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Technical Appendix 10.1: Peat Survey Results Report

TECHNICAL APPENDIX 10.1: PEAT DEPTH RESULTS REPORT

10.1 Introduction

The Proposal

10.1.1 This Technical Appendix presents information relevant to the proposed Harris-Stornoway 132 kV OHL Replacement. It should be read in conjunction with EIAR Volume 2 in particular **Chapter 2: Description of Proposed Development (EIAR Volume 2)** for details of the Proposed Development, and **Chapter 10: Hydrology, Hydrogeology, Geology and Soils (EIAR Volume 2)**.The location of the Proposed Development is shown in **Figure 1.1: Location Plan and Overview (EIAR Volume 3a)**.

Requirement for the Report

10.1.2 Ramboll was commissioned by the Applicant to undertake peat depth and coring surveys to aid the design process and to inform an assessment of the nature and condition of the peatland for the Proposed Development.

10.1.3 This Technical Appendix has been produced in accordance with guidance published by Scottish Environment Protection Agency (SEPA), NatureScot (NS) and the Scottish Government, which is referenced in the following sections.

10.1.4 This Technical Appendix is supported by the following:

- **Figure 10.1: Surface Water Features (EIAR Volume 3a);**
- **Figure 10.3: Bedrock Geology (EIAR Volume 3a);**
- **Figure 10.4: Superficial Geology (EIAR Volume 3a);**
- **Figure 10.6: Carbon and Peatland Mapping (2016) (EIAR Volume 3a);**
- **Figure 10.7: Peat Depth Plan (EIAR Volume 3a);**
- **Annex 10.1.1: Peat Coring Data; and**
- **Annex 10.1.2: Core Sample Photographs.**

10.2 Methodology

Desk Study

10.2.1 A review of desk top information was undertaken to understand the likely geology and ground conditions at the Site. This included a review of the following:

- online British Geological Survey (BGS) solid and superficial geological mapping[1];
- online Scottish Natural Heritage carbon and peatland map[2];
- habitat survey information from **Chapter 8: Ecology (EIAR Volume 2)**; and
- hydrogeological and hydrological information from **Chapter 10: Hydrology, Hydrogeology, Geology and Soils (EIAR Volume 2)**.

Field Survey

10.2.2 Peat depth surveys were undertaken at the Site to understand the baseline peat conditions and potential constraints, and to inform the design of the Proposed Development to minimise, as far as practicable, the potential direct and indirect effect on peat and carbon rich soils. Two rounds of peat surveys were undertaken across the

[1] British Geological Survey Online Viewer (2022) https://mapapps.bgs.ac.uk/geologyofbritain/home.html [Accessed August 2022]

[2] Scottish Natural Heritage (2016).Carbon and Peatland 2016 map (http://map.environment.gov.scot/soil_maps/) [Accessed August 2022]

Site, based on the Proposed Development design. Surveys followed best practice guidance for development on peatland[3,4] published at the time of the surveys.

10.2.3 The first survey was undertaken during June and July 2022 and included peat probing undertaken at 10 m intervals along cardinal points for a total of 50 m from the centre of each proposed pole location.

10.2.4 The second survey was undertaken in August 2022 and included a similar methodology of peat probing with peat coring at targeted areas across the Site.

10.2.5 Peat cores were taken using a Russian auger, with a sample volume of 0.5 l, and field tests and observations were undertaken to identify:

- depth of acrotelm;
- degree of humification (using Hodgson, 1974), to establish amorphous, intermediate, fibrous, and content; and
- degree of humification using the Von Post, (Hobbs, 1986) classification.

10.2.6 Samples were submitted to a soils testing laboratory to analyse each sample for bulk density, loss on Ignition (Organic Content), Moisture Content, and pH.

Peat Probing

10.2.7 The Phase 1 and Phase 2 surveys were undertaken based on the layout of the Proposed Development at the time of the surveys. This used a combination of low density survey carried out on a grid across the Study Area (refer to **Figure 10.7: Peat Depth Plan (EIAR Volume 3a)** showing grid form), with additional points taken as necessary, and high-density probing on the confirmed layout of the Proposed Development, known at the time of the survey. This approach was undertaken as the layout of the Proposed Development was relatively mature at the time of the survey. The surveys included a 50 m micrositing zone where possible.

10.2.8 Probing was carried out using collapsible avalanche probes, allowing for probing greater than 6 m depth.

10.2.9 The survey points and field data were collected using a handheld Trimble GPS unit. Peat depth data was modelled using Inversive Distance Weighted (IDW) interpolation in GIS software, and a depth model generated using incremented peat depth categories.

10.2.10 Peat cores were taken using a Russian auger, with a sample volume of 0.5 l, and field tests and observations were undertaken. The probing results are included in **Annex 10.1.1**, and records taken include:

- depth of acrotelm;
- degree of humification (using Hodgson, 1974), to establish amorphous, intermediate, fibrous and content;
- degree of humification using the Von Post classification;
- fine fibre content, based on scale of F0 (none) to F3 (very high);
- coarse fibre content, based on scale of R0 (none) to R3 (very high);
- water content, based on scale of B1 (dry) to B5 (very wet); and
- substrate underlying the peat where this was possible.

10.2.11 A peat depth probe was taken adjacent to the core location, and cores were photographed (refer to **Annex 10.1.2**).

10.2.12 Samples of known volume were taken for laboratory analysis. During laboratory analysis, the samples were weighed, dried, and a subsample taken for loss on ignition testing. The total moisture content was determined from weight measurements. Peat pH was also determined.

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[3] Scottish Government, Scottish Natural Heritage, SEPA. (2017). *Peatland Survey. Guidance on Developments on Peatland, online version only.*

[4] Scottish Renewables and SEPA (2012). *Development on Peatlands. Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste.*

Limitations and Assumptions

10.2.13 The design and layout of the Proposed Development was relatively advanced prior to commencement of the Phase 1 survey, therefore a more targeted approach was taken which allowed micrositing to avoid areas of deep peat.

10.2.14 However, there are some differences between the final design and the extent of the peat survey results based on design changes made through this process, as a result of micrositing etc. The safety of the surveyors was considered, particularly in areas of dense and recently felled plantation, areas of deep peat etc. and some proposed peat probe points may not have been recorded.

10.2.15 The peat survey probing points provide high resolution coverage of the Study Area, and these revealed the peatland to be typically shallow (less than 1.0 m) but with several areas of the Site comprised of deeper peat. It is considered that the peat depths collected, and interpolations derived from these data, are representative of the Site.

10.2.16 The Proposed Development has been located away from the deep peat locations where practicable. It has not been possible to site all the poles out of deep peat based on the other environmental and technical constraints.

10.3 Results

10.3.1 Baseline data are required to inform an assessment of the effects the Proposed Development would have on peat and carbon rich soils. This report presents baseline data collected from a desk-based review and field survey results.

Desk Study

10.3.2 The 1:625,000 and 1:50,000 scale geological mapping available from the BGS[1] shows the majority of the site to be underlain by the Lewissian Gneiss Complex, the recorded geology has been broken down into 10 km sections, with the origin at the northern end of the route.

- 0 km to 10 km - Outer Hebrides Thrust Zone Mylonites Complex - Protocataclasite. Metamorphic bedrock formed between 4,000 and 541 million years ago between the Archean Eon and Ediacaran period;
- 10 km to 20 km- Outer Hebrides Thrust Zone Mylonites Complex - Protocataclasite and Cataclasite. Metamorphic bedrock formed between 4,000 and 541 million years ago between the Archean Eon and Ediacaran period;
- 20 km to 30 km - Outer Hebrides Thrust Zone Mylonites Complex - Protocataclasite and Cataclasite and Lewisian Complex - Gneiss. Metamorphic bedrock formed between 4,000 and 541 million years ago between the Archean Eon and Ediacaran period;
- 30 km to 40 km- Scourie Dyke Swarm - Ortho-amphibolite. Metamorphic bedrock formed between 2500 and 1600 million years ago between the Siderian and Statherian periods, Scourian Gneisses - Amphibolite. Metamorphic bedrock formed between 4,000 and 2,500 million years ago during the Archean Eon period, Outer Hebrides Thrust Zone Mylonites Complex - Protocataclasite and Lewisian Complex - Gneiss. Metamorphic bedrock formed between 4000 and 541 million years ago between the Archean Eon and Ediacaran period;
- 40km to 50km - Lewisian Complex - Gneiss. Metamorphic bedrock formed between 4000 and 541 million years ago between the Archean Eon and Ediacaran period; and
- 50 km to 60 km - Lewisian Complex - Gneiss and Amphibolite. Metamorphic bedrock formed between 4,000 and 541 million years ago between the Archean Eon and Ediacaran period, Uig Hills - Harris Igneous Complex - Granite, Vein Complex (marginal Zone) - Granite and porphyritic granite. Igneous bedrock formed between 2,500 and 1,600 million years ago between the Siderian and Statherian periods.

10.3.3 The 1:50,000 BGS mapping is shown on **Figure 10.3: Bedrock Geology (EIAR Volume 3a)**.

10.3.4 Following uplift and faulting (which is present across the 56 km of the route, including crossing the Outer Hebrides Thrust Zone) the landscape underwent considerable change during cycles of glacial and inter glacial periods with up to 700 m of ice covering the mountains of north Harris during the most recent glacial period, the Main Late Devension glaciation.

10.3.5 The superficial geology of the Site predominantly comprises Peat (which began forming approximately 6,000 years ago with occasional Glacial Till underlying the peat. The 1:50,000 BGS mapping is shown on **Figure 10.4: Superficial Geology (EIAR Volume 3a)**.

10.3.6 The Scottish Natural Heritage carbon rich soils, deep peat and priority habitat mapping[2] **(Figure 10.6: Carbon and Peatland Mapping 2016 (EIAR Volume 3a))** shows Class 1, Class 2, Class 3, and Class 5 soils along the route with the most predominant class of soils present being Class 1 followed by Class 2.

10.3.7 The definition of the soils present is as follows:

- Class 1: Nationally important carbon-rich soils, deep peat and priority peatland habitat. Areas likely to be of high conservation value;
- Class 2: Nationally important carbon-rich soils, deep peat and priority peatland habitat. Areas of potentially high conservation value and restoration potential;
- Class 3: Dominant vegetation cover is not priority peatland habitat but is associated with wet and acidic type. Occasional peatland habitats can be found. Most soils are carbon-rich soils, with some areas of deep peat; and
- Class 5: Soil information takes precedence over vegetation data. No peatland habitat recorded. May also include areas of bare soil. Soils are carbon-rich and deep peat.

Field Survey

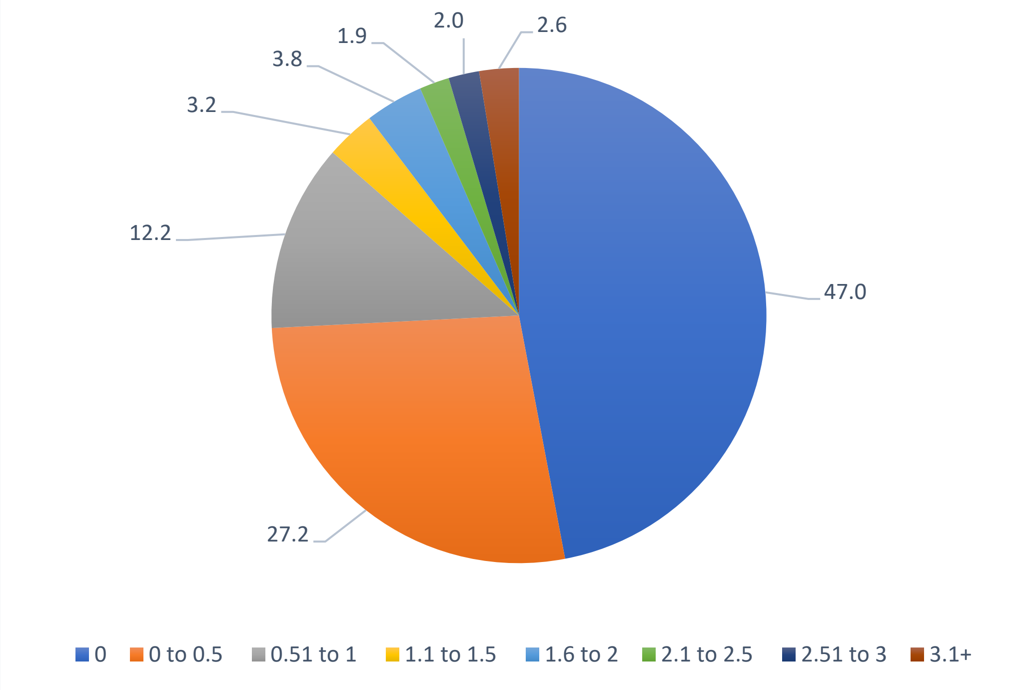
Peat Probing

10.3.8 During the peat depth probing surveys, a total of 12,939 peat depth probes were taken as shown in **Figure 10.7: Peat Depth Plan (EIAR Volume 3a)**.

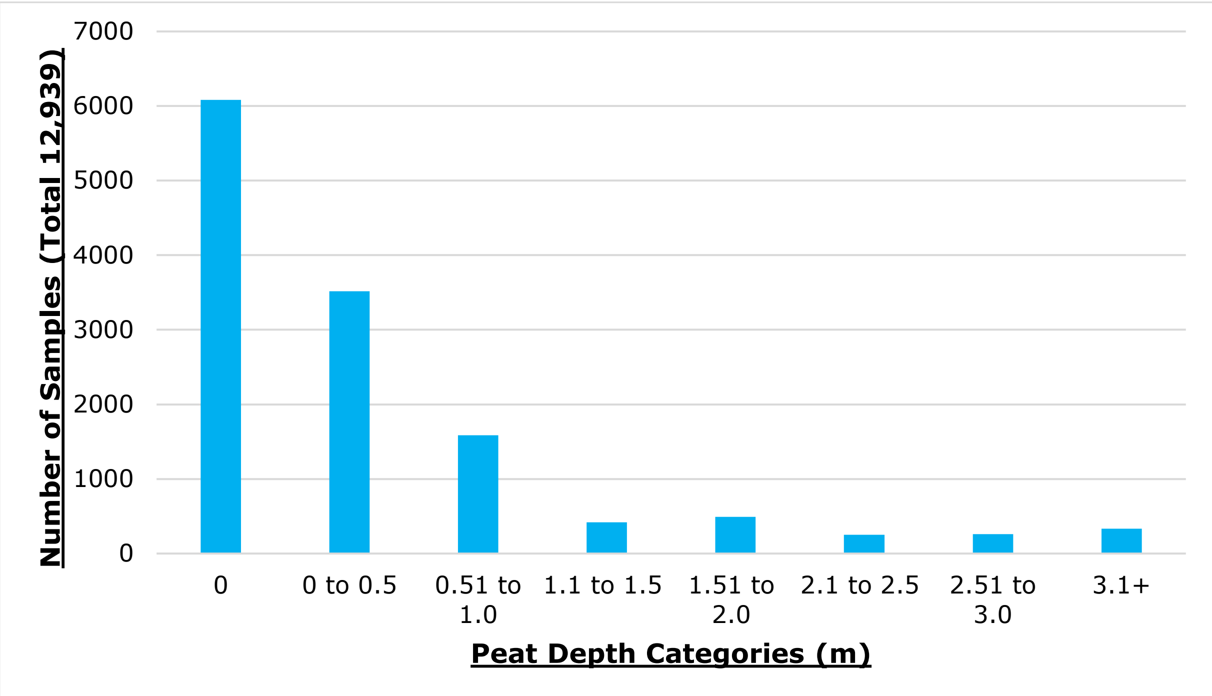
10.3.9 **Figure 10.7: Peat Depth Plan (EIAR Volume 3a)** shows the results of the peat depth survey at the Site, as well as the specific depth class at each sample location and is based on IDW data interpolation and consequently the peat depth contours and boundaries are to a degree indicative.

10.3.10 **Graph 10.1** and **Graph 10.2** below present the percentage and frequency of peat probe results within the specific peat depth categories recorded during the peat depth survey probe surveys.

Graph 10.1: Percentage Peat Depth (m) Categories (Phase 1 and Phase 2 Combined)



Graph 10.2: Peat Depth Frequency Distribution (Phase 1 and Phase 2 Combined)



10.3.11 As shown on **Graph 10.1** and **Graph 10.2**, most of the Site has either no peat present or has a shallow depth of peat present (approximately 74.2 % of peat probes were <0.5 m in depth). These areas of shallow peat can be considered as organo-mineral soils. These are further summarised as follows:

- 6,083 no. samples (47.0 %) located on land with no peat/absent;
- 3,517 no. samples (27.2 %) located on land with less than or equal to 50 cm depth of peat or organomineral soil;
- 1,585 no. samples (12.2 %) on land with between 51 cm and 100 cm depth of peat; and
- 1,754 no. samples (13.6 %) located on land with more than 100 cm depth of peat.

10.3.12 Peat along the site was found to be mostly shallow (where present), with some areas of deeper peat. The deeper peat was generally recorded in the northern and central parts of the Site, associated with moorland and peat bog. The peat probe depth and interpolated contours are shown on **Figure 10.7: Peat Depth Plan (EIAR Volume 3a)**. The maximum peat depth recorded was 5.3 m. The mean peat depth recorded was approximately 0.47 m (47 cm).

10.3.13 A summary of the areas of deep peat recorded is presented in **Table 10.3.12 of Technical Appendix 10.3 Peat Landslide Hazard Risk Assessment (EIAR Volume 4)**.

Core Sample Results

10.3.14 At each core sample location, a peat depth probe was taken adjacent to the core sample to compare the probed depth against cored depth, and the results are presented in **Table 10.1.1** below:

Table 10.1.1: Comparison of Peat Probe and Coring Depth

Sample ID	Probed Depth (cm)	Cored Depth (cm)	Difference Probed to Cored (cm)
LT245-PC01	180	50	130
LT245-PC02	180	100	80
LT245-PC03	180	170	10
LT245-PC04	300	50	250
LT245-PC05	300	100	200
LT245-PC06	300	150	150
LT245-PC07	300	200	100
LT245-PC08	220	50	170
LT245-PC09	220	100	120
LT245-PC10	220	150	70
LT245-PC11	220	200	20
LT245-PC12	270	50	220
LT245-PC13	270	100	170
LT245-PC14	270	150	120
LT245-PC15	270	200	70
LT245-PC16	100	50	50
LT245-PC17	100	100	0
LT245-PC18	160	50	110
LT245-PC19	160	125	35
LT245-PC20	220	50	170
LT245-PC21	220	100	120
LT245-PC22	220	150	70
LT245-PC23	170	50	120
LT245-PC24	170	100	70
LT245-PC25	170	150	20

10.3.15 The results indicate that the peat probing potentially overestimates the true peat depths, as coring indicates that there is a potential mean overestimation of 105.8 cm. This is due to the density of peat and underlying substrate and the diameters of the peat probe and Russian auger, whereby the probe is narrower and is easier to penetrate deeper into the peat layers.

Depth of Acrotelm

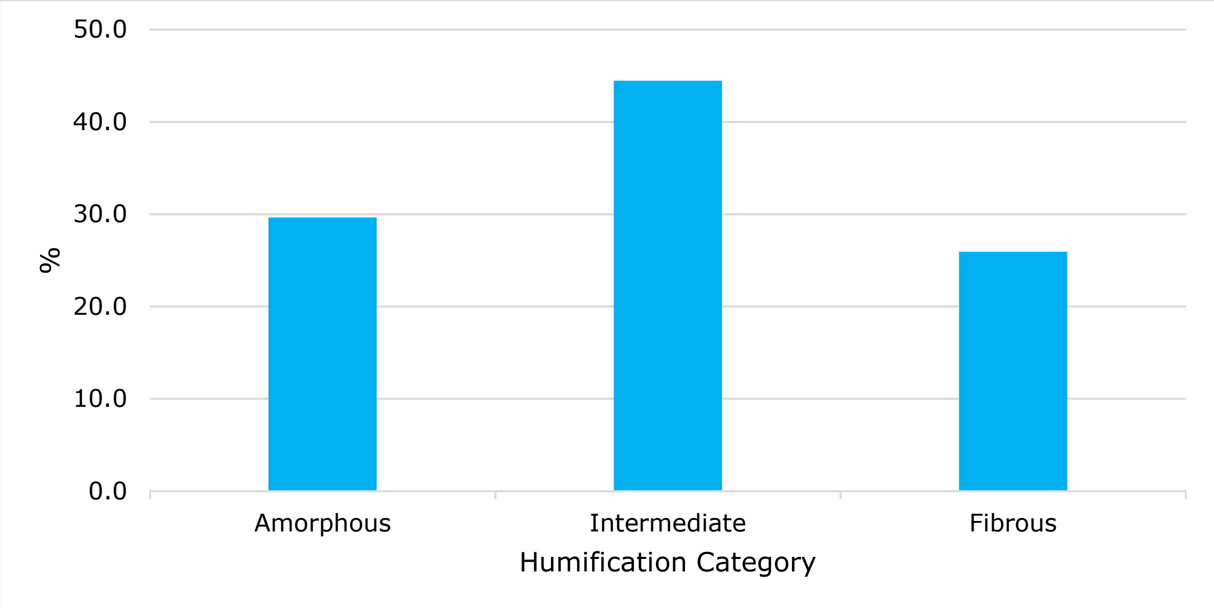
10.3.16 Acrotelmic peat was recorded in all sample locations, ranging from between 0.1 m and 0.9 m depth, with a mean of 0.5 m. It is recommended that for the purposes of construction and subsequent reinstatement, that where a sufficient peat depth exists, the top 0.5 m of material should be treated as acrotelm. This approach will allow excavation of intact turves for reinstatement purposes where they are present, which will in turn facilitate quicker regeneration of disturbed areas. Even if little vegetation is present within this top layer, it should still be treated as acrotelmic material as it may contain a seedbank, particularly in open habitats, which will aid re-vegetation of reinstatement areas.

Degree of Humification

10.3.17 The degree of humification was recorded in the field with each 0.5 m sub-sample being categorised as either fibrous, intermediate, or amorphous peat (see Section 2: Methodology).

10.3.18 **Graph 10.3** summarises the degree of humification, which indicated that most of the samples are classed as intermediate, which is suggestive of some humification in the samples.

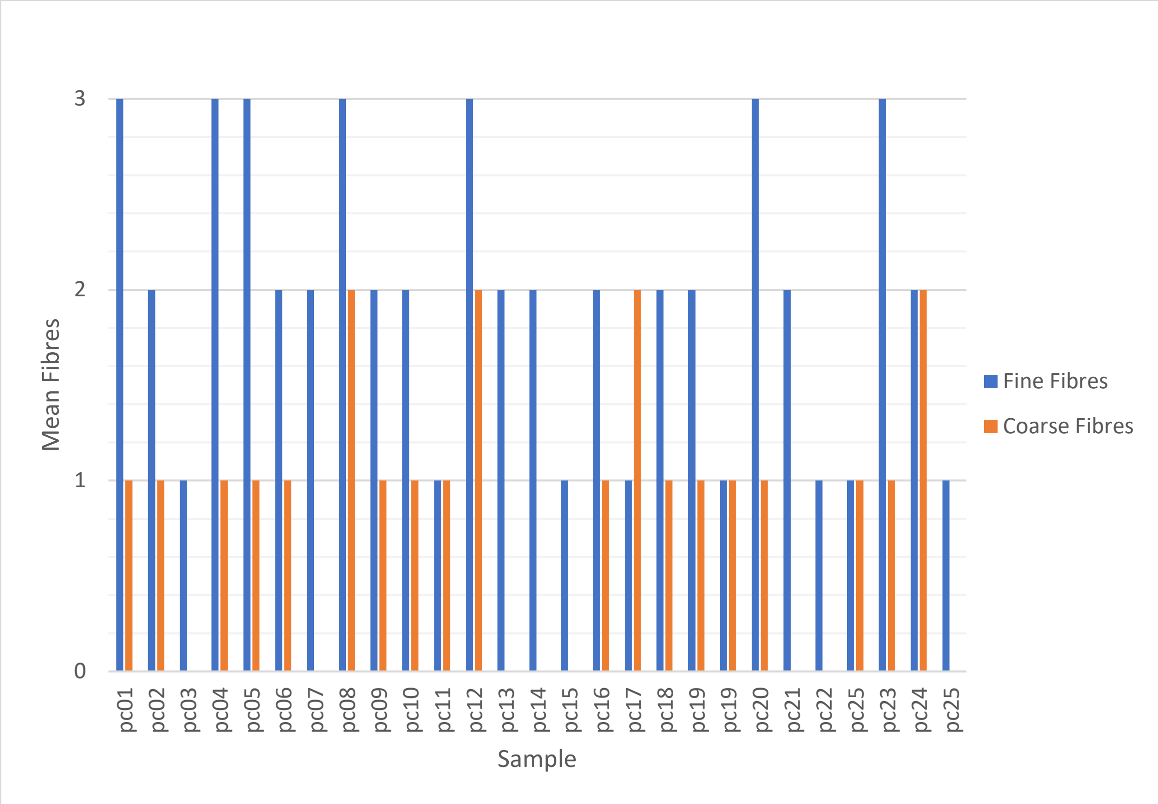
Graph 10.3: Degree of Humification



Fibrous Content

10.3.19 The fibrous content was recorded in the field, in accordance with the methods discussed in Section 10.2, with each 0.5 m sub-sample categorised for coarse and fine fibre content. The proportions of course and fine fibres within the peat samples were derived in the field according to the Hobbs scale, where F0/R0 indicate no fine/coarse fibre content to F3/R3 which is indicative of high fine/coarse fibre content respectively. The results indicate that the fine fibre contents are mostly moderate (F2). The majority of the sample locations were assessed as low coarse fibre content (R1). These results are summarised in **Graph 10.4**.

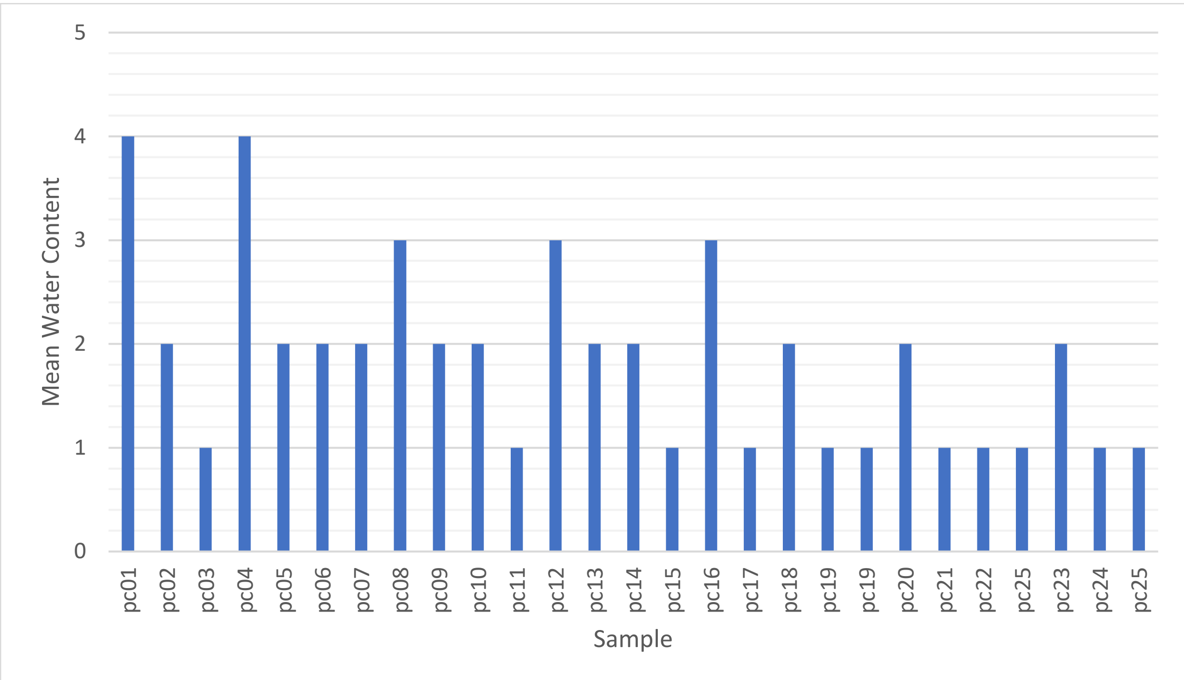
Graph 10.4: Fibrous Content



Water Content

10.3.20 The water content of the samples was determined in the field using the Hobbs scale, where B1 is dry and B5 is very wet. The results are summarised in **Graph 10.5**. The results indicate that the majority of the samples are indicative of dry or semi-dry peat (B1/B2), with the remaining samples classified as having some moisture present or wet.

Graph 10.5: Water Content



Von Post Scale (Degree of Humification)

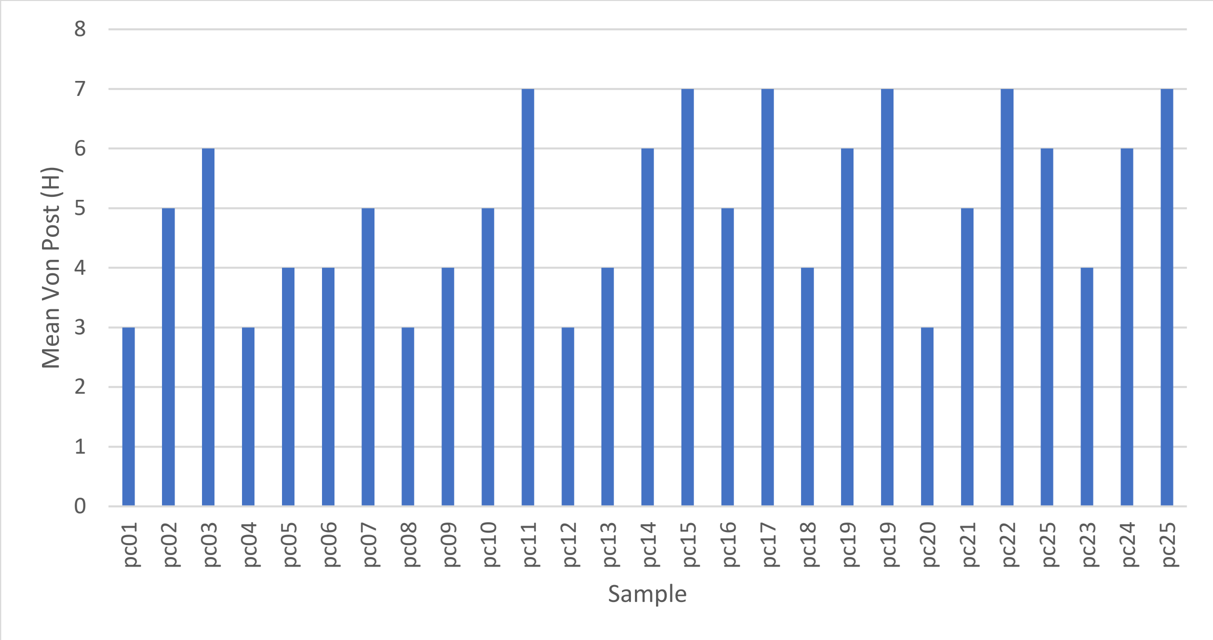
10.3.21 An estimate of the degree of humification according to the Von Post Scale was carried out on samples at all core locations. This was undertaken using the criteria as shown in **Table 10.1.2** below.

Table 10.1.2: Degree of Humification using Von Post Scale

Von Post Score	Squeezed Liquid Appearance	Extruded Peat	Plant Residue	Humification Description
H1	Clear, colourless	None	Plant structure unaltered. Fibrous, elastic	Undecomposed
H2	Almost clear, yellow-brown	None	Plant structure distinct, almost unaltered	Almost undecomposed
H3	Slightly turbid, brown	None	Plant structure distinct, most remains easily identifiable	Very weakly decomposed
H4	Strongly turbid, brown	None	Plant structure distinct, most remains identifiable	Weakly decomposed
H5	Strongly turbid, contains a little peat in suspension	Very little	Plant structure clear but indistinct and difficult to identify	Moderately decomposed
H6	Muddy, much peat in suspension	One third	Plant structure indistinct but clearer in residue, most remains undefinable	Well decomposed
H7	Strongly muddy	One half	Plant structure indistinct	Strongly decomposed
H8	Thick mud, little free water	Two thirds	Plant structure very indistinct – only resistant material such as roots	Very strongly decomposed
H9	No free water	Nearly all	Plant structure almost unrecognisable	Almost completely decomposed
H10	No free water	All	Plant structure not recognisable, amorphous	Completely decomposed

10.3.22 The results are shown in **Graph 10.6** below, where the vertical axis refers to the Von Post scale of peat decomposition (on a scale of H1 to H10).

Graph 10.6: Mean Von Post

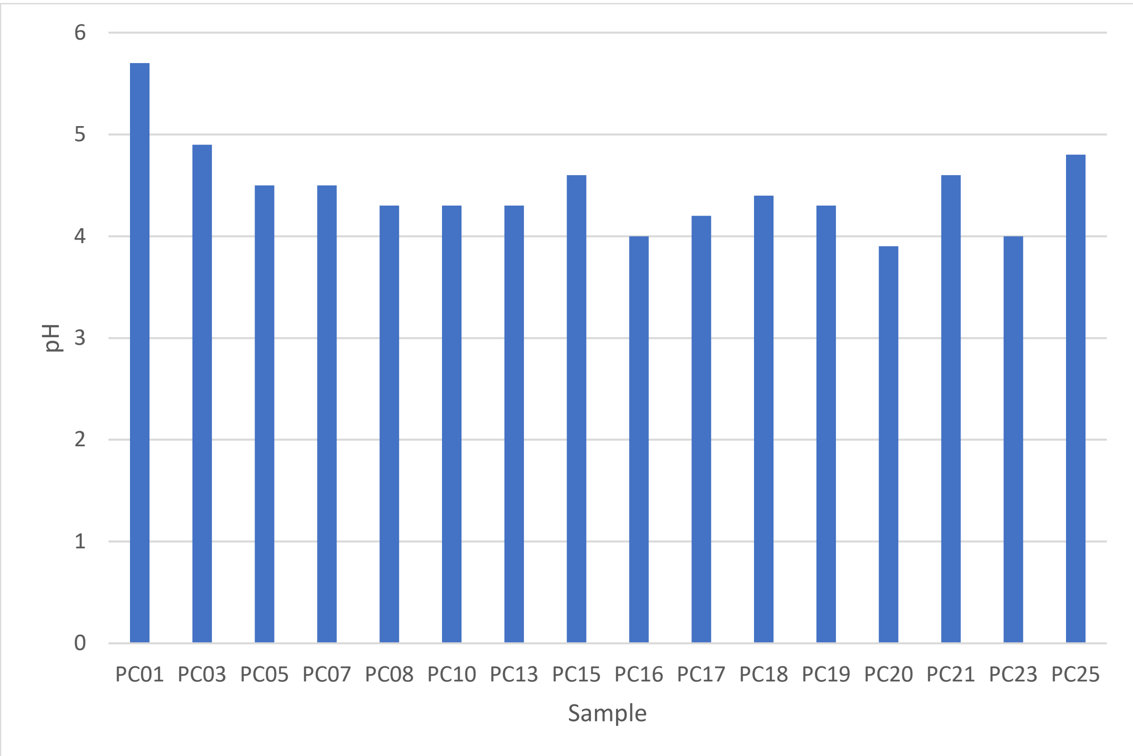


10.3.23 The results indicate that all the samples were found to be between H3 and H7 on the Von Post Scale, indicating very weakly decomposed to strongly decomposed peat, with the majority of the samples being between H3 and H5. There is evidence of some intensively managed areas of the Site, where there are areas of woodland plantation and artificial drainage. In some areas diffuse natural drainage systems were also noted. It is likely that there is potential for acrotelmic and peat to be highly modified as result of desiccation associated with forestry and artificial drainage. There is also evidence of significant peat cutting across parts of the Site.

pH of Samples

10.3.24 The pH values of the core samples were analysed in a laboratory, and the results provided in **Graph 10.7** below.

Graph 10.7: Mean pH

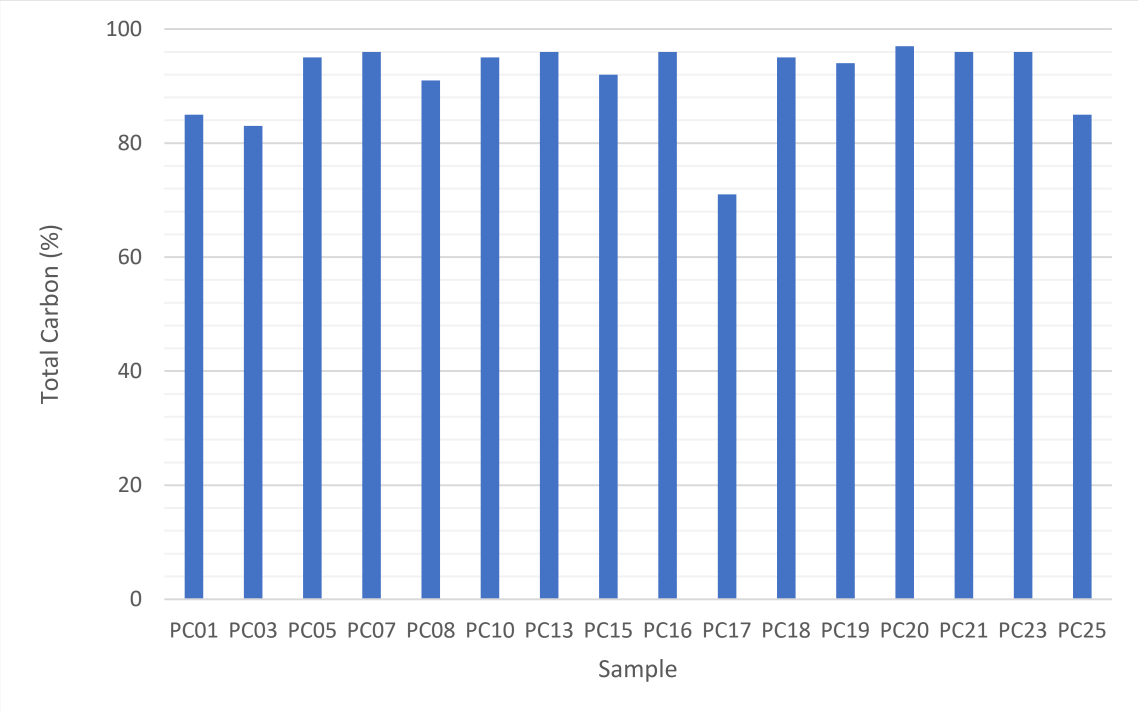


10.3.25 The mean pH value was 4.5, with a range between 3.9 and 5.7, which indicates that all samples are acidic in nature. This result is typical of peat and carbon rich soils.

Total Carbon (%)

10.3.26 The total carbon context was derived by laboratory analysis for each sample and is summarised in **Graph 10.8**. The results indicate a predominantly consistent high carbon content with a mean of 91.4 % with the exception of one location where the total carbon was found to be 71 %.

Graph 10.8: Total Carbon



Underlying Substrates

10.3.27 At each location, where possible, a broad characterisation was made of the underlying substrate below the peat horizon. The underlying substrate was found to vary by location between cohesive, granular and rock.

10.4 Summary

10.4.1 The results of the peat surveys at the Site are summarised as follows:

- Overall, the peat depth is relatively shallow (<0.5 m) or is absent across large areas of the Site, with some deep areas of peat present in the northern and central sections (>1.0 m), and are generally associated with open moorland and peat bog. The deepest peat recorded in these areas was 5.3 m thickness. The mean peat depth was 0.47 m across the Study Area. Peat depths are shown on **Figure 10.7: Peat Depth Plan (EIAR Volume 3a)**;
- The Proposed Development has been located away from the deep peat locations where practicable. It has not been possible to site all the poles out of deep peat based on the other environmental and technical constraints. It is proposed that poles located in deep peat would be constructed using construction methods to minimise peat excavated or permanently displaced;
- No permanent access tracks are to be constructed and temporary access will be gained using methods that do not require the permanent excavation of peat (i.e. using bog mats);
- Acrotelmic peat was found at all sample locations with an average depth of 0.5 m (and a maximum depth of 0.9 m), although it has been assumed for the purpose of assessment that the depth of acrotelm is 0.5 m;

- The peat across the Study Area is generally intermediate in nature, with the samples assessed as having mostly moderate fine fibre content (F2). The majority of the sample locations were assessed as having a low coarse fibre content (R1);
- The results on the Von Post Scale indicate that the majority of the samples tested scored relatively high, between H3 and H7, indicating weakly to strongly decomposed peat. Areas of the Site have historically been intensively managed with significant areas of commercial forestry plantation and felling, with artificial drainage measures used. In some areas diffuse natural drainage systems were also noted as well as historic and current peat cutting. Within the commercial plantation and forestry areas it was noted that the acrotelmic peat was highly modified as a result of planting and felling activities;
- The mean water content of the peat were generally noted to be dry or semi-dry, with some samples containing some moisture;
- The peat was found to be acidic with a mean pH value of 4.5, and a range between 3.9 and 5.7, indicative of peat and carbon rich soils; and
- Laboratory analysis of samples indicates that the peat has a high total carbon content.

ANNEX 10.1.1 – PEAT CORING DATA

Sample ID	LT245-PC01	LT245-PC02	LT245-PC03	LT245-PC04	LT245-PC05	LT245-PC06	LT245-PC07	LT245-PC08	LT245-PC09	LT245-PC10
Infrastructure	Pole	Pole	Pole	Pole	Pole	Pole	Pole	Pole	Pole	Pole
Planted/ Unplanted	Planted	Planted	Planted	Planted	Planted	Planted	Planted	Planted	Planted	Planted
Probed Depth	1.8	1.8	1.8	3.0	3.0	3.0	3.0	2.2	2.2	2.2
Cored Depth	0.5	1.0	1.7	0.5	1.0	1.5	2.0	0.5	1.0	1.5
Depth of Acrotelm	0.5	0.7	0.7	0.5	0.9	0.9	0.9	0.5	0.7	0.7
Colour	Light Brown	Mid Brown	Dark Brown	Light Brown	Light Brown	Medium Brown	Medium Brown	Light Brown	Mid Brown	Mid Brown
Depth of Sub Sample	0.5		1.00-1.50		0.50-1.00		1.50-2.00	0.5		1.00-1.50
Amorphous (0=No/1=Yes)	0	0	1	0	0	0	0	0	0	0
Fibrous (0=No/1=Yes)	1	0	0	1	1	0	0	1	0	0
Intermediate (0=No/1=Yes)	0	1	0	0	0	1	1	0	1	1
Fine Fibres (F)	3	2	1	3	3	2	2	3	2	2
Coarse Fibres (R)	1	1	0	1	1	1	0	2	1	1
Water Content (B)	4	2	1	4	2	2	2	3	2	2

Sample ID	LT245-PC01	LT245-PC02	LT245-PC03	LT245-PC04	LT245-PC05	LT245-PC06	LT245-PC07	LT245-PC08	LT245-PC09	LT245-PC10
Von Post Scale (H)	3	5	6	3	4	4	5	3	4	5
% Moisture	93		91		93		93	92		95
pH	5.7		4.9		4.5		4.5	4.3		4.3
Total Carbon (%)	85		83		95		96	91		95
Substrate	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known

Sample ID	LT245-PC11	LT245-PC12	LT245-PC13	LT245-PC14	LT245-PC15	LT245-PC16	LT245-PC17	LT245-PC18	LT245-PC19	LT245-PC20	LT245-PC21	LT245-PC22	LT245-PC23	LT245-PC24	LT245-PC25
Infrastructure	Pole	Pole	Pole	Pole	Pole	Pole	Pole	Pole	Pole	Pole	Pole	Pole	Pole	Pole	Pole
Planted/ Unplanted	Planted	Planted	Planted	Planted	Planted	Planted	Planted	Planted	Planted	Planted	Planted	Planted	Planted	Planted	Planted
Probed Depth	2.2	2.7	2.7	2.7	2.7	1.0	1.0	1.6	1.6	2.2	2.2	2.2	1.7	1.7	1.7
Cored Depth	2.0	0.5	1.0	1.5	2.0	0.5	1.0	0.5	1.25	0.5	1.0	1.5	0.5	1.0	1.5
Depth of Acrotelm	0.7	0.5	0.6	0.6	0.6	0.2	0.2	0.1	0.1	0.5	0.5	0.5	0.4	0.4	0.4
Colour	Dark Brown	Yellow Brown	Light Brown	Mid Brown	Dark Brown	Dark Brown	Black Brown	Dark Brown	Dark to Black Brown	Light Brown	Mid Brown	Black Brown	Light Brown	Dark Brown	Mid to Black Brown
Depth of Sub Sample			0.50-1.00		1.50-2.00	0.50	0.50-1.00	0.50	0.50-1.00	0.50	0.50-1.00		0.50		1.00-1.50

Sample ID	LT245-PC11	LT245-PC12	LT245-PC13	LT245-PC14	LT245-PC15	LT245-PC16	LT245-PC17	LT245-PC18	LT245-PC19	LT245-PC20	LT245-PC21	LT245-PC22	LT245-PC23	LT245-PC24	LT245-PC25
Amorphous (0=No/1=Yes)	1	0	0	0	1	0	1	0	1	0	0	1	0	0	1
Fibrous (0=No/1=Yes)	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0
Intermediate (0=No/1=Yes)	0	0	1	1	0	1	0	1	1	1	0	0	1	0	0
Fine Fibres (F)	1	3	2	2	1	2	1	2	2	3	2	1	3	2	1
Coarse Fibres (R)	1	2	0	0	0	1	2	1	1	1	0	0	1	2	0
Water Content (B)	1	3	2	2	1	3	1	2	1	2	1	1	2	1	1
Von Post Scale (H)	7	3	4	6	7	5	7	4	7	3	5	7	4	6	7
% Moisture			94		94	88	91	91	90	90	91		89		89
pH			4.3		4.6	4.0	4.2	4.4	4.3	3.9	4.6		4.0		4.8
Total Carbon (%)			96		92	96	71	95	94	97	96		96		85
Substrate	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known

ANNEX 10.1.2 – CORE SAMPLE PHOTOGRAPHS

	
LT245-PC01 0.0m – 0.5m	**LT245-PC02 0.5m – 1.0m**
	
LT245-PC03 1.0m – 1.5m	**LT245-PC04 0.0m – 0.5m**

LT245-PC05 0.5m – 1.0m

LT245-PC06 1.0m – 1.5m

LT245-PC07 1.5m – 2.0m

LT245-PC08 0.0m – 0.5m

Technical Appendix 10.2: Outline Peat Management Plan

TECHNICAL APPENDIX 10.2: OUTLINE PEAT MANAGEMENT PLAN

10.1 Introduction

The Proposal

10.1.1 This Technical Appendix presents information relevant to the Harris to Stornoway 132 kV Overhead Line (OHL) Replacement. It should be read in conjunction with **EIAR Volume 2** for full details of the Proposed Development, as well as the following documents:

- Technical Appendix 10.1: Peat Depth Results Report (EIAR Volume 4); and
- Technical Appendix 10.3: Peat Landslide Hazard Risk Assessment (PLHRA) (EIAR Volume 4).

Requirement for the Peat Management Plan (PMP)

10.1.2 Ramboll was commissioned by the Applicant to undertake peat depth and coring surveys, presented in **Technical Appendix 10.1: Peat Depth Results Report (EIAR Volume 4)**, to aid the design process and inform the Outline PMP (OPMP) for the Proposed Development, as presented here within.

10.1.3 This appendix has been produced in accordance with guidance published by Scottish Environment Protection Agency (SEPA), NatureScot and the Scottish Government, which is referenced in the following sections. This OPMP specifically refers to the OHL and associated infrastructure.

10.1.4 A more detailed final PMP would be developed post-consent following more extensive ground investigation and would specify the proposed peat and soil management methodologies to be employed during construction as part of the Construction Environmental Management Plan (CEMP).

10.1.5 The purpose of the PMP is to:

- define the materials that would be excavated as a result of the Proposed Development, focusing specifically on the excavation of peat;
- report detailed investigations into peat depths affected by the Proposed Development;
- detail proposals for the management of excavated peat and other soils;
- determine volumes of excavated arisings and proposals for re-use or reinstatement using excavated materials; and
- detail management techniques for handling, storing and depositing peat for reinstatement.

10.1.6 The PMP is a 'live' document and would evolve during the different stages of the Proposed Development and as such would be subject to review to address:

- requirements to discharge future consent and planning conditions;
- detailed ground investigations and design development;
- unforeseen conditions encountered during construction;
- changes in best practice during the life of the Proposed Development; and
- changes resulting from the construction methods used by the Appointed Contractor.

10.1.7 Whilst this OPMP provides a base standard for good practice, where avoidance or further minimisation of risks to the environment can be demonstrated through use of alternative methods or improvements to current practices, the Appointed Contractor would implement these wherever possible.

10.1.8 This OPMP has been prepared in accordance with appropriate guidance and best practice[1,2,3].

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[1] Scottish Government, Scottish Natural Heritage, SEPA (2017) *Peatland Survey. Guidance on Developments on Peatland*, on-line version only.

[2] Scottish Renewables and SEPA (2012). *Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste.*

[3] SEPA (2011). *Restoration Techniques Using Peat Spoil from Construction Works.*

Limitations and Asssumptions

10.1.9 The Site is predominantly covered with a varying thickness of peat and carbon-rich soils. The design of the Proposed Development has taken into consideration peat depths, along with other technical and environmental constraints, and the Proposed Development's infrastructure has been sited away from these areas, where possible.

10.1.10 Peat probing and mapping have been used to inform the design process at strategic points in the design evolution of the Proposed Development. However, there are some differences between the final design and the extent of the peat survey results based on design changes made through this process, as a result of micrositing etc[4].

10.1.11 However, the peat survey probing points do provide high resolution coverage of the Site, which revealed the peatland to be typically shallow (<1.0 m) although deeper areas peat were noted in the northern and central areas of the Site associated with areas of peat bog and moorland. It is considered that the peat depths collected, and interpolations derived from these data, are representative of the Site and have adequately informed the layout of the Proposed Development.

10.1.12 The peat excavation and reuse volumes included in this OPMP are intended as an initial indication. They are based on a series of design assumptions and estimates for the Proposed Development layout and peat depth sample data interpolated across discrete areas of the Site. Such parameters can still vary over a small scale and therefore local topographic changes in the geological profile may impact the total accuracy of the volume calculations.

10.1.13 The OPMP is a 'live' document and would be further developed by the Appointed Contractor, post consent. Further peat probing would be undertaken along with detailed ground investigation surveys to finalise and inform the final PMP post consent, prior to construction works commencing. This approach informs the Proposed Development and can minimise impacts on deep peat.

10.2 Peatland Condition

Definitions of Peat

10.2.1 Organic material less than 0.5 m depth is not defined as peat by the Scottish Government, NatureScot, and SEPA guidance *Peatland Survey. Guidance on Development on Peatland (2017)[1]*, which states that 'peat soil is an organic soil which contains more than 60 per cent of organic matter and exceeds 50 centimetres (cm) in thickness'. This is also confirmed by The James Hutton Institute who define shallow peat as having a 'prescribed depth of organic matter of 50-100 cm', and the Forestry Commission who use 45 cm as the critical depth for peat to occur. On this basis, peat is classified as organic material over 0.5 m in depth.

10.2.2 Peat can be separated into three main layers: acrotelmic (the upper living layer), catotelmic (the middle to lower layer) and occasionally amorphous (lower layer) peat.

10.2.3 Acrotelmic peat is the living layer of peat including the peat turf or turve being a thin, floating vegetation mat layer. The acrotelm is generally found within the top layer of peat (often less than 0.5 m) depending on the degree of decomposition and fibrous nature of the peat (approximately H1 to H6 on the Von Post classification scale (see **Technical Appendix 10.1: Peat Depth Results Report (EIAR Volume 4)**). The acrotelm is generally of high permeability, decreasing with depth. The water table fluctuates in this layer and conditions vary from aerobic to anaerobic. Material may be fibrous or pseudofibrous (plant remains recognisable), spongy, and when excavated strength is lost but retains integral structure and can stand unsupported when stockpiled over 1 m.

10.2.4 Catotelmic peat is the dead layer of peat found deeper than acrotelmic peat which has some remnant plant structures. Material has high water content and is permanently below the water table (saturated) therefore organic matter decomposes anaerobically. Some plant structures may be recognisable but are highly humified losing most

[4] These changes are considered to be minor and not significant.

of their characteristics (approximately H6 to H9 on the Von Post classification scale) and strength. Water flow through the catotelm is slow unless peat structures such as sink holes or peat pipes are present.

10.2.5 Finally, amorphous peat is highly decomposed organic material where all recognisable plant remains are absent (approximately H9 to H10 in the Von Post classification scale). These deposits are dark brown to black in colour, plastic, are low tensile strength and are unable to stand unsupported over 1 m when stockpiled.

Desk Study

10.2.6 The 1:625,000 and 1:50,000 scale geological mapping available from the BGS[5] shows the majority of the site to be underlain by the Lewissian Gneiss Complex, the recorded geology has been broken down into 10 km sections, with the origin at the northern end of the route.

- 0 km to 10 km - Outer Hebrides Thrust Zone Mylonites Complex - Protocataclasite. Metamorphic bedrock formed between 4,000 and 541 million years ago between the Archean Eon and Ediacaran period;
- 10 km to 20 km- Outer Hebrides Thrust Zone Mylonites Complex - Protocataclasite and Cataclasite. Metamorphic bedrock formed between 4,000 and 541 million years ago between the Archean Eon and Ediacaran period;
- 20 km to 30 km - Outer Hebrides Thrust Zone Mylonites Complex - Protocataclasite and Cataclasite and Lewisian Complex - Gneiss. Metamorphic bedrock formed between 4,000 and 541 million years ago between the Archean Eon and Ediacaran period;
- 30 km to 40 km- Scourie Dyke Swarm - Ortho-amphibolite. Metamorphic bedrock formed between 2500 and 1600 million years ago between the Siderian and Statherian periods, Scourian Gneisses - Amphibolite. Metamorphic bedrock formed between 4,000 and 2,500 million years ago during the Archean Eon period, Outer Hebrides Thrust Zone Mylonites Complex - Protocataclasite and Lewisian Complex - Gneiss. Metamorphic bedrock formed between 4000 and 541 million years ago between the Archean Eon and Ediacaran period;
- 40 km to 50 km - Lewisian Complex - Gneiss. Metamorphic bedrock formed between 4000 and 541 million years ago between the Archean Eon and Ediacaran period; and
- 50 km to 60 km - Lewisian Complex - Gneiss and Amphibolite. Metamorphic bedrock formed between 4,000 and 541 million years ago between the Archean Eon and Ediacaran period, Uig Hills - Harris Igneous Complex - Granite, Vein Complex (marginal Zone) - Granite and porphyritic granite. Igneous bedrock formed between 2,500 and 1,600 million years ago between the Siderian and Statherian periods.

10.2.7 The 1:50,000 BGS mapping is shown on **Figure 10.3: Solid Geology (EIAR Volume 3a)**.

10.2.8 Following uplift and faulting (which is present across the 56 km of the route, including crossing the Outer Hebrides Thrust Zone) the landscape underwent considerable change during cycles of glacial and inter glacial periods with up to 700 m of ice covering the mountains of north Harris during the most recent glacial period, the Main Late Devension glaciation.

10.2.9 The superficial geology of the Site predominantly comprises Peat (which began forming approximately 6,000 years ago with occasional Glacial Till underlying the peat. The 1:50,000 BGS mapping is shown on **Figure 10.4: Superficial Geology (EIAR Volume 3a)**.

10.2.10 The Scottish Natural Heritage carbon rich soils, deep peat and priority habitat mapping[6] (**Figure 10.6: Carbon and Peatland Mapping 2016 (EIAR Volume 3a)**) shows Class 1, Class 2, Class 3, and Class 5 soils along the route with the most predominant class of soils present being Class 1 followed by Class 2.

10.2.11 The definition of the soils present is as follows:

[5] British Geological Survey. Geology of Britain viewer (classic): https://mapapps.bgs.ac.uk/geologyofbritain/home.html [Accessed 05/07/22]

[6] Scotland Carbon and Peatland 2016 Map. Available online: https://soils.environment.gov.scot/maps/thematic-maps/carbon-and-peatland-2016-map/. [Last accessed August 2022].

- Class 1: Nationally important carbon-rich soils, deep peat and priority peatland habitat. Areas likely to be of high conservation value;
- Class 2: Nationally important carbon-rich soils, deep peat and priority peatland habitat. Areas of potentially high conservation value and restoration potential;
- Class 3: Dominant vegetation cover is not priority peatland habitat but is associated with wet and acidic type. Occasional peatland habitats can be found. Most soils are carbon-rich soils, with some areas of deep peat; and
- Class 5: Soil information takes precedence over vegetation data. No peatland habitat recorded. May also include areas of bare soil. Soils are carbon-rich and deep peat.

Summary of Peat Depth

10.2.12 Most of the Site has either no peat present or has a shallow depth of peat present (approximately 74.2 % of peat probes were <0.5 m in depth). The survey results indicate that the peat depth is variable ranging between 0.0 m and 5.3 m thickness. The peat thickness on the Site was found to be mostly shallow, but with some deep areas of deeper peat. The peat probe depth and interpolated contours are shown on **Figure 10.7: Peat Depth Plan, EIAR Volume 3a**). The mean peat depth recorded was 0.47 m (47 cm).

10.2.13 Overall, the peat depths sampled across the Site were relatively shallow, with occasional deep pockets recorded. The peat was found to be generally in a state of weak to strong decomposition. For areas of peat within the forestry, this is likely to be due to the coniferous plantation and associated extensive artificial drainage, which has resulted in modification to the integrity and composition of the peat and carbon rich soils.

Peatland Condition

10.2.14 Two peat depth surveys were undertaken at the Site, with a combined total of 12,939 peat probes taken. The results of the surveys were used to inform the design layout of the Proposed Development.

10.2.15 Most of the Site has either no peat present or has a shallow depth of peat present (approximately 74.2 % of peat probes were <0.5 m in depth). These areas of shallow peat can be considered as organo-mineral soils. These are further summarised as follows:

- 6,083 no. samples (47 %) located on land with no peat/ absent;
- 3,517 no. samples (27.2 %) located on land with less than or equal to 50 cm depth of peat or organomineral soil;
- 1,585 no. samples (12.2 %) fell on land with between 51 cm and 100 cm depth of peat; and
- 1,754 no. samples (13.6 %) located on land with more than 100 cm depth of peat.

The Proposed Development's infrastructure has been located away from these deeper peat locations where practicable, taking into account other environmental and technical constraints, or microsited to minimise potentially significant adverse effects. However, based on the other design and technical constraints, it has not been possible to site the Proposed Development entirely outwith areas of peat. Further details of the peatland condition and findings from the peat surveys are included in **Appendix 10.1: Peat Depth Results Report (EIAR Volume 4**).

10.3 Classification of Peat

10.3.1 Peat was characterised as part of the peat survey which considered the physical properties of peat cores taken across the Site. The key measures of peat condition, which are important to establishing the appropriate type of reuse, are noted in **Table 10.2.1**. Overall, the sample results suggest that the acrotelm layer is on average 0.5 m thickness, but it is recommended that the upper 0.5 m should be reused as part of the reinstatement programme, where this depth of material is available. Excavation of 0.5 m ensures that the acrotelm remains as intact as possible and captures much of the underlying seed bank material which would aid vegetation regeneration. With regards to the catotelm material within the Site, the results indicate that the majority of the material is intermediate.

Table 10.2.1: Peat Classification	
Peat Type	**Key Measures and Survey Summary**
Acrotelm	Depth - Acotelmic peat was recorded in all sample locations, ranging from between 0.1 m and 0.9 m depth, with a mean of 0.5 m. It is recommended that for the purposes of construction and subsequent reinstatement, that where a sufficient peat depth exists, the top 0.5 m of material should be treated as acrotelm. This approach would allow excavation of intact turves for reinstatement purposes where they are present, which would in turn facilitate quicker regeneration of disturbed areas.
Acrotelm/Catotelm	Degree of Humification - most of the samples are classed as intermediate, which is suggestive of some humification in the samples. The remainder were recorded as both amorphous and fibrous.
	Fibrous Content - The results indicate that the fine fibre contents are mostly moderate (F2). The majority of the sample locations were assessed as low coarse fibre content (R1).
	Water Content - The results indicate that the majority of the samples are indicative of dry or semi-dry peat (B1/B2), with the remaining samples classified as having some moisture present or wet.
	Von Post - The results indicate that all the samples were found to be between H3 and H7 on the Von Post scale, indicating very weakly decomposed to strongly decomposed peat, with the majority of the samples being between H3 and H5. There is evidence of some intensively managed areas of the Site, where there are areas of woodland plantation and artificial drainage. In some areas diffuse natural drainage systems were also noted. It is likely that there is potential for acrotelmic and peat to be highly modified as result of desiccation associated with forestry and artificial drainage. There is also evidence of significant peat cutting across parts of the Site.

10.4 Estimated Peat Balance

10.4.1 The volume of peat required to be excavated and reinstated due to the Proposed Development has been estimated based on the following data and assumptions:

- peat depth survey data from probing undertaken at the Site;
- excavations take place only within the construction footprint;
- peat would shrink on replacement due to some inevitable dewatering during handling and compaction at placement;
- no permanently excavated access tracks are proposed as part of the Proposed Development, and existing tracks would be utilised;
- temporary peat excavated for temporary infrastructure such as the construction compound and laydown could be reinstated, and therefore not considered as part of the permanent excavation volumes; and

- for the purpose of the assessment and in the absence of any peat characteristic information it is assumed that the top 0.5 m is characterised as acrotelmic peat, with catotelmic peat below that.

10.4.2 Specific design assumptions used to estimate the peat volumes to be excavated and reinstated due to the Proposed Development are as follows:

- The proposed excavation footprints for 671 low profile trident ‘H’ pole locations. It has been assumed that an area of 625 m^2 of disturbance would be required at each pole location. It has been assumed that peat can be stored and reinstated at each pole location and no surplus peat is anticipated;
- The maximum peat depth recorded at each pole location has been used as a conservative estimate for peat depth excavation volumes;
- Pole locations that cannot be relocated or microsited to avoid deep peat would utilise a ‘bog shoe’ type foundation, where no surplus peat would be permananently excavated and can be restored.;
- It has been assumed that all peat can be reinstated within the working areas at each pole location;
- No new permanent access tracks are proposed, and access would be gained using existing access tracks and use of low ground pressure vehicles and trackway panels in boggy/soft ground areas to reduce any damage to, and compaction of, the ground. There is potential for proposed temporary access tracks to be required; however, the use of these accesses would be kept to a minimum to minimise disruption to habitats along the route. In certain situations, helicopters may be used for pole delivery to point of installation;
- Where possible, these would use 'floating' construction techniques where these are located over deep peat. It is assumed that no significant volumes of peat would be excavated and temporary access tracks could be reinstated on completion of construction works; construction activities would be undertaken in accordance with the good practice measures included within the Applicant’s General Environmental Management Plans (GEMPS) (**Technical Appendix 2.2: SSEN GEMPS (EIAR Volume 4)**); and
- Construction compound sites (temporary/permanent) have not been identified at this stage. This would be the responsibility of the principal contractor, who would identify suitable sites and apply for separate planning permission.

10.4.3 **Table 10.2.2** provides an estimate of the volumetric peat excavation for the Proposed Development. These volumes would be subject to review and updated following ground investigation, and detailed design as part of the post-consent process, prior to construction.

Table 10.2.2: Estimated Peat Volume to be Excavated

Element	Estimated Total Peat Volume to be Excavated (m^3)	Estimated Acrotelmic Peat Volume to be Excavated (m^3)	Estimated Catotelmic Peat Volume to be Excavated (m^3)
Poles	467,187.50	152,250.00	314,937.50
Temporary Access Tracks	0	0	0
TOTAL	**467,187.50**	**152,250.00**	**314,937.50**

10.4.4 **Table 10.2.3** provides an estimate of the potential reinstatement opportunities for the Proposed Development.

Table 10.2.3: Estimated Peat Volumes to be Reinstated Opportunities

Element	Area to be Restored (m^2)	Average Depth of Restroration Area (m)	Volume of Acrotelmic Peat Reinstatement Opportinities (m^3)	Volume of Catotelmic Peat Reinstatement Opportinities (m^3)	Total Reinstatement Opportunities (m^3)
Poles	414,375	1.11	152,250.00	314,937.50	467,187.50

Table 10.2.3: Estimated Peat Volumes to be Reinstated Opportunities					
Temporary Access Tracks	0	0	0	0	0
TOTAL			**152,250.00**	**314,937.50**	**467,187.50**

10.5 Requirements for the Detailed Peat Management Plan

10.5.1 The Appointed Contractor would be required to update this OPMP prior to the construction phase commencing, based on additional information such as the results of further ground investigations and detailed design. As part of this update the following key activities are anticipated:

- update the PMP with relevant measures as set out in SSEN GEMPS as included in **Technical Appendix 2.2: SSEN GEMPS (EIAR Volume 4)** with specific reference to 'Working in Sensitive Habitats' and 'Soil Removal, Storage and Reinstatement';
- ensure the excavated peat is placed in peat storage areas at the infrastructure location ready for the restoration phase;
- reuse some of the excavated peat, on-site, as indicated in **Table 10.2.3**. The PMP should specify where the contractor intends to reuse peat on site and provide estimates of the quantities that would be used. The reuse of peat would be subject to the conditions and methods of reinstatement described in the PMP and relevant GEMPS; and
- remaining peat would be used for habitat restoration.

10.5.2 The final PMP would include the following:

- project background, such as the Proposed Development description, peat-related planning conditions attached to the consent, and peat management recommendations;
- confirmation of excavated peat volumes based on completion of ground investigation and review of detailed design;
- review of peat restoration opportunities, including any restoration requirements;
- a construction timetable and highlight any seasonal considerations;
- comply with SEPA Construction Site Licence, as required;
- a detailed method statement for peat and mineral soil handling, including specification of equipment to be used;
- measures to be put in place to deal with weather related events (flash floods, peat slide, snow melt, dust);
- appropriate use of track and road material, and other hard-standing material to minimise pollution;
- detail measures to enable sediment management in emergency situations, to cope with high rainfall and runoff;
- scheduling of peat restoration works would be undertaken in line with SPPs and GEMPS, according to agreed methodologies and with guidance and supervision from a suitably experienced Ecological Clerk of Works (EcoW);
- scheduling of construction to benefit site restoration; and
- a record keeping system of what the final PMP would include.

10.6 Monitoring and Record Keeping

10.6.1 An ECoW, experienced in working with peat, would be appointed by the Appointed Contractor prior to commencement of the construction phase. The ECoW would be responsible for monitoring compliance against the final PMP and other relevant documents such as the final CEMP. They would also be responsible for ensuring the legislative requirements are complied with.

10.6.2 The contractor and the ECoW would be responsible for maintaining clear records during the construction phase such as depths and types of peat excavated, plans showing peat storage areas and locations of reinstated peat.

10.7 Peat and Mineral Soil Handling Methods

10.7.1 This section provides guidance to help the contractor in both planning and executing the construction works for the Proposed Development. Working in peat cannot be avoided because parts of the Site is underlain by peat of variable depth and thickness (refer to **Figure 10.7: Peat Depth Plan (EIAR Volume 3a)**). Careful handling of the peat would also be required to ensure its suitability for reuse.

10.7.2 The Appointed Contractor would provide a detailed method statement for works in peat habitats, including but not limited to:

- how to minimise the area of impact;
- how to avoid/work around areas of higher quality vegetation (with the assistance of the ECoW);
- means of access to areas of work and to areas where peat would be reused;
- methods of peat removal;
- managing water in the peat and pollution prevention;
- where to avoid unnecessary intrusive work wherever possible; and
- drainage measures and design and use of appropriate techniques to maintain local hydrology.

10.7.3 The final PMP would detail the methods and timing involved in handling, storing and using peat for reinstatement. The final method statement for this should be based on the following principles:

- the surface layer of peat and vegetation (acrotelm) would be stripped separately from the catotelmic peat. Where possible this would involve an excavation depth of 0.5 m and the creation of turves;
- the turves should be as large as practicably possible to minimise desiccation effects during storage;
- the turves should be kept wet but not saturated, and not allowed to dry out when in temporary storage;
- contamination of excavated peat with other substrate materials (e.g., gravels, clays or silts) should be avoided and these materials stored separately where excavated;
- acrotelmic material would be stored separately from catotelmic material even if some of this layer appears to be lacking vegetation, since it may contain a seedbank that is useful for re-establishing vegetation;
- any risk of peat slide must be considered by a suitably qualified engineer and where risk is identified protective measures developed and agreed with the Applicant before further construction works take place. Reference should be made to the findings presented in **Technical Appendix 10.3: Peat Landslide Hazard Risk Assessment (EIAR Volume 4)** and subsequent detailed assessment;
- careful handling would be essential to retain any existing structure and integrity of the excavated materials and thereby maximise the potential for excavated material to be reused;
- plan all works to reduce the need for double handling the peat;
- movement of excavated turves and peat should be kept to a minimum and it is preferable to transport peat intended for translocation to its final destination at the time of excavation;
- less humified catotelmic peat (consolidated peat), which maintains its structure upon excavation, should be kept separate from any highly humified amorphous peat;
- consider the timing of excavation activities to avoid very wet weather periods to reduce the risk of peat becoming wet and unconsolidated, thereby reducing pollution or peat slide risk;
- acrotelmic material for reuse within the Site would be replaced as intact as possible once construction is complete; and

- to minimise handling and transportation of peat, acrotelmic and catotelmic materials for re-use within the Site would be replaced, as far as is reasonably practicable, in the location from which it was removed. Acrotelmic material must be placed on the surface.

10.7.4 The handling of peat should be monitored and supervised by the ECoW to ensure the above principles are adopted and implemented during construction of the Proposed Development. Based on the current project programme, it is anticipated that the peat excavation and soil stripping activities would be undertaken throughout the duration of the works between months 5 and 27, as and when required at each pole location..

10.8 Minimising Damage to Existing Vegetation

10.8.1 To minimise damage to the existing vegetation, construction plant required for reinstatement and landscaping works would be positioned on constructed access tracks, hardstanding areas or existing disturbed areas wherever possible. Areas to be excavated would be clearly marked on the plans and then on the ground to ensure that no work is undertaken outside the construction footprint.

10.8.2 Tracked, low ground-pressure, long reach excavators would be used for peat handling and reinstatement works. A low ground-pressure excavator would be used if the extent of the long reach arm is insufficient. Other machinery, such as tippers, would also be tracked and low-ground pressure type when required to travel on soft ground and the use of ground protection mats could be required.

10.8.3 Reinstatement of vegetation would be focused on natural regeneration utilising peat vegetated turves (acrotelm). In the unlikely event that the quantity of excavated acrotelm turves is not sufficient, a nurse moorland grass seed mix would be used. The species mixture would be specified in the final PMP and could include lowland species to encourage early establishment.

10.9 Planning of Peat Reinstatement

10.9.1 Peat reinstatement and restoration would be undertaken using methods to minimise double handling of peat and the distances between source and receptor areas where practicable. Peat translocation, reinstatement and restoration would be carried out concurrently with other elements of the Proposed Development's construction. To achieve this, a detailed peat restoration plan would be included in the final PMP along with peat management recommendations as per SEPA guidance.

10.9.2 When peat is disturbed or translocated artificially it is prone to drying because fragmentation allows water to drain away and prevents it from accumulating. To create conditions suitable for wet bog restoration, the reinstated peat needs to be kept wet, otherwise, the vegetation would dry out, the peat would shrink and crack, and would ultimately be eroded by water and wind, which would make the restoration unsuccessful and likely to create problems such as peat floods, water pollution, and peat landslides.

10.9.3 The main principle of keeping the water close to the reinstated surface (maintenance of high-water table) is to use natural and artificial enclosures to slow down the horizontal flow of water. For the enclosure to work, the peat surface needs to be flush with or only slightly (<0.3 m) above the level of adjacent land (to allow for settlement). If the level of translocated peat is substantially higher, then it would be at high risk of drying out and easily eroded as water would not be held effectively by the peat alone, it would naturally flow sideways.

10.10 Temporary Peat Storage

10.10.1 During construction, temporary peat storage would be required before the excavated material could be re-used in restoration and placed in its end use location. The final method statement for this temporary storage of peat would be based on the following guiding principles:

- temporary storage of peat shall be minimised and where required would be temporarily stored in stockpiles/bunds adjacent to and surrounding each infrastructure site;
- acrotelm, catotelm, and any clay/glacial till or other substrate would be stored separately and appropriately to ensure no mixing of materials and to prevent cross-contamination;

- suitable storage areas shall be sited in areas with lower ecological value, low stability risk areas and at a minimum distance of 30 m from watercourses. Identified suitable areas would form part of the final PMP and would be agreed in advance with the ECoW;
- peat turves would be stored in wet conditions where possible (e.g. within waterlogged former excavations) or irrigated in order to prevent desiccation;
- larger stockpiles are preferable to numerous small stockpiles, which minimises exposure to sun and wind, which could lead to desiccation. Stockpiles would not exceed 2 m in height and would be sited with due consideration for slope stability. Benching of stored peat could be necessary to provide stability;
- stores of non-turf, i.e. catotelm, would be bladed off to reduce surface area and desiccation of the stored peat;
- stores of peat, particularly catotelmic material, would be inspected by the Appointed Contractor weekly and following heavy rainfall or thaw conditions to check for any evidence of movement, tension cracks or instability in the stored peat. If there is any evidence of instability, appropriate remedial measures would be taken as necessary on the advice from a suitably qualified engineer;
- in dry weather periods, consideration shall be given to watering stored turves and peat to prevent drying out, wastage and erosion;
- pollution prevention measures would be installed around peat storage areas;
- reinstatement would, in all instances, be undertaken at the earliest opportunity to minimise storage of turves and other materials;
- timing the construction and reinstatement work, as much as possible, to avoid periods when peat materials are likely to be wetter; and
- where practical, transportation of peat on the site, from excavation to temporary storage and restoration locations, would be minimised.

10.11 Reinstatement of Peat

Pole Foundations

10.11.1 Peat excavated for poles and working areas would be stored as close to the poles as possible, so as to avoid double handling of materials. The construction of the poles involves the excavation of the acrotelm and catotelm, or top, organic layer of peaty soils, and some mineral subsoil. These would be separated on excavation, ensuring no mixing of the different peat layers, and different soil types. Once all the soil has been excavated and the higher bearing underlying subsoil has been reached, the pole foundation would then be constructed.

10.11.2 Up to 50 cm of acrotelm would be used to reinstate the surface vegetation and catotelm re-used to backfill excavations where practicable dependent on the type and depth of the foundation excavation.

10.11.3 Following construction of the pole, turves would be replaced along the excavation/working area edges to allow quicker re-vegetation. Acrotelm turves would be used for this purpose, only where required and would tie in with the surrounding topography, landscape and ground conditions to prevent adverse environmental effects.

10.11.4 Poles located in deep peat would be constructed using a ‘bog shoe’ type foundation solution, where practicable, and it has been assumed that no specific restoration is required.

10.11.5 It is anticipated that no surplus peat would be generated from the installation of the poles and can be stored and backfilled.

Temporary Access Tracks

10.11.6 No temporary access tracks are proposed at this stage but if used would be restored following removal of the stone hardstanding. Peat would be reinstated to be flush with the ground. No permanent access tracks are proposed.