Appendix 10.1 Outline Peat Management and Restoration Plan

Contents

This page is intentionally blank.

Appendix 10.3 Outline Peat Management and Restoration Plan

Introduction

This Outline Peat Management and Restoration Plan (PMP) document has been prepared by Fluid Environmental Consulting (Fluid) on behalf of the Applicant for the construction of the Proposed Development, located in the north west of Yell, Shetland Isles. The site is close to the coast on the northern and western sides and it is accessed from the south east by the A968 public road. The landscape is principally one of undulating peat moorland, with numerous waterbodies (from bog pools to small lochs) and small burns. The moorland includes areas of grassland and the whole of the land within the Site Boundary is subject to sheep grazing.

The infrastructure of the Proposed Development comprises of 630m of existing tracks that will be upgraded and widened, 8,400m of new floated tracks, 2,200m of new excavated tracks, 160m of temporary floated tracks that will be subsequently restored, 18 wind turbine locations and associated crane hardstandings and floated laydown areas, three temporary construction compounds, a substation, meteorological mast and four borrow pit search areas.

The total area of the Proposed Development footprint, including existing tracks, is 279,327m^2, an additional area of 47,964m^2 (see calculations section) is also considered as this is the area outside of the infrastructure footprint that would either be excavated or covered by hardcore to build the infrastructure. The total area of the Proposed Development footprint is therefore 327,291m^2, as this incorporates the drains and batters associated with the infrastructure. The existing Old Cullivoe Road is not included in this volume, only the widened portion and any new drainage.

The design of the Proposed Development has been undertaken as an iterative process to avoid areas of deep peat as much as possible to limit peat excavation and to limit the potential for peat slide, as presented in Chapter 2 of the 2019 EIA Report, Chapter 3 of the 2020 Supplementary Environmental Information (SEI) and Chapter 3 of SEI 2.

The PMP will be further developed and implemented subsequent to the Proposed Development receiving consent from the Scottish Government. Further details and specific plans will be determined during the detailed design process and once further site investigations have been undertaken. These details will then be included in a detailed PMP as a part of the required Contractor's detailed Construction Environmental Management Plan (CEMP) to be approved by SIC in consultation with SEPA. The responsibility for the implementation of the PMP will be with the Principal Contractor (PC).

The PMP has been developed due to the presence of peatland and peat habitats (including blanket bog, mire and heath) on the Proposed Development site (Chapter 7, Ecology, of the 2019 EIA Report, 2020 SEI and SEI 2).

The potential volumes of peat extracted and re-used have been calculated based on an area specific or infrastructure specific basis using a modelled peat contour plan developed on a high-density probing grid where excavations will be undertaken (Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey. Guidance on Developments on Peatland). This has allowed high levels of confidence in the estimation of the volumes of peat that will be excavated and that will then require appropriate re-use. This report should be read in conjunction with Chapter 10 of SEI 2 and its associated figures and appendices.

The PMP addresses the management of peat during the construction period and the immediate restoration of the site once construction has been completed. In accordance with the Scottish Environment Protection

Agency's (SEPA) Regulatory Position Statement (2010) Developments on Peat, as much peat as possible is reused on site.

Objectives

The PMP has been developed to demonstrate that peat has been afforded significant consideration and necessary protection during the construction phase of the Proposed Development, should consent be granted. It aims to propose mitigation measures that will minimise any impacts to peat, and present the long-term habitat restoration and management plans for key areas in order to enhance the site.

The PMP outlines the overall approach of minimisation of peatland disruption that has been adopted. It aims to ensure that all further opportunities to minimise peat disturbance and extraction will be taken.

The PMP seeks to identify that appropriate proposals to re-use the surplus peat can be accommodated within the site layout, without significant environmental or health and safety implications, to minimise risk in terms of carbon release and human health.

Structure

The structure of the PMP is as follows:

- legislation, policy and guidance;
- role of the PMP;
- definition of peat, details of peatland characteristics and peat conditions on site;
- avoidance and minimisation of peat disturbance;
- peat balance between excavation and reuse on site of surplus peat;
- peat excavation and handling methods/ controls and temporary peat storage; and
- reuse in infrastructure construction restoration.

Tables are included showing:

- a summary of depth of penetration probe data;
- a summary of interpreted peat depth at infrastructure areas;
- a summary of dimension and area details of the infrastructure;
- where excavated peat will be generated and the associated quantities;
- where excavated peat will be re-used and the associated quantities; and,
- a summary of the peat extraction and re-use balance.

Legislation, Policy and Guidance for Peat Management

Legislation, Policy and Guidance

When considered as part of a carbon landscape, peat has the capacity to act as a carbon sink. The management of peat therefore has implications for carbon emissions and climate change. There is a substantial body of relevant legislation and guidance regarding climate change and carbon which is relevant to the management of peat including:

- The UK Climate Change Act (2008);

- Carbon Landscapes and Drainage, 2012 'The Carbon and Water Guidelines', www.clad.ac.uk;
- Forestry Commission, 2011, 'Forests and climate change: UK Forestry Standard Guidelines.

Other key documents relied upon to inform this draft PMP include:

- Scotland's National Peatland Plan Working for our future. Scottish Natural Heritage 2015;
- Best Practice Guidance to Planning Policy Statement 18 'Renewable Energy', August 2009;
- Good practice during windfarm construction (Scottish Renewables, SNH, SEPA & Forestry Commission Scotland, 4th Edition 2019);
- Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey. Guidance on Developments on Peatland;
- SEPA Regulatory Position Statement – Developments on Peat. February 2010;
- Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste Scottish Renewables, 17 January 2012;
- Forestry Civil Engineering and SNH (2010). Floating Roads on Peat: A Report into Good Practice in Design, Construction and Use of Floating Roads in Peat with particular reference to Wind Farm Developments in Scotland;
- Forestry Commission (2012). Forests & Water Guidelines. 5th Edition. HMSO;
- Scottish Executive (2017) Peat Landslide Hazard and Risk Assessments. Best Practice Guide for Proposed Electricity Generation Developments. Second Edition; and
- Towards an assessment of the state of UK Peatlands, JNCC 2010.

Role of the Peat Management Plan

The PMP is intended to be a working document to be used throughout the key stages of the design, construction, operation, decommissioning and re-instatement phases of the Proposed Development as part of an overall CEMP as follows:

Stage 1: Environmental Impact Assessment

It is necessary to show how, through site investigation and iterative design, the Proposed Development has been designed to minimise, so far as reasonably practicable, the quantity of peat which will be excavated; that volumes of peat anticipated to be excavated by the Proposed Development have been considered; and how excavated peat will be managed. The overall aim is to minimise the impacts associated with excavation of peat by using the following hierarchy of design principles: prevent excavation; reduce volumes of peat excavated; and reuse excavated peat in a manner to which it is suited. This hierarchical approach comprises:

1. calculation of estimated volumes of excavated peat and potential reuse volume requirements based upon the Proposed Development site design / layout;
2. determine whether there is likely to be adverse or beneficial overall peat balance, and whether the generation of excess material can be avoided, and, if not, where reductions in the volumes of excavated materials may be achieved;
3. site layout is refined to avoid areas of deeper peat and hence reduce carbon impacts of the project construction activities;
4. record specific examples of how overriding principles of prevention and minimisation of peat disturbance are to be taken into account in the design of the site;

5. the assessment is to be consistent with and feeds into the peat stability and carbon payback assessment; and

6. identify limitations and make recommendations for further site investigation (post-consent) in order to steer detailed design and micro siting such that opportunities for further reductions in excavated peat volumes can be implemented where possible.

Stage 2: Post Consent / Pre-Construction

As part of the 2019 EIA Report, 2020 SEI and SEI 2, it has been demonstrated that, on the basis of the investigation and data gathered, it is likely that the excavated materials for the Proposed Development can be managed in an appropriate manner. The peat mass balance calculations may be further developed and refined post planning consent, and prior to the relevant works commencing, as a consequence of any further or more detailed ground investigation or survey works required to inform detailed design, or that may be required under planning consent conditions.

Stage 3: Construction Stage

Actual peat volumes excavated from site during construction will be recorded against predicted volumes provided in Table 5 of this PMP. Within micro-siting allowances, the alignment and design of tracks, hardstanding orientation and construction methods will be reviewed to avoid/minimise peat disturbance as much as possible in light of the more detailed information available once construction actually commences. A regular review and update of the peat mass balance table will be undertaken by the appointed PC and monitored by the Environmental Clerk of Works (ECoW) on site and made available to regulators as required.

Peat Conditions

Definitions of Peat

Organic material less than 0.5m depth is not defined as peat. This is in accordance with guidance from:

- Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey. Guidance on Developments on Peatland states that *'Peat soil is an organic soil which contains more than 60 per cent of organic matter and exceeds 50 centimetres in thickness'*;
- The James Hutton Institute define shallow peat as having *'a prescribed depth of organic matter of 50 – 100 cm'* *(*https://www.hutton.ac.uk/learning/exploringscotland/soils/organicsoils); and
- Also, The Forestry Commission use 45 cm as the critical depth for peat to occur (Understanding the GHG implications of forestry on peat soils in Scotland, 2010).

Peat can therefore be classified as organic material over 0.5m in depth.

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:

- Acrotelmic peat is the living layer of the 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 0.5m) depending on the degree of decomposition and fibrous nature of the peat (approximately H1 to H6 on the von post classification scale). 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 up to 1m.

- 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 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.
- 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 up to 1m when stockpiled.

Peat Conditions on Site

Desk Based Review

The site was assessed for peat vegetation through desktop review of maps and plans and a number of surveys by ecologists and hydrologists; and through intrusive site investigation in terms of peat depth probing and coring across the Proposed Development site and access track routes.

The land within the Site Boundary covers approximately 1,679ha. It ranges in altitude between just over 0 and 120m above sea level. The site is characterised by bog pool complexes on higher ground with watercourses in the valleys and a mix of man-made, and natural, drainage networks on the side slopes.

The land cover for the site predominantly comprises of undulating open moorland. The vegetation is upland in character, waterlogged and dominated by blanket bog and other mire types, with areas of grassland in the more sheltered valleys and on better-drained slopes.

The peatland areas are natural organic, dystrophic and oligiotrophic blanket peat mostly intact and relatively untouched with some evidence of very localised disturbance in and around occasional drainage grips and the existing access track, including historical peat cuttings and small borrow pits along the existing track.

The 2019 EIA Report Ecology Chapter (Chapter 7) notes *'The relatively gentle topography of the site and the prevailing climate conditions have resulted in the widespread presence of blanket bog. Blanket bog occurs in over 75% of the 1679 ha site and dominated habitat mosaics in a further 14% of the site. The condition of the blanket varies across the site, but good quality bog, with numerous pool complexes occurs in several areas across the site.'*

'There is some hagging locally, mainly in the east central area north of Gossa Water, and Scottish Water notes that the Gossa watershed is partly degraded, with the water quality being characterised by a high amount of organic material as a consequence of hags and erosion gullies being present (Scottish Water, personal communication, meeting on 09 January 2019).'

'Blanket bog covers the majority of the access track Study Area and was noted as being in generally good condition, containing occasional oligotrophic pools, although some small sections are heavily eroded.'

The site overlies Gneissose Psammite and Gneissose Semipelite, metamorphic bedrock formed approximately 542 to 1,000 million years ago, originally sedimentary rocks, later altered by high grade regional metamorphism, but as peat depth often exceeds 2m most of the vegetation is not within the influence of this formation. The mineral soils along the burns may derive some mineral nutrients from this source. There is no evidence of peat cutting on site however there are areas of erosion, peat hag and erosion in gullies although these are sporadic and infrequent.

Peat Survey Methodology

To obtain a detailed understanding of the spatial and depth distribution of peat and its properties, a series of tasks have been completed which include:

- National vegetation classification (NVC) habitat mapping (detailed within the Ecology Chapter 7 of the 2019 EIA Report);
- Depth penetration probing (see peat survey report Appendix 10.2 of the 2019 EIA Report) at over 13,000 locations:
  - in a 100m grid over the whole of the site;
  - at turbines and crane hardstandings, construction compounds and the substation on a 10m grid along with 20m probing in the surrounding area up to 50m distance.

    There are some locations where the 2021 Layout has resulted in small areas of infrastructure being moved into areas that are not completely covered at this frequency. However these are very minor, are covered by slightly lower density probing and the peat depth model in these areas is still considered to be sufficiently valid to allow the appropriate calculations to be undertaken.

    The Applicant will commit to completing peat surveying in the 100m micrositing allowance area prior to construction in order to comply with the 100m micrositing request;
  - at borrow pit search areas on a 10m grid;
  - at construction compounds and the substation on a 10m grid, and
  - along the track at 50m intervals and 10m offsets along the tracks.
- Peat coring at 174 locations to verify the probing is representative of peat depth and to assess the peat structure and properties;
- Collection of 20 peat samples for laboratory analysis of total organic carbon and dry bulk density for input to the carbon calculator assessment;
- Development of a penetrable substrate depth map to indicate the maximum depth of probe penetration at all investigated points across the site;
- Development of an interpreted maximum depth of peat contour map to indicate the potential penetrable substrate or inferred peat depth based on the depth penetration probing results and verified by coring;
- Calculation of the maximum potential peat volumes that will be removed due to excavation for infrastructure based on the depth penetration probing results; and,
- Examination of areas where peat will be reused to allow calculation of reuse volumes.

Peat Surveys

Four depth of penetration surveys have been completed in 2018 and 2019.

Phase 1

A first phase of peat depth probing was undertaken in May 2018 and comprised a 100m grid across the part of the site that was considered for development with the exception of areas where ornithological restrictions were in place around lochs. A total of 1,338 peat probes were undertaken and 40 cores. These data were used as an input to the constraints map for development of the initial infrastructure layout.

Phase 2

Once the Proposed Development initial layout was determined Fluid completed further detailed probing and coring in October and November 2018 at the following specification:

- at 50m intervals with 10m offset probes along all proposed and existing access tracks and coring at 500m intervals;
- at all turbine bases and hardstanding areas in a 10m grid, along with probing in the 50m micrositing area on a 20m grid and 2 cores per turbine/hardstanding area;
- at construction compounds on a 10m grid and 2 cores per construction compound;
- at the substation on a 10m grid with 10m probing within the micrositing area where there are no other constraints and 2 cores; and
- at all borrow pit search areas on a 10m grid and 2 cores per borrow pit.

This totalled 9,622 probes and 119 cores.

Phase 3

Following further optimisation of the layout a further phase of depth of penetration probing was completed in January 2019 where infrastructure had moved out of the previously probed areas. This totalled 2,070 probes and 15 cores.

Phase 4

An additional area of probing on a 20m grid was completed in February 2019 where the southern construction compound was relocated. This totalled 31 probes.

A total of 13,061 probes and 174 cores were completed across the four campaigns.

As noted above, additional peat depth surveying was not deemed necessary for the 2021 Layout as the changes to the infrastructure layout are minimal. Only a small proportion of these have been relocated outside of the high density probing where they are still covered by a reasonable density of probes and a robust peat depth model.

<u>Peat Survey Results</u>

A total of 13,061 probes were undertaken during the various campaigns between May 2018 and February 2019. Each probe recorded the depth of penetration and the potential substrate at the limit of penetration (Appendix 10.2 Peat Survey Report, 2019 EIA Report).

Of the 13,061 locations probed a total of 1,067 probes (8.2%) recorded depths of 0.5m or less, 2,941 probes (22.5%) recorded depths of penetration between >0.5m and 1.0m and 9,053 probes (69.3%) recorded depths of penetration >1.0m (Table 1).

Table 1 – Depth of Penetration Distribution

Depth Range (m)	Number of Probes	Percentage of Probes
0 to 0.5 (no peat)	**1,067**	**8.2%**
>0. 5 – 1.0	2,941	22.5%
>1.0 – 1.5	3,642	27.9%
>1.5 – 2.0	3,523	27.0%
>2.0 – 2.5	1,071	8.2%
>2.5 – 3.0	494	3.8%

Depth Range (m)	Number of Probes	Percentage of Probes
>3.0 – 3.5	180	1.4%
>3.5 – 4.0	92	0.7%
>4.0 – 4.5	23	0.2%
>4.5 – 5.0	16	0.1%
>5.0 – 5.5	5	0.04%
>5.5 – 6.0	6	0.05%
>6.0	1	0.01
Total	13,061	100%

The depth of penetration at each probe location is presented on Figure 10.8 of SEI 2.

Based on the data collected an interpreted peat depth map (Figure 10.9 of SEI 2) was produced to demonstrate the variation in peat across the site and at the various infrastructure locations of the 2021 Layout. A comparison of the peat depth with the 2021 Layout infrastructure footprint is presented in Table 2:

Table 2 – Peat Depth Distribution across 2021 Layout Infrastructure Footprint

Depth Range (m)	**Area of infrastructure footprint (m^2)**	**Area of infrastructure footprint (%)**
0 to 0.5 (no peat)	19,524	6.94%
>0. 5 – 1.0	69,242	24.61%
>1.0 – 1.5	100,246	35.63%
>1.5 – 2.0	65,409	23.25%
>2.0 – 2.5	21,435	7.62%
>2.5 – 3.0	3,123	1.11%
Pea>3.0 – 3.5	993	0.35%
>3.5 – 4.0	524	0.19%
>4.0 – 4.5	172	0.06%
>4.5 – 5.0	228	0.08%
>5.0 – 5.5	451	0.16%
>5.5+	15	0.01%
Total	281,362	100%

Note: The area of the infrastructure footprint is larger than the area of new infrastructure as the latter does not include the area of existing track. The area of infrastructure footprint does not include side slopes and drains although these are calculated and included in the peat excavation calculations.

These data indicate that deep peat (>1.0m depth) is present across 68.5% of the Proposed Development 2021 Layout infrastructure and no peat (0 – 0.5m depth) is present across 6.9% of the Proposed Development 2021 Layout infrastructure.

A total of 174 cores were completed with the majority encountering peat with acrotelm and catotelm layers identifiable. In parts of the site vegetation and tussocks form layers over 0.5m in thickness immediately next to acrotelm of 0.05m to 0.30m thick. A conservative average acrotelm depth of 0.15m has therefore been used and the peat depth minus the acrotelm depth can been used to calculate the potential catotelm thickness.

Peat Characteristics

The peat is fibrous and moist in nature at the surface with a large acrotelmic layer up to 30cm in thickness where vegetation at the surface was present. The catotelmic peat was up to a maximum of 6m in thickness, with well-preserved cotton grass, sphagnum moss and wood in places within the soil profile. No clear basal layer of amorphous peat (H9/H10) was observed. The peat characterisation studies concluded that the site comprises active peatland across much of the open moorland with some degradation/modification from very localised historical peat extraction near the A968 road, which mostly shows some good recovery.

These values have been used in calculations of volumes of peat across the site where the peat contour map indicates that peat is present (e.g. >0.5m probe depth). Catotelm and amorphous peat volumes were calculated together as a result of there being no clear basal layer of amorphous peat observed.

Habitat Conditions

Habitat mapping and NVC survey was undertaken by Botanaeco and is detailed within Chapter 7 Ecology and Figures 7.2-7.3 of the 2019 EIA Report.

Blanket bog dominates the site with approx. 75% cover (M17b, M17c, M1, M2 and M3). Bare peat habitat is rare across the site and confined to moderate slopes and vertical faces within areas of peat hag, although there are some erosional gullies in the Gossa Water catchment. Acid/neutral flush (M6a, M6c, M29 and M32a) is associated with the flanks and bases of the small valleys of the watercourses, or the edges of lochs and lochans. Some influence from base-rich substrates (Flush and spring: basic – M10a) is evident in the south-western coastal area, in the occurrence of basic flushes, just beyond the Site boundary.

Avoidance and Minimisation of Peat Disturbance

Avoidance

The 2021 Layout has been designed to avoid or minimise impact on blanket bog habitats. In practice this has been undertaken where possible by avoiding the deepest peat, which is normally where the best quality blanket bog habitats occur and are to some extent preserved. The design elements aimed at minimising effects on blanket bog systems that have been incorporated are:

- avoiding the deepest intact peat with tracks, compounds, substation, borrow pits, turbines and crane pads where possible;
- avoidance of the summit bog pool complexes; and
- avoidance of areas where peat slide risk is moderate or higher.

Further Minimisation

The disturbance of peat by the construction of the tracks, crane hardstandings, turbine foundations and other infrastructure will be minimised as much as practicably possible, taking into account the other constraints to the Proposed Development, in order to try and reduce any peat waste on site and reduce potential carbon losses from the peat excavation process.

Throughout the construction process, the appointed PC (and / or Designer) will aim to minimise the volumes of excavated peat. As far as possible, appropriate handling and storage of excavated materials will be undertaken such that their integrity and subsequent reuse is not jeopardised.

Although every effort has been made to map and identify sensitive habitats as thoroughly as possible, adjustment within the micrositing limits is likely to allow further improvements to avoid particularly sensitive pockets of habitat. Therefore, the ECoW will walk the site with engineers before construction commences, pointing out areas of sensitive habitat and identifying where impact can be reduced by minor movement of infrastructure within the micro-siting available. These areas will be clearly marked with post and tape. The ECoW will also ensure that any micro-siting does not lead to movements into more sensitive habitats.

Further measures to minimise peat disturbance will be incorporated in the development and construction process. The principles of the waste hierarchy (outlined above) will be adhered to in order to:

- avoid and/or minimise production of excavated peat;
- reuse, where possible, excavated peat on site to facilitate habitat, ecological and hydrogeological restoration, improvement and enhancement; and
- avoid waste peat being sent for disposal, recovery and/or reuse off site.

All contractors will be made aware of the sensitivity of peat and wetland habitats and the ECoW will clearly mark sensitive habitats near to construction areas. Contractors will be required to work within the narrowest practical construction corridor when working in or near areas of peat.

All plans and method statements will be accompanied by justification of the final design and/or construction methods identified by the PC, including reasons for discounting alternative methods. This is required in order to demonstrate that all avenues for avoiding hydrological disruption and reducing the disturbance and excavation of peat have been considered.

It is anticipated that an ECoW will be appointed for the construction of the Proposed Development that will:

- identify areas of sensitive habitat;
- clearly mark sensitive habitats near to construction areas and make the principal contractor aware of the sensitivity of peat habitats and inform all sub-contractors;
- walk the areas affected by the Proposed Development with engineers before construction commences;
- authorise minor movement of infrastructure within the micro-siting available where impact can be reduced; and
- monitor that any micro-siting does not result in movements into more sensitive habitats and deep peats unless unavoidable.

Excavation and Reuse Volume Estimates

Peat Excavation Assumptions

The Proposed Development infrastructure and dimensions used in the peat balance calculations are summarised in Table 3 and Table 4. The infrastructure areas and excavation calculations are based on the Proposed Development 2021 Layout GIS shape files provided plus the following assumptions:

Excavated Tracks

- drains will be installed alongside the excavated tracks within the excavated section which will increase the width of the excavated base from either 5m or 6m depending on the track section by an additional metre;
- slope batters will be installed along the 6m or 7m excavated width on a 2 in 1 gradient, extending the footprint to about 10m or 11m wide depending on peat depth; and
- limited additional drains will be installed where required upgradient of the excavated tracks to protect the saturation state of the peat.

The peat volume excavated therefore includes all the peat within the 6m or 7m width over the total length of excavated track plus the amount of peat extracted from the slope batter and any additional drains.

Floated Tracks

- It is assumed that floated tracks will be elevated above ground level by up to 1m. Slopes will be installed either side of the 5m or 6m wide tracks on 2 in 1 slopes, therefore they will extend the floating track about 2m on either side (9m or 10m total track width).
- V drains will be installed either side of the track at 0.5m length of each V.
- It is assumed that the short sections of track leading to areas that will be restored post construction, e.g. borrow pits and construction compounds, will also be removed post construction for restoration.

Floated Tracks alongside Old Cullivoe Road

- It is assumed the Old Cullivoe Road will require to be widened by 3m and therefore floated tracks will be elevated above ground level by up to 1m. Slopes will be installed on the sides of the Old Cullivoe Road away from the existing track on 2 in 1 slopes; and
- V drains will be installed either side of the track at 0.5m length of each V.

Temporary Floated Construction Compounds

- It is assumed that the floated construction compounds (C2 and the substation construction compound) will be elevated above ground level by up to 1m. Slopes will be installed on all sides of the construction compounds on 2 in 1 slopes.
- V drains will be installed on all sides of the construction compounds at 0.5m length of each V.
- It is assumed that the geogrid and hardcore comprising the floated construction compounds will be removed at the end of the construction period.

Excavated Construction Compound

- Construction compound C1 will be excavated and will have slope batters installed along the perimeter on a 2 in 1 gradient to ground level with the base raised above the surrounding ground.
- V drains will be installed on three sides of the compound at 0.5m length of each V.

Floated substation

- It is assumed that the floated substation will be elevated above ground level by up to 1m. Slopes will be installed on all sides of the substation on 2 in 1 slopes.
- V drains will be installed on all sides of the substation at 0.5m length of each V.

Turbine Foundations

- Turbine foundations will be backfilled with concrete. The areas outside of this footprint will have sloped sides for construction. Where these adjoin the crane hardstanding they will be filled with hardcore. Where these adjoin the surrounding habitat they will be backfilled with the material removed.
- V drains will be installed on the side of the turbine foundations not connected to the crane hardstandings at 0.5m length of each V.

Crane Hardstandings

- The excavated crane hardstanding areas will have slope batters installed along the perimeter on a 2 in 1 gradient to ground level where the base is raised above the surrounding ground.
- V drains will be installed on all sides of the crane hardstandings at 0.5m length of each V.

Laydown and Assembly Areas

- The laydown and assembly areas are temporary and comprised of bog mats which will be removed at the end of construction.
- V drains will be installed on the sides of the laydown area connected to the surrounding habitat at 0.5m length of each V.

Borrow Pits

- Borrow pits will be excavated with a perimeter diversion V ditch on all sides of the borrow pit at 0.5m length of each V.

Table 3 – Infrastructure Dimension Final Layout

Infrastructure	Dimensions	Area (m^2)
Turbines (total of 18)	15m diameter (176m^2 area)	3,167
Crane hardstanding (total of 18)	Irregular shape of between 1,584m^2 and 1,840m^2	28,602
Temporary Laydown Area (total of 18)	Irregular shape of between 1,629m^2 and 2,169m^2	36,497
Temporary Assembly Area (total of 18)	Irregular shape of between 743m^2 and 1,269m^2	19,583
Construction Compound 1	Approximately square 100m x 100m	9,990
Construction Compound 2	Approximately square 50m x 51m	2,501
Substation Construction Compound	Approximately rectangular 50m x 60m	2,996
Substation	Approximately rectangular 60m x 100m	6,006
Borrow Pit A	Approximately rectangular 100m x 240m	28,792
Borrow Pit C	Irregular	5,098

Infrastructure	Dimensions	Area (m^2)
Borrow Pit D	Irregular	6,741
Borrow Pit E	Irregular	39,185
New Excavated Track	Variable widths of 5m and 6m and approximate length of 990m which includes bellmouths and turning areas	24,794
New Floated Track	Width of 5.5m and approximate length of 12,500m which includes bellmouths and turning areas	61,860
Existing track (widened)	3m wide strip on one side of 650m length of existing 3m wide track	1,940
Total		279,327

The following areas are also used for the peat calculations:

Table 4 – Infrastructure Additional Dimensions

Infrastructure	Dimensions	Area (m^2)
Turbines (18 in total) (excavated)	2 in 1 excavation around free perimeter of between 0m and 24m, plus 0.5m V drains	1,169
Crane hardstanding (18 in total) (excavated)	2 in 1 excavation around free perimeter of between 209m and 300m, plus 0.5m V drains	6,721
Laydown Area (18 in total) (floated)	0.5m V drains along free perimeter	1,681
Temporary Assembly Area (18 in total) (floated)	0.5m V drains along free perimeter	2,109
Construction Compound 1 (excavated)	2 in 1 slope back to ground level around free perimeter of 267m, plus 0.5m V drains	592
Construction Compound 2 (floated)	2 in 1 slope back to ground level around free perimeter of 139m, plus 0.5m V drains	377
Substation Construction Compound and substation (floated)	2 in 1 slope back to ground level around free perimeter of 415m, plus 0.5m V drains	830
Borrow Pit A	0.5m V drains along 430m free perimeter	54
Borrow Pit C	0.5m V drains along 318m free perimeter	40
Borrow Pit D	0.5m V drains along 242m free perimeter	43
Borrow Pit E	0.5m V drains along 703m free perimeter	88
New Excavated Track	1m wider than footprint on each side of track for drainage and 2 in 1 slope back to ground level along free perimeter of 1,826m, plus 0.5m V drains	4,844
New Floated Track	2 in 1 slope back to ground level around free perimeter of 16,403m, plus 0.5m V drains	44,452
Existing track (widened and floated)	2 in 1 slope back to ground level around free perimeter of 411m, plus 0.5m V drains	792
Total		**77,486**

Excavated Volumes

Peat excavation volumes associated with the project have been calculated using the GIS package ArcGIS based on the data in Tables 3 and 4 and these further assumptions:

- A contour map of assumed peat depth based on interpolation of values from probing undertaken across the site (shown in Figure 10.9 of SEI 2).
- Dimensions of the proposed areas for excavation for site infrastructure based on the 2021 Layout ArcGIS shapefiles provided (shown in Figure 10.9 of SEI 2) and detailed in Table 3.
- An estimated acrotelm depth of 0.15m across infrastructure area where peat (>0.5m organic soil) is present based on the peat core data.
- An estimated catotelm thickness of the average depth of the peat minus the acrotelm (0.15m) across infrastructure area where peat is present and based on the peat core data.
- An assumption that the probe depth is representative of the actual depth of the peat (validated by the spatial coverage of 174 cores).
- Any peat excavated for cable trenches is stored adjacent to the trench while the track is laid and then replaced, therefore this volume is not applicable to the excavated volume.
- The Met Mast will be suspended and supported by ballast above ground and therefore no excavation is required.

Using the interpreted peat depth contour map (Figure 10.9 of SEI 2), the volumes of peat that would be excavated during construction were calculated based on the 2021 Layout infrastructure dimensions (ArcGIS shapefiles) and associated excavation areas provided for the Proposed Development. These calculations produced the following volume estimates and are detailed in Table 5, Table 6 and Table 7:

- a total volume of peat to be excavated of 186,243m^3;
- a total volume of acrotelm to be excavated of 26,045m^3;
- a total volume of catotem to be excavated of 160,198m^3; and
- a total volume of penetrable soils to be excavated of 5,610m^3.

Table 5 – Excavated Peat Volumes based on 2021 Layout Actual Footprint

Infrastructure	Infrastructure area (m^2)	Average peat depth over infrastructure area (m)	Percentage of infrastructure with >0.5m depth of peat	Area of infrastructure with >0.5m depth of peat (m^2)	Average peat depth over area of infrastructure with >0.5m depth of peat (m)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)	Volume of soils excavated (m^3)
Turbine 11	176	1.96	100.0	176	1.96	345	26	319	0
Turbine 12	176	1.05	100.0	176	1.05	184	26	158	0
Turbine 13	177	0.73	100.0	177	0.73	128	27	102	0
Turbine 14	176	1.61	100.0	176	1.61	283	26	257	0
Turbine 15	176	0.67	98.9	174	0.67	116	26	90	1
Turbine 16	176	1.35	100.0	176	1.35	238	26	212	0
Turbine 17	176	1.06	100.0	176	1.06	186	26	160	0
Turbine 18	176	1.99	100.0	176	1.99	350	26	324	0
Turbine 19	176	1.79	100.0	176	1.79	316	26	289	0
Turbine 20	173	1.76	100.0	173	1.76	305	26	279	0
Turbine 21	176	0.96	100.0	176	0.96	169	26	143	0
Turbine 22	176	0.71	100.0	176	0.71	125	26	99	0
Turbine 23	177	1.47	100.0	177	1.47	261	27	234	0

Infrastructure	Infrastructure area (m^2)	Average peat depth over infrastructure area (m)	Percentage of infrastructure with >0.5m depth of peat	Area of infrastructure with >0.5m depth of peat (m^2)	Average peat depth over area of infrastructure with >0.5m depth of peat (m)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)	Volume of soils excavated (m^3)
Turbine 24	176	1.66	100.0	176	1.66	293	26	266	0
Turbine 25	176	1.48	100.0	176	1.48	261	26	235	0
Turbine 26	176	1.80	100.0	176	1.80	317	26	291	0
Turbine 27	176	1.99	100.0	176	1.99	350	26	323	0
Turbine 28	176	0.36	23.3	41	0.74	30	6	24	34
Crane hardstanding 11	1,662	1.99	100.0	1,662	1.99	3,314	249	3,065	0
Crane hardstanding 12	1,601	1.47	100.0	1,601	1.47	2,345	240	2,105	0
Crane hardstanding 13	1,904	1.08	100.0	1,904	1.08	2,047	286	1,761	0
Crane hardstanding 14	1,664	1.38	100.0	1,664	1.38	2,293	250	2,043	0
Crane hardstanding 15	1,662	0.97	100.0	1,662	0.97	1,607	249	1,358	0
Crane hardstanding 16	1,639	1.59	100.0	1,639	1.59	2,613	246	2,367	0
Crane hardstanding 17	1,584	0.89	96.8	1,533	0.91	1,397	230	1,167	20
Crane hardstanding 18	1,662	2.36	100.0	1,662	2.36	3,919	249	3,670	0
Crane hardstanding 19	1,641	1.59	100.0	1,641	1.59	2,606	246	2,360	0

Infrastructure	Infrastructure area (m^2)	Average peat depth over infrastructure area (m)	Percentage of infrastructure with >0.5m depth of peat	Area of infrastructure with >0.5m depth of peat (m^2)	Average peat depth over area of infrastructure with >0.5m depth of peat (m)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)	Volume of soils excavated (m^3)
Crane hardstanding 20	1,666	1.71	100.0	1,666	1.71	2,854	250	2,604	0
Crane hardstanding 21	1,689	0.93	94.7	1,599	0.96	1,530	240	1,290	32
Crane hardstanding 22	1,663	1.06	100.0	1,663	1.06	1,764	249	1,515	0
Crane hardstanding 23	1,661	1.36	100.0	1,661	1.36	2,257	249	2,008	0
Crane hardstanding 24	1,599	1.55	100.0	1,599	1.55	2,480	240	2,240	0
Crane hardstanding 25	1,840	1.60	100.0	1,840	1.60	2,942	276	2,666	0
Crane hardstanding 26	1,663	1.73	100.0	1,663	1.73	2,872	249	2,623	0
Crane hardstanding 27	1,802	2.24	100.0	1,802	2.24	4,033	270	3,763	0
Crane hardstanding 28	1,572	0.75	71.8	1,128	0.93	1,047	169	878	126
Temporary Laydown Area 11	2,090	2.05	100.0	2,090	2.05	0	0	0	0
Temporary Laydown Area 12	2,090	1.81	100.0	2,090	1.81	0	0	0	0
Temporary Laydown Area 13	1,763	2.16	100.0	1,763	2.16	0	0	0	0

Infrastructure	Infrastructure area (m^2)	Average peat depth over infrastructure area (m)	Percentage of infrastructure with >0.5m depth of peat	Area of infrastructure with >0.5m depth of peat (m^2)	Average peat depth over area of infrastructure with >0.5m depth of peat (m)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)	Volume of soils excavated (m^3)
Temporary Laydown Area 14	2,090	1.36	100.0	2,090	1.36	0	0	0	0
Temporary Laydown Area 15	2,090	1.30	99.9	2,087	1.30	0	0	0	0
Temporary Laydown Area 16	1,662	1.78	100.0	1,662	1.78	0	0	0	0
Temporary Laydown Area 17	2,169	0.97	100.0	2,169	0.97	0	0	0	0
Temporary Laydown Area 18	2,090	2.26	100.0	2,090	2.26	0	0	0	0
Temporary Laydown Area 19	2,090	1.43	100.0	2,090	1.43	0	0	0	0
Temporary Laydown Area 20	2,090	1.53	99.8	2,085	1.54	0	0	0	0
Temporary Laydown Area 21	2,090	0.80	100.0	2,090	0.80	0	0	0	0
Temporary Laydown Area 22	2,090	1.11	97.9	2,046	1.12	0	0	0	0

Infrastructure	Infrastructure area (m^2)	Average peat depth over infrastructure area (m)	Percentage of infrastructure with >0.5m depth of peat	Area of infrastructure with >0.5m depth of peat (m^2)	Average peat depth over area of infrastructure with >0.5m depth of peat (m)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)	Volume of soils excavated (m^3)
Temporary Laydown Area 23	2,090	1.49	100.0	2,090	1.49	0	0	0	0
Temporary Laydown Area 24	2,092	1.26	100.0	2,092	1.26	0	0	0	0
Temporary Laydown Area 25	2,102	1.56	100.0	2,102	1.56	0	0	0	0
Temporary Laydown Area 26	2,090	1.54	100.0	2,090	1.54	0	0	0	0
Temporary Laydown Area 27	1,629	2.29	100.0	1,629	2.29	0	0	0	0
Temporary Laydown Area 28	2,090	1.24	90.9	1,899	1.33	0	0	0	0
Temporary Assembly Area 11	1,255	1.89	100.0	1,255	1.89	0	0	0	0
Temporary Assembly Area 12	743	1.47	100.0	743	1.47	0	0	0	0
Temporary Assembly Area 13	1,262	1.41	100.0	1,262	1.41	0	0	0	0

Infrastructure	Infrastructure area (m^2)	Average peat depth over infrastructure area (m)	Percentage of infrastructure with >0.5m depth of peat	Area of infrastructure with >0.5m depth of peat (m^2)	Average peat depth over area of infrastructure with >0.5m depth of peat (m)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)	Volume of soils excavated (m^3)
Temporary Assembly Area 14	1,006	1.81	100.0	1,006	1.81	0	0	0	0
Temporary Assembly Area 15	1,252	1.10	100.0	1,252	1.10	0	0	0	0
Temporary Assembly Area 16	1,256	1.07	93.2	1,170	1.13	0	0	0	0
Temporary Assembly Area 17	1,256	0.99	96.3	1,209	1.01	0	0	0	0
Temporary Assembly Area 18	1,269	1.85	100.0	1,269	1.85	0	0	0	0
Temporary Assembly Area 19	1,256	1.64	100.0	1,256	1.64	0	0	0	0
Temporary Assembly Area 20	1,133	1.29	99.7	1,130	1.29	0	0	0	0
Temporary Assembly Area 21	1,224	1.98	100.0	1,224	1.98	0	0	0	0
Temporary Assembly Area 22	1,031	1.16	100.0	1,031	1.16	0	0	0	0

Infrastructure	Infrastructure area (m^2)	Average peat depth over infrastructure area (m)	Percentage of infrastructure with >0.5m depth of peat	Area of infrastructure with >0.5m depth of peat (m^2)	Average peat depth over area of infrastructure with >0.5m depth of peat (m)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)	Volume of soils excavated (m^3)
Temporary Assembly Area 23	1,145	1.24	100.0	1,145	1.24	0	0	0	0
Temporary Assembly Area 24	1,252	1.74	100.0	1,252	1.74	0	0	0	0
Temporary Assembly Area 25	1,256	2.10	100.0	1,256	2.10	0	0	0	0
Temporary Assembly Area 26	1,125	1.88	100.0	1,125	1.88	0	0	0	0
Temporary Assembly Area 27	862	1.04	95.5	823	1.06	0	0	0	0
Temporary Assembly Area 28	1,255	1.89	100.0	1,255	1.89	0	0	0	0
Construction Compound 1	9,990	0.75	99.1	8,404	0.83	6,933	1,261	5,673	589
Construction Compound 2	2,501	1.68	100.0	2,501	1.68	0	0	0	0
Substation Construction	9,005	1.13	99.8	8,974	1.13	0	0	0	0

Infrastructure	Infrastructure area (m^2)	Average peat depth over infrastructure area (m)	Percentage of infrastructure with >0.5m depth of peat	Area of infrastructure with >0.5m depth of peat (m^2)	Average peat depth over area of infrastructure with >0.5m depth of peat (m)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)	Volume of soils excavated (m^3)
Compound and substation									
Borrow Pit A	28,792	0.67	62.5	17,989	0.88	15,830	2,698	13,132	3,460
Borrow Pit C	5,098	1.13	100.0	5,098	1.13	5,776	765	5,011	0
Borrow Pit D	6,741	1.14	98.7	6,650	1.15	7,621	998	6,623	37
Borrow Pit E	39,185	1.06	91.8	35,983	1.12	40,409	5,397	35,011	1,127
New Track Excavated	24,794	1.42	98.5	24,423	1.44	35,169	3,663	31,506	38
New Track Floating	61,860	1.58	98.8	61,136	1.58	0	0	0	0
Existing Track to be widened	1,940	0.61	51.1	991	0.90	446	74	372	146
Total	**279,327**					**160,363**	**19,749**	**140,614**	**5,610**

Table 6 – Excavated Peat Volumes based on Excavated Slopes and Drains around 2021 Layout Infrastructure

Infrastructure	Additional Infrastructure area– slopes and drains (m^2)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)
Turbine 11	111	95	16	80
Turbine 12	67	29	9	20
Turbine 13	52	16	7	9
Turbine 14	94	65	13	52
Turbine 15	47	13	6	7
Turbine 16	0	0	0	0
Turbine 17	68	30	9	21
Turbine 18	103	90	14	75
Turbine 19	99	77	14	63
Turbine 20	102	78	14	64
Turbine 21	63	25	8	17
Turbine 22	51	15	7	9
Turbine 23	84	53	12	41
Turbine 24	97	69	13	56
Turbine 25	0	0	0	0
Turbine 26	103	81	14	66
Turbine 27	0	0	0	0
Turbine 28	27	5	3	2
Crane hardstanding 11	456	398	64	334
Crane hardstanding 12	349	218	48	170
Crane hardstanding 13	286	128	38	90
Crane hardstanding 14	336	196	46	150
Crane hardstanding 15	256	103	34	69

Infrastructure	Additional Infrastructure area– slopes and drains (m^2)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)
Crane hardstanding 16	499	341	69	272
Crane hardstanding 17	235	87	31	56
Crane hardstanding 18	526	551	75	477
Crane hardstanding 19	369	251	51	200
Crane hardstanding 20	401	297	56	241
Crane hardstanding 21	251	96	33	63
Crane hardstanding 22	275	121	37	85
Crane hardstanding 23	333	191	45	146
Crane hardstanding 24	366	243	51	192
Crane hardstanding 25	539	370	75	295
Crane hardstanding 26	404	301	56	245
Crane hardstanding 27	716	708	101	607
Crane hardstanding 28	123	38	16	22
Laydown Area 11	99	17	12	6
Laydown Area 12	99	17	12	6
Laydown Area 13	22	4	3	1
Laydown Area 14	99	17	12	6
Laydown Area 15	99	17	12	6
Laydown Area 16	83	15	10	5
Laydown Area 17	101	18	12	6
Laydown Area 18	99	17	12	6
Laydown Area 19	99	17	12	6
Laydown Area 20	99	17	12	6
Laydown Area 21	99	17	12	6

Infrastructure	Additional Infrastructure area– slopes and drains (m^2)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)
Laydown Area 22	99	17	12	6
Laydown Area 23	99	17	12	6
Laydown Area 24	99	17	12	6
Laydown Area 25	99	17	12	6
Laydown Area 26	99	17	12	6
Laydown Area 27	94	17	11	5
Laydown Area 28	99	17	12	6
Temporary Assembly Area 11	131	23	15	8
Temporary Assembly Area 12	99	17	12	6
Temporary Assembly Area 13	132	23	16	8
Temporary Assembly Area 14	121	21	14	7
Temporary Assembly Area 15	131	23	15	8
Temporary Assembly Area 16	125	22	15	7
Temporary Assembly Area 17	132	23	16	8
Temporary Assembly Area 18	132	23	16	8
Temporary Assembly Area 19	132	23	16	8
Temporary Assembly Area 20	116	20	14	7
Temporary Assembly Area 21	130	23	15	8
Temporary Assembly Area 22	111	20	13	6
Temporary Assembly Area 23	131	23	15	8
Temporary Assembly Area 24	131	23	15	8
Temporary Assembly Area 25	132	23	16	8
Temporary Assembly Area 26	128	23	15	7
Temporary Assembly Area 27	95	17	11	6

Infrastructure	Additional Infrastructure area– slopes and drains (m^2)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)
Temporary Assembly Area 28	111	95	16	80
Construction Compound 1	592	185	77	108
Construction Compound 2	99	17	12	6
Substation Construction Compound and Substation	295	52	35	17
Borrow Pit A	305	54	36	18
Borrow Pit C	226	40	27	13
Borrow Pit D	242	43	29	14
Borrow Pit E	499	88	59	29
New Track Excavated	17,196	17,251	3,086	14,165
New Track Floating	11,646	2,050	1,371	679
Existing track to be widened	792	51	34	17
Total	43,572	25,880	6,296	19,584

Note: Any minor differences in totals are due to rounding up/down

Table 7 – Total Peat Excavation Volumes of the 2021 Layout

	Total area of infrastructure, slopes and drains (m^2)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)
Total Infrastructure Footprint	279,327	160,363	19,749	140,614
Excavated slopes and drains around infrastructure	77,486	25,880	6,296	19,584
Total	**356,813**	**186,243**	**26,045**	**160,198**

In order to determine accurate peat volumes, probing and/ or other ground investigation techniques will be employed as necessary prior to and during the construction period in order to inform micro-siting requirements and to further update the PMP.

Allowance for Bulking of Peat

An allowance of an increase of 10% in the volume of the extracted peat has been included as requested by SEPA (paragraph 2.14 of letter 26 October 2020). This increases the total volume of peat to be reused to:

Total volume of peat 204,867m^3

Total volume of acrotelm 28,650m^3

Total volume of catotelm 176,218m^3

Peat Reuse Volumes

The excavated peat will be reused around the site in the following areas:

- In all four borrow pits to a depth of 2m as peat within borrow pits and in adjacent areas is present up to 2m and in places up to 3m (see Plates 2 to 5 below);
- In construction compound 1 to a depth of 2m as peat within footprint and in adjacent areas is present up to 2m (see Plate 6 below);
- along the 2 in 1 sloped verges along all tracks (both cut and floated) and around all infrastructure where it is adjacent to peat in a 0.5m thickness. In practice this will involve peeling back the top 0.5m of peat in these areas and relaying it over the slope along with controlling water runoff from the track and flows from adjacent peat. This is described further below;
- in areas where floated construction compounds are removed subsequent to the construction period in a 0.3m thickness; and
- in any drains that can be backfilled subsequent to restoration, e.g. around the borrow pits and around as much infrastructure as possible to promote peat restoration.

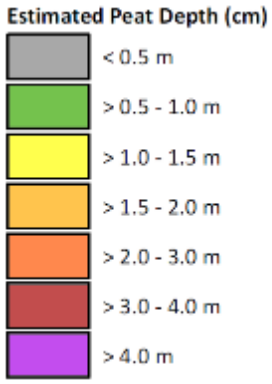

Plate 1. Legend of peat depths for Plates 2 to 6

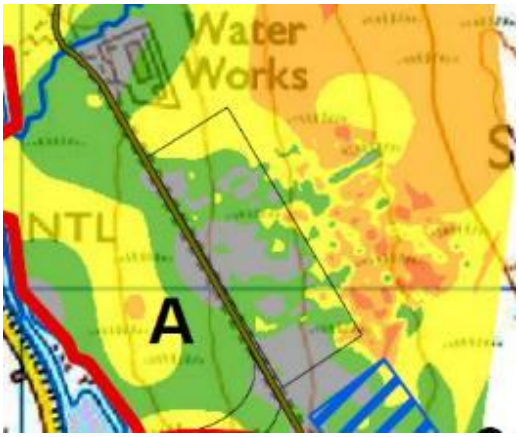

Plate 2. Borrow Pit A

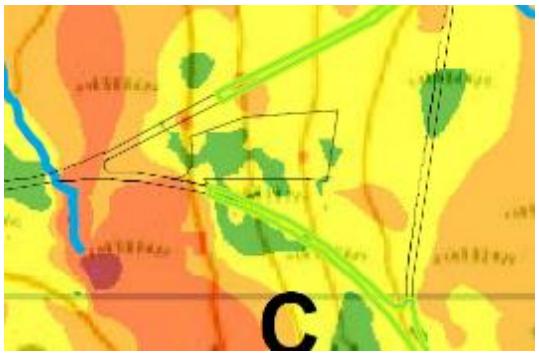

Plate 3. Borrow Pit C

Plate 4. Borrow Pit D

Plate 5. Borrow Pit E

Plate 6. Construction Compound 1

The thickness of peat in each area are shown on Figure 10.11 of SEI 2 and the associated volumes are presented in Table 8. Further discussion on the methodology for reuse is discussed below.

Table 8 – Estimated Reuse Volumes

Reuse Type	Reuse Summary	Area (m2)	Acrotelm volume (m3)	Catotelm volume (m3)	Total Volume (m3)
Peat reinstatement around free perimeter of turbine foundation	Length of 0m to 24m per turbine with a 2 in 1 slope. Excavated peat stored adjacent for replacement to surface once turbine concreting complete.	921	130	567	697
Peat reinstatement along verges of crane hardstanding	Length of 95m to 138m per crane hardstanding with 0.5m thickness of peat reinstatement on a 2 in 1 slope.	5,432	774	2,263	3,036

Reuse Type	Reuse Summary	Area (m2)	Acrotelm volume (m3)	Catotelm volume (m3)	Total Volume (m3)
Peat reinstatement on construction compound 1 when infrastructure removed	Area of 9,990m2 plus 402m2 of side slope around perimeter to be reinstated with 2m of peat plus backfilling of drain area of 190m2.	10,392	1,521	18,677	20,198
Peat reinstatement on construction compound 2 when infrastructure removed	Reinstatement of 0.3m of peat over an area of 2,501m2 plus backfilling of drain area of 99m2.	2,600	387	464	851
Peat reinstatement on substation construction compound when infrastructure removed	Reinstatement of 0.3m of peat over an area of 2,996m2 plus backfilling of drain area of 110m2.	3,153	462	549	1,012
Peat reinstatement along verges of substation	Reinstatement of 0.5m of peat on an area of 519m2 of 2 in 1 slopes around the substation.	519	84	252	336
Peat reinstatement in all 4 borrow pits	Peat placed at a thickness of 2m in each borrow pit plus backfilling of drain area of 1,272m2.	81,088	12,123	148,963	161,086
Peat reinstatement along verges of excavated tracks	Peat placed in a 0.5m thickness along excavated track verges	13,757	1,955	5,736	7,690
Peat reinstatement along verges of new and upgraded floated tracks	Peat placed in a 0.5m thickness along floated track verges	32,620	7,364	10,871	18,235

Reuse Type	Reuse Summary	Area (m2)	Acrotelm volume (m3)	Catotelm volume (m3)	Total Volume (m3)
Peat reinstatement along verge of widened existing cut track	Peat placed in a 0.5m thickness along excavated track verges	608	82	258	340
Total		**151,090**	**24,882**	**188,600**	**213,481**

It is assumed that the cable trenches will have no impact on peat as the removed volume will be rapidly used to backfill the same trench once the cables have been laid shortly after the trench is opened up and clay will be used at regular intervals to prevent preferential pathways developing in the sand/cable layer at the base of the trench.

Final implementation of peat reuse and classification will be subject to geotechnical on site tests e.g. shear vane testing, to determine peat stability and type and use potential.

Net Peat Balance

The volume of peat predicted to be excavated does not exceed the intended re-use volume so no disposal of excess peat off site is expected for the 2021 Layout of the Proposed Development. The excavated peat volumes and volumes of peat to be re-used are summarised in Table 9 below.

Table 9 – Net Peat Balance

	Acrotelm volume (m3)	Catotelm volume (m3)	Total Volume (m3)
Excavated Peat (plus 10% for bulking)	28,650	176,218	204,867
Potential Peat Reuse	24,882	188,600	213,481
Total Balance	3,768	-12,382	-8,614

Based on the figures and reuse strategy presented it is expected that over the life time of the Proposed Development there will be a potential for more peat to be reused on the site than the volume excavated. This is as a result of about 17.5ha of peatland habitat being directly lost to tracks, turbines and crane hardstandings generating a total amount of excavated peat of around 205,000m^3 and there is a capacity for the reuse of almost 213,500m^3 of peat onsite.

The calculations for the re-use of excavated peat are based on discussions with SEPA on the re-use of peat which indicated that peat could be re-used for restoration up to 2 metres thick in borrow pits given the deep peat

nature of the site along with up to 0.5m along verges. This is also considered appropriate for the construction compound as it will allow the extension and improvement of the peat habitat in this area once restored.

Handling Excavated Materials

Excavation

The following methodologies for excavation of peat are recommended:

- Areas of peat within the footprint of any excavation will have the top layer of vegetation stripped off as turf prior to construction by an experienced specialist contractor. When excavating areas of peat. Often it is easiest to achieve this by removing large turfs up to 500mm in order to keep the peat intact.
- These turfs should be stored adjacent to the construction area in a way that ensures they remain moist and viable (see temporary storage below). Excavated turfs should be as intact as possible so as to minimise carbon losses. Stacking of vegetated turves will be avoided in order to best preserve the viability of the vegetation layer.
- Peat will then be removed, stored separately and kept damp (Carbon and Water Guidelines 2012). The moisture content of stored/stockpiled peat will be monitored monthly and if it falls below 25% of that in surrounding, intact peat then it will be watered.
- Excavated soils and turfs will be handled so as to avoid cross contamination between distinct horizons and ensure reuse potential is maximised.
- Mineral soil and aggregate will be kept separate from peat or peaty soils in order to avoid contamination (which could result in a change in chemical or hydrological properties in the peat, reducing the likelihood of successful reinstatement on placement).
- Prior to any excavations, the PC will produce a detailed Method Statement identifying where and how excavated peat will be used in reinstatement works. Specific requirements for the excavation, handling, storage and reinstatement of peat will be outlined in this Method Statement. The PC will consider potential impacts on downstream hydrological receptors and also the potential for instability issues with the excavated material.
- Care will be taken when stripping and removing topsoil and peat turfs and appropriate storage methods used on site, i.e. excavated material will be stored in separate horizons and vegetation rich top layers will be stored vegetation side up.
- Classification of excavated materials will depend on their identified re-use in reinstatement works. At this site it is anticipated that the material to be excavated will comprise peat (which may be sub-divided into turf, acrotelm and catotelm/amorphous), peaty soils and mineral soils (subsoil and topsoil).

Temporary Storage

Following excavation, peat will be required to be temporarily stored before reuse, although peat restoration will commence in locations as soon as feasible e.g. in borrow pits as they are completed. Excavated peat should be stored in stockpiles to minimise carbon losses while being stored.

Where possible excavated turfs will be stored adjacent to the construction area such that they remain moist and viable.

Areas for temporary storage required for peat will be identified in the PC's Method Statement taking into account constraints and mitigation requirements identified in further pre construction investigations. This will describe any intended drainage, pollution prevention and material stability mitigation measures that may be required. The following general guidelines will apply:

- The appropriate temporary storage areas for excavated peat will also be as close to the excavation as practicable.
- A number of areas for temporary peat storage have been identified alongside the proposed tracks (Figure 10.11 of SEI 2). These have been determined to be suitable area for temporary excavated peat storage as the ground conditions are suitable for some loading, the peat slide risk is low, they are outside of the main watercourse buffers and the gradients are low (Figures 10.10a and 10.10b of SEI 2). This would be supplemented by smaller peat storage areas near to each section of infrastructure where the peat is extracted and to be re-used to minimise the handling and transportation requirements.
- The design and location of stockpiles, including incorporated drainage elements, will be agreed with the ECoW and Geotechnical Consultant / Geotechnical Clerk of Works prior to excavation works commencing.
- Temporary peat storage areas should be located so that erosion and run off is limited, leachate from the material is controlled, and stability of the existing peatland in the vicinity is not affected.
- Excavated material is to be stockpiled at least 50m away from watercourses. This will ensure that any wetting required on stored peat does not runoff and discharge into adjacent watercourses.
- Any edges of cut peat that may remain exposed, or areas of peat excavation on steep slopes, will be covered with geotextile or similar approved. This will allow re-turfing and re-vegetation and reduce erosion risks.
- Suitable storage areas are more appropriately sited in areas with lower ecological value and low slopes. Cleared areas of forestry are preferred to areas of higher ecological value or areas close to watercourses.
- Temporary peat storage should be in locations where the water table can be kept artificially high.
- An up-gradient cut off ditch should be installed around the edge of the storage bund in order to collect up-gradient surface water runoff and divert water runoff from eroding the toe of the bund.
- It is desirable to keep haul distances of excavated peat as short as possible and as close to intended re-use destinations to minimise plant movements in relation to any earthworks activity including peat management in order to minimise the potential impact on the peat structure. It is important that temporary storage is safe and keeps the material suitable for its planned reuse.
- The handling and storage of peat will seek to ensure that excavated peat does not lose either its structure or moisture content. Peat turves require careful storage and wetting and to be maintained to prevent drying out and subsequent oxidisation to ensure that they remain fit for re-use.

- Stockpiling of peat should be in large volumes, taking due regard to potential loading effects. Piles should be bladed off at the side to minimise the available drying surface area.
- Higher piles are more likely to become dewatered, while smaller piles expose a greater area to evaporation. Reducing mound size may also increase likelihood of erosional losses as particulate organic carbon (POC).
- Stockpiles should be battered so as to limit instability and erosion and should be bunded or covered using impermeable material. The bunds should extend to a level above the toe of the stockpiled material to provide restraint to surface runoff.
- When planning the temporary storage areas any additional disturbance areas should be minimised.
- Transport of peat to temporary storage areas, restoration areas or designated spoil areas will be by low ground pressure vehicles to avoid excessive compaction of the peat.

Reuse of Peat in Infrastructure and Borrow Pit Restoration

Bare Peat

There are a number of important methodologies regarding the exposure of bare peat including:

- The amount of time any bare peat will be exposed will be minimised to preserve its integrity.
- The phasing of work should be carried out to minimise the total amount of exposed ground at any one time. By stripping turf and replacing as soon as possible after peat has been re-distributed there will be minimal areas of bare peat.
- Any peat areas on steep ground or that remains partially bare will be covered using geotextile or a similar method to stop erosion.
- Any areas of bare peat, where vegetation is not re-growing, will be seeded with a seed mixture obtained from the existing habitat. Stock exclusion in these areas will continue until vegetation is properly established.
- The re-vegetated areas will be monitored.
- Areas where full recovery is complete will have fences removed.

This approach has been shown to be effective on other peat sites and the turfs re-grow quickly both establishing vegetation and consolidating the peat.

Infrastructure Re-use

Peat re-use around and within infrastructure areas is an important aspect of the Proposed Development as it allows an opportunity to maintain the integrity of the excavated peat, enhance habitats and create new habitats. This will be undertaken through:

- The PC will be required to provide appropriate plant for undertaking all reinstatement works such that no unnecessary disturbance of the ground surface occurs. In order to minimise disturbance and damage to the ground surface, any mobile plant required for reinstatement works will be positioned on constructed access tracks, hard standing areas or existing disturbed areas wherever possible. The use of a long reach excavator for excavations and reinstatement works is preferable as it enables sufficient room to allow initial side casting and subsequent pulling back of turves over reinstated peat or soil.

- Excavated catotelm or amorphous peat will only be used in restoration works where the topography allows straight forward deposition with no pre-treatment or containment measures and without risk to the environment. Suitable scenarios may be present in those disturbed areas where natural topography profile allows such use. A fibrous layer of acrotelm and turf will be placed above any catotelm or amorphous peat reinstated.
- Reinstatement of vegetation will be focused on natural regeneration utilising peat vegetated turfs. To encourage stabilisation and early establishment of vegetation cover, where available, peat turfs (acrotelmic material) or other topsoil and vegetation turves in keeping with the surrounding vegetation type will be used to provide a dressing for the final surface.
- Any reinstatement and re-profiling proposals will consider, and mitigate against, identified significant risks to environmental receptors. In particular, in areas of replaced peat, water management will be considered in the PC's Construction Method Statements to ensure that as far as possible an appropriate hydrological regime is re-established within areas of disturbance. Particular attention will be paid to maintaining hydrological continuity and preventing the creation of preferential subsurface flow paths (for instance within backfilled cable trenches).
- When cutting the track the vegetation layer (approx. 500mm thick) will be undercut and rolled back. A geotextile layer will then be installed on the side slopes of the track immediately after track construction to prevent erosion. The undercut vegetation layer will then be rolled back over the verge of the installed track. Through careful management of upgradient water and track cambers to shed water to the peat on the verges the level of saturation can be maintained.
- Peat placed on track verges should gently taper in to the adjacent land form, with the peat blocks placed snugly together and the edge of the peat placed furthest from the track should be firmed in to the adjacent ground to form a seal, in order to minimise water loss through evaporation.
- Track edges and passing places would be reinstated post construction through the removal of capping material and the reuse of peat turves. Where peat turves are used to reinstate track edges this will be done in a manner to ensure works tie in with the surrounding topography, landscape and ground conditions.
- The design and construction of tracks on peat shall be done in such a way so as to reduce impacts on the existing peat hydrology at the site. The built track should allow for the transmittance of water, so natural drainage can be maintained as far as possible.
- Where possible drains will be blocked as soon as they are no longer required to reduce impacts on adjacent peat habitat and allow recovery of the drains to peat habitat.

Summary

A high-density grid of over 13,000 peat probes and associated cores has been completed at all site infrastructure in 2018 and 2019 to obtain a detailed understanding of peat variability, depth and characteristics at the site. Additional peat depth surveying was not deemed necessary for the 2021 Layout as the changes to the infrastructure layout are minimal. Only a small proportion of the layout changes have been relocated outside of the high density probing where they are still covered by a reasonable density of probes and a robust peat depth model.

The total volume of excavated peat associated with the infrastructure footprint, associated excavated slopes and drains has been calculated at about 205,000m^3 with about 28,650m^3 of acrotelmic peat and about 176,200m^3 of catotelmic peat.

The potential reuse of excavated peat has been calculated based on SEPA guidance and totals almost 213,500m^3, comprised of about 24,900m^3 of acrotelmic peat and 188,600m^3 of catotelmic peat.

Based on the peat depth, characteristics and distribution investigations undertaken across the development area and the 2021 Layout, a surplus of peat is not expected to be generated by the Proposed Development. All estimated excavated peat is planned for re-use for restoration work during the construction and post-construction phases of the Proposed Development.

Further investigations will be undertaken prior to works commencing to confirm peat depth, distribution and characterisation. The additional survey data will be used to inform any micro-siting, and potentially further minimise the volume of peat extracted. The peat management plan will be further updated using the additional survey data and detailed infrastructure design. The detailed PMP will be approved by SIC in consultation with SEPA as part of the CEMP pursuant to the imposition of a planning condition.

The PC will maintain a record of actual peat volumes excavated and the subsequent peat re-use to compare the predicted and actual peat volumes. This record during the construction, operation, decommissioning and restoration phases of the Proposed Development will be made available for review by regulators as and when required.

References

- The UK Climate Change Act (2008);
- Carbon Landscapes and Drainage, 2012 'The Carbon and Water Guidelines', www.clad.ac.uk;
- Forestry Commission, 2011, 'Forests and climate change: UK Forestry Standard Guidelines.

Other key documents relied upon to inform this draft PMP include:

- Scotland's National Peatland Plan Working for our future. Scottish Natural Heritage 2015;
- Best Practice Guidance to Planning Policy Statement 18 'Renewable Energy', August 2009;
- Good practice during windfarm construction (Scottish Renewables, SNH, SEPA & Forestry Commission Scotland, 4th Edition 2019);
- Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey. Guidance on Developments on Peatland;
- SEPA Regulatory Position Statement – Developments on Peat. February 2010;
- Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste Scottish Renewables, 17 January 2012;
- Forestry Civil Engineering and SNH (2010). Floating Roads on Peat: A Report into Good Practice in Design, Construction and Use of Floating Roads in Peat with particular reference to Wind Farm Developments in Scotland;
- Forestry Commission (2012). Forests & Water Guidelines. 5th Edition. HMSO;
- Scottish Executive (2017) Peat Landslide Hazard and Risk Assessments. Best Practice Guide for Proposed Electricity Generation Developments. Second Edition;
- Towards an assessment of the state of UK Peatlands, JNCC 2010;
- Understanding the GHG implications of forestry on peat soils in Scotland, 2010;