Appendix 7.4

Peat Management Plan

Consulting Report

Appendix 7.4 - Peat Management Plan Glenmuckloch to Glenglass Reinforcement Project

Dumfries & Galloway
SPEN

22-LUC-034-D-002v03

13/01/2023

Prepared for
LUC

Client
SPEN

DOCUMENT CONTROL

Version	Description	Prepared by	Approved by	Date
01	Issued as draft	AM	-	19/10/2022
02	Issue	AM	KW	04/11/2022
03	Issue following minor access changes	AM	KW	13/01/2023

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1. INTRODUCTION

1.1. Background

SP Energy Networks (SPEN, the Applicant) is seeking consent under Section 37 of the Electricity Act 1989 and deemed planning permission under section 57 of the Town and Country Planning (Scotland) Act 1997 for construction and operation of the Glenmuckloch to Glenglass Reinforcement Project (GGRP) in Dumfries and Galloway (see Plate 1.1). The GGRP comprises the construction of a new double circuit 132kV steel lattice tower OHL, approximately 9.3km in length, between the new Glenmuckloch substation (also part of the GGRP) and the existing 132kV substation at Glenglass (expansion of which is being proposed under a separate application). It is proposed that 40 steel towers will be installed along the length of the route with ancillary works including forestry felling, access tracks, working areas, laydown areas/construction compounds, winching/pulling areas and watercourse crossings. Further information on the proposals is provided in Chapter 4 of the EIAR ('Development Description').

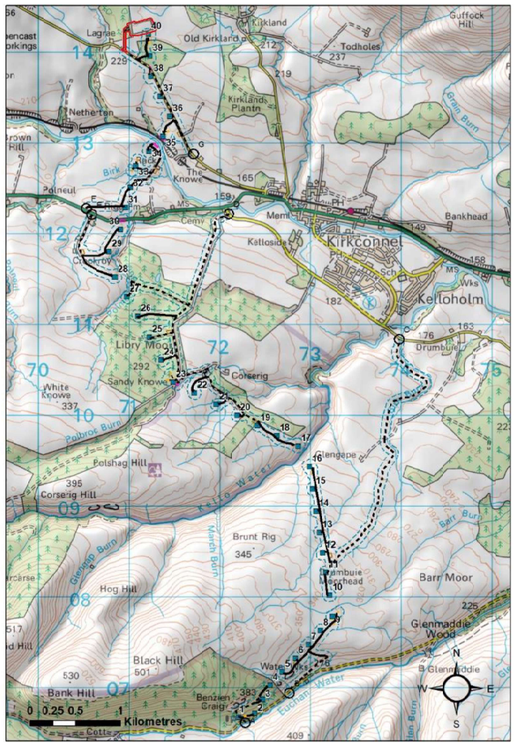

Plate 1.1 The GGRP location

This Peat Management Plan (PMP) follows guidance (Scottish Renewables & SEPA, 2012) on the assessment of peat excavation and reuse for wind farms in Scotland, noting that this guidance is also used for other infrastructure in peatlands). The PMP was prepared in parallel with a Peat Landslide Hazard and Risk Assessment (PLHRA, Appendix 7.5) and is informed by peat depth probing undertaken by Kaya Consulting Ltd and documented in Appendix 7.3.

1.2. Scope of Work

The scope of the PMP is as follows:

- Summarise the design principles adopted for design of the infrastructure with respect to peat soils, including the approach to peat characterisation and the identification of opportunities taken to minimise impacts on peatlands within the GGRP.
- Calculate the potential volumes of peat that may be excavated in association with construction, both acrotelmic and catotelmic peat.
- Identify and justify reuse of acrotelmic and catotelmic peat where it cannot be reinstated at source.
- Identify good practice measures to ensure excavated peat is stored safely and with minimal loss of function prior to its reinstatement.

The report structure is outlined below.

1.3. Report Structure

This report is structured as follows:

- Section 2 provides an outline of relevant guidance relating to the excavation, storage and reuse of peat.
- Section 3 provides an overview of the GGRP and proposed infrastructure based on the scheme described in the main EIAR chapters and on desk study review of site information.
- Section 4 describes the approach to and results of peat excavation calculations and summarises opportunities for reuse of excavated peat soils within the GGRP.
- Section 5 provides general good practice measures and measures specific to the conditions at the GGRP.

Where relevant information is available elsewhere in the EIAR, this is referenced in the text rather than repeated in this report.

2. CONTEXT TO PEAT MANAGEMENT

2.1. Peat as a Carbon Store

Priority peatland habitats comprise blanket bog, lowland raised bog, lowland fens, and part of the upland flushes, fens and swamps, as listed in the UK Biodiversity Action Plan (UK BAP). Blanket bog is the most widespread of these habitat types in Scotland, and therefore it is blanket bog that is usually of relevance for proposed developments in upland areas.

Blanket bogs in the UK started forming in the early Holocene, with most UK bogs initiating prior to 6,000 years ago under cooler and wetter conditions than at present. Where bogs remain waterlogged and peat forming plant species persist, blanket bog is still considered to be actively forming and accumulating organic matter, and therefore can be considered a carbon sink. A bog that is not losing carbon/peat but is no longer accumulating organic matter can be considered a carbon store, and a degrading bog can be considered a carbon source (Mills et al, 2021).

A peatland may change state between sink, store and source through natural processes or as a result of human activity. The purpose of the peat management plan is to avoid impacts on the peat carbon stores at the GGRP by avoiding peat, where possible, or by minimising impacts where peat cannot be avoided. Where there are opportunities to improve peat condition, e.g., through restoration, and in so doing, help convert carbon sources into stores or sinks, this may also be facilitated by the peat management plan.

2.2. Good Practice Guidance

Where peat is to be excavated in association with built infrastructure, it may be considered to be a waste product under the following legislation:

- Environmental Protection Act 1990 (as amended).
- Landfill (Scotland) Regulations 2003 (as amended).
- The Waste Management Licensing (Scotland) Regulations 2011.

To address this legislation, a number of guidance documents have been issued to assist applicants in responsibly planning, installing and operating infrastructure in peatland settings. This PMP has been informed by this collective good practice, which includes the following documents:

- Good Practice during Wind Farm Construction, Version 4 (Scottish Renewables, Scottish Natural Heritage, Scottish Environmental Protection Agency, Forestry Commission Scotland, 2019).
- Developments on Peat and Off-Site Uses of Waste Peat, WST-G-052 (SEPA, 2017).
- Peatland Survey. Guidance on Developments on Peatland (Scottish Government, Scottish Natural Heritage and SEPA, 2017a).
- Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments (Second Edition) (Scottish Government, 2017).
- Carbon and Peatland 2016 Map (GIS) (Scottish Natural Heritage, 2016a).
- Carbon-rich Soils, Deep Peat and Priority Peatland Habitat Mapping, Consultation Analysis Report (Scottish Natural Heritage, 2016b).
- Scotland's National Peatland Plan - Working for our future (Scottish Natural Heritage, 2015a).
- Constructed Tracks in the Scottish Uplands, 2nd Edition (Scottish Natural Heritage, 2015b).

- Developments on Peatland: Guidance on the assessment of peat volumes, reuse of excavated peat and the minimisation of waste (Scottish Renewables and SEPA, 2012).
- Floating Roads on Peat - A Report into Good Practice in Design, Construction and Use of Floating Roads on Peat with particular reference to Wind Farm Developments in Scotland (Scottish Natural Heritage and Forestry Commission Scotland, 2010).

In general terms, the guidance considers appropriate activities to be undertaken at the Environmental Impact Assessment stage, post-consent/pre-construction and construction stages. The overarching principles are generally the same across the different guidance documents and are set out below.

During EIA:

i. Determine at a sufficient level of detail the distribution of peat within a site to assess the likely level of impact of proposed works.

ii. Calculate the volumes of peat likely to be excavated during construction.

iii. Demonstrate how excavated peat will be managed (ii and iii together comprising an assessment of the "peat and soil balance").

These activities are normally considered within a PMP, delivered as part of the Environmental Impact Assessment Report (EIAR) at the planning stage.

Where a development is given a consent, during the pre-construction period:

i. Calculate a refined peat and soil mass balance through further site investigation works (including intrusive works such as detailed probing across final infrastructure footprints and/or trial pits to verify the nature of probed materials).

ii. Draft further detailed topographic survey and design level excavation, storage and reuse plans to enable contractors to bid for and implement the works.

iii. Identify key good practice measures within the PMP that integrate with other related plans or control documents for construction, including, where applicable, the Construction and Decommissioning Environmental Management Plan, Site Waste Management Plan, Habitat Management Plan (where relevant) and Geotechnical Risk Register.

During the construction stage:

i. Utilise micro-siting to optimise infrastructure locations relative to final pre-construction information gathered on site.

ii. Monitor, adjust and implement the PMP to accommodate deviations in expected peat volumes and adapt reuse measures to actual site volumes.

iii. Set-up monitoring programmes to identify the new post-construction baseline and provide a basis for monitoring the success of the PMP and identify appropriate mitigation where necessary.

Through the different stages of the project, the strategy should be to prevent disturbance to and losses of peat through appropriate reuse, wherever possible.

2.3. Approach for GGPR

The strategy for peat management for the Proposed Development follows SEPA's guidance for developments on peat and uses of waste peat (SEPA, 2017). The hierarchy is as follows:

- **Prevent** the creation of waste peat by minimising overlap of infrastructure with peat, where it is possible to do, and given other site and design constraints that may influence tower locations and associated infrastructure (such as tracks).
- **Reuse** peat on site in construction, reinstatement or in restoration (restoring off-site will require environmental authorisation).
- **Recycle** as a soil substitute or for use in other works (where on-site or off-site use in restoration is not possible).
- **Dispose**, only if all other options have been explored and discounted.

At the GGRP, a combination of prevention and reuse has formed the peat management strategy. Outline details of this strategy are provided below, and full detail of excavation and reuse proposals are provided in Section 4.

2.3.1. Prevent

Prevention involves minimising the amount of peat excavated during construction by informed layout planning. The extent to which this is possible is not just a function of the amount of peat on site, but also of the presence of other constraints (e.g., landscape visual impacts, hydrology, terrestrial ecology) and the practical requirements construction (e.g., tower spacings, acceptable gradients for tracks/working areas).

2.3.2. Reuse

The primary reuse strategy for peat management is to use peat to reinstate temporary construction locations and dress permanent infrastructure to help prevent degradation of exposed aggregate surfaces. Reinstatement approaches are derived from the Good Practice guidance detailed in Section 2.1 and from wider good practice approaches developed as part of construction in peatlands over the last few years and include:

This is considered in further detail in Section 4.

2.3.3. Restore

There are limited opportunities to use peat in restoration within the GGRP, since there are no peat cuttings, no gullied or eroded areas requiring restoration and drains are relatively minor in dimensions (which, if they were to be restored, would be dammed using conventional peat dams rather than by using borrowed materials).

2.3.4. Disposal

Disposal is not anticipated as part of the construction works for the Proposed Development.

3. DESK STUDY

3.1. Topography

The GGRP has a north-to-south alignment between the proposed Glenmuckloch Substation (c. 230m) on footslopes to the south of Kirkland Hill and Niviston Hill in the north and the Glenglass Substation (c. 290m, the extension of which is proposed under a separate application) below Bank Hill and Black Hill in the south (**Figure 7.4.1**). The proposed overhead line (OHL) contours to the south and east of Black Hill before descending towards the Kello Water (c. 200m), then contouring the footslopes of Hunter's Hill before descending Libry Moor to cross the River Nith (c. 160m), rising again to the Glenmuckloch Substation.

The hillslopes are generally gentle (<5°) to moderate (<10°) in slope angle for much of the route (**Figure 7.4.2**), other than where towers are sited on valley sides above watercourses (e.g. around Kello Water) or on the footslopes below Black Hill (<15°).

3.2. Peat Depth

Peat depth probing was undertaken by Kaya Consulting in several phases between November 2020 and August 2022, in accordance with Scottish Government (2017) guidance, and described in detail in Appendix 7.3 of the EIAR:

- Peat probing was undertaken on 10m grids for all tower footprints, working areas and the Glenmuckloch substation, with probing at 50m intervals and 10m to 30m offsets along access tracks.
- A total of 2,908 locations were probed, with the iterative nature of the probing programme used to steer successive phases of probing towards areas with deep peat (>0.5m).
- In all cases, probed locations fell well within the maximum probe length (5m) and therefore the full depth of peat was recorded in all cases.
- A subsample of peat cores was undertaken using a gouge auger (shown in Figure 6A of Appendix 7.3).

Approximately 80% of probed locations recorded organic soil (depths <0.5m) while 19 of 37 cored locations were in areas of deep peat. Core logging undertaken by the probing team indicated the acrotelm to be c. 0.3m deep, where present. Substrate material was noted to be clay rich.

Interpolation of peat depths was undertaken in the ArcMap GIS environment using an inverse distance weighted approach. This approach was selected because it preserves recorded depths at each probe location, unlike some other approaches (e.g. kriging), is computationally simple, and minimises 'bullseye' effects. The approach was selected after comparison of outputs with three other methods (natural neighbour, kriging and TIN).

The peat depth model is shown on **Figure 7.4.3** with probing locations superimposed. Peat generally occurs in isolated pockets along the OHL route, other than on the eastern flanks of Black Hill on Drumbuie Moorhead where deposits are more extensive. Here, peat depths reach up to 2.0m, but are more typically 1.0-1.5m between Towers 8 and 11. Other pockets of shallower peat occur between Towers 5 and 6, Towers 21 and 22, between Towers 33 and 34, to the north of Tower 28 and in localised areas around the proposed Glenmuckloch Substation.

There is a small section of access track towards Tower 7 which was amended at a late stage and for which it was not possible to acquire peat depth data. Based on the slope angle in this area (>10° and

frequently >15°) and on the relationship between peat depth and slope in this part of the site (peat is only found in pockets on the gentler slopes above), the likelihood of encountering peat in this area is considered to be very low.

Efforts have been made to minimise overlap as far as possible, resulting in:

- Minor overlap of the proposed Glenmuckloch Substation on peat at the northern limit of the GGRP.
- 29 of 40 towers and their foundations avoiding peat altogether, with only 4 towers overlapping with peat exceeding 1.0m in depth.
- Of the 8.3km of new, temporary access track, only c. 1,200m is routed over peat (where defined as >0.5m depth).

As a result, the proposed layout has prevented peat excavation over the majority of its footprint.

3.3. Peat Geomorphology and Condition

Satellite imagery available as an ArcGIS Basemap layer was used to interpret and map features within the site boundary. Additional imagery from different epochs available on both Google Earth™ and bing.com/maps was also referred to in order to validate the satellite imagery interpretation. Publicly available high resolution (0.5m) LiDAR data also informed the mapping, and this data is often sufficiently resolute to identify instability features (depressions, lobes of runout) even where these are not visible on aerial or satellite imagery. The resulting geomorphological map is shown on **Figure 7.5.4** of the PLHRA. Mapping was undertaken by a Chartered Geologist / peatland geomorphologist with over 20 years' experience of assessing peat landslides, and key features of interest were inspected in the field by the probing team.

In keeping with the relatively minor peat depths along much of the route, peatland geomorphological features are generally lacking with little evidence of gullying, pool systems or features typical of intact upland peatlands. Where peat is present, it is typically planar (i.e., undissected), or on the southeast slopes of Black Hill punctuated by occasional areas of rock close to surface. A number of the minor watercourses along the route are apparent as vegetation rich gullies and flushes. Elsewhere, away from the peat soils, the valley sides of main watercourses are locally steep into V-shaped valley floors. There are no areas of open, bare peat suitable for turf translocation

The Carbon and Peatland (2016) Map indicates the vast majority of the route to lie within Class 3, Class 5 and mineral soils, with a small pocket of Class 1 adjacent to Tower 8. This means that while peat and organic soils are likely to be locally present, peatland habitats are either absent or of poorer quality, the small pocket of Class 1 area excepted. The Class 1 area will not be directly impacted by proposed infrastructure or temporary construction and is located upslope of the working areas (so any short term hydrological changes are unlikely to have indirect effects). Based on interpretation of satellite imagery, there are no distinctive habitat features that differentiate the area from the wider surroundings and it is not clear why this small area has been identified as Class 1.

3.4. Drainage

There are no major eroded gullies with the potential for blocking, reprofiling or peat placement within the GGRP. While drains are numerous, they are limited in size with no accommodation space for peat.

3.5. Land Use

Land use varies along the OHL route with open fells supporting grazing in the south of the route (to the Kello Water) and coniferous plantation north of the Kello Water to the proposed Glenmuckloch Substation. The exceptions are areas of open fell to the west of Libry Wood and to the north and south of the River Nith. The forestry will remain a commercial forest subsequent to construction of the Proposed Development, and therefore there are no opportunities to undertake forest to bog restoration in the vicinity of proposed infrastructure, since, other than north of the proposed Glenmuckloch Substation, there are no areas of peat of sufficient size to restore within the 80m wayleave corridor.

Within the peat covered areas, there are no peat cuttings for restoration. There are no borrow pits proposed as part of the development, and therefore no opportunities for peat reinstatement within such excavations.

4. PEAT EXCAVATION AND STORAGE

4.1. Excavation calculations

The majority of infrastructure comprising the Proposed Development will require full excavation of the peat or soils underlying the infrastructure footprints during construction (see Chapter 4 of the EIAR, 'Development Description'). However, all access tracks and working areas will be reinstated post-construction, with only the access track to the new Glenmuckloch Substation and upgrades to existing tracks remaining in place. The exceptions will be the substation footprint and the foundations for the towers.

In this section, the following terms are used to describe groundworks associated with the GGRP infrastructure:

- **Permanently excavated:** peat will be permanently removed from the infrastructure footprint, stored locally and reused elsewhere.
- **Temporarily excavated:** peat will be temporarily removed from the infrastructure footprint, stored locally and fully reinstated at the point of excavation post-construction.
- **Landscaping:** the process of using peat to 'dress' the boundaries of infrastructure.

It should be noted that due to the narrow and linear infrastructure corridor (with associated tight application area) and generally temporary nature of excavation, there are very few opportunities for reuse of peat in tying in permanent infrastructure. Furthermore, as noted in the previous section, there are no real opportunities to restore peat within the GGRP.

Excavation volumes have been calculated as the product of the average peat depth under each infrastructure footprint (derived from the peat model) and the indicative footprint area (detailed for each infrastructure type below).

For each infrastructure item, the upper 0.3m of the peat profile is assumed to be acrotelm and any remaining depth is assumed to be catotelm. A 0.3m thickness of turf and underlying peat is a sufficiently thick continuous layer to avoid damaging the roots of the excavated vegetation and provide a coherent 'turf' to relay.

Soils less than 0.5m in depth are assumed to be organic (or other) soils other than peat and are classed as 'soil' for the purposes of this assessment. Detailed reuse calculations for these soils have not been undertaken.

4.1.1. Tower foundations and working areas

Each tower location will comprise four leg foundations measuring either 4m x 4m ($16m^2$) or 5m x 5m ($25m^2$) (dependent on tower type, see Chapter 4 of the EIAR) and a working area (50m x 50m or 25m x 25m). Tower foundations will be permanently excavated and peat from these locations will require reuse. Working areas will be temporarily excavated with soils and/or peat stored locally and then reinstated at the point of excavation post-construction.

To calculate excavation and reuse volumes, the following has been undertaken:

- 4m x 4m or 5m x 5m excavations have been digitised within each working area of the proposed layout, with a spacing equivalent to the tower footprint.

- The peat depth model has been used to calculate the mean depth of peat at each leg foundation, with the volume of peat excavation calculated as the product of the footprint (16m^2 / 25m^2) and the peat depth.
- The peat depth model has also been used to calculate temporary excavations within working areas (both tower working areas and ancillary working areas) as a product of the working area footprint and the mean peat depth across each footprint.

While these calculations do involve a minor double count of the peat within the foundation footprints in working areas, this is considered to be a conservative approach to the calculation of volumes and therefore a precautionary approach.

4.1.2. Access tracks

For all new tracks on soil / peat, the track footprint has been multiplied by the mean depth within each peat depth class on **Figure 7.4.3** (e.g., 0.0-0.5m, 0.5-1.0m, etc) to calculate an excavation volume per track segment. The exceptions are three sections of floating track, which have been defined where tracks overlap peat of >1.0m depth for lengths in excess of 100m. Shorter track lengths over peat have not been specified due to the complexity of building floating to cut and fill transitions over such short distances.

The three sections of floating track are shown on **Figure 7.4.3** and are located as follows:

- A 130m section between Tower 40 and Tower 39.
- A 250m section between Tower 11 and Tower 10.
- A 400m section between Tower 9 and Tower 7.

Both cut and fill and floating tracks will be fully removed and the ground reinstated post-construction. It is anticipated that the sections of floating track will experience compression and consolidation under loads from both the aggregates used to construct tracks and from the vehicle passes that take place during construction, leaving a shallow trough along the track alignment.

4.1.3. Substation

The Glenmuckloch Substation and accesss track will be permanently excavated over its full footprint (c. 250m x 120m), though only the northwest corner will be in peat.

The excavated peat and soil volumes based on comparison of the peat depth model with proposed infrastructure are shown in Table 4.1. Figures are quoted to 5m^3 to avoid rounding errors leading to inaccurate totals in later tables rather than to imply accuracy of calculations to 1m^3.

Permanently excavated peat will be generated from the tower foundations and the Glenmuckloch substation and is equivalent to 595m^3 of acrotelm and 1,315m^3 of catotelm (or 1,910m^3 in total). The remaining peat will be reinstated directly at the point of excavation.

Infrastructure	Type of Excavation	Excavation Volume (m^3)			
		Soil	Acrotelm	Catotelm	Peat total
Tower foundations	Permanent	n/a	140	260	400
Working areas	Temporary*	16,700	510	1,390	1,900
Access tracks	Temporary	4,840	1,380	2,990	4,370
Substation and access track	Permanent**	3,750	455	1,055	1,510
	Totals	**25,300**	**2,485**	**5,695**	**8,180**

Table 4-1 Peat excavation volumes for all infrastructure (*includes tower leg foundations, **includes permanent track excavation at Glenmuckloch Substation)

4.2. Direct reinstatement and reuse

Excavated peat will be re-used in two ways:

1. Direct reinstatement of temporary excavations for infrastructure.
2. Creation of a a larger contiguous area of deep peat to the north of the Glenmuckloch Substation by linking two distinct deep peat deposits at either end of its footprint.

Where peat <1.0m deep is temporarily excavated from cut and fill tracks or working areas, it will be stored locally, kept viable and then directly reinstated as the track is removed.

Where peat >1.0m has floating track construction and therefore no excavation, it is anticipated that the underlying peat will undergo secondary compression (following primary consolidation) for the duration of the construction works. This will likely yield a permanent elevation loss to the ground surface (i.e., the ground surface will not 'rebound'). The estimated loss if the full depth of the more compressible acrotelm and c. 0.1m of the underlying catotelm, giving a net elevation loss (or trough depth) of 0.4m.

As a result, there is potential for surface drainage pathways to develop within the resulting troughs. This effect will be mitigated by the reuse of peat generated for permanent excavation (leg foundations) as reinstatement material for these areas. Catotelmic peat will be placed in the base of the troughs and sealed with acrotelmic turves, which will have been excavated and stored separately. Where there is insufficient acrotelm to fully seal the troughs, a checkerboard pattern of turves will be used within the troughs and seeding (with a locally appropriate seed mix) will be undertaken in the bare areas in between.

It is anticipated that all working areas will be reinstated with materials excavated prior to construction and stored locally, with surplus peat displaced by the leg foundations being used for floating track reinstatement (see above). However, there is still anticipated to be a minor peat surplus following track reinstatement, and this peat will be used to form a levelled batter along the north side of the Glenmuckloch substation. This area is located between two large pockets of deep peat (to the west

of a N-S oriented ride, and to the east of the proposed substation). This will create a larger contiguous areas of deep peat along this margin.

The presence of the substation will aid in retaining the peat in-place and keeping the peat wet (since the slope falls gently towards the substation from the north). The proposed batter footprint will be 180m in length by 4m up / downslope, with a mean thickness of 1m. The final geometry of the batter will depend on the actual excavated volumes and the requirements for floating track reinstatement considered above.

Table 4.2 shows reuse volumes based on the descriptions above:

Type of reuse	Re-use Volume (m^3)		
	Acrotelm	Catotelm	Total
Reinstatement within compressed areas of floating track	125	40	165
Reuse to create larger contiguous peat area along northern margin of the Glenmuckloch substation	470	1,275	1,745
Totals	**595**	**1,315**	**1,910**

Table 4-2 Peat reuse volumes Peat Balance

Based on the above, all excavated peat can either be directly reinstated, reused for reinstatement of floating track ground levels, or reused to create a larger contiguous deep peat area to the north of the Glenmuckloch substation.

The next section summarises good practice for excavation, handling, storage re-use and monitoring associated with peat excavations at the Proposed Development.

4.3. Recommended storage locations

Where possible, to avoid multiple handling of peat, excavated materials will be reinstated directly at their point of excavation. Where this is not possible, for example due to construction phasing e.g., a requirement to temporarily store adjacent to foundation working areas prior to reinstatement, storage will be required locally. In these cases, it is important to ensure peat is stored safely with minimal risk of instability of stored materials while they are kept in good condition prior to reinstatement. Section 5 provides good practice advice on peat storage.

5. GOOD PRACTICE

5.1. Background

Good practice measures in relation to peat excavation and reuse are now generally well defined following a number of years of practice (at wind farm sites) across the UK and Ireland. In Scotland in particular, there is an increasing body of experience relating to peat restoration, facilitated by Peatland Action (Scottish Natural Heritage, 2017). As a result, there are a number of specialist contractors who have experience in the planning, design and implementation of peat restoration works in the Scottish uplands. A key step in delivering the restoration proposals described above is identification of appropriate contractors to implement the restoration plans at each location.

The sections below outline good practice measures related to excavation and handling, storage, and reinstatement and restoration of peat in association with infrastructure construction.

5.2. Excavation and handling

The following good practice measures are proposed for excavation and handling:

- A minimum thickness of 300mm of acrotelmic peat or turved organic soil should be excavated where sufficient soil is present; where less than 300mm is present, the full depth of soil and surface vegetation should be excavated.
- Excavation and transport of peat/soil shall be undertaken to avoid cross-contamination between soil horizons (e.g., organic soil and underlying mineral soil / substrate).
- Where possible, cross-tracking of plant over undisturbed vegetation should be minimised, and excavated materials transported to their storage locations along constructed track.
- If working is required away from constructed roads / tracks, the use of long reach excavators should be encouraged in order to minimise cross-tracking.
- If landscaping of road / track margins is required for temporary works, it is preferable for vegetated organic soils to be used for this purpose rather than acrotelmic peat (which should be stored).
- Wherever possible, double handling of peat should be minimised (in particular for catotelmic peat) by direct transport of materials to their point of storage.

5.3. Storage

The following good practice measures are proposed for storage:

- Eliminate storage where possibly by single handling from the point of excavation to a location of reuse.
- If storage cannot be avoided, minimise storage time by taking a holistic approach to excavation and restoration such that catotelmic peat (in particular) is used as soon as possible after excavation.
- Store excavated acrotelmic and catotelmic peat separately during excavation works, which will be undertaken by an experienced contractor specialising in peat groundworks and restoration.
- Acrotelmic peat and turved soil blocks should be stored turf side up to prevent damage to vegetation.

- Storing in areas of minimal gradient where 'runoff' or drainage away from the point of storage is minimised (these areas will also satisfy to avoid areas of lower stability)
- Fewer, larger stores will be preferable to a greater number of small stores, since the total potential area of drying surface will be less.
- Where storage is required in the medium term, preparing the peat to minimise the surface exposed to drying (e.g., through blading off of catotelmic peat and use of appropriate cover to minimise moisture loss).
- The Ecological Clerk of Works (ECoW) should work with an appointed Geotechnical Engineer (GE) to review the placement and condition of stored peat.
- Storage areas should be outside any area identified in the PLHRA as of 'Medium' risk or greater (see Appendix 7.5) and should be more than 50m away from watercourses, away from sensitive habitats and away from the edge of excavations.
- Peat and soil stores should be appropriately bunded to prevent risks from material instability and prevent runoff of sediment and water from the stockpiles
- The condition of the excavated peat, in particular its moisture content, should be regularly monitored and local water utilised to periodically 'refresh' stored peat and prevent desiccation.

5.4. Reinstatement and Restoration

The following good practice measures are proposed for reinstatement and restoration:

- Where possible, turves and underlying catotelmic peat should be reinstated at the locations from which they were removed.
- Any bare peat exposed at the surface of a reinstated area should be seeded with a seed mix or translocated vegetation appropriate to the locality.
- Where insufficient turves are available to full cover reinstated soils, a checkerboard pattern of turf blocks should be used, with turf squares no less than $1m^2$ to act as seed points interspersed amongst the bare areas.
- Reinstated ground levels should tie in with the surrounds, and any bulking up should be avoided by tamping down soils and turves.
- If appropriate, temporary fencing may be required to enable vegetation to establish following reinstatement works and prevent damage by livestock, deer or rabbits.

5.5. Monitoring

During construction, monitoring should be undertaken in any areas where peat is stored, as follows:

- Regular visual inspection of the outer peat surface of any stored peat to identify any evidence for drying or cracking.
- Regular coring of stored peat to log the moisture content of stored peat (using the von Post scale to monitor changes in moisture content for peat on the outside and within the peat mound).
- Clear specification of an action plan in response to these observations, including modifications to coverings, implementation of watering, or construction of temporary berms to retain water in the storage footprint.

- Acceleration of re-use for vulnerable stores if so identified.

Key to the success of the strategy for peat management will be careful monitoring of the post-construction works and any restoration activities. A monitoring programme should be initiated once restoration and peat reinstatement works have been completed, and should include:

- Review of % vegetation cover and vegetation composition in areas of bare peat that have been reinstated or in any areas that have been seeded (due to a lack of available turved material).
- Review of stability of deposits in their new locations.
- Fixed point photography in order to aid review over a series of monitoring intervals.

If required, mitigation recommendations should follow from the monitoring and include:

- Specification of seeding appropriate to the target vegetation or stabilisation with geotextile if revegetation is not occurring naturally (which will assist re-wetting and retention of moisture contents).
- Construction of wood dams (or equivalent) if any creep of peat soils is evident at any restored location.

Monitoring should be carried out at 3 months and 12 months after construction and reinstatement works have concluded.

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