 within the survey area.

3.6.5.2 MG10 Holcus lanatus – Juncus effusus rush-pasture

This community is very scarcely distributed within the survey area. *Juncus effusus* tussocks are the most obvious feature of this community, though *Juncus acutiflorus* was also recorded occasionally. Between these tussocks is a species poor sward of *Holcus lanatus*, *Agrostis stolonifera* and *Poa trivialis*. Forb species included *Ranunculus repens*, *Ranunculus acris* and *Cardamine pratensis*. It is distinct from other rush dominated communities by the higher frequency of grasses that are frequently grazed which maintains the open, short sward of the grass pasture between the tussocks of rush species.

All MG10 communities were assigned to the MG10a typical sub-community. Planting of trees on these communities is considered to be acceptable as all stands are species poor.

There are no restrictions to planting upon this community.

3.6.6 Tall herb and fern (C1)

3.6.6.1 U20 Pteridium aquilinum – Galium saxatile community

This community is widespread and covers large areas within the survey area. *Pteridium aquilinum* is the overwhelmingly dominant species within this community. Where U20 occurred, fronds of *Pteridium aquilinum* carpeted much of the ground and smothered the growth of most other species. As such, species diversity was generally low throughout

Where *Pteridium aquilinum* fronds were growing in loose clumps, a grassy assemblage of *Agrostis capillaris, Anthoxanthum odoratum, Holcus lanatus* and *Festuca ovina* were all frequent. Pleurocarpous mosses formed conspicuous patches on the ground beneath the fronds. Species recorded included *Rhytidiadelphus loreus, Pleurozium schreberi*, *Hypnum jutlandicum*, *Hypnum cupressiforme s.s*. and *Hylocomium splendens* which were found to be frequent to abundant in places.

Two sub-communities were recorded within the survey area, U20a *Pteridium aquilinum – Galium saxatile* and U20b *Vaccinium myrtillus – Dicranum scoparium* sub-communities. The U20a is often set in more lowland situations and contains a grassier assemblage than U20b. The U20b sub-communities are located on well drained, steep slopes set within peatland communities. The U20b sub-community often contained some heath and bog vegetation such as *Calluna vulgaris*, *Potentilla erecta, Avenella flexuosa* and *Vaccinium myrtillus*.

There are no restrictions to planting upon this community.

3.6.7 Dry heath (D1.1)

3.6.7.1 H10 Calluna vulgaris – Erica cinerea heath

This heathland community is widespread within the survey area. The community is dominated by dwarf shrubs including heather *Calluna vulgaris* and bell heather *Erica cinerea.* The dwarf shrubs within this community are characteristically short due to constant browsing from herbivores. Other species recorded within the community include green-ribbed sedge *Carex binervis*, blaeberry *Vaccinium myrtillus,* heath grass *Danthonia decumbens,* heath bedstraw *Galium saxatile* and tormentil *Potentilla erecta*. Robust pleurocarpous bryophytes are common within this community, frequently recorded species included *Rhytidiadelphus loreus, Hylocomium splendens, Pleurozium schreberi and Hypnum jutlandicum.*

Two sub-communities were assigned to H10 communities within the survey area. The H10a sub-community has no real distinguishing features other than a lack of species listed as notable within other sub-communities. The H10c *Festuca ovina – Anthoxanthum odoratum* sub-community was recorded in areas where the soil was composed of a mineral nature which allows grasses to be more prominent within the heathland. Apart from the grasses for which the sub-community is named, species recorded included *Agrostis capillaris*, *Galium saxatile*, *Potentilla erecta* and small amounts of *Nardus stricta*.

This community is on the Scottish Biodiversity List as a priority habitat. The habitat is abundant, locally, regionally and nationally however and the condition of the communities within the survey area are poor. These communities have been classified as having moderate sensitivity to plantation proposals. No restrictions are necessary however for the reasons stated above.

3.6.7.2 H12 Calluna vulgaris - Vaccinium myrtillus heath

H12 *Calluna vulgaris – Vaccinium myrtillus* heath was recorded in the south-west of the survey area throughout the survey area. The community covered moderate sized areas that were uniform in their composition. It is a dry heath community with *Calluna vulgaris* and *Vaccinium myrtillus* as co-dominants and is found on a range of shallow peat substrates (<50cm in depth) but may occur on deeper areas of peat where long term muirburn regimes has dried the peat surface out and created a heath type species community.

Dwarf shrubs are overwhelmingly dominant and provide little room for other plant growth. Cowberry V*accinium vitis-idaea,* viviparous sheep's fescue *Festuca vivipara,* fir clubmoss *Huperzia selago* and wavy hair-grass *Avenella flexuosa* were also present but were patchy in their occurrence. The vegetation is thick and interspersed with a familiar common assemblage of robust bryophytes growing through the dwarf shrubs. Moss species recorded include *Leucobryum glaucum*, *Rhytidiadelphus loreus, Hylocomium splendens, Pleurozium schreberi* and *Hypnum jutlandicum*.

One of the three described sub-communities were recorded within the survey area. The H12a *Calluna vulgaris* sub-community has no real distinguishing species of its own.

Woodland creation is not permissible where they occur as mosaics with modified or blanket bog communities where there is a peat depth greater than 50cm.

This community is on the Scottish Biodiversity List as a priority habitat. The habitat is abundant, locally, regionally and nationally however and the condition of the communities within the survey area are poor. These communities have been classified as having moderate sensitivity to plantation proposals. No restrictions are necessary however for the reasons stated above.

3.6.7.3 H18 Vaccinium myrtillus - Avenella flexuosa heath

H18 communities are found on well drained slopes. The community requires free draining soils that are neutral to acidic in nature, on a mixture of shallow peat and mineral soils (Averis *et al.,* 2004). This is a heath community where *Vaccinium myrtillus* is the dominant dwarf shrub with *Calluna vulgaris* being only thinly scattered throughout. Pleurocarpous mosses are frequent to abundant within this community and contain species such as *Rhytidiadelphus loreus, Pleurozium schreberi, Hylocomium splendens* and *Hypnum jutlandicum*.

This community is frequent in the northern half of the survey area. One of the three described sub-communities were recorded during the present habitat surveys. The H18a *Hylocomium splendens - Rhytidiadelphus loreus* sub-community has a carpet of robust mosses that is distinctive in this sub-community as is hard fern *Blechnum spicant* which was locally frequent.

This community is on the Scottish Biodiversity List as a priority habitat. The habitat is abundant, locally, regionally and nationally however and the condition of the communities within the survey area are poor. These communities have been classified as having moderate sensitivity to plantation proposals. No restrictions are necessary however for the reasons stated above.

3.6.8 Wet heath (D2)

3.6.8.1 M15 Trichophorum germanicum – Erica tetralix wet heath

This community is sparsely distributed within the survey area. The M15 community illustrates a wide variation in its flora including species that occur as dominants or co-dominants. Species that were recorded in high frequency included *Trichophorum germanicum*, *Erica tetralix* and *Calluna vulgaris*. It is possible that some areas of M15 have been derived from blanket bog communities and still occurs on a peat layer exceeding 50cm in depth. However, areas of M15 occurring on deep peat within the survey area is largely restricted to where they form mosaics with other blanket bog communities. Comparing the results of the NVC with peat depth survey data will inform which M15 communities are considered to be blanket bog and those which are classified as wet heath.

One sub-community was recorded within the survey area. The M15b Typical sub-community and has frequent *Erica tetralix* and *Calluna vulgaris*.

Providing the community is not on a peat depth greater than 50cm in depth, there are no restrictions to planting upon this community.

3.6.9 Wet heath/acid grassland mosaic (D6)

3.6.9.1 U6 Juncus squarrosus – Festuca ovina grassland

This community is located on a mixture of mineral deficient, shallow peat substrates and is often found adjacent to degraded peatland areas. The dark green basal rosettes of *Juncus squarrosus* is the most prominent feature of this habitat type. These are mixed with *Anthoxanthum odoratum, Agrostis canina, Avenella flexuosa*, *Galium saxatile* and *Potentilla erecta*. Bryophytes recorded within this community included *Hylocomium splendens*, *Pleurozium schreberi, Rhytidiadelphus squarrosus* and *Calliergonella cuspidata*.

Two U6 sub-communities were recorded within the survey area. The U6a Sphagnum species sub-community was the only NVC community to fall within the wet D6 wet heath/acid grassland mosaic Phase 1 habitat type. This community was located to the north-west of the core survey area on gently sloping ground. The U6a Sphagnum species sub-community may be derived from blanket bog communities or wet heath with a similar assemblage of plants, though *J. squarrosus* is always dominant in their present

form. Similarly, the U6c *Vaccinium myrtillus* sub-community occurs on peat soils, though these are ordinarily shallow in depth (<50cm).

While it is unlikely that U6 communities will occur on a peat depth greater than 50cm in depth, U6a and U6c communities may have been modified from blanket bog communities and the peat depth should be checked before planting is considered.

3.6.10 Blanket bog (E1.6.1)

3.6.10.1 M19 Calluna vulgaris - Eriophorum vaginatum blanket mire

This habitat is dominated by large swathes of *Calluna vulgaris, Eriophorum vaginatum* and sparse but regular shoots of *Eriophorum angustifolium*. Bryophytes are dominated by common pleurocarpous mosses including *Hylocomium splendens, Pleurozium schreberi, Rhytidiadelphus loreus* and *Hypnum jutlandicum*. Sphagnum species are not as well represented in this community as either M17 or M18 blanket mires. However, *S. capillifolium* can be conspicuous and is the most common *Sphagnum* species, though *S. papillosum* was present in small amounts.

Only one of the three described sub-communities were recorded during the present surveys. The M19a *Erica tetralix* sub-community was the most frequent of the two and was found throughout much of the survey area. M19a is often located where the topography is flat or only slightly inclined so that a continuous peat layer can form. The community was rather uniform in composition and contained *Trichophorum germanicum*, purple moor-grass *Molinia caerulea* and crowberry *Empetrum nigrum* where they were all occasional with species such as *Narthecium ossifragum* and *Drosera rotundifolia* occurring in wetter areas.

As a blanket bog community, these are not suitable for planting.

3.6.11 Wet Modified Bog (E1.7)

3.6.11.1 M25 Molinia caerulea – Potentilla erecta mire

This community occurs on moderately wet peat substrates and is widely distributed within the survey area. *Molinia caerulea* is the most dominant species within this community and can form large conspicuous tussocks. Botanical diversity is very low within all M25 communities recorded. The species poor form of M25 is not a recognised sub community, it is therefore not assigned to one. Some M25 communities within the survey area have been assigned to the M25a *Erica tetralix* sub-community. M25a can be derived from blanket bog, due to the assemblage of species recorded which include *Calluna vulgaris, Erica tetralix, Aulacomnium palustre, Polytrichum commune, Eriophorum angustifolium* and *Sphagnum fallax*.

3.6.12 Acid/neutral flush (E2.1)

3.6.12.1 M6 Carex echinata - Sphagnum fallax/denticulatum mire

These mires are situated in valley bottoms, sloping valley sides or channels within the site where water flows slowly. M6 communities are defined by the dominance of rush species such as *Juncus effusus* or *J. acutiflorus* with a ground layer of *Sphagnum* species such as *S. fallax, S. cuspidatum* and *S. palustre*. M6 can be differentiated from similar NVC communities such as M23 *Juncus effusus/acutiflorus – Galium palustre* mires as these typically lack the abundance of *Sphagnum* found in M6 communities.

This community has four sub-communities associated with it, all of which were recorded within the survey area. Two of the described sub-communities (M6a and M6b) are dominated by sedge species, whereas the other two (M6c and M6d) are dominated by rushes. M6a is dominated by *Carex echinata*, where it can form a uniform composition almost to the exclusion of all other species. The M6b *Carex nigra* sub-community was the least frequent of all the sub-communities recorded within the survey area. *Carex nigra*

is the most frequent species, with lesser amounts of glaucous sedge *Carex panicea*, *Festuca ovina* and *Anthoxanthum odoratum*. *Festuca vivipara* tended to replace *Festuca ovina* at higher altitudes. Some stands of both M6a and M6b were found to be species rich.

M6c *Juncus effusus* sub-community is a mire where acidic water flows and tends to be species poor in comparison with M6d. The M6d *Juncus acutiflorus* sub-community was the most frequently recorded sub-community within the survey area. M6d contains a more varied species assemblage than the M6c sub-community and has sharp-flowered rush *Juncus acutiflorus* as the dominant rush species rather than *Juncus effusus*. Creeping buttercup *Ranunculus repens*, creeping forget-me-not *Myosotis secunda*, *Achillea ptarmica*, *Ranunculus flammula*, *Dactylorhiza fuchsii*, *Carex echinata, Viola palustris* and *C. nigra* were frequently recorded.

Planting of trees upon this community is not appropriate on species rich stands (mainly M6a and M6b in this instance) due to the conservation value of habitat and the species that rely upon it. Each individual stand has been considered separately and the relative constraints category applied which can be found in Figure 4 in Appendix C.

3.6.12.2 M4 Carex rostrata – Sphagnum fallax mire

This community occupies areas that are restricted to permanently wet areas. All M4 communities within the survey area were moderately species rich and dominated by bottle sedge *Carex rostrata* as the vascular plant component and *Sphagnum fallax* as the dominant component of the bryophyte assemblage. Other sedges are frequently found within these areas including *Carex canescens, Carex flacca, Carex panicea, Carex pulicaris* and *Carex nigra*. Other species recorded in this community included *Viola palustris* and occasional *Comarum palustre*.

This is a species rich community that is not suitable for planting.

3.6.13 Basic Flush (E2.2)

3.6.13.1 M10 Carex dioica – Pinguicula vulgaris mire

This community was restricted to small areas and is dependent on base-rich water flushing the surface vegetation which prevents them from drying out. The base-rich conditions allow suitable habitat for species such as dioecious sedge *Carex dioica*, *C. panicea*, *Carex demissa, Carex lepidocarpa* and butterwort *Pinguicula vulgaris.*

This community also contained a diverse assemblage of bryophytes species such as *Scorpidium revolvens, Scorpidium scorpioides, Aneura pinguis, Scapania undulata, Palustriella falcata* and *Warnstorfia exannulata*. Some species more suited to acidic conditions were also recorded within this community, this was largely due to the small nature of these mires where encroachment from plants more suited to acidic conditions from the surrounding peaty substrates was common.

The community was assigned to the M10a *Carex demissa - Juncus bulbosus sub-community.* All M10 mires recorded in the survey area were groundwater dependent. As such, they are not suitable for planting upon.

3.6.13.2 M11 Carex demissa - Saxifraga aizoides mire

These mires are similar in many ways to M10 communities in that they are found where springs or flushes create a permanently wet habitat with base rich water flowing over stony ground. The water within these communities contains a greater amount of base than M10 mires, providing conditions for species such as *Saxifraga aizoides, Juncus articulatus, Eriophorum latifolium* and *Philonotis fontana* to be frequently recorded.

Planting of trees upon this community is not appropriate due to all stands being considered groundwater dependent and the conservation value of the species that occupy it.

3.6.14 Bryophyte dominated spring (E2.3)

3.6.14.1 M32 Philonotis fontana – Micranthes stellaris spring

This community forms small areas that are largely confined to the northern half of the survey area. The spring vegetation relies on groundwater arising from the sub-surface and keeps the area permanently wet. The chemical composition of the groundwater is important to maintain the vegetation within these communities.

These habitats have a rich bryophyte assemblage including *Philonotis fontana, Scapania undulata, Dichodontium palustre, Bryum pseudotriquetrum, Warnstorfia exannulata* and *Sphagnum denticulatum*. Vascular plants are equally as varied as the bryophytes and are dominated by species such as *Chrysosplenium oppositifolium*, *Ranunculus omiophyllus, Montia fontana, Myosotis secunda* and *Epilobium palustre*. *Micranthes stellaris* was not recorded within in this community within the survey area. However, the NVC type is still a close fit and the absence of *M. stellaris* most likely due to the low altitude of the survey area.

The M32a *Sphagnum denticulatum* sub-community was dominated by the named species but also included other Sphagna including *Sphagnum fallax* and *S. inundatum*. The M32b *Montia fontana-Chrysosplenium oppositifolium* sub-community is predominantly also occupied by their named species.

Planting of trees upon this community is not appropriate due to all stands being considered groundwater dependent and the conservation value of the species that occupy it.

3.6.14.2 M35 Ranunculus omiophyllus – Montia fontana spring

This is a community that is small in size and found in wet runnels, springs or depressions in the landscape. Four small to medium sized M35 communities were recorded during the survey. While these communities lacked *Ranunculus omiophyllus*, this was replaced by the ecologically and taxonomically similar *R. hederaceus.* The community was vegetatively the same in all other aspects. These communities are formed from visible springs where constant water maintains wet ground conditions Dominant species within this community included *Agrostis stolonifera, Glyceria fluitans* and *Montia fontana*. Bryophytes were rather poorly represented within the communities identified on site and restricted to common pleurocarpous species such as *Calliergonella cuspidata and Calliergon cordifolium.* No sub-communities are described for this community.

Planting of trees upon this community is not appropriate due to all stands being considered groundwater dependent and the conservation value of the species that occupy it.

3.6.15 Swamps (F1)

3.6.15.1 S19 Eleocharis palustris swamp

This community was recorded in a single location in the western end of the survey area. It was a small area dominated by Eleocharis palustris and was accordingly assigned to the S19a *Eleocharis palustris* sub-community.

3.6.15.2 S27 Carex rostrata – Comarum palustre tall herb fen

This community was recorded in two areas on small mesotrophic ponds. The only sub-community recorded was the S27a *Carex rostrata – Equisetum fluviatile* sub community. It is particularly rich in herbaceous species including *Comarum palustre, Pedicularis palustris, Caltha palustris, Filipendula ulmaria* and *Ranunculus repens*. *Lychnis flos-cuculi* was also recorded in the shallower areas.

3.6.16 Woodland and scrub (A1)

3.6.16.1 W11 Quercus petraea-Betula pubescens-Oxalis acetosella woodland

This community was restricted to eastern sections of the survey area and often formed mosaics with other woodland communities. *Quercus sp.* and *Betula pubescens* are found throughout with a ground layer consisting of locally abundant *Hyacinthoides non-scripta, Anemone nemorosa, Oxalis acetosella*, *Anthoxanthum odoratum, Agrostis capillaris* and *Athyrium filix-femina*.

3.7 Habitat survey results summary

A summary of habitat communities and their conservation designation is provided in Table 3-1. The table also includes a summary of their suitability for planting.

Table 3-1: Habitat Community Summary

NVC Community	EUNIS Code	Phase 1 code	Scottish Biodiversity List (SBL)	GWDTE	Annex 1 code	Suitable for planting?
H10	F2.25	D1.1	European dry heaths	-	4030	Yes
H12	F2.25	D1.1	European dry heaths	-	4030	Yes
H18	F2.25	D1.1	European dry heaths	-	4030	Yes
M4	D2.33	E3.1	-	-	-	No
M6	D2.22	E2.1	Upland flushes, fens and swamps	High	-	Only where not species rich
M10	D4.15	E2.2	Upland flushes, fens and swamps	High	H7230	No
M11	D4.24	E2.2	Upland flushes, fens and swamps	High	H7230	No
M15	D1.22	D2	wet heath	Moderate	H4010, H7130	Yes – if peat depth is less than 50cm
M19	D1.11	E1.6.1	Blanket bog	-	H7130	No
M23	E3.41 & E3.42	B5	Purple moor-grass and rush pastures (lowland)	High	-	Yes – providing they are not groundwater dependent or species rich
M25	F4.13	E1.7	Purple moor-grass and rush pastures (upland)	Moderate	-	Yes – providing they are on a peat layer <50cm in depth or species rich
M32	D2.2C	E2.3	Upland flushes, fens & swamps	High	-	No
M35	D2.2C	E2.2	Upland flushes, fens and swamps	High	-	No
MG6	E2.111	B4	-	-	-	Yes
MG7	E2.6	B4	-	-	-	Yes
MG9	E3.41	B2.2	-	Moderate	-	Yes
MG10	E3.44	B5	Purple moor-grass and rush pastures (lowland)	Moderate	-	Yes

NVC Community	EUNIS Code	Phase 1 code	Scottish Biodiversity List (SBL)	GWDTE	Annex 1 code	Suitable for planting?
U4	E1.72X	B1.1	-	-	-	Yes – providing they are not species rich
U5	E1.71	B1.1	-	-	-	Yes – providing they are not species rich
U6	E3.52	B1.1	-	Moderate	-	Yes - providing they are on a peat layer <50cm in depth
U20	E5.31	C1	-	-	-	Yes
W11	G1.83	A1.1.1	Upland mixed ash wood	-	H9180	No
S19	D2.33	F1	Upland flushes, fens and swamps	-	-	Yes
S27	D2.33	F1	Upland flushes, fens and swamps	-	-	No

**Presence of deep peat not been addressed within this report. Site specific guidance has been provided for species richness and GWDTE dependency.*

3.8 Groundwater Dependent Terrestrial Ecosystems (GWDTEs) results

GWDTEs are classified according to SEPA (2017), defining each NVC community on their potential dependency on groundwater. Groundwater dependency is often linked to wetlands containing flora that is dependent upon the chemical composition of the water fed from a groundwater source. SEPA defines the habitats with regard to their potential for groundwater dependency, therefore not all communities listed may be truly groundwater dependent.

Table 3-2 lists the NVC communities that have a potential for groundwater dependency. The table categorises each habitat type according to whether they are likely to be moderately or highly groundwater dependent as defined by SEPA (2017). In total, there are six communities listed as moderate and six communities listed as having high potential for groundwater dependency.

Table 3-2: Potential GWDTE recorded on site

NVC code	NVC community name	GWDTE potential
MG9	*Holcus Lanatus – Deschampsia cespitosa grassland*	Moderate
MG10	*Holcus lanatus - Juncus effusus rush pasture*	Moderate
U6	*Juncus squarrosus - Festuca ovina grassland*	Moderate
M15	*Trichophorum germanicum - Erica tetralix wet heath*	Moderate
M25	*Molinia caerulea - Potentilla erecta mire*	Moderate
S27	*Carex rostrata – Comarum palustre tall herb fen*	Moderate
M6	*Carex echinata - Sphagnum fallax mire*	High
M10	*Carex dioica – Pinguicula vulgaris mire*	High
M11	*M11 Carex demissa - Saxifraga aizoides mire*	High
M23	*Juncus effusus/acutiflorus – Galium palustre mire*	High
M32	*Philonotis fontana-Saxifraga stellaris spring*	High
M35	*Ranunculus omiophyllus – Montia fontana spring*	High

Of the communities that are listed as having potential for groundwater dependency, after the assessment process, several are considered to be dependent on groundwater within the survey area. These are:

- All M10, M11, M32 & M35 communities in the survey area are derived from springheads and are dependent upon groundwater.

- A number of M6 mires are found to be dependent upon groundwater sources, these have been identified and labelled accordingly in the constraints section.

3.9 Recommendations

Following the evaluation of the ecological features on site, the following recommendations should be considered when designing any potential woodland proposals:

- Habitats which are species rich should be left unplanted due to their importance to biodiversity or associated conservation value. These have been coded accordingly in the constraints map (See Figure 4 in Appendix C) as either red which is an area not to be planted or amber where the habitat is of intermediate conservation importance.

- GWDTEs should not be planted upon. A buffer of 20m should also be adhered to when planting.

- Peatlands should not be planted upon where the peat depth is greater than 50cm. A peat depth survey is required to provide this evidence where doubt exists.

- Native woodland communities should be retained.

- A 10m buffer surrounding habitats considered to be of high sensitivity (Areas coded red in Figure 4 in Appendix C) is recommended.

3.10 Summary

The habitat surveys were carried out between the 3rd and the 6th of June 2024. The surveys have identified areas with important ecological features within the survey area that are sensitive to negative impacts from any potential woodland plantation scheme. A total of 24 different NVC communities have been recorded.

Maps have been produced to inform the planting design so that sensitive ecological features can be avoided. Peatland habitats can be planted upon if they are shown to contain a peat layer less than 50cm in depth. All blanket bog modified bog communities are coded red until proven otherwise through peat depth survey data. Heathland is considered to be intermediate in sensitivity and is only suitable where they occur on a peat depth less than 50cm.

A number of groundwater dependent communities have also been identified within the survey area (See Figure 4 in Appendix C). These should not be planted upon and a buffer of 20m applied to each.

3.11 References

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Appendix A. NVC & Phase 1 habitat Map

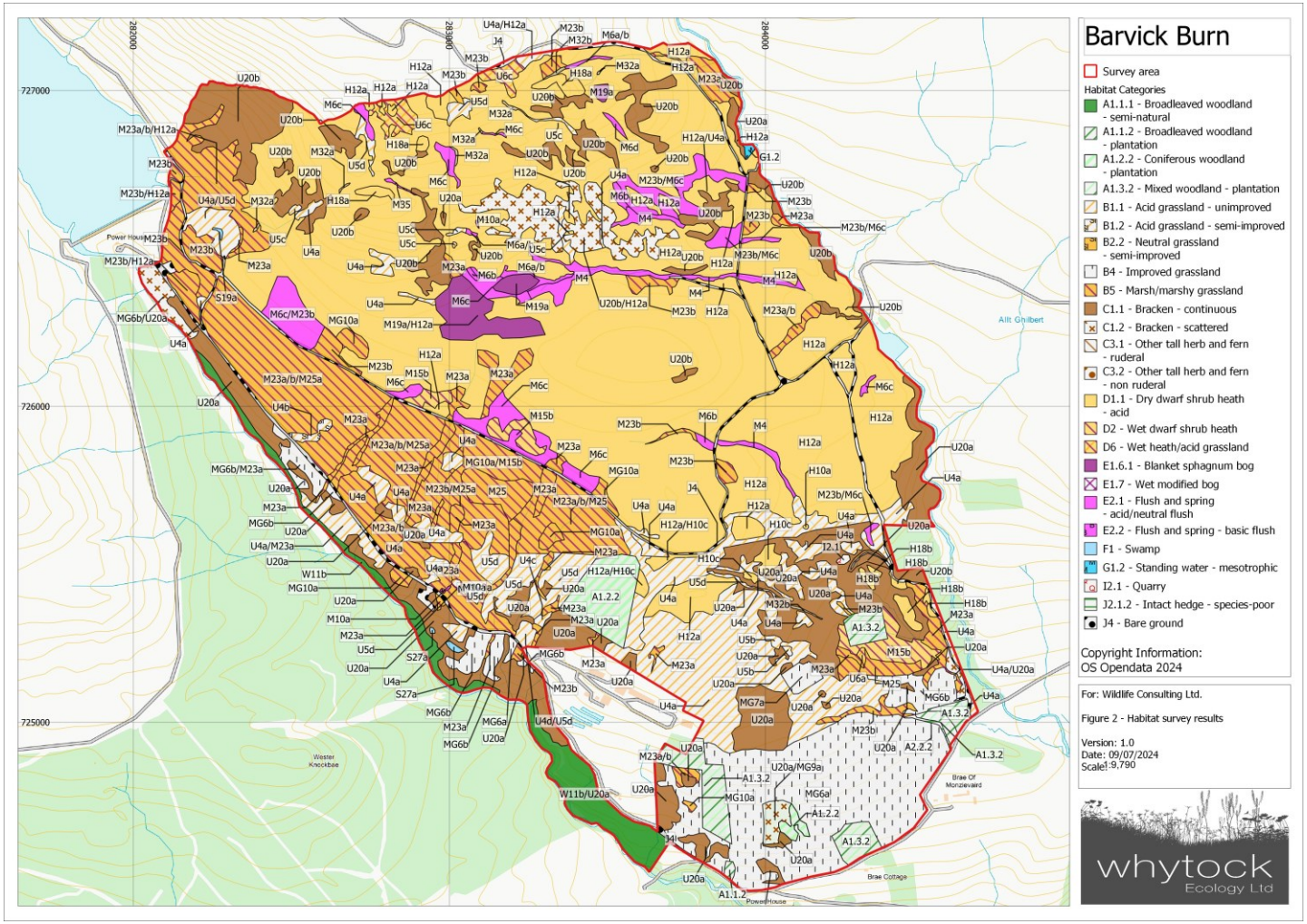

Figure 2: NVC survey map overview. Labelled according to community or sub-community. Where mosaics occur, polygons are coloured by the dominant habitat type.

Appendix B. GWDTEs

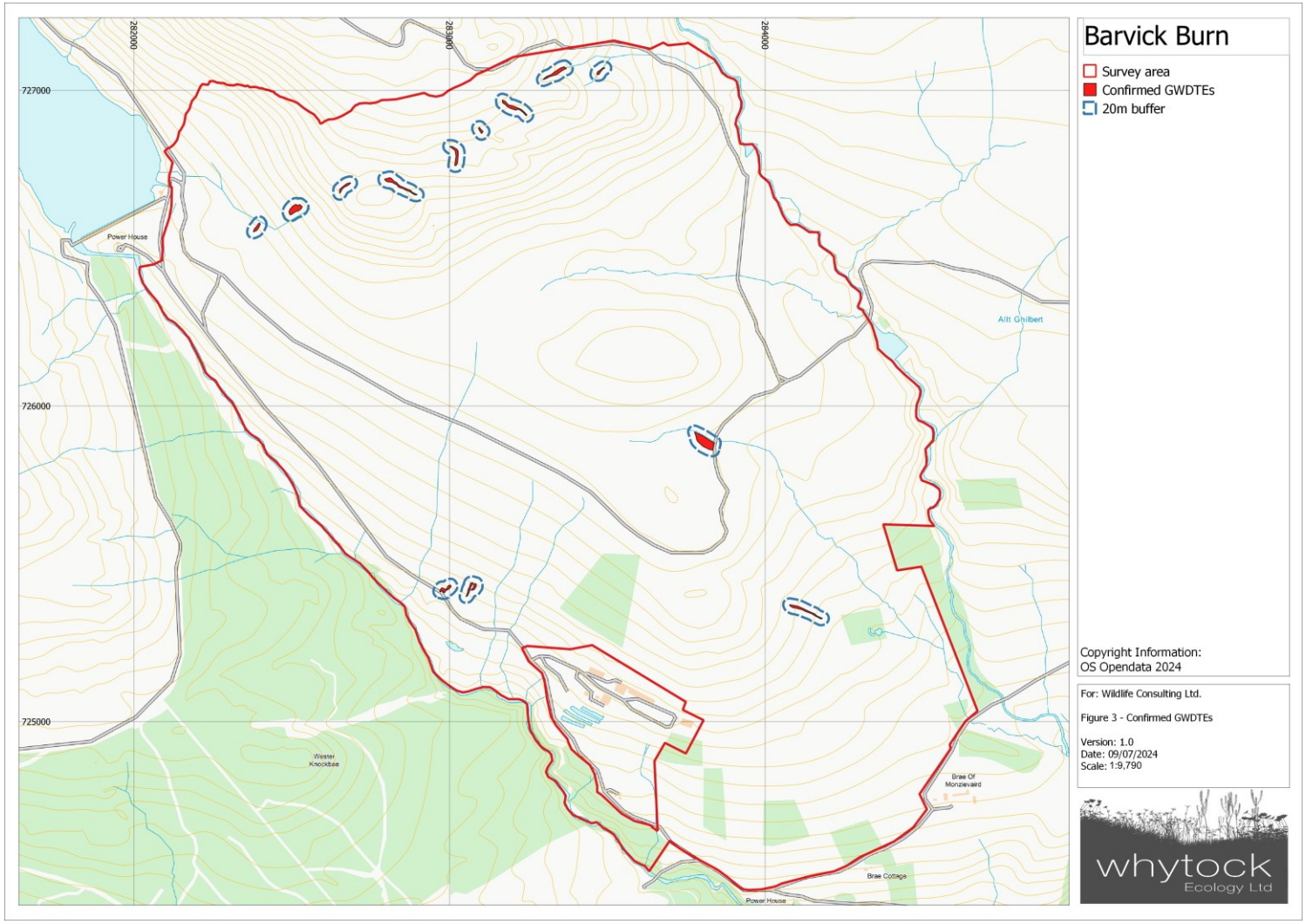

Figure 3: Confirmed GWDTEs and 20m buffers

Appendix C.Constraint maps

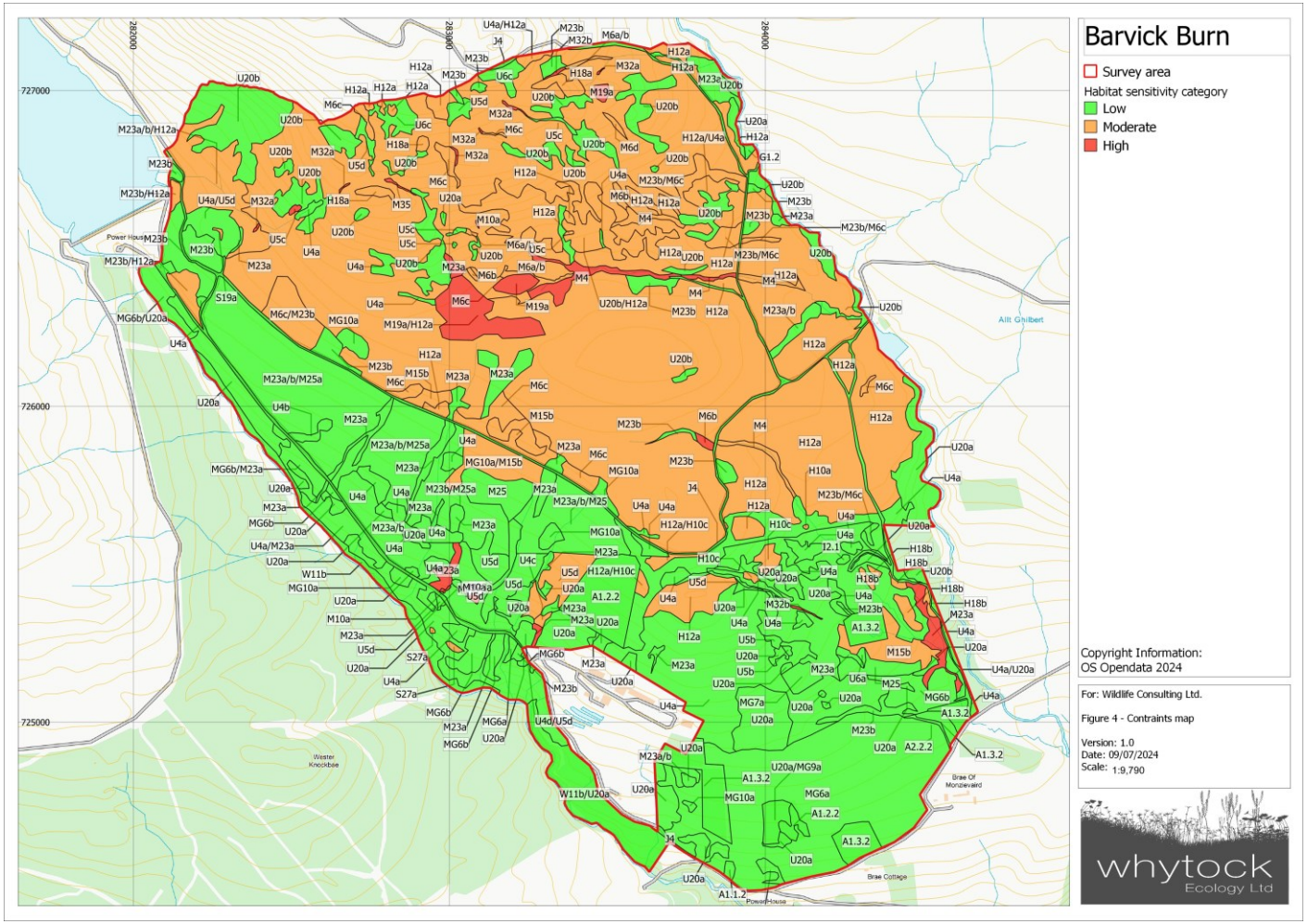

Figure 4: Constraints map showing relative habitat sensitivity. Areas coded as red are high conservation value and are not suitable for planting. Areas coded as amber are intermediate sensitivity. Green areas are low sensitivity.

Appendix D. Target notes

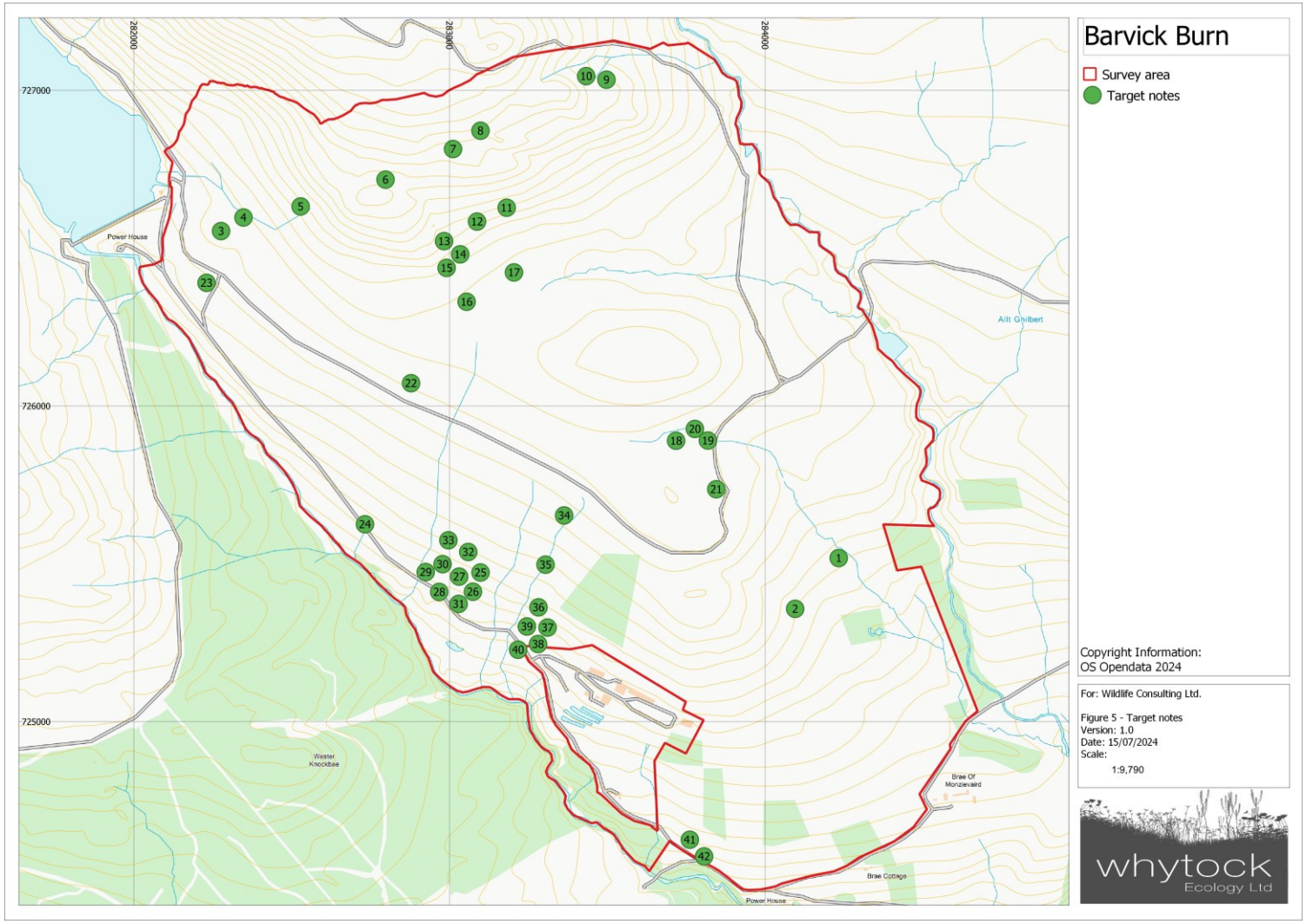

Figure 5: target note map showing locations of each.

Target Notes

Target Note ID	Comment	Grid reference
1	Quarry	NN8423325518
2	M32b springhead	NN8409525357
3	Common spike rush dominated swamp	NN8227626554
4	*Carex canescens*	NN8234726597
5	Springs into U5c grassland	NN8252826632
6	Montia fontana dominated springhead	NN8279726717
7	M32a springheads	NN8301126814
8	M32a springhead	NN8309826872
9	*Philonotis fontana* springhead and *Ptilidium crista-castrensis*	NN8349727033
10	Beech fern - *Phegopteris connectilis*	NN8343227045
11	Scapania uliginosa	NN8318126628
12	springhead (poached) into M10 NVC community	NN8308726584
13	Alchemilla glabra	NN8298226522
14	Holly - *Ilex aquifolium* tree - senescent and harshly browsed	NN8303326480
15	M23a with *Eriophorum latifolium* and butterwort - *Pinguicula vulgaris*	NN8299026437
16	M19 - burnt	NN8305426330
17	*Triglochin palustris*	NN8320426423
18	Small *Salix aurita* scrub	NN8371725889
19	*Salix phylicifolia*	NN8381825890
20	Small M10 springhead	NN8377725927
21	*Kiaeria blyttii*	NN8384525736
22	Chickweed wintergreen - *Lysimachia europaea*	NN8287826072
23	Early purple orchid - *Orchis mascula*	NN8223026390
24	Small M10 NVC community with *Eriophorum latifolium*	NN8273225625
25	Small M10 NVC community with *Eriophorum latifolium*	NN8309825472
26	M10 NVC community with *Eriophorum latifolium*	NN8307425411
27	*Saxifraga aizoides*	NN8303025459
28	M10 NVC community with *Eriophorum latifolium*	NN8296725410
29	*Eriophorum latifolium*	NN8292425473
30	*Avenella pubescens* frequent	NN8297725498
31	*Ranunculus bulbosus* and some *Lotus corniculatus* in U5 grassland	NN8302825372
32	*Eriophorum latifolium* and butterwort - *Pinguicula vulgaris*	NN8305925537
33	*Lysimachia nummularia, Crepis paludosa* and *Briza media*	NN8299625574
34	*Eleocharis quinqueflora*	NN8336325653

Target Note ID	Comment	Grid reference
35	*Ranunculus flammula* frequent	NN8330425497
36	U5 with *Briza media*	NN8328125361
37	quaking grass - *Briza media*	NN8331025297
38	Heath fragrant orchid - *Gymnadenia borealis*	NN8328025245
39	*Carex pulicaris* and *Carex pallescens*	NN8324425301
40	*Galium uliginosa* frequent	NN8321725227
41	*Cruciata laevipes* and *Potentilla sterilis* frequent	NN8376124625
42	Crosswort - *Cruciata laevipes* frequent	NN8380624572

Appendix E. EUNIS habitat map

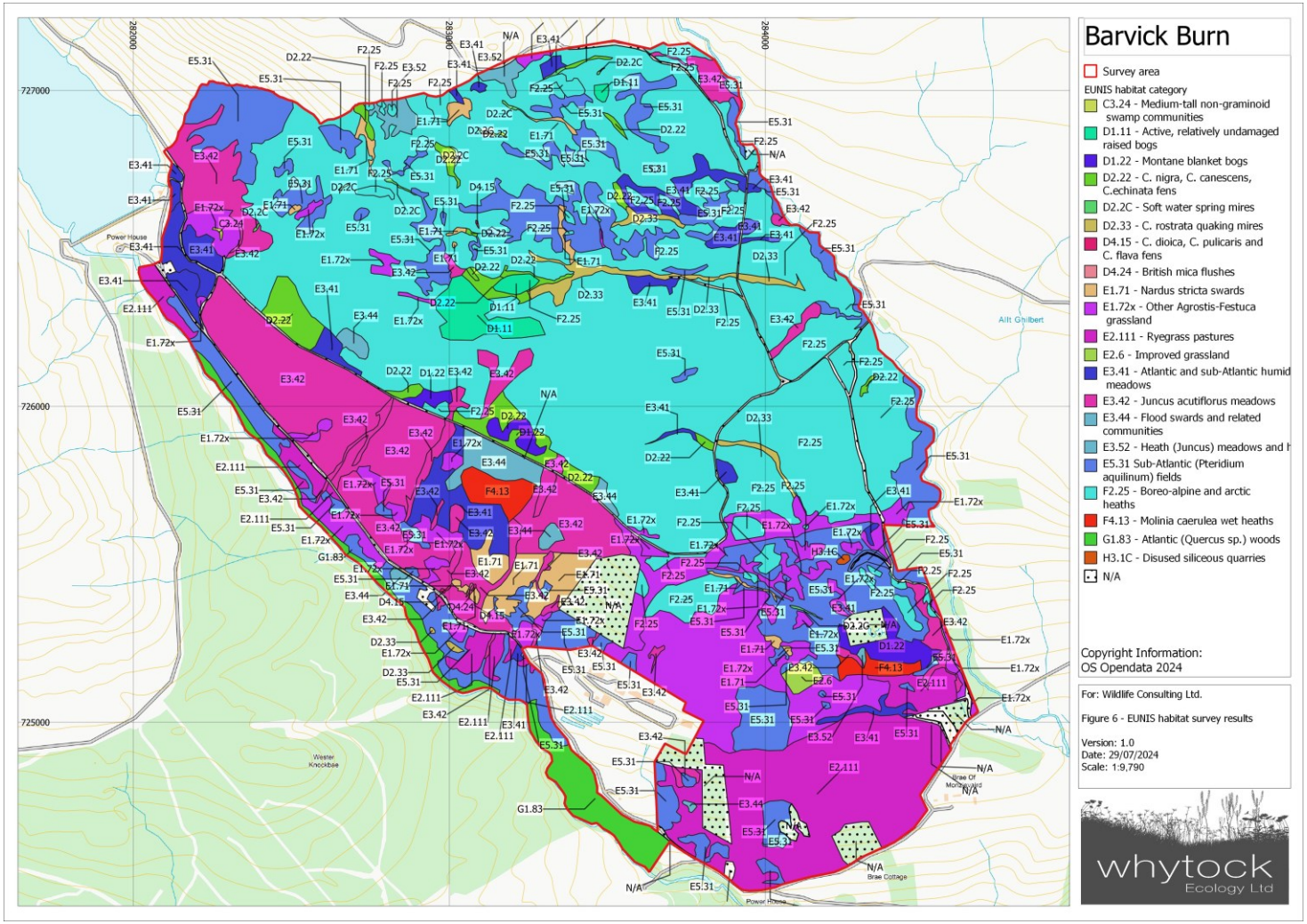

Figure 6: Map showing EUNIS habitat survey results. Based on dominant EUNIS habitat classifications.

4 Protected Species

4.1 Introduction

Site visits to the survey area was undertaken in August 2024 in order to assess the habitats in terms of their suitability for protected species including, but not limited to, badger *Meles meles*, bats, European beaver *Castor fiber* otter *Lutra lutra*, red squirrel *Sciurus vulgaris*, water vole *Arvicola amphibius* and reptiles to record evidence of the presence of protected species.

4.2 Methods

The field survey was undertaken with reference to guidance outlined by the Chartered Institute of Ecology and Environmental Management (CIEEM)[xxvii]. Species specific survey areas are described in Table 4-1 below. Surveys focused on recording any evidence of the presence of protected species and invasive species. The field survey methods undertaken centred on species with the potential to be present as derived from the habitats present and on our knowledge of the local area.

Table 4-1: Protected Species Survey Methods

Species/Guild	*Survey Methods*
Otter, Water Vole and Beaver	Chanin (2003) "Monitoring the Otter" and Liles (2003) "Conserving Otter Breeding Sites". Otter - Walkover to record resting places (holts or couches), spraints, prints, slides or otter sightings. Water vole – Walkover to record latrines, burrows, feeding stations or water vole sightings. Beaver – Walkover to record, burrows, lodges, feeding signs, prints, droppings or beaver sightings. The survey area for otter comprised accessible, suitable habitats within 200m of the site for otter and 50m for water vole and beaver.
Bats	Collins (2023). Any structures or mature trees were assessed in terms of potential suitability to support roosting bats within the Site and to a distance of up to 30m where access was available and direct or potential indirect impacts were deemed a possibility. These features were scrutinised with binoculars. Any signs of roosting bats such as staining, and droppings were recorded. Each building where potential direct or indirect impacts were envisaged were assigned a qualitative rating of Negligible, Low, Moderate or High potential for supporting roosting bats according to the Bat Conservation Trust guidelines (Collins, 2023). For trees, they were assessed as either presenting Potential Roost Features (PRF) for individuals / very low numbers (PRF-I) or PRFs to support multiple bats (PRF-M). Only features with a deemed greater than Negligible potential for structures and PRF-M for trees were subject to detailed target notes and would require further assessment. For those features with Negligible and PFR-I suitability, site teams should be aware that bats could be present and emergency procedures in place should a bat or evidence of be encountered during the works.

[xxvii] CIEEM (2017) Guidelines for Preliminary Ecological Appraisal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester.

Species/Guild	*Survey Methods*
Red squirrel and pine marten	Searches for stripped cones, pine marten scats and the presence of any dray structures in trees or dens were undertaken within 50m of the site.
Badger	Harris et al. (1989) "Surveying Badgers". Evidence for the presence of badger was searched for including the presence of setts, foraging signs, latrines, prints, mammal paths and guard hairs, as well as any badger sightings. The survey area for this receptor comprised accessible land within 50m of the Development site.
Reptiles	A watching brief was maintained throughout the survey for the presence of common reptile species such as common lizard *Zootoca vivipara*, slow worm *Anguis fragilis* and adder *Vipera berus*.
Invasive Species	A walkover survey was undertaken to record the presence of any invasive species listed on Schedule 9 of the Wildlife and Countryside Act.

4.3 Survey Limitations

The protected species walkover provides a snapshot of ecological conditions at the time of the site visit and does not aim to record and assess the presence and impact of all plants or animals that may be present at the Site at different times of the year. Where required, further specific surveys or monitoring has been recommended.

The site visit was undertaken during the summer 2024 which is within the optimal time for undertaking most ecological surveys when many protected species are active.

It is considered that findings of the findings are valid up to 12 months, though it cannot be guaranteed that there would not be a change in ecological baseline during this time period.

4.4 Survey Results

4.4.1 Badger

No active badger setts were identified during the walkover. A single hole disused outlier sett was identified (TN07) located just to the southwest of the site. Several other burrows were noted during the survey but were all attributed to rabbit *Oryctolagus cuniculus* and not badger.

4.4.2 Bats – Structures

A single structure (TN09) was identified during the walkover, comprising a small bridge deemed to be of low potential to support roosting bats.

4.4.3 Bats – Trees

There were several trees identified within the survey area with potential to support roosting bats. This included:

- TN06 – Ash tree (PRF-M)
- TN10 – mixture of aspen, oak and ash with some providing features to support multiple bats (PRF-M)

- TN11 – Ash tree (PRF-M)
- TN13 – Ash tree (PRF-M)

In addition there were several trees deemed to support features that could provide roosting opportunities for single or very low number of bats (PRF-I) (see Appendix G).

4.4.4 Beaver

No evidence of beaver was recorded within the site during the walkover. The site is connected to known areas of beaver populations (River Earn). Given the lack of evidence beaver will not be considered further.

4.4.5 Otter

Evidence of otter was recorded along the Turret Burn with a sprainting site (TN17) and a single place of rest (Appendix G - TN08) with spraints within.

In both cases these features are on the Turret Burn adjacent to the western boundary of the site.

4.4.6 Pine Marten

No evidence of pine marten was recorded during the walkover. The site holds some potential features, though the open nature of the site does make the area sub-optimal at best. The surrounding much larger stands of woodland to the west of the site offer much better opportunities for pine marten. This species is not considered further in this report.

4.4.7 Red Squirrel

No evidence of red squirrel was recorded during the site visits. The site is typically open and though does support some trees, is not extensive or likely to provide sustained foraging and shelter opportunities for this species. The surrounding much larger stands of woodland to the west of the site offer much better opportunities for red squirrel. This species is not considered further in this report.

4.4.8 Reptiles

The areas of heathland and non-farmed acid grassland areas have potential to support common reptiles such as adder, common lizard and slow worm. A rock pile (TN01) was also noted to offer potential as a hibernacula for this group.

4.4.9 Water Vole

No evidence of water vole was identified during the site visits. There are some areas of suitable habitat with stands of marshy grassland and springs, but these are typically isolated and not connected to other areas of suitable habitat. The burns (Turret and Barvick) as relatively fast flowing and considered unsuitable for this species. It is considered that water vole are not a likely receptor to the site and will not be considered further.

4.5 Appraisal and Recommendations

4.5.1 Badger

A single two-hole disused badger sett (TN07) was recorded during the walkover. This was outwith the site, but within 30m of the site boundary and therefore could be subject to disturbance should this sett become active. However, between the site and the sett is the access road to the farm, and given the baseline level of disturbance, the planting of the trees within the site is not considered to present any significant increase in the baseline disturbance. However, it should be ensured that

works will not directly impact this disused sett either through planting, or through works facilitation such as track works, or laydown areas.

4.5.2 Bats – Structures

A single bridge (TN09) was identified as having low bat roost potential. This feature is not located within the site, but located c. 27m south west but with the existing access located along the closest site boundary. As such given the existing baseline disturbance it is considered there is no mitigation or further assessment necessary.

4.5.3 Bats – Trees

Several areas of trees were identified with potential to support roosting bats. Of these, two trees and one stand of trees were assessed as having potential to support multiple bats (PRF-M), with other with potential to support single or very low numbers of bats (PRF-I).

Given the proposed project is the creation of further woodland it is considered unlikely that there would be any short term negative effects on the potential roost sites. However, for those trees or stands identified as PRF-M, route protection zones around existing trees should be in place in order to maintain these trees and their potential roost features in the long term. Whilst trees with PRF-I are not deemed to require further assessment or mitigation, it is recommended that the same protocol is used to also protect these trees from potential damage.

The planting those areas of trees including those with feathered edges to the planting blocks will likely provide suitable habitat in the long term for roosting and foraging bats and therefore make provide an overall positive impact on the local bat resource.

4.5.4 Otter

A single otter place of shelter was recorded during the walkover (TN08) along Turret Burn outwith the site but within 30m of the site. There should be a 30m no planting buffer in order to minimise the risk of disturbance to this otter place of shelter. Where this is not possible, further monitoring and potential lichening may be required. Otter spraint was also recorded along the burn indicating use of the burn for foraging and commuting.

4.5.5 Reptiles

The large rock pile (TN01) was noted to present optimal opportunity for hibernating reptiles. It is recommended that this should be left in situ. The incorporation of open areas of ground and areas of open woodland will continue to provide opportunities for reptile species at the site for basking.

Should reptiles be encountered during the works, animals should be allowed to vacate the works area. Where assistance is required, animals can be picked up with a gloved hand and removed to a suitable area out with the work zones. Should an adder be encountered then only trained persons should attempt to handle and move them.

Appendix F. Ornithological Survey Conditions

2023 Survey Timings and Weather Conditions

Visit	Date	Survey start time	Survey end time	Hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
1	26/04/23	08:45	13:00	1	2	NW	0	8	2	2	0	0
				2	2	NW	0	8	2	2	0	0
				3	2	NW	0	8	2	2	0	0
				4	2	NW	0	8	2	2	0	0
1	27/04/23	04:30	10:30	1	2	E	0	8	2	2	0	0
				2	2	E	0	8	2	2	0	0
				3	2	E	0	8	2	2	0	0
				4	2	E	0	8	2	2	0	0
				5	2	E	1	8	1	1	0	0
				6	2	E	1	8	1	1	0	0
1	28/04/23	07:00	10:30	1	2	E	1	8	1	1	0	0
				2	2	E	0	8	2	2	0	0
				3	2	E	1	8	1	1	0	0
				4	2	E	1	8	1	1	0	0
2	22/05/23	04:00	12:30	1	2	SW	0	4	2	2	0	0
				2	2	SW	0	4	2	2	0	0
				3	2	SW	0	4	2	2	0	0
				4	2	SW	0	5	2	2	0	0
				5	2	SW	0	5	2	2	0	0
				6	2	SW	0	4	2	2	0	0
				7	2	SW	0	4	2	2	0	0
				8	2	SW	0	4	2	2	0	0
				9	2	SW	0	4	2	2	0	0
2	23/05/23	08:00	13:00	1	2	NW	0	4	2	2	0	0
				2	2	NW	0	4	2	2	0	0
				3	2	NW	0	4	2	2	0	0
				4	2	NW	0	5	2	2	0	0
				5	2	SW	0	5	2	2	0	0
				6	2	SW	0	4	2	2	0	0

Visit	Date	Survey start time	Survey end time	Hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
2	24/05/23	08:00	12:00	1	2	W	0	5	2	2	0	0
				2	2	W	0	5	2	2	0	0
				3	2	W	0	5	2	2	0	0
				4	2	W	0	5	2	2	0	0
				5	2	W	0	5	2	2	0	0
3	16/06/23	06:00	11:00	1	1	NE	0	3	2	2	0	0
				2	1	NE	0	4	2	2	0	0
				3	2	NE	0	4	2	2	0	0
				4	2	NE	0	4	2	2	0	0
				5	2	NE	0	4	2	2	0	0
3	17/06/23	06:00	11:00	1	1	NE	0	8	2	2	0	0
				2	1	NE	0	8	2	2	0	0
				3	2	NE	0	8	2	2	0	0
				4	2	NE	0	8	2	2	0	0
				5	2	NE	0	8	2	2	0	0
3	18/06/23	06:00	10:00	1	1	SW	0	2	2	2	0	0
				2	1	SW	0	2	2	2	0	0
				3	1	SW	0	2	2	2	0	0
				4	2	SW	0	2	2	2	0	0
EA VP 1	31/10/23	08:00	14:30	1	3	NE	0	4	2	2	0	0
				2	3	NE	0	4	2	2	0	0
				3	3	NE	0	4	2	2	0	0
				4	3	NE	0	4	2	2	0	0
				5	3	NE	0	5	2	2	0	0
				6	3	NE	0	5	2	2	0	0
EA VP 2	28/11/23	09:00	15:30	1	1	NE	0	2	2	2	0	0
				2	1	NE	0	2	2	2	0	0
				3	2	NE	0	1	2	2	0	0
				4	2	NE	0	1	2	2	0	0
				5	2	NE	0	1	2	2	0	0
				6	2	NE	0	1	2	2	0	0
	29/12/23	09:00	15:30	1	2	NW	0	2	2	2	0	2
				2	2	NW	0	2	2	2	0	2

Visit	Date	Survey start time	Survey end time	Hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
EA VP 3				3	2	NW	0	2	2	2	0	2
				4	2	NE	0	2	2	2	0	2
				5	2	NE	0	4	2	2	0	2
				6	2	NE	0	4	2	2	0	2
EA VP 4	29/01/24	09:00	15:30	1	1	N	0	8	2	2	1	0
				2	1	N	0	8	2	2	1	0
				3	2	N	0	8	2	2	1	0
				4	2	N	0	8	2	2	1	0
				5	2	N	0	8	2	2	1	0
				6	2	N	0	8	2	2	1	0
EA VP 5	22/02/24	10:00	16:30	1	2	NW	0	4	2	2	0	0
				2	2	NW	0	4	2	2	0	0
				3	3	NW	0	4	2	2	0	0
				4	3	NW	0	4	2	2	0	0
				5	3	NW	0	4	2	2	0	0
				6	3	NW	0	4	2	2	0	0
EA VP 6	11/03/24	10:00	16:30	1	2	NE	0	8	2	2	0	0
				2	2	NE	0	8	2	2	0	0
				3	2	NE	0	8	2	2	0	0
				4	2	NE	0	8	2	2	0	0
				5	2	NE	0	8	2	2	0	0
				6	2	NE	0	8	2	2	0	0
1	14/05/24	05:00	10:00	1	1	SW	0	5	2	2	0	0
				2	1	SW	0	7	2	2	0	0
				3	2	SW	0	8	2	2	0	0
				4	1	SW	0	5	2	2	0	0
				5	1	SW	0	4	2	2	0	0
1	15/05/24	05:00	09:00	1	2	SW	0	3	2	2	0	0
				2	1	SW	0	3	2	2	0	0
				3	1	SW	0	4	2	2	0	0
				4	2	SW	0	4	2	2	0	0
2	06/06/24	07:00	11:00	1	1	SE	0	2	2	2	0	0
				2	1	SE	0	2	2	2	0	0

Visit	Date	Survey start time	Survey end time	Hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
				3	1	SE	0	3	2	2	0	0
				4	2	S	0	4	2	2	0	0
2	07/06/24	06:00	10:00	1	2	SW	0	5	2	2	0	0
				2	2	SW	0	5	2	2	0	0
				3	2	SW	0	5	2	2	0	0
				4	2	SW	0	5	2	2	0	0

Wind speed: according to Beaufort Scale
Wind direction: according to 16-point compass
Cloud cover: in eights of sky (oktas)
Cloud height: 0 = <150m; 1 = 150-500m; 2 = >500m
Visibility: 0 = Poor (<1km); 1 = Moderate (1-2km); 2 = Good (>2km)
Rain: 0 = None; 1 = Drizzle/Mist; 2 = Light showers; 3 = Heavy showers; 4 = Heavy rain
Frost: 0 = None; 1 = Ground; 2 = All day
Snow: 0 = None; 1 = On site; 2 = High ground

Appendix G. Protected Species Target Notes

Protected Species Target Notes

Target Note Ref	Easting	Northing	Details
1	283866	725545	Rock pile - Potential reptile hibernaculum
2	284088	725627	Burrows set into mound have open entrances and may be confused for badger but small inside and with rabbit dung
3	284169	725655	Burrows set into mound have open entrances and may be confused for badger but small inside and with rabbit dung
4	284110	725187	Large burrows present in warrens, but only rabbit dung present
5	283890	724511	Row of low bat potential ash, maple and sycamore (PRF-I)
6	283873	724483	Moderate bat potential ash (PRF-M)
7	283751	724552	Two-hole disused outlier sett with no sign of recent use
8	283683	724531	Otter resting place with multiple spraints present
9	283687	724528	Low bat potential bridge
10	283636	724529	Aspen, oak and ash of low and moderate potential for roosting bats on the banks of the Turret Burn (PRF-M and PRF-I)
11	283576	724547	Ash with high bat potential (PRF-M)
12	283923	724377	Lots of low bat potential beech and oak West of the Turret with minor features of no greater than low potential (PRF-I)
13	283781	724862	Ash with moderate potential for roosting bats (PRF-M)
14	284132	724873	Ash with low potential for roosting bats (PRF-I)
15	284408	725001	Beech trees with low potential for roosting bats (PRF-I)
16	284513	724759	Farm buildings surrounded with low bat potential beech (PRF-I)
17	282860	725323	Otter spraint.