Appendix 8.2

Habitats and Vegetation

SPEN

Glenmuckloch to Glenglass Reinforcement Project

Appendix 8.2 Habitats and Vegetation Survey Report

Final report
Prepared by LUC
January 2023

SPEN

Glenmuckloch to Glenglass Reinforcement Project
Appendix 8.2 Habitats and Vegetation Survey Report

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Contents

Chapter 1
Introduction

1.1 This Technical Appendix details the full methods and results of the habitats and vegetation surveys undertaken to inform the assessment of the likely effects of the proposed Glenmuckloch to Glenglass Reinforcement Project ('the GGRP').

1.2 This Appendix should read in conjunction **with Chapter 7: Hydrology, Geology, Hydrogeology, Peat and Water Resources, Chapter 8: Ecology** and **Chapter 9: Ornithology** of the Environmental Impact Assessment (EIA) Report and the following Appendices:

- **Appendix 8.1:** Legislation Context and Desk Study
- **Appendix 8.3:** Protected Species Survey Report
- **Appendix 8.4:** Badger Survey Report (Confidential)

1.3 This Technical Appendix is supported by the following figures which are included in in **Appendix A**:

- **Figure 8.2.1:** Ecology Survey Area
- **Figure 8.2.2:** Phase 1 Habitat Survey Map
- **Figure 8.2.3:** National Vegetation Classification Survey Plan

1.4 Habitat photographs are included in **Appendix B**.

Scope

1.5 LUC was appointed by SP Energy Networks (SPEN) to complete a suite of ecological surveys, including habitats and vegetation surveys, to inform an EIA of the proposed GGRP.

1.6 In December 2019 LUC submitted a Scoping Report (on behalf of the Applicant) as a means of agreeing the full scope of surveys relevant to the EIA This included undertaking phase 1 habitat and National Vegetation Classification surveys within the Study Area between August 2019 and September 2022.

1.7 For the purpose of this Technical Appendix, 'Study Area' includes the development footprint, wayleave, and a 250m buffer. The development is described in detail within **Chapter 4: Project Description** within the EIA Report. This is illustrated in **Appendix A, Figure 8.2.1 – Ecology Survey Area**.

Site Overview

1.8 The Study Area covers approximately 704ha and is located approximately 1km to the west of Kirkconnell within the Dumfries & Galloway Council area. The Study Area is dominated by commercial coniferous plantation woodland, improved/ marshy grassland grazed pasture with localised mosaics of modified wet heath and acid grassland. The River Nith transects the north of the Study Area. Smaller watercourses present within the Study Area include the Kelso Water, Euchan Water, their various tributaries and smaller ditches and drainage features. Other habitats present within the Study Area include a quarry, bare ground/ hard standing and buildings. The habitats within the Study Area are common and characteristic of the habitats present in the wider landscape.

1.9 The majority of the habitats within the Study Area have been influenced by either commercial forestry or grazing pressure and/or previous management.

Survey Area

1.10 The new 132kV overhead line (OHL) comprises the construction of a new double circuit 132kV steel lattice tower OHL, approximately 9.3km in length between a new substation at Glenmuckloch to the existing 132kV substation at Glenglass to reinforce the network to accommodate several connection requirements as a result of renewable energy development in the Sanquhar area.

The OHL will be supported on L7 steel lattice towers. A detailed description of the GGRP development is included within **Chapter 4: Development Description.**

1.11 The Study Area included the development footprint, wayleave and a buffer of 250m for the purposes of habitat surveys for GWDTE's in line with best practice.

Chapter 2
Methods

2.1 There were two components to the field surveys, a phase 1 habitat survey and a more detailed National Vegetation Classification (NVC) survey. The methods are outlined in detail below and follow best practice guidance produced by the Chartered Institute of Ecology and Environmental Management (CIEEM)[1] and the British Standards Institute[2] .

2.2 NVC was used to identify habitats of Nature Conservation Concern, including those habitats that could be indicative of groundwater dependency (GWDTE)[3]

2.3 The data collected from the surveys was recorded and mapped using ArcGIS software (notably the Field Maps app), using GPS-enabled Samsung tablets.

Desk Study

2.4 A desk study was undertaken to inform obtain existing habitats information to inform habitat and vegetation surveys. An account of the method adopted, and findings of the desk study is provided in **Appendix 8.1: Legislation Context and Desk Study**, which also sets out the legislative provisions afforded to habitats of concern.

Field Survey – Phase 1 Habitat Survey

2.5 A phase 1 habitat survey was undertaken, following standard methods[4], between August 2019 and September 2022 by experienced ecologists. The phase 1 habitat survey method provides a means of rapidly classifying broad habitat types in any given terrestrial survey area. During the survey, field surveyors walked all accessible parts of the Study Area to map broad habitat types and their boundaries. Sufficient species identification was undertaken to accurately classify habitat types, using the DAFOR scale[5] where necessary. The output of the survey comprises habitat accounts, field maps and associated photography, and target notes (where required).

2.6 The Study area for phase 1 habitat survey and National Vegetation Classification surveys included 100m development footprint, wayleave and a buffer zone of up to 250m to identify Habitats of Nature Conservation Concern (e.g. GWDTE). The extent of the Study Area is presented on Appendix A - **Figure 8.2.1**

Field Survey - National Vegetation Classification Survey

2.7 NVC surveys were undertaken between August 2019 and September 2022 of all habitats identified as being of conservation interest during the phase 1 habitat survey[6]. NVC survey was completed following best practice guidelines[7] to map habitats based on the characteristics of the vegetation. Structure, condition and species composition were recorded including detailed notes on the species present and abundance within stands of vegetation.

2.8 The Domin scale of cover/abundance (**Table 2.1**) was used in compliance best practice guidelines. Data collected in the field was assessed and NVC communities (and, where possible and appropriate, sub-communities) were assigned to each assemblage. Domin Scale of Cover/ Abundance.

Table 2.1: Percentage Vegetation Cover and Corresponding Domin Value

Cover	Domin
91-100%	10
76-90%	9
51-75%	8
34-50%	7
26-33%	6
11-25%	5
4-10%	4
<4% (many individuals)	3
<4% (several individuals)	2
<4% (few individuals)	1

Ground Water Dependent Terrestrial Ecosystems (GWDTEs)

2.9 GWDTEs are defined by SEPA[3] and are considered important indicators of sensitive groundwater movement. NVC communities listed in the SEPA guidance are those which, if present, are considered to indicate that a wetland is likely to be either highly or moderately groundwater dependent depending on the hydrogeological setting.

2.10 Where these communities were identified, and they were not obviously surface or rainwater fed (e.g. marshy grassland on watershed and ombrogenous bog systems), they were subject to detailed botanical survey. **Table 2.2** sets out a decision-making tool that was used to establish the level of groundwater dependency of each community.

Table 2.2: GWDTE Decision Tool[8]

Criteria	Yes	No
A. Is the GWDTE vegetation evidently influenced by groundwater? (i.e. base-enriched (M10, M11, M37 and/or M38) and/or discharging from an evident point source such as a spring head (M31, M32, M33).		
If the answer to A is 'Yes' then field assessment ends at this stage and the GWDTE is treated as 'high', as per the guidance. If 'No', continue to B.		

[1] CIEEM (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal and Marine.* Winchester: Chartered Institute for Ecology and Environmental Management and CIEEM (2017). *Guidelines for Preliminary Ecological Appraisal.* 2nd Edition
[2] British Standards Institute (2013). BS42020: 2013 Biodiversity – Code of Practice for Planning and Development.
[3] SEPA (2017) Land Use Planning System SEPA Guidance Note 31. Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems.
[4] Joint Nature Conservation Committee (2010). *Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit.* Peterborough: JNCC..
[5] DAFOR scale: D=Dominant, A=Abundant, F=Frequent, O=Occasional, R=Rare.
[6] Defined as Annex 1 habitats, Scottish Biodiversity List habitats, habitats included in the Dumfries and Galloway Biodiversity Action Plan, and habitats considered to indicate potential GWDTE.
[7] Rodwell, J.S. (2006). NVC Users' Handbook. Peterborough: JNCC.
[8] Botanaeco (2018) GWDTE Decision Tool. Available at: https://botanaeco.co.uk/gwdte [Accessed October 2022]

Criteria	Yes	No
B. Is the GWDTE polygon associated with an evident surface water feature? i.e. is the vegetation located within one of the following topographic locations:		
Watershed/ridge		
Watercourse		
Floodplain		
Ponding location, pond, loch etc (localised depression)		
Surface water conveyance (drain, gully, rill, etc.)		
If the answer to B is 'Yes' then the GWDTE polygon is no more than 'moderate' and very likely to be 'low'. Additional floristic and environmental data should be collected, including photographs to allow for further, desk-based determination of the groundwater dependency. If 'No', continue to C.		
C. Is the GWDTE polygon associated with an ombrogenous system? i.e. with blanket bog or wet heath habitat. This is especially relevant to M6 and M25:		
Presence/persistence of distinctive bog habitat, species and/or associations.		
Deep peat not confined to depressions/valleys (>0.5 m visible in drains or hagged areas).		
If the answer to C is 'Yes' then the GWDTE is no more than 'moderate' and very likely to be 'low'. Additional floristic and environmental data should be collected, including photographs to allow for further, desk-based determination of the groundwater dependency.		

Nomenclature

2.11 Standardised vernacular names followed by the scientific name upon first use (italicised within the text) are used for vascular plants (graminoids, herbs and shrubs). Scientific names only are used for the moss, liverwort, and lichen species because although vernacular names are now in existence, they are not in general usage.

Competency

2.12 All habitat and vegetation surveys were undertaken within the appropriate seasonal windows in 2021 and 2022, by academically and professionally qualified LUC ecologists who are members of CIEEM. The data has been assessed by ecologists with extensive experience in interpreting habitat datasets.

Constraints and Limitations

2.13 All ecological surveys represent a snap-shot in time. Habitats and species assemblages are dynamic and change over time in response to a range of variables. Data presented in this Technical Appendix should not be considered a long-term interpretation of ecological data and should not be relied upon as such.

2.14 Surveys were completed during the optimal survey season for habitat and vegetation studies (April to September), and as such, the data gathered is considered robust for the purposes of informing the EIA Report.

2.15 While care has been taken to collect and review habitat data, it is not possible to account for any changes that may occur in the intervening period between data collection and submission of the EIA Report.

Chapter 3
Baseline

Desk Study

3.1 A desk study was undertaken to inform habitat and vegetation surveys. An account of the method adopted, and findings, is provided in **Appendix 8.1** which also sets out the legislative provisions afforded to habitats, notably habitats of conservation concern[9].

3.2 **Appendix 8.1** provides details of the desk study findings, but the Study Area did not support any statutory or non-statutory sites designated for their habitat assemblages. However one statutory designated site (<5km) relevant to terrestrial ecology was present within the Study Area:

- North Lowther Uplands SSSI – Is located approx. 1.7km to the north-east at its closest point. This is notified for its assemblage of upland habitats (including blanket bog, wet and dry heath and acid grassland).
- Muirkirk Uplands SSSI – Is located approx. 1.7km to the north-west at its closest point. This site is notified for its upland assemblage and blanket bog.

3.3 The Muirkirk and North Lowther SPA was also identified approx. 1.7km from the Study Area at the closest point. This is designated for ornithological interest, therefore is considered not considered within this Chapter, see **Chapter 9: Ornithology** for further details and assessment of the ornithological features of the abovementioned SSSIs.

3.4 Appendix A – Figure 8.2.2 provides an illustration of the location of the location of the these sites in relation to the development.

Detailed Habitat Descriptions

3.5 The phase 1 habitat and NVC community descriptions below are supported by, and should be read in conjunction with, Appendix A – **Figure 8.2.2** and **Figure 8.2.3** and habitats photographs are presented in **Appendix B.**

Phase 1 Habitat Survey

3.6 The Study Area is dominated by habitats typical of the valley systems of the Dumfries and Galloway area, where the acidic and peaty conditions of higher altitude hills support heath and bog systems, which give way to assemblages of roughly grazed slopes and more intensively managed pastures in the valleys and easily accessible plains. The area is punctuated throughout by connected blocks of mature commercial forestry, which was historically planted in wetter, acidic areas where grazing opportunities were limited. Broadleaved woodland is typically restrained to riparian corridors, forestry edges and small isolated fragments of historically larger woodlands.

3.7 The Study Area also included the A76 and the railway line to the north and the access track and several buildings associated with Glenglass Sub-station to the south.

3.8 **Table 3.1** provides a breakdown of the primary and secondary phase 1 and NVC habitats recorded and their relative land take within the Study Area.

Table 3.1: Phase 1 Habitats Recorded within the Study Area

Phase 1 Habitat – Primary Habitat Code	Phase 2 Habitat Survey – Secondary Habitat Code	NVC Code (where appropriate)	Total Habitat Area (Ha)	Proportion of Study Area (%)
A1.1.1 Broadleaved woodland (semi-natural)	B4 Improved grassland, G2 Running water	W11 *Quercus petraea-Betula pubescens-Oxalis acetosella* woodland	7.354	1.044%
A1.1.2 Broadleaved woodland (plantation)	A2.1 Scrub (dense/continuous), B2.2 Neutral grassland (semi-improved), B5 Marshy grassland	N/A	20.909	2.969%
A1.2.2 Coniferous plantation woodland	A1.1.2 Broadleaved woodland (plantation), B2.2 Neutral grassland (semi-improved), B5 Marshy grassland	N/A	159.021	22.579%
A1.3.1 Mixed Woodland (Semi-natural)	G2 Running water	N/A	1.079	0.153%
A1.3.2 Mixed woodland (plantation)	B5 Marshy grassland	N/A	16.404	2.329%
A4.2 Felled Coniferous woodland	B2.2 Neutral grassland (semi-improved), C1.1 Bracken (continuous), D6 Wet heath/acid grassland	N/A	17.271	2.452%
B1.2 Acid Grassland (Semi-improved)	C1.2 Bracken (scattered)	U2 *Deschampsia flexuosa* grassland	2.556	0.363%
B1.2 Acid grassland/ C1.2 Bracken mosaic	N/A	N/A	11.056	1.570%
B2.2 Neutral Grassland (Semi-improved)	B5 marshy grassland, A3.3 Mixed scattered trees	N/A	12.737	1.809%
B4 Improved Grassland	N/A	N/A	12.176	1.729%
B5 Marshy Grassland	A3.1 Broadleaved scattered trees, A3.1 Broadleaved scattered trees, A3.3 Mixed scattered trees	M23 *Juncus effusus/ acutiflorus-Galium paluste* rush-pasture	223.260	31.701%
	N/A	MG10 *Holcus lanatus-Juncus effusus* rush-pasture		

[9] NatureScot (no date) A guide to understanding the Scottish Ancient Woodland Inventory (AWI). Available at: https://www.nature.scot/doc/guide-understanding-scottish-ancient-woodland-inventory-awi [Accessed October 2022]

Phase 1 Habitat – Primary Habitat Code	Phase 2 Habitat Survey – Secondary Habitat Code	NVC Code (where appropriate)	Total Habitat Area (Ha)	Proportion of Study Area (%)
	B1.2 Acid grassland (semi-improved), B2.2 Neutral grassland (semi-improved), D6 Wet heath/acid grassland	N/A		
D2 Wet dwarf shrub heath	N/A	M15 *Scirpus cespitosus-Erica tetralix* wet heath	0.230%	0.033%
		U5 *Nardus stricta-Galium saxatile* grassland	0.230%	0.033%
D6 Wet Heath/ Acid Grassland	N/A	M15 *Scirpus cespitosus-Erica tetralix* wet heath	32.036	4.549%
		U5 *Nardus stricta-Galium saxatile* grassland	32.036	4.549%
		N/A	6.328	0.899%
	B5 Marshy grassland	N/A	3.425	0.486%
E1.7 Wet Modified Bog	A3.1 Broadleaved scattered trees	M25 Molina caerulea-Potentilla erecta mire	34.880	4.953%
G2 Running Water	N/A	N/A	1.700	0.241%
I 2.1 Quarry	N/A	N/A	0.185	0.026%
J1.1 Arable	N/A	N/A	95.222	13.521%
J3.6 Buildings	N/A	N/A	0.647	0.092%
J4 Bare Ground and Hard Standing	N/A	N/A	13.534	1.922%
Total			**704.273**	**100%**

A1.1.1 Broadleaved woodland (semi-natural)

3.9 Semi-natural broadleaved woodland habitat is primarily limited to the peripheries of the railway line and the riparian corridor associated with the River Nith to the north of the Study Area. The dominant species present within the canopy were: alder *Alnus* spp, silver birch *Betula pendula*, hawthorn *Crataegus monogyna*, rowan *Sorbus acuporia*, sitka spruce *Picea sitchensis*, sycamore *Acer pseudoplatanus* with abundant: hazel *Corylus avellana*, poplar species *Populus* spp. sessile oak *Quercus petraea*, and willow species *Salix* spp.

3.10 The dominant species present within the ground cover layer were: jointed rush *Juncus articulates*, soft rush *Juncus effuses*, tufted hair grass *Decampsia cespitosa*, Yorkshire fog *Holcus lanatus*, with abundant common bracken *Pteridium aquilinum,* common bent *Agrostis capillaris L*, creeping bent *Agrostis stolonifera*, fern spp *Polypodiophyta* spp., common nettle *Urtica dioica*, rosebay willow herb *Chamaenerion angustifolium*, sharp flowered rush *Juncus acutiflorus*. The following species were frequent: annual meadow grass *poa annua*, common sorrel *Rumex acetosa* L, common speedwell *Veronica persica,* creeping thistle *Cirsium arvense*, Fern species, *Gallium* species, purple moor grass *Molinia caerulea*, tormintil, tufted hair grass, *Rhytodidelphus* spp., Scabious species, sweet vernal grass *Anthoxanthum odoratum* L., marsh thistle *Cirsium palustre*. In addition, the following species were occasional: crested dogstail *Cynosurus cristatus*, coltsfoot *Tussilago farfara*, marsh willowherb *Chamaenerion angustifolium* and spear thistle *Cirsium vulgare* with rare cleavers *Galium aparine* L., ling heather *Calluna vulgaris*, narrow leaved birdsfoot trefoil *Lotus tenuis*, red stem feathermoss *Pleurozium schrebe,* Scottish bellflower *Campanula rotundifolia* and yarrow *Achillea millefolium*.

A1.1.2 Broadleaved woodland (plantation)

3.11 Broadleaved woodland plantation cover was primarily limited to the north of the Study Area and peripheries of Forestry and Land Scotland Corserig commercial coniferous plantation at the centre of the Study Area. Species present included frequent alder, silver birch, hawthorn, rowan, and occasional hazel. The ground cover habitat included frequent: bramble *Rubus fruticosus*, Broad leaved dock *Rumex obtusifolius* L, common bent, common nettle *Urtica dioica*, creeping bent, heath rush *Juncus squarrosus*, jointed rush, lesser celandine *Ficaria verna*, soft rush, Yorkshire fog and occasional common bracken, coltsfoot, common sorrel, creeping thistle *Cirsium arvense,* daisy *Bellis perennis*, spear thistle *Cirsium vulgare*, tormentil and red stem feathermoss.

A1.2.2 Coniferous plantation woodland

3.12 Commercial forestry plantation is prolific across the Study Area, with five main plantation blocks present:

- Inkstall Plantation 1 to the north of the Study Area: Young conifer plantation
- Inkstall Plantation 2 to the south of the A76 – mature conifer plantation
- FLS Corserig Plantation close to the centre of the Study Area – young/ mature conifer plantation
- FLS Euchanhead Plantation – Mature conifer plantation

3.13 The dominant species were Sitka spruce and Norway spruce *Picea abies* varying from semi-mature to mature in age and rowan. Other species included frequent sliver birch, occasional yew *Taxus baccata* and Scots pine *Pinus sylvestris*.

3.14 Beneath the canopy there was dominant mountain fern moss *Hylocomium splendens,* common bent grass*,* abundant creeping buttercup *Ranunculus repens,* jointed rush, Yorkshire fog, and frequent soft rush, red stem feather moss, annual meadow grass and occasional S*phagnum fallax*, P*olytricum* mosses, common sorrel, creeping thistle nettle, broadleaved dock *Rumex obtusifolius* L, chickweed *Stellaria media*, creeping buttercup *Ranunculus repens* and wavy hair grass *Avenella flexuosa*. The following species were frequent: harestail cotton grass, P*olytrichum commune* and wood moss *Hylocomium splendens*. Occasional bilberry *Vaccinium myrtillus* L, bramble, lady fern *Athyrium filix-femin*, ling heather, *Rhytodidelphus squarossus*, *Sphagnum fallax*, tormentil, and wavy hair grass and white clover were recorded. Marsh fern *Thelypteris palustris,* sneezewort *Achillea ptarmica,* Timothy *Phleum pratens* and wood fern *Dryopteris expansa* were rarely recorded within this habitat.

A1.3.1 Mixed woodland (semi-natural)

3.15 Several small areas of mixed woodland were identified in proximity of the Polbroc Burn close to the centre of the Study Area. This area appeared to be a result of natural self-seeding of broad-leaved species within the corridor of the water course and windblown seeding from coniferous species from the adjacent plantations. The abundant species within the habitat were: alder, birch, hazel, sitka spruce, soft rush, sycamore and rowan an willow. Annual meadow grass, broadleaved dock, common nettle, lady fern, oak and rosebay willow herb were frequent with occasion bramble and ling heather.

A1.3.1 Mixed woodland (plantation)

3.16 A small area of mixed plantation was present around the northern peripheries of FLS Corserig plantation, the canopy was dominated by rowan, sycamore and Norway spruce with abundant alder, birch, hazel, sessile oak*,* sitka spruce and willow *Salix* spp. The understorey was comprised of abundant soft rush with frequent annual meadow grass, common bent, creeping bent grass, nettle, broadleaved dock, jointed rush, lady fern *Athyrium filix-femin*, purple moor grass *Molinia caerulea*, tufted hair grass, rosebay willowherb and Yorkshire fog, Occasional bramble and ling heather were also recorded.

A2.1 Scrub (Dense/ Continuous) and A2.2 Scattered Scrub

3.17 An area of dense and continuous scrub was recorded around the FLS Euchanhead plantation within the south of the Study Area, connecting with and forming a mosaic with marshy grassland habitat (See below). The dominant species within this habitat was

rosebay willow herb and abundant alder, common bent, common nettle, creeping thistle, hawthorn, silver birch, soft rush and willow species. Frequent oak, rowan and wild cherry.

A3.1 Scattered Trees (Broadleaved, Coniferous and Mixed)

3.18 Scattered self-seeded alder, birch, rowan and sitka spruce were present at various locations across the Study Area.

A4.2 Felled Coniferous Woodland

3.19 The south west section of the FLS Corserig plantation had been felled. Ground cover was dominated by brash which smothered the ground flora which was dominated by: broadleaved dock, common bent grass, common nettle, creeping thistle, cross-leaved heath *Erica tetralix*, bracken, ling heather and soft rush. The following species were abundant: fern species, red fescue, rosebay willow herb, sheep's fescue, sharp flowered rush, silver birch, tufted hair-grass and willow species. Coltsfoot, purple moor grass and tormentil were frequent. The following species were also recorded occasionally: bilberry, bramble, common dandelion, heath bedstraw, oak saplings, sitka spruce, silver birch, *Sphagnum fallax*, Yorkshire fog.The understorey that remains indicated that the underlying soils are acidic in nature and may have historically been heathland

B1.2 Acid Grassland (Semi-improved)

3.20 Small areas of acid grassland habitat are present to the south of Kello Water. In places, this habitat was encroached by small areas of bracken. These areas were dominated by heath rush, matgrass *Nardus stricta,* purple moor grass *Molinia caerulea*, red feather moss, tormentil and wavy hair-grass. The following species were also frequent: heath bedstraw *Galium saxatile, Polytrichum commune,* sheep's fescue *Festuca ovina*. *Sphagnum* spp., sweet vernal.

3.21 In additional following species were also common bent, creeping buttercup, curly dock *Rumex crispus*, white clover *Trifolium repens* with occasional common bracken, ling heather, matgrass, scabious species, soft rush were also recorded. Bilberry and bog asphodel were rare.

3.22 The acid grassland species were more dominant on slightly higher altitudes and species assemblages suggests an historic transition towards heath and bog species, suggesting a peat-forming soil structure. These areas were subject to grazing by livestock

B1.2 Acid grassland/ C1.2 Bracken Mosaic

3.23 Small areas of acid grassland/ bracken mosaic habitat are present to the south of Kello Water. Acid grassland species are as described above. The areas with bracken were dominated by the following species: annual meadow grass, common bracken, common hogweed, red fescue *Festuca rubra*, matgrass, tufted hair grass, sharp flowered rush, wavy hair-grass and Yorkshire fog. Hawthorn, ling heather tormentil and rosebay willowherb were occasional within this habitat. This area is subject to grazing by livestock which is demonstrated by the colonising species, such as rosebay willowherb, which indicates disturbance to the field layer.

B2.2 Neutral Grassland (semi-improved)

3.24 This habitat is present within the Study Area in small areas between plantation blocks, on steep sloped in proximity to the water courses and in the vicinity of the sub-station. Annual meadow grass, common bent grass, meadow grass. soft rush, sweet vernal grass, wavy hair grass and Yorkshire fog are dominant within this habitat. Common sorrel, creeping buttercup, creeping thistle, lady fern tufted hair grass and white clover are abundant and birch, devil's bit scabious *Succisa pratensis*, hawthorn, sitka spruce, sweet vernal grass, Timothy, tormentil and willow, yarrow were rare within the habitat. This habitat is characterised as rough grazing pasture, rather than naturally occurring neutral grassland.

B4 Improved Grassland

3.25 Two areas of improved grassland recorded within the centre of the Study Area. Once area to the south of Kello Water was in a slightly lower lying valley with semi-improved/ marshy grassland surrounding which allowed easy access for grazing sheep. The other area was located to the north of Polbroc Burn and was an area being used for grazing horses.

3.26 This habitat was dominated by: Perennial ryegrass *Lolium perenne* and Yorkshire fog and buttercup species, perennial ryegrass, rough meadow grass and white clover were abundant. There was also frequent common bent grass and soft rush and occasional common mouse-ear, crested dogstail and sharp flowered rush.

B5 Marshy Grassland

3.27 The marshy grassland was dominant to the north and south of the River Nith and to the west of FLS Corserig plantation and to the east and south of FLS Euchanhead plantation. The species composition of the habitat within the Study Area varied little by location and comprised areas of rough pasture. Species assemblages are limited to those species that can withstand grazing pressure and very few forbs were identified.

3.28 This habitat is dominated by annual meadow grass, hare's-tail cotton grass *Eriophorum vaginatum,* jointed rush, purple moor grass, *Politricum commune*, rosebay willowherb, sharp flowered rush, soft rush, *Sphagnum palustre*, *Sphagnum fallax,* tufted hair grass and Yorkshire fog.

3.29 Abundant species within the habitat included: common bent grass, common marsh bedstraw *Galium palustre,* common sorrel, creeping bent grass, creeping thistle, crested dogs tail, deer grass, heather *Calluna vulgaris,* sheep's fescue, sedge Eriophrum Sp., false oat grass *Arrhenatherum elatius,* hazel, heath rush, common hogweed *Heracleum sphondylium* L., ling heather *Calluna vulgaris*, marsh thistle, marsh bedstraw, purple moor grass, red fescue *Fescuca rubra*, red stemmed feather moss, rough meadowgrass, *Sphagnum capifolium, Sphagnum papilosum*. tormentil, water mint *Mentha aquatica,* and wavy hair grass.

3.30 There were frequent alder, birch, broadleaved dock, common bracken, curly dock, heath wood rush *Luzula multiflora*, marsh bedstraw, marsh thistle, rowan, toad rush *Juncus bufonius*, white clover and wild Angelica *Angelica sylvestris* present.

3.31 The habitat also included occasional bramble, sweet vernal grass, broadleaved dock, bitter cress *Cardamine* spp., mouse ear *Cerastium fontanum*, chickweed and *Rhytodidelphus squarosus*, black sedge *Carex nigra,* creeping buttercup, cross leaved heath, devils bit scabious, field horsetail *Equisetum arvense*, foxglove *Digitalis* spp, goat willow, hard fern *Blechnum* spp., hawthorn, marsh violet, meadowsweet *Filipendula ulmaria*, opposite leaved golden saxifrage *Chrysosplenium oppositifolium*, spear thistle , sycamore, white clover, willow and wood rush Luzula spp.

3.32 The following species were recorded within this habitat although their occurrence was rare in distribution: bog asphodel *Narthecium ossifragum*, Scottish bellflower *Campanula rotundifolia*, sphagnum moss *Sphagnum fallax*, bog myrtle Myrica Gale, bottle sedge *Carex rostrata,* butterwort *Pingulica* spp., common knapweed *Centaurea nigra,* crowberry *Empetrum nigrum*, figwort *Scrophularia* spp, marsh violet, ragged robin *Silene flos-cuculi*, ragwort *Senecio jacobaea* L. and star sedge *Carex echinate*.

D6 Wet Heath

3.33 This habitat was present to the south of the Study Area, to the east of FLS Euchanhead plantation and is above 300m in altitude. This habitat is present in a mosaic of acid grassland. The species assemblage suggests an historic transition towards bog species, suggesting a peat-forming soil structure. These areas were subject to grazing by livestock

3.34 The dominant species recorded included: bilberry *Vaccinium myrtillus* L, hares-tail cotton grass species *Eriophotum vaginatum*, deer grass *Trichophorum cespitosum* , purple moor grass, polytrichum mosses, *Sphagnum palustre*, and wavy hair grass. These species indicate the presence of underlying acidic soil conditions and potentially underlying peat.

3.35 Abundant cross leaved heath, creeping thistle, common bent, heath rush, heather C*alluna vulgaris,* jointed rush, matgrass, tormentil and frequent bracken, sheep's fescue, red fescue, sharp flowered rush and soft rush were present. Marsh bedstraw *Galium palustre, Sphagnum capilaris*, soft rush and tufted hair grass was also frequent.

3.36 Occasional bracken, buttercup, cross leaved heath, crowberry. heath bedstraw, *Rhytodidelphus* moss, *Sphagnum fallax* were also recorded. The following species were rare within the wet heath habitat within the Study area: bog violet *Viola uliginosa* and bottle sedge *Carex rostrata*.

E1.7 Wet Modified Bog

3.37 Several small areas of wet modified bog were present to the west of Lagrea Burn, to the south of the River Nith, to the west of the Inkerstall commercial plantation and to the north of Polmeur Burn within the Study Area. The communities present are comprised of poor quality bog and mire, that are heavily influenced by historic and current agricultural practices (including drainage and grazing).

3.38 This habitat was dominated *by* purple moor-grass, P*olytricum* and *Sphagnum fallax* mosses and soft rush, with red stem moss and sharp flower moss being abundant. There is also frequent hares-tail cotton grass, heath rush, step moss *Hylocomium splendens* and tufted hairgrass. In addition, there was occasional common sorrel, heath bedstraw, heath wood rush and marsh thistle and rare recording of heather, marsh violet *Viola palustris* and rare *Scottish bellflower,* and Sphagnum moss species.

E1.8 Dry Modified Bog

3.39 There are several localised areas of dry modified bog within the Study Area, these areas are much degraded due to heavy grazing. These areas are dominated by false oat-grass and deer-grass, purple moor-grass, red fescue, red-stem feather moss and wavy hair grass with abundant hares-tail cotton grass and crowberry. Ling heather, P*olytricum* species, soft rush and tormentil were frequent, black sedge and Sphagnum mosses were occasional. Sitka spruce saplings were also present but these were rare.

G2 Running Water

3.40 There are five main water courses within the Study Area: River Nith, Kello Burn, Thwater Burn, Polmeur Burn and Euchan Water. The River Nith is the largest water course within the Study Area. In addition, there is also a network of small tributaries and drainage channels within the Study Area.

3.41 The River Nith is approximately 12m wide and 1m deep with varied substrates of stones and cobbles with some boulders and bedrock in places. The main water body appeared to be clear at the time of survey and flow was smooth with some ripples. Earth banks with Riparian on north bank includes broadleaved trees, ground flora includes ramsons which leads up to a steep slope to railway line. South Bank is marshy grassland with sheep grazing.

3.42 The Kello Water channel is approximately 5-6m wide with moderate flow, however it is turbulent sections. The other water courses within the Study area are predominantly located within the grassland habitats previously described and have a variety of stone/ cobbled substrate. Where in-stream vegetation was present this was dominated by common bent, jointed rush, soft rush, and sweet vernal grass.

I 2.1 Quarry

3.43 An active quarry was identified within the north-west of the Study Area; this was devoid of vegetation.

J1.1 Arable

3.44 Arable land was present to the north of the A76 and immediately to the north and south of the A76. Several of these fields were being spread with slurry at the time of survey. Daisy, perennial ryegrass, soft rush and white clover were frequent.

J3.6 Buildings

3.45 Three buildings were identified within the Study Area. This included one building, associated with the existing substation, located to the South of the Study Area which was of sheet metal and brick construction. The second building was Whiteside windfarm storage room which is located within the south of the Study Area and is comprised of rough cast walls with an equal pitched roof. The third building recorded was located within the North of the Study Area. The stone cottage included a double pitched roof, however the route has been altered to avoid this feature.

J4 Bare Ground and Hard Standing

3.46 There are several areas of bare ground/ hard standing present within the south of the Study Area, this is predominantly comprised of access tracks/ roads and loading areas associated with forestry activities. These areas were largely devoid of vegetation, however there was sporadic willow regeneration and encroachment of the following species on bare ground areas: daisy, brambles, broad leaved dock, buttercup, cocksfoot, hairy bitter crest, marsh thistle, red fescue and soft rush.

National Vegetation Classification Survey Communities

3.47 The majority of habitats within the Study Area are considered to be common and widespread within the context of the wider landscape. However, **Table 3.2** provides further details of those habitats of conservation concern identified within the Study Area where NVC surveys were undertaken.

3.48 The NVC communities are also described below. This should be read in conjunction with**, Figure 8.2.3** and photographs in **Annex A.**

Table 3.2: Habitats of Conservation Concern Identified for NVC Survey

Phase 1 Habitat Type	NVC Code where appropriate	Policy Priority	Total Habitat Area (Ha)
A1.1.1 and A1.1.2 Broadleaved woodland (semi-natural and plantation)	W11 *Quercus petraea-Betula pubescens-Oxalis acetosella* woodland	Dumfries and Galloway Biodiversity Action Plan	28.2635
A1.3.2 Mixed Woodland (Plantation)	N/A	Dumfries and Galloway Biodiversity Action Plan	
B1.2 Acid Grassland (semi-improved)	U2 *Deschampsia flexuosa* grassland	Scottish Biodiversity List	1.2780
B5 Marshy Grassland	M23 *Juncus effusus/ acutiflorus-Galium paluste* rush-pasture	Dumfries and Galloway Biodiversity Action Plan, potential GWDTE	19.1179
	MG10 *Holcus lanatus-Juncus effusus* rush-pasture		32.5262
D2 Wet dwarf shrub heath	M15 *Scirpus cespitosus-Erica tetralix* wet heath	Annex 1 habitat[10], Scottish Biodiversity List	0.2296
	U5 *Nardus stricta-Galium saxatile* grassland	Scottish Biodiversity List	0.2296
D6 Wet Heath/ Acid Grassland	M15 *Scirpus cespitosus-Erica tetralix* wet heath	Annex 1 habitat, Scottish Biodiversity List, Dumfries and Galloway Biodiversity Action Plan, potential GWDTE	32.0358
	U5 *Nardus stricta-Galium saxatile* grassland		32.0358
E1.7 Wet Modified Bog	M25 *Molina caerulea-Potentilla erecta* mire	Scottish Biodiversity List. Dumfries and Galloway Biodiversity Action Plan, potential GWDTE	24.1796
	N/A		10.6999
G2 Running Water	N/A	Scottish Biodiversity List. Dumfries and Galloway Biodiversity Action Plan.	0.0015
Total			**180.5976**

Broadleaved Woodland (Semi-natural) W11 *Quercus petraea-Betula pubescens-Oxalis acetosella* woodland

3.49 This woodland community was recorded on the steep rocky slopes of the River Nith to the north of the Study Area, See **Appendix A - Figure 8.3.3**. This area was dominated by sessile oak and birch with frequent common nettle, brambles, broadleaved dock, lesser celandine. Soils were free draining and showed signs of grazing.

[10] JNCC. Description of Northern Atlantic Wet Heaths with *Erica tetralix*. Available At: https://sac.jncc.gov.uk/habitat/H4010/ (accessed 11/11/22)

Acid Grassland - U2 *Deschampsia flexuosa* grassland

3.50 This acid grassland community was dominated by wavy-hair grass and jointed rush with occasional soft rush and rare Sphagnum moss and was recorded to the south of Kello Water within the Study Area, See **Appendix A - Figure 8.3.3**. This habitat is characterised by the moist but free draining soils and has been degraded due to nutrient enrichment as a result of over-grazing.

Acid Grassland - U5 *Nardus stricta-Galium saxatile* grassland

3.51 This acid grassland community was present within a mosaic of acid grassland and wet heath to the south of the Study Area, See **Appendix A - Figure 8.3.3**. The community was dominated by cross-leaved heath, deergrass, jointed rush, soft rush and wavy-hair grass with frequent heather, harestail cotton-grass and Sphagnum mosses. This habitat has been degraded due to nutrient enrichment as a result of over-grazing.

Marshy Grassland - M23 *Juncus effusus/ Acutiflorus-Galium paluste* rush-pasture

3.52 This marshy grassland community was recorded in the vicinity of the River Nith and to the west of FLS Corserig plantation and to the east and south of FLS Euchanhead plantation within the Study Area, See **Appendix A - Figure 8.3.3**. Prevailing conditions within this habitat are wet, moderately acid to neutral peaty and mineral soils. The communities present are comprised of poor quality marshy grassland, that is heavily influenced by historic and current agricultural practices (including drainage and grazing). The habitat was species poor, with vegetation dominated by soft rush and abundant common sorrel, crested dogstail, marsh thistle, tufted hair-grass, jointed rush. Heath wood rush, purple moor grass and rare Sphagnum moss and Yorkshire fog.

Marshy Grassland - MG10 Holcus lanatus-Juncus effusus rush-pasture

3.53 This marshy grassland community was recorded to the north of the Study Area, See **Appendix A - Figure 8.3.3**. This habitat is characteristic of permanently moist and periodically inundated soils. This habitat has been degraded due to nutrient enrichment as a result of over-grazing. This habitat is dominated by soft rush, with abundant common sorrel, Yorkshire fog, and frequent broad-leaved dock, marsh thistle, tufted hair-grass

Wet Heath - M15 *Scirpus cespitosus-Erica tetralix* wet heath

3.54 This M15 community is recognised as an Annex 1 habitat under the Habitats Regulations. One localised area of this plant community was recorded to the south of the Study Area to the east of FLS Euchanhead plantation, See **Appendix A - Figure 8.3.3**. This was dominated by heather with frequent cross-leaved heath, deergrass, hairs-tail cotton grass purple-moor grass and soft rush. However, the habitat was very degraded with the presence of drainage channels up to 2m deep and is comprised of poor quality heath, that is heavily influenced by historic and current agricultural practices (including drainage and grazing).

Wet Modified Bog - M25 *Molina caerulea-Potentilla erecta* mire

3.55 This localised wet modified bog community was recorded in small areas to the west of Lagrea Burn, to the south of the River Nith, to the west of the Inkerstall commercial plantation and to the north of Polmeur Burn within the Study Area. See **Appendix A - Figure 8.3.3**. This community occurs on moist but well-aerated acid to neutral peats and mineral soils sometimes on the margins of springs and the drier fringes of mires and bogs, and it typically closely associated with wet heath and other wet grasslands.

3.56 The communities present are comprised of poor quality bog and mire, that is heavily influenced by historic and current agricultural practices (including drainage and grazing).

3.57 This habitat was dominated by purple moor-grass and soft rush with frequent heath wood rush, red stem moss, sharp flower moss and rare P*olytricum* and *Sphagnum fallax.* It generally lacked diversity and abundance of sphagnum species.

Groundwater Dependant Terrestrial Ecosystems (GWDTE)

3.58 Five NVC communities were recorded which potentially indicated groundwater dependency according to SEPA guidance[3] interpretation of potential groundwater dependency based on the vegetation alone. The communities present are comprised of poor quality marshy grassland, heath and bog that is heavily influenced by historic and current agricultural practices (including drainage and grazing).

3.59 The NVC data gathered, coupled the site walk overs undertaken by hydrologists, confirmed that due to the vegetation composition, topographic and hydrological setting, none of the habitats within the Study Area were considered to be GWDTE's.

3.60 Also see para 7.5 and 7.70, **Chapter 7 : Hydrology, Geology, Hydrogeology, Peat and Water Resources,** .

Chapter 4
Discussion

Habitats of Conservation Concern

4.1 A desk study was undertaken to inform habitat and vegetation surveys. An account of the method adopted, and findings, is provided in **Technical Appendix 8.1** which also sets out the legislative provisions afforded to habitats, notably habitats of conservation concern.

4.2 Eight Habitats of conservation interest were recorded within the Study Area are detailed in **Table 3.2** above, of these:

- Once Annex 1 habitat (M15).
- Five Scottish Biodiversity List habitats: acid grassland, wet heath, wet modified bog, dry modified bog and rivers.
- Seven Local Biodiversity Plan Priority habitats: Broadleaved woodland (semi-natural and plantation), mixed woodland (Plantation), acid grassland (semi-improved), marshy grassland, wet heath, modified bog and rivers
- Five potential GWDTE communities: M15, M23, MG10, M25, and U5. Within the Study Area the marshy/ acid grassland and modified bog habitats present could reflect a degree of groundwater dependency. However, field studies identified that these features are predominantly purple moor grass wavy-hair grass and soft rush, on heavily acid/ marshy grassland and modified bog which has peat less than 0.5m in depth, and on ground which includes a network of small watercourses and field drains. As detailed in **Chapter 7** of the EIA Report, as there are no GWDTE habitats areas are present within the Study Area, an assessment of potential effects on GWDTEs has not been undertaken.

4.3 All of the Habitats of Conservation Concern recorded within the Study Area were very degraded and were heavily influenced by historic and current agricultural practices (including drainage and grazing) and were of poor quality with generally low species diversity.

Precautionary Mitigation

A series of species-specific mitigation measures set out below have been adopted within the development aimed to protect habitats during the construction phase of the development. These measures represent a combination of standard, well-rehearsed techniques and measures specifically designed for the development.

- The development and application of a Construction Environment Management Plan (CEMP), which will set out guidance on compliance with nature conservation legislation and policy;
- Production of a Pollution Prevention Plan (PPP) and adherence to Guidelines on Pollution Prevention (GPPs), which will significantly reduce the likelihood and severity of pollution events;
- Production of Construction Method Statements (CMS);
- Production of a Water Protection Plan (WPP) and a CAR construction site licence (CSL) will be obtained from SEPA. This will include the application of appropriate buffers around watercourses, which will protect riparian habitat while reducing disturbance and the likelihood of pollution events;
- Production of a Peat Management Plan to set out a number of good practice measures in relation to minimising disturbance and the management of peat during construction.
- The use of temporary access roads and ‘brash mats’ to reduce potential for soil erosion;
- Presence of an Environmental Clerk of Works (ECoW) during all operations to provide ongoing support and monitoring. The ECoW role should be developed in accordance with current good practice guideline.

Chapter 5
Closing Statement

5.1 The majority of habitats within the Study Area are considered to be common and widespread within the context of the wider landscape. However, the Study Area supported eight habitats that are recognised to be of conservation concern. A series of standard mitigation measures have been adopted within the development design to safeguard to protect habitats within the Study Area.

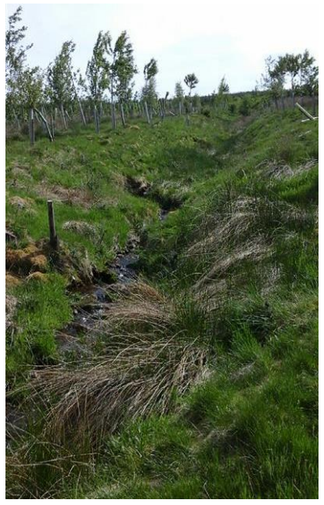
Appendix A

Figures

Appendix B

Habitat Photographs

Table B.1: Habitat Photographs

Habitat Photographs	
A1.1.1 Broadleaved Woodland (Plantation)	**A1.1.2 Broadleaved Woodland (Semi-natural)**
	
A1.2.2 Coniferous Woodland (Plantation)	**A1.3.2 Mixed Woodland (Plantation)**
	
A4.2 Felled Coniferous Woodland	**B1 Acid Grassland and Wet Heath Mosaic**

Habitat Photographs	
	
B5 Marshy Grassland	**E1.7 Wet Modified Bog**
	
B5 Marshy Grassland being Grazed	**D6 Wet Heath/ Acid Grassland Mosaic**

Habitat Photographs

E1.7 Wet Modified Bog, Sheep Grazed

G2 Running Water – Field Drain with Low Flow

G2 Running Water – River Nith

J1.1 Arable Land

Habitat Photographs

J3.6 Building – Derelict Stone Cottage

J4 Bare Ground – Access Track

Appendix B
Habitat Photographs

Glenmuckloch to Glenglass Reinforcement Project
January 2023