Appendix 10.2: Peat Management Plan

Melgarve Cluster Project: Environmental Impact Assessment

Scottish & Southern Electricity Networks (SSEN)

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Basis of Report

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1.0 Introduction

1.1 General

SLR Consulting Ltd (SLR) was commissioned by Scottish and Southern Electricity Networks to undertake a Stage 1 Outline Peat Management Plan (PMP) for proposed grid connection infrastructure development (the "Proposed Development").

The development comprises the connection of the proposed Cloiche and proposed Dell 2 Wind Farm to the existing Melgarve substation.

The work has been undertaken by a team of Geotechnical Engineers and Geologists, with over 17 years' experience in undertaking peat assessments and specialising in the assessment of soils, geology and water for renewable power projects throughout the UK and Ireland.

1.2 Site Description

The Proposed Development is located within an open landscape in the Scottish Highlands encompassing several land estates including Dell, Glendoe, Glenshero and Garrogie. The approximate centre of the Site is located at NH 48700 00200.

The Proposed Development comprises an approximate 15km linear stretch of land between the proposed Cloiche and proposed Dell 2 Wind Farm heading south towards Melgarve substation. The PMP has assessed the Proposed Development using the peat depth interpolation areas which extend out to a maximum areal extent defined as 100m from each peat depth survey point, with consideration of wider assessment areas not defined by distance but by review of geomorphology and hydrological and topographic boundaries.

The north of the Proposed Development is accessed through the existing access to the operational Stronelairg Wind Farm which is located approximately 15km east of Fort Augustus. Access to the north of the Proposed Development can be gained off the B862 via the existing access to Glendoe Power Station Glendoe Estate, Fort Augustus, Inverness PH32 4BZ.

Access to the south of the Proposed Development can be gained via the access to Melgarve substation, which is located to the west of Laggan and to the east of Melgarve and centred on the approximate NGR of NN 500 956. Access to the area can be gained via the minor General Wades Military Road, off the A86 and runs south of the River Spey to Garvamore after which the road crosses the River Spey.

The location and layout of the Proposed Development are detailed on Figure 10.2.1 and Figure 10.2.2.

1.3 Proposed Development

The Proposed Development covered within this application will comprise the construction of approximately 16.9 km of underground cable and overhead line routes to connect the proposed Dell 2 Wind Farm and proposed Cloiche Wind Farm to Melgarve substation. Details of the proposed infrastructure are listed below:

- 7 km of new double circuit steel structure 132kV overhead line (OHL).
- 9.9 km of new 132kV underground cable (UGC).
- Cable Sealing End (CSE) compounds would be required to facilitate the transition between OHL and UGC.
- New permanent and temporary access tracks would also be required to facilitate the construction and operation of the Proposed Development.

Full details of the Proposed Development are provided in Volume 1, Chapter 3: The Proposed Development of the EIA Report.

1.4 Objectives

The PMP outlines the overall approach of minimising disruption to peatland, and it aims to ensure that all further opportunities to minimise peat disturbance and extraction would be taken during detailed design and construction of the development.

The PMP has been developed to demonstrate that peat has been afforded significant consideration during the routeing, alignment, design and construction phase of the Proposed Development, should consent be granted. It aims to propose mitigation measures that would minimise any impacts and the long-term habitat restoration and management plans.

Significant consideration has been given to the track and cable alignments to make use of existing and proposed access tracks.

The PMP seeks to identify that appropriate proposals to re-use the surplus peat can be accommodated within the Proposed Development and associated Outline Habitat Management Plan (OHMP) proposals (**Appendix 8.4**), without significant environmental or health and safety implications, to minimise risk in terms of carbon release and human health.

The purpose of this report is to ensure that there has been a systematic consideration of peat management and a quantitative assessment throughout the development process.

1.5 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 Construction Environmental Management Plan (CEMP). These stages are outlined below.

1.5.1 Stage 1: Environmental Impact Assessment (EIA)

The Outline Peat Management Plan will be submitted as part of the EIA. From this initial report the Peat Management Plan will be developed further into a Stage 2 Pre-Construction PMP.

1.5.2 Stage 2: Post Consent / Pre-Construction

As part of the EIA, it will have been demonstrated that, based on the investigation and data collected, 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 prior to the relevant works commencing, following detailed ground investigation or further survey works required to inform detailed design, or that may be required under planning consent conditions.

1.5.3 Stage 3: Construction Stage

Actual peat volumes excavated during construction will be recorded against the overall predicted volumes. Within micrositing allowances, the alignment and design of tracks, tower foundation and associated construction methods will be reviewed to avoid/minimise peat disturbance as much as possible considering the more detailed information available once construction commences. A regular review and update of the peat mass balance table will be undertaken by the appointed Contractor and monitored by the Ecological Clerk of Works (ECoW) on-site and made available to regulators as required.

1.6 Legislation and Guidance

The PMP has been compiled in accordance with the following legislation and best practice guidance:

- National Planning Framework for Scotland 4 (NPF4) (Scottish Government, February 2023)[1];
- Scottish Government, Scottish Natural Heritage, SEPA (2014) 'Peat Survey Guidance; Developments on Peatland: Site Surveys'[2];
- SEPA Regulatory Position Statement - Developments on Peat (Scottish Environment Protection Agency, 2010)[3];
- Good Practice during Windfarm Construction, 4th Edition (Scottish Renewables, Scottish Natural Heritage (now NatureScot), Scottish Environment Protection Agency, Forestry Commission Scotland, Historic Environment Scotland, Marine Scotland Science and AEECoW, 2019)[4];
- Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste (Scottish Renewables and SEPA, 2012)[5];
- The Waste Management Licensing (Scotland) Regulations 2011[6];
- Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Scottish Government, January 2017)[7]; and
- Floating Roads on Peat - Report into Good Practice in Design, Construction and Use of Floating Roads on Peat with reference to Wind Farm Developments in Scotland (Forestry Commission Scotland & Scottish Natural Heritage, 2010)[8].

1.6.1 Requirements of National Planning Policy 4

The intent of Policy 5 (Soils) of National Planning Policy 4 (NPF4)[1] is "*to protect carbon rich soils, restore peatlands and minimise the disturbance of soils from development*".

The Policy states [5(a)] that development proposals should only be supported if they are designed and constructed:

- *in accordance with the mitigation hierarchy by first avoiding and then minimising the amount of disturbance to soils on undeveloped land; and*
- *in a manner that protects soils from damage including from compaction and erosion, and that minimises soils sealing.*

Further [5(c)] confirms *that development proposals on peatland, carbon rich soils, and priority peatland will only be supported if they are:*

- *essential infrastructure and there is a specific locational need and no other suitable site;*

1 Scottish Government (2023). https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2022/11/national-planning-framework-4-revised-draft/documents/national-planning-framework-4-revised-draft/national-planning-framework-4-revised-draft/govscot%3Adocument/national-planning-framework-4-revised-draft.pdf

2 Scottish Natural Heritage (SNH), SEPA, Scottish Government & James Hutton Institute. (2014)' Peat Survey Guidance; Developments on Peatland: Site Surveys'.

3 Scottish Environment Protection Agency. 2010. Regulatory Position Statement – Developments on Peat

4 Scottish Renewables, Scottish Natural Heritage, Scottish Environmental Protection Agency, Forestry Commission Scotland, Historic Environment Scotland, Marine Scotland, AEECoW (2019)., Good Practice During Wind Farm Construction. 4th Edition.

5 Scottish Renewables, Scottish Environment Protection Agency. 2012. Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste

6 Scottish Government 2011, The Waste Management Licensing (Scotland) Regulations 2011. https://www.legislation.gov.uk/sdsi/2011/9780111012147/contents

7 Peat Landslide Hazard and Risk Assessments (Scottish Government, April 2017)

8 Scottish Natural Heritage, Forestry Commission (August 2010). Floating Roads on Peat

- *the generation of energy from renewable sources that optimises the contribution of the area to greenhouse gas emissions reductions targets;*
- *small-scale development directly linked to a rural business, farm or croft;*
- *supporting a fragile community in a rural or island area; or*
- *restoration of peatland habitats.*

And [5(d)] confirms *that where development on peatland, carbon-rich soils or priority peatland habitat is proposed, a detailed site specific assessment will be required to identify:*

- *the baseline depth, habitat condition quality and stability of carbon rich soils;*
- *the likely effects of the development on peatland, including on soil disturbance; and*
- *the likely net effects of the development on climate emissions and loss of carbon.*

Policy 5 also confirms that the site specific (above) assessment [5(d)] "*should inform careful project design and ensure, in accordance with relevant guidance and the mitigation hierarchy, that adverse impacts are first avoided and then minimised through best practice. A peat management plan will be required to demonstrate that this approach has been followed, alongside other appropriate plans required for restoring and/ or enhancing the site into a functioning peatland system capable of achieving carbon sequestration*".

This stage 1 PMP considers the protection and safeguarding of peat and seeks to fulfil the requirements of Policy 5(d) with further detail on peatland habitat and peatland restoration provided in the Outline Habitat Management Plan.

1.6.2 Mitigation Hierarchy

SEPA[3] has published guidance regarding the mitigation hierarchy for developments on peat which is summarised below:

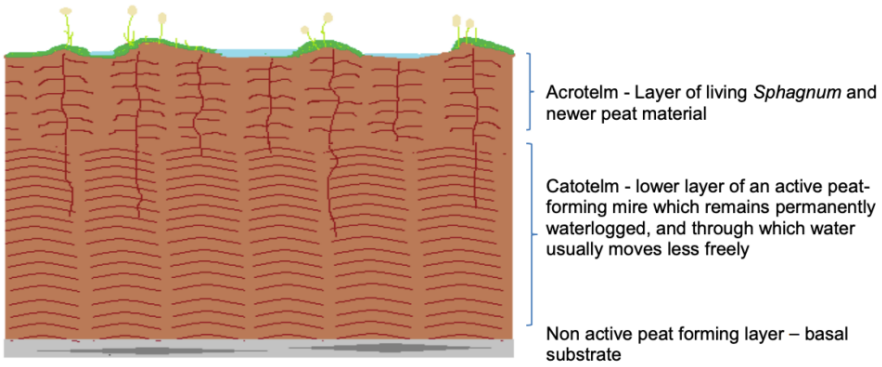
- Prevention – avoiding generating excess peat during construction (e.g. by avoiding peat areas or by using construction methods that do not require excavation such as floating tracks);
- Re-use – use of peat produced on-site in restoration, provided that its use is fully justified and suitable;
- Recycling / Recovery / Treatment – modify peat produced on-site for use as fuel, or as a compost / soil conditioner, or dewater peat to improve its mechanical properties in support to re-use; and
- Storage – applying the SEPA guidance, storage of peat up to a depth of 2m is not classified as a waste and, however clarification should be sought from the waste regulator prior to re-use and care must be taken to ensure that it does not cause environmental pollution.

1.6.3 Definition of Peat

Peat is defined as a material consisting of the partially decomposed remains of plant material and organic matter preserved over a period in a waterlogged environment resulting in anaerobic conditions, and is of depths >0.5m.

Peat can be classed as two principal types, the acrotelm layer and the catotelm layer as shown on **Plate 1-1**.

Plate 1-1: Drawing of two layered Structure of Active Bog Peatlands above Non-Active Peat[9]



The acrotelm layer is found in the upper layer of peat where conditions are relatively dry and comprises living vegetation and partially decomposed plant material. Hydraulic conductivity in this layer tends to be higher in relation to distance from the water table. The thickness of the acrotelm layer varies depending on topography such as steepness of slope, peat hags, and hummocks. In particular, the acrotelm layer can be affected during periods of drought or as a consequence of drainage. Fibrous in texture, the acrotelm layer has some tensile strength and is generally considered to be stable for storage and re-use.

The catotelm layer is found under the acrotelm layer and comprises decayed plant material and organisms and is denser and with a very low hydraulic conductivity. The catotelm layer sits below the water table resulting in permanent anaerobic conditions. The catotelm layer is amorphous and has very low tensile strength making it less suitable for storage and re-use.

9 Bruneau, P.M.C & Johnson, S.M. 2014. Scotland's peatland - definitions & information resources. Scottish Natural Heritage Commissioned Report No 701.

2.0 Fieldworks

Peat depth surveys have been undertaken across a number of phases by SLR as detailed below:

- Phase 1 undertaken during August 2022.
- Phase 2 undertaken over several visits during July, August and November 2023 and February 2024.

2.1 Methodology

The surveys carried out followed best practice guidance for developments on peatland[2,5]. Phase 1 peat probing resulted in probing on a 100m grid on initial assessment areas of the Proposed Development and was used in preliminary site layout designs. Phase 2 probing saw detailed probing undertaken across the Proposed Development layout, focussing on access tracks, cable routes, tower locations and other site infrastructure.

Probing was typically undertaken on linear infrastructure (permanent/temporary tracks and UGC) at 25 to 50m spacings with offset probing locations either side (approximately 10-25m). Infrastructure (towers and substations) was probed at typically 10m grid spacings.

The proposed underground cable route from the proposed Dell 2 Wind Farm substation is required to pass through Stronelairg Wind Farm where it is proposed to run adjacent to the existing tracks and underground cables. Therefore, where the proposed Dell 132kV underground cable intersects existing utility infrastructure, peat probes were undertaken at a safe offset distance as agreed with the client. At Melgarve substation peat probing was also undertaken at safe offset distances from existing infrastructure. However, due to the extensive earthworks undertaken for the construction of the existing substation no peat was encountered within this area.

The thickness of the peat was assessed using a graduated peat probe, approximately 6mm diameter and capable of probing depths of up to 10m. This was pushed vertically into the peat to refusal and the depth recorded, together with a unique location number and the co-ordinates from a handheld Global Positioning System instrument (GPS). The accuracy of the GPS was quoted as ±2m, which was considered sufficiently accurate for this survey. All data was uploaded into a GIS database for incorporation into various drawings and analysis assessments.

Where the peat probing met refusal on a hard substrate, the ‘feel’ of the refusal can provide an insight into the nature of the substrate. An assessment of the substrate was made and recorded at each probe hole. The following criteria were used to assess material:

- Solid and abrupt refusal – rock;
- Solid but less abrupt refusal with grinding or crunching sound – sand or gravel or weathered rock;
- Rapid and firm refusal – clay; or
- Gradual refusal – dense peat or soft clay.

The relative stiffness of the peat was also assessed from the resistance to penetration of the probe and to the effort required to extract the probes (retrieval of the probe was often impossible for one person). In all instances refusal was met on obstructions allowing identification of subsurface geology.

2.2 Peat Depth

Peat is generally defined as a soil with a surface organic layer in excess of 0.5m**Error! Bookmark not defined.**. Where the probing recorded less than 0.5m thick, it is considered to be a peaty soil (or organo-mineral soil). Soils with a peaty organic horizon over mineral soil are often referred to as 'peaty soils'. These organo-mineral soils are extensive across the UK uplands, but do not meet recognised definitions of peat as they are either shallower than peat or have a lower carbon density.

The peat was found to vary across the Proposed Development in terms of thickness and coverage. When viewed in conjunction with the peat depth figures, Figure 10.2.3 and Figure10.2.4, it is evident that the peat is encountered across the Proposed Development. Deeper peat was generally encountered in flatter, lower gradient areas of the Proposed Development.

A total of 6,733 peat probes were undertaken across all survey phases, with the results summarised in Table A and detailed within the peat depth interpolation figures provided in Figure 10.2.3 and Figure10.2.4. The interpolation was undertaken using the Inverse Distance Weighting (IDW) methodology. All probing data is provided in Annex A.

Table A: Peat Probing Results

Peat Thickness (m)	**No. of Probes**	**Percentage (of total probes undertaken on-site)**
0 (no peat)	235	3.5
0.01 – 0.49 (peaty soil)	3,176	47.2
0.50 – 0.99	1,501	22.3
1.00 – 1.49	882	13.1
1.50 – 1.99	522	7.8
2.00 – 2.49	273	4.1
2.50 – 2.99	99	1.5
3.00 – 3.49	31	0.5
3.50 – 3.99	12	0.2
> 4.00	2	0.03

2.3 Peat Condition

Peat is described using BS5930[10] and the Von Post classification[11]. Peat samples were collected by SLR during Phase 2, using a peat auger and used to inform interpretations of the peat condition and underlying substrate.

Based on interpretations from probing and peat core samples, the peat within the Proposed Development is predominantly fibrous to pseudo fibrous. There are some localised deposits of shallow peat that generally comprise clayey layers, whilst areas of thicker peat are predominantly fibrous layers.

Based on field descriptions at augering points, most of the shallow peat would be classified as between H2 and H5 in the Von Post classification, showing insignificant to moderate

10 BS 5930:2015+A1:2020, Code of practice for ground investigations

11 Von Post, L. and Grunland, E., (1926), 'Sodra Sveriges torvillganger 1' Sverges Geol. Unders. Avh., C335, 1-127.

decomposition. Peat core logs and photographs are presented within Annex B and the geomorphology detailed in the Peat Landslide Hazard Risk Assessment[12] (PLHRA).

12 SLR 2024. Peat Landslide Hazard Risk Assessment. LT419 Melgarve Substation Extension. 424.011232.00001. March 2024.

3.0 Potential Impacts on Peat During Construction

The initial construction phase for the Proposed Development will include soil and peat stripping and excavation activities associated with constructing of the Proposed Development.

There are four main types of impact on peat which can occur during construction. These are:

- Loss of structural integrity and peat strength, due to stripping off or damaging the surface vegetation turf, excavation, handling and transporting peat (particularly wet, subsurface peat);
- Erosion and gullying, caused by exposure and desiccation of bare peat surfaces primarily caused by water erosion, due to surface runoff after rainfall;
- Contamination, caused by leaks, spillages or inappropriate laydown of materials; and
- Peat slide, caused by laying wet peat on top of wet peat, laying other heavy materials (including excavated mineral soil or other construction materials) on top of wet peat or by inappropriate stockpiling, such as attempting to create stockpiles of peat that are too high, without bunding, engineering or geotechnical support.

A range of methods and control measures are described below which are designed to prevent these impacts from occurring.

4.0 Peat Management Proposals

The Proposed Development design required to take account of a number of environmental and technical constraints. The design sought to avoid areas of known or potential thick peat where possible, taking into account other environmental and technical factors such as ecology, ornithology, archaeology, hydrology, topography and existing infrastructure. The Proposed Development has largely avoided areas where peat is >1m and efforts have been made by iterative design to minimise the footprint of site infrastructure on peat >0.5m as far as practicable. Where peat and peaty soils are to be excavated, re-used or reinstated, the following good practice applies.

4.1 Excavation

Excavated peat should be excavated as turves, including the acrotelm (surface vegetation) and a layer of adjoining catotelm (more humified peat) typically up to 0.5m thick in total, or as blocks of catotelm; the acrotelm should not be separated from its underlying peat;

- the turves should be as large as possible to minimise desiccation during storage, though the practicalities of handling should be considered;
- the mixing of excavated peat with substrate materials to be avoided at all times; and
- consider timing of excavation activities to avoid very wet weather and avoid multiple handling to minimise the likelihood of excavated peat losing structural integrity.

If possible, extract intact full depth acrotelm layers from the top surface of the peat deposit. This technique will maintain connectivity between the surface vegetation and the partially decomposed upper layers of the catotelm.

4.2 Re-use

All excavated material (including peat and non-peat soils) from the installation of the steel lattice towers and underground cables will be re-used for reinstatement surrounding the towers and within and surrounding the underground cable trench.

It is anticipated that the volume of material excavated for the new permanent access track can be entirely reused for a variety of restoration purposes, including verge restoration to taper into the existing peatland by infilling depressions and levelling-out gradients as part of the cut and fill track construction process. As a result, based on a maximum width 6m wide new permanent access track, the balance between excavation and re-use will be zero. Post construction, permanent access track will be restored to a width of 2.5m with the exception of the permanent access tracks leading up to CSE where it will be re-instated to 3.5m

There is also potential for excavated peat to be used for habitat restoration on or locally to the Proposed Development. This potential re-use option has not been quantified but will provide an additional method to retain and beneficially re-use material.

4.3 Storage

The following good practice applies to the storage of peaty soils/peat:

- stripped materials should be carefully separated to keep peat and other type of soils apart;
- to minimised handling and haulage distances, excavated material should be stored local to the site of excavation or end point of restoration;
- peat turves should be stored in wet conditions or irrigated in order to prevent desiccation (once dried, peat will not rewet);

- stockpiling of peat should be in large volumes to minimise exposure to wind and sun (and desiccation), but with due consideration for slope stability, but should not exceed 1m in height to maintain stability of stockpile;
- stockpiles should be isolated from watercourses or drains with appropriate bunding to minimise pollution risks;
- to be stored a minimum of 10m from any watercourse.
- stores of non-turf (catotelm) peat should be bladed off to reduce the surface area and desiccation of the stored peat; and
- peat storage areas should be monitored during periods of very wet weather, or during snowmelt, to identify early signs of peat instability.

4.4 Temporary Storage

Any peaty soils/peat to be removed during construction would require a temporary storage area near to the construction works/area of re-use. Where peat cannot be transferred immediately to an appropriate restoration area, short term storage will be required. In this case, the following good practice applies:

- peat should be stored around the excavation perimeter at sufficient distance from the cut face to prevent overburden induced failure;
- local gullies, diffuse drainage lines (or very wet ground) and locally steep slopes should be avoided for peat storage; and
- drying of stored peat should be avoided by irrigation or by seeding (although this is unlikely to be significant for peat materials stored less than 2 months).

For infrastructure with longer term storage requirements, the following good practice applies:

- peat generated from permanent excavations should be transported directly to its allocated restoration location, to minimise the volume being stockpiled with the possibility of drying out;
- stores of catotelm peat should be bladed off to reduce their surface area and minimise desiccation;
- where transport cannot be undertaken immediately, stored peat should be irrigated to limit drying and stored on a geotextile mat to promote stability; and
- monitoring of large areas of peat storage during wet weather or snowmelt should be undertaken to identify any early signs of peat instability.

4.5 Transport

The following good practice applies to transport:

- movement of turves should be kept to a minimum once excavated, and therefore it is preferable to transport peat planned for translocation and reinstatement to its destination at the time of excavation; and
- if HGVs/dump trucks that are used for transporting non-peat material are also to be used for peat materials, measures should be taken to minimise cross-contamination of peat soils with other materials.

4.6 Handling

Following refinement of the peat model, a detailed storage and handling plan should be prepared forming part of the detailed CEMP, including:

- best estimate excavation volume at each infrastructure location (including peat volumes split into area/volume of 'acrotelm' or 'turf', and volume of catotelm) which would be achieved by undertaking additional probing in line with current guidance;
- volume to be stored locally and volume to be transferred directly on excavation to restoration areas elsewhere (e.g. peat storage areas) in order to minimise handling;
- location and size of storage area relative to tower foundations and natural peat morphology / drainage features; and
- irrigation requirements and methods to minimise desiccation of excavated peat during short term storage.

These parameters are best determined post-consent, informed by detailed ground investigation with the micro-siting areas for each element of infrastructure.

4.7 Restoration

During restoration, the following best practice should be followed:

- carefully evaluate potential restoration sites, such as peat storage areas for their suitability, and agree that these sites are appropriate with the ECoW, landowners and relevant consultees;
- undertake restoration and revegetation or reseeding work as soon as practically possible;
- where required, consider exclusion of livestock from areas of the Proposed Development undergoing restoration, to minimise impacts on revegetation; and
- as far as reasonably practicable, restoration will be carried out concurrently with construction rather than at its conclusion.

4.8 Access Tracks

There is a number of relevant guidance[4,8] available to support access track design in peatlands. Guidance is generally focused on floating tracks and excavated tracks and is summarised below. Based on the avoidance of significant areas of thick peat with tracks all typically present on peat <1.0m and only limited sections of track on localised areas of peat >1.0m then the use of excavated tracks is proposed. Floating tracks may be considered on suitable length sections of access track where peat depths are >1m, where detailed ground investigation confirms suitability.

Excavated tracks require complete excavation of soil/peat to a competent substrate. Excavated tracks will generally be undertaken where peat depths are less than 1m. This peat/soil would require storage ahead of re-use elsewhere within Proposed Development. Good practice guidance relates mainly to drainage in association with excavated tracks:

- trackside ditches should capture surface water (within the acrotelm) before it reaches the road;
- interceptor drains should be shallow and flat bottomed (and preferably entirely within the acrotelm to limit drawdown of the water table);
- any stripped peat turves should be placed back in the invert and sides of the ditch to assist regeneration and prevent erosion to the peat and wash out that could occur; and
- culverts and cross drains should be installed under excavated tracks to maintain subsurface drainage pathways (such as natural soil pipes or flushes). Discharge from constructed drainage should allow for as much diffuse dispersion of clean (silt free)

water as possible while minimising disturbance to existing peatland as far as possible. Silt mitigation measures will be incorporated into all constructed drainage as per the requirements of the CEMP.

Although excavation is normally undertaken in peat of minor thickness (< 1.0m), there is a possibility of minor slippage from the cut face of the peat mass. Accordingly:

- free faces should be inspected for evidence of instability (cracking, bulging, excessive discharge of water or sudden cessation in discharge); and
- where significant depths of peat are to be stored adjacent to an excavation, stability analysis should be conducted to determine Factor of Safety (FoS) and an acceptable FoS adopted for loaded areas.

Regular routine monitoring should be scheduled post-construction to ensure that hydrological pathways and track integrity have been suitably maintained.

4.9 Cable Trenches

Typical cable trenches will require excavations of up to 2 metres below ground level (mbgl) and the removal of soil/peat to a competent substrate. Soil/peat deposits are expected to be reinstated along with suitable construction materials. This peat/soil would require storage ahead of re-use. Good practice guidance relates mainly to drainage in association with cable trenches:

- due to the variability of peat characteristics and therefore the assumed bearing capacity, it is advised that where differential settlement is envisaged (due to the variability of the peat but also the site conditions) engineered solutions are recommended for the installation of cables and joints;
- long term site trials may require the investigation of a number of solutions that either best suit site conditions or provide the greatest mitigation of risk. This could also involve more detailed site investigation to gain better understanding of the geology/hydrogeology of the Proposed Development;
- in the case of installing cable ducts, more onerous quality assurance may be required during the works. This may involve the production of a Specification for Works and third party Construction Quality Assurance (CQA) to oversee the general workmanship and testing of materials during construction and installation;
- the depth of the installed cable / duct should aim to be minimised as much as possible and the use of machinery kept to a minimum in order to limit the disturbance to the surrounding peat;
- it has been shown that construction work on peat can have destabilising effects on peat and therefore all work carried out should aim to limit the disturbance to the peat;
- avoid the possibility of draining the upper peat layer. A desiccated peat layer is denser, occupies less volume and is therefore more prone to settlement;
- ensure suitable support measures are in place whilst undertaking cuttings into peat to maintain the stability of adjacent peat terrain;
- drainage measures are critical in maintaining hydrological conditions and development of robust drainage systems that will minimise sedimentation into natural watercourses whilst being easily maintainable is crucial. This may involve the use of check dams and erosion protection; and
- it is crucial that construction methods do not disturb established drainage within the peat, such as peat pipes, and that sensitive areas are demarked and are not surcharged, either by soil or water in any case.

4.10 Monitoring and Inspection

There would be frequent, routine and regular inspections of peat in all stockpiles and temporary storage areas as part of the PMP audit process. Inspections would assess in situ peat physical conditions, integrity of containment and temporary drainage conditions, and they would seek to confirm that stockpile design and management was adequate to prevent erosion and peat slide. These inspections would take place weekly during stockpile creation and storage.

Should any problems be observed during regular visual inspections of peat stockpiles, this would invoke implementation of an appropriate corrective action which would be recorded and monitored for effectiveness. Types of corrective actions would include, but would not necessarily be limited to; modification of temporary drainage, additional or modified bunding, incorporating of sediment fencing if required, light re-grading to correct any areas of surface erosion, etc.

Regular, frequent inspections of peat conditions during construction and restoration phases of work would be carried out by the Engineer and ECoW as follows:

- peat surface, peat profile and peat consistency conditions would be carried out as part of ground investigations prior to the start of construction. This information would provide detailed information on the baseline conditions for each part of the infrastructure footprint;
- restored peat conditions would be inspected immediately after restoration to ensure that the methods detailed in the PMP had been correctly implemented and to inform any corrective actions should they be required;
- further monitoring to be undertaken where required to ensure restoration works have been correctly implemented; and
- the physical condition of peat would be retained as carefully as possible both at the peat storage and the peat restoration stages. This is particularly important for vegetation establishment.

5.0 Estimation of Peat Volumes

Table B provides an estimate of peat and peaty soil volumes to be excavated and re-used during the construction of the Proposed Development. The peat and peaty soil excavation and re-use volumes are detailed for each infrastructure element in Annex A. The excavated materials data from Annex A indicates that the areas of infrastructure within the Proposed Development are typically located in areas of peat <1.0m.

The table also demonstrates the following:

- the avoidance of areas of thick peat where possible;
- the excavation of materials is minimised where possible;
- and any excavation and re-use is undertaken in line with updated industry good practices and guidance; and
- limitations and consideration for future work.

Table B: Excavated Materials Management Plan

Method	Volume of Excavated Material (m^3)	Opportunity for Avoidance or Minimisation of Excavated Material	Re-use Requirements	Hierarchy Adherence	Limitations and Considerations
Permanent Excavated Access Tracks approximately 5.2km long by 6m maximum width with an average peat depth of 0.54m.	16,997	Tracks have been subject to several design iterations, to avoid deep peat where possible.	19,830m^3 of excavated peat and soil could be used along access tracks. Track to be restored to 2.5m post construction with the exception of the access to the CSE where it will be re-instated to 3.5m. Verge restoration and visual screening, particularly along access track. Sections of the route may require cut and fill and these slopes would require restoration to minimise visual impact.	Avoidance and re-use of excavated peat. Avoidance was first level of screening to avoid areas of deeper peat. Routing has been planned on thinner peat or peaty soils where possible. The layout design has been guided by constraints which highlight ecological, hydrogeological and geomorphological - all of which identify the peat areas to avoid.	Requires detailed ground investigation to fully characterise ground conditions.
Temporary Excavated Access Tracks approximately 5.2km long by 3.5m width with an average peat depth of 0.45m.	8,176	Tracks have been subject to several design iterations, to avoid deep peat where possible.	Temporary tracks to be reinstated on completion. 8,176m^3 of excavated peat would be used to re-instate access tracks.	Re-use of excavated peat.	Requires detailed ground investigation to fully characterise

Method	Volume of Excavated Material (m^3)	Opportunity for Avoidance or Minimisation of Excavated Material	Re-use Requirements	Hierarchy Adherence	Limitations and Considerations
					ground conditions.
Underground cable trenches approximately 9.9km long by 25 - 37m width with an average peat depth of 0.7m.	220,014	Underground cables alignments have been subject to several design iterations, to avoid deep peat where possible.	Underground cable trenches to be reinstated on completion. 220,014m^3 of excavated peat would be used to re-instate trenches.	Re-use of excavated peat.	Requires detailed ground investigation to fully characterise ground conditions.
Steel Lattice Tower Foundations 33 No. towers each with 4 No. pad foundations and working area (excavation area of 2,025m^2). Average peat depth of 0.59m.	39,392	Tower locations have been subject to a number of design iterations to avoid thicker peat and steep slopes.	At tower foundations excavations are to be reinstated on completion. 39,392m^3 of excavated peat would be used to re-instate at tower locations. This would be stored adjacent to the tower working area and would be limited to 1m height.	Avoided areas of thick peat for Tower foundations where possible to minimise removal of excessive materials.	Requires detailed ground investigation to fully characterise peat and peaty soils.
Total Excavated	284,578m^3	Total Re-use	287,411m^3		

6.0 Waste Classification

This section of the Stage 1 Outline PMP includes the method for dealing with peat which could potentially be classified as waste (only if the above volumes estimate significant quantities of catotelm peat, which cannot be re-used).

Table C outlines where those materials that are likely to be generated on-site, fall within the Waste Management Licensing (Scotland) Regulations 2011.

Based on the results presented in this document, it has been concluded that all of the materials to be excavated on-site would fall within the non-waste classification and would be re-used on-site. Based on a detailed probing exercise and visual inspection of the peat, it is predominantly fibrous peat which would be suitable to be re-used on-site. Typically, the peat was found to be fibrous and fairly dry within the top metre before becoming slightly more pseudo-fibrous with depth.

Table C: Excavated Materials – Assessment of Suitability

Excavated Material	Indicative Volume % of total excavated soils	Is there a suitable use for material	Is the Material required for use on Site	Material Classified as Waste	Re-use Potential	Re-use on Site
Turf and Acrotelmic Peat An estimated acrotelm depth of 0.3m based on peat survey results.	38	Yes	Yes	Not classified as waste	Yes	Will be re-used in reinstatement of access track verges, cut and fill verges, road verges, side slopes and check drains. Peripheral embankments of tower foundations.
Catotelmic peat	62	Yes	Yes	Not classified as waste	Yes	Will be re-used in reinstatement of access track verges, cut and fill verges, road verges, side slopes and check drains. Peripheral embankments of tower foundations.
Amorphous Catotelm Peat (amorphous material unable to stand unsupported when stockpiled >1m)	0	Potentially	Potentially*	Potentially if not required as justifiable restoration of habitat management works	Limited	If peat does not require treatment prior to re-use it can be used on-site providing adequate justification and method statements are provided and approved by SEPA. If it is unsuitable for use without treatment then it may be regarded as a waste. However every attempt to avoid this type of peat has been incorporated into the design.

*Such uses for this type of material are limited, however there may be justification for use in the base of peat restoration areas to maintain waterlogged conditions and prevent desiccation of restored area and in some habitat management works such as gully or ditch blocking where saturated peat is required to mimic mire type habitats and encourage establishment of sphagnum.

7.0 Conclusion

This Stage 1 Outline PMP presents a pre-construction assessment of the expected peat extraction and reuse volumes associated with the works phase of the construction of the Proposed Development. The PMP also provides the guiding principles which would be applied during the construction of the Proposed Development. Peat depth surveys have shown that there are localised peat deposits across the Proposed Development.

Through a process of continued design refinement (focused on minimising peat excavation volumes) and adoption of best practice working method, the Proposed Development is expected to achieve an overall peat balance. Thus, all excavated material will be required for reuse as part of the works and no surplus peat is anticipated.

The figures detailed within this report are to be considered indicative at this stage. The total peat volumes are based on a series of assumptions for the layout of the Proposed Development and the results of several phases of peat probing. Such parameters can still vary over small scale areas and therefore topographic changes in the bedrock profile could impact the total accuracy of the volume calculations.

The various calculations presented here would be updated and expanded upon as part of detailed design works, taking account of pre-construction site investigations and micro-siting, to confirm actual quantities of arising peat. The Applicant would achieve an actual balance between arising peat and reinstatement by prioritising the areas for reinstatement, following advice from the project ECoW and Geotechnical Engineer. It is anticipated that a detailed, construction phase PMP would be developed, and maintenance and updating of this plan in conjunction with a Geotechnical Risk Register. The implementation of the detailed PMP would ensure a robust commitment to excavating, storing and reinstating peat in a manner that follows best practice and ensures the protection of peat throughout the construction and post-construction phases.

Figures

Appendix 10.2: Peat Management Plan

Melgarve Cluster Project: Environmental Impact Assessment

Scottish & Southern Electricity Networks (SSEN)

SLR Project No.: 428.011232.00001

Annex A Excavated Materials Calculations

Appendix 10.2: Peat Management Plan

Melgarve Cluster Project: Environmental Impact Assessment

Scottish & Southern Electricity Networks (SSEN)

SLR Project No.: 428.011232.00001

Infrastructure	Length (m)	Width (m)	Area (m^2)	Average Depth (m)	Number	Total Excavated Volume (m^3)	Length (m)	Width (m)	Area (m^2)	Average Depth (m)	Number	Total Re-use Volume (m^3)	Notes
Permanent Access Track	5246	6	31476	0.54	1	16997	5246	3.5	18361	0.54	2	19830	Reinstated to 2.5m post construction.
Temporary Access Track	5191	3.5	18169	0.45	1	8176	5191	3.5	18169	0.45	1	8176	
Dell 132kV Cable Alignment (from Dell substation to OHL)	7398	25	184942	0.91	1	168297	7398	25	184942	0.91	1	168297	Includes junction box infrastructure
Cloiche 132kV Cable Alignment (from Cloiche substation to OHL)	1816	25	45408	1.06	1	48132	1816	25	45408	1.06	1	48132	Includes junction box infrastructure
Cloiche and Dell 132kV Cable Alignment (from OHL to Melgarve substation)	745	37	27567	0.13	1	3584	745	37	27567	0.13	1	3584	Includes junction box infrastructure
MG1B	45	45	2025	0.76	1	1548	45	45	2025	0.76	1	1548	Includes CSE infrastructure
MG2B	45	45	2025	0.73	1	1471	45	45	2025	0.73	1	1471	
MG3B	45	45	2025	0.23	1	463	45	45	2025	0.23	1	463	
MG4B	45	45	2025	1.29	1	2604	45	45	2025	1.29	1	2604	
MG5B	45	45	2025	0.56	1	1128	45	45	2025	0.56	1	1128	
MG6B	45	45	2025	0.93	1	1890	45	45	2025	0.93	1	1890	
MG7B	45	45	2025	0.88	1	1787	45	45	2025	0.88	1	1787	
MG8B	45	45	2025	1.08	1	2194	45	45	2025	1.08	1	2194	
MG9B	45	45	2025	0.55	1	1116	45	45	2025	0.55	1	1116	
MG10B	45	45	2025	1.36	1	2755	45	45	2025	1.36	1	2755	
MG11B	45	45	2025	0.43	1	868	45	45	2025	0.43	1	868	
MG12B	45	45	2025	1.02	1	2063	45	45	2025	1.02	1	2063	
MG13B	45	45	2025	0.84	1	1706	45	45	2025	0.84	1	1706	
MG14B	45	45	2025	0.34	1	691	45	45	2025	0.34	1	691	
MG15B	45	45	2025	0.36	1	735	45	45	2025	0.36	1	735	
MG16B	45	45	2025	0.43	1	863	45	45	2025	0.43	1	863	
MG17B	45	45	2025	0.86	1	1742	45	45	2025	0.86	1	1742	
MG18B	45	45	2025	0.76	1	1548	45	45	2025	0.76	1	1548	
MG19B	45	45	2025	0.46	1	934	45	45	2025	0.46	1	934	
MG20B	45	45	2025	0.31	1	631	45	45	2025	0.31	1	631	
MG21B	45	45	2025	0.64	1	1292	45	45	2025	0.64	1	1292	
MG22B	45	45	2025	0.39	1	780	45	45	2025	0.39	1	780	
MG23B	45	45	2025	0.93	1	1888	45	45	2025	0.93	1	1888	
MG24B	45	45	2025	0.47	1	953	45	45	2025	0.47	1	953	
MG25B	45	45	2025	0.21	1	434	45	45	2025	0.21	1	434	
MG26B	45	45	2025	0.56	1	1131	45	45	2025	0.56	1	1131	
MG27B	45	45	2025	0.22	1	444	45	45	2025	0.22	1	444	
MG28B	45	45	2025	0.22	1	441	45	45	2025	0.22	1	441	
MG29B	45	45	2025	0.25	1	496	45	45	2025	0.25	1	496	
MG30B	45	45	2025	0.29	1	592	45	45	2025	0.29	1	592	
MG31B	45	45	2025	0.33	1	671	45	45	2025	0.33	1	671	
MG32B	45	45	2025	0.36	1	732	45	45	2025	0.36	1	732	
MG33B	45	45	2025	0.40	1	802	45	45	2025	0.40	1	802	Includes CSE infrastructure
Totals						**284578**						**287411**	

Total Excavated Volume (m^3)	**284578**
Total Re-use Volume (m^3)	**287411**
Net Balance (m^3)	**-2833**

Annex B Peat Coring Data

Appendix 10.2: Peat Management Plan

Melgarve Cluster Project: Environmental Impact Assessment

Scottish & Southern Electricity Networks (SSEN)

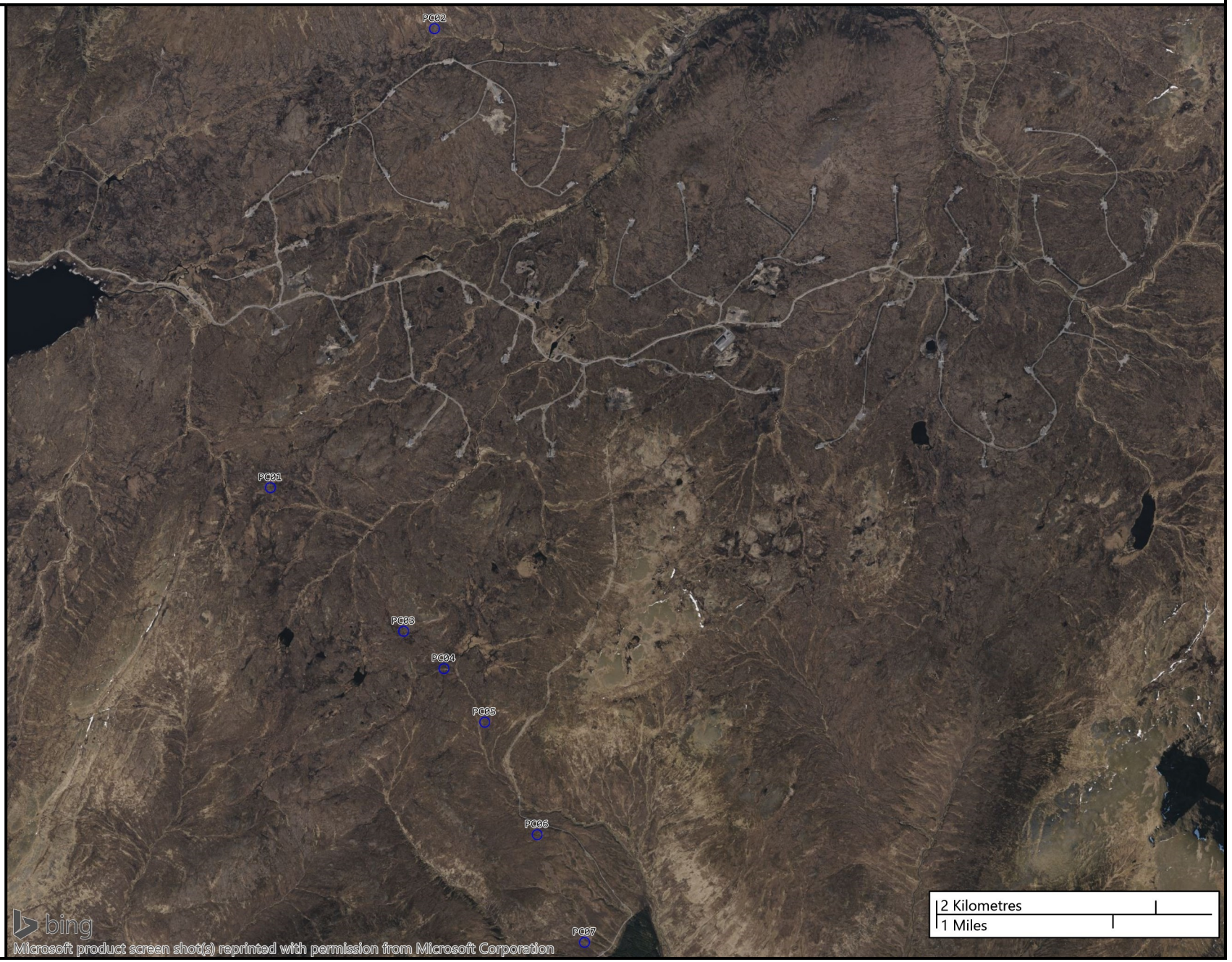
SLR Project No.: 428.011232.00001

Project Id:	428.011232.00001	Title:	Site Plan
Project Title:	Melgarve Cluster Project: EIA	Scale:	1:50000
Location:	Highlands		
Client:	SSEN		

SLR

Legend Key

Locations By Type - PC



Peat Core Log

Hole No. **PC01**

Sheet 1 of 1

Project: Melgarve Cluster Project: EIA	Client: SSEN		Dates: 30-08-2023
Project No: 428.011232.00001	Logger: FS	Approved By: RW	Coordinates: E: 248404.00 N: 801740.00
Location: Highlands	Hole Type: PC	Level:	Vertical Scale: 1:16

Water	Depth (m)	Sample Type	Depth	Recovery (%)	Depth (m) / Discontinuity Detail	Level (mAOD)	Legend	Stratum Description
	0.00 - 1.00	C	0.00 - 1.00	Recovery = 85%	1.30			Brown spongy fibrous PEAT. Frequent plant remains (H2, B2).
	1.00 - 2.00	C	1.00 - 2.00	Recovery = 100%	2.00			Dark brown spongy pseudo-fibrous PEAT. Frequent plant remains (H4, B2).
								Peat Core Complete at 2.00m

Remarks:

Peat core recovered using peat auger. Peat core refused on granular material. Samples logged in accordance with BS5930 and Von Post Scale.

Peat Core Log

Hole No. **PC02**

Sheet 1 of 1

Project: Melgarve Cluster Project: EIA	Client: SSEN		Dates: 30-08-2023
Project No: 428.011232.00001	Logger: FS	Approved By: RW	Coordinates: E: 250065.00 N: 805889.00
Location: Highlands	Hole Type: PC	Level:	Vertical Scale: 1:16

Water	Depth (m)	Sample Type	Depth	Recovery (%)	Depth (m) / Discontinuity Detail	Level (mAOD)	Legend	Stratum Description
	0.00 - 1.00	C	0.00 - 1.00	Recovery = 100%	1.00			Brown spongy fibrous PEAT. Frequent plant remains (H2, B2).
	1.00 - 2.00	C	1.00 - 2.00	Recovery = 100%	2.00			Dark brown spongy pseudo-fibrous PEAT. Frequent plant remains (H4, B2).
								Peat Core Complete at 2.00m

Remarks:

Peat core recovered using peat auger. Peat core refused on granular material. Samples logged in accordance with BS5930 and Von Post Scale.

Peat Core Log

Hole No. **PC03** Sheet 1 of 1

Project: Melgarve Cluster Project: EIA	Client: SSEN		Dates: 06-11-2023
Project No: 428.011232.00001	Logger: CR	Approved By: RW	Coordinates: E: 249577.00 N: 800379.00
Location: Highlands	Hole Type: PC	Level:	Vertical Scale: 1:16

Water	Depth (m)	Sample Type	Depth	Recovery (%)	Depth (m) / Discontinuity Detail	Level (mAOD)	Legend	Stratum Description
	0.00 - 1.00	C	0.00 - 1.00	Recovery = 100%				Dark brown spongy fibrous PEAT. Frequent plant remains (H4), (B2).
	1.00 - 1.70	C	1.00 - 1.70	Recovery = 100%	1.70			Dark brown spongy pseudo-fibrous PEAT. Occasional plant remains (H5), (B3).
					1.70			Peat Core Complete at 1.70m

Remarks:

Peat core recovered using peat auger. Peat core refused on granular material. Samples logged in accordance with BS5930 and Von Post Scale.

Peat Core Log

Hole No. **PC04**

Sheet 1 of 1

Project: Melgarve Cluster Project: EIA	Client: SSEN		Dates: 06-11-2023
Project No: 428.011232.00001	Logger: CR	Approved By: RW	Coordinates: E: 249935.00 N: 800023.00
Location: Highlands	Hole Type: PC	Level:	Vertical Scale: 1:16

Water	Depth (m)	Sample Type	Depth	Recovery (%)	Depth (m) / Discontinuity Detail	Level (mAOD)	Legend	Stratum Description
	0.00 - 1.00	C	0.00 - 1.00	Recovery = 100%				Dark brown spongy fibrous PEAT. Frequent plant remains (H4), (B2).
	1.00 - 2.00	C	1.00 - 2.00	Recovery = 100%	1.75			Light brown clayey fine to coarse SAND.
					2.00			Peat Core Complete at 2.00m

Remarks:

Peat core recovered using peat auger. Peat core refused on granular material. Samples logged in accordance with BS5930 and Von Post Scale.

Peat Core Log

Hole No. **PC05**

Sheet 1 of 1

Project: Melgarve Cluster Project: EIA	Client: SSEN		Dates: 06-11-2023
Project No: 428.011232.00001	Logger: CR	Approved By: RW	Coordinates: E: 250292.00 N: 799518.00
Location: Highlands	Hole Type: PC	Level:	Vertical Scale: 1:16

Water	Depth (m)	Sample Type	Depth	Recovery (%)	Depth (m) / Discontinuity Detail	Level (mAOD)	Legend	Stratum Description
	0.00 - 1.00	C	0.00 - 1.00	Recovery = 100%	1.20			Brown spongy pseudo-fibrous PEAT. Occasional plant remains (H5), (B3).
	1.00 - 1.30	C	1.00 - 1.30	Recovery = 100%	1.30			Light brown clayey fine to coarse SAND.
								Peat Core Complete at 1.30m

Remarks:

Peat core recovered using peat auger. Peat core refused on granular material. Samples logged in accordance with BS5930 and Von Post Scale.

Peat Core Log

Hole No. **PC06**

Sheet 1 of 1

Project: Melgarve Cluster Project: EIA	Client: SSEN		Dates: 06-11-2023
Project No: 428.011232.00001	Logger: CR	Approved By: RW	Coordinates: E: 250736.00 N: 798469.00
Location: Highlands	Hole Type: PC	Level:	Vertical Scale: 1:16

Water	Depth (m)	Sample Type	Depth	Recovery (%)	Depth (m) / Discontinuity Detail	Level (mAOD)	Legend	Stratum Description
	0.00 - 1.00	C	0.00 - 1.00	Recovery = 100%	0.80			Dark brown spongy fibrous PEAT. Frequent plant remains (H4), (B2).
					1.00			Dark brown spongy pseudo-fibrous PEAT. Occasional plant remains (H5), (B3).
	1.00 - 1.20	C	1.00 - 1.20	Recovery = 100%	1.20			Brown coarse silty subangular to subrounded fine to medium GRAVEL of various lithologies.
								Peat Core Complete at 1.20m

Remarks:

Peat core recovered using peat auger. Peat core refused on granular material. Samples logged in accordance with BS5930 and Von Post Scale.

Peat Core Log

Hole No. PC07

Sheet 1 of 1

Project: Melgarve Cluster Project: EIA	Client: SSEN		Dates: 06-11-2023
Project No: 428.011232.00001	Logger: CR	Approved By: RW	Coordinates: E: 251139.00 N: 797466.00
Location: Highlands	Hole Type: PC	Level:	Vertical Scale: 1:16

Water	Depth (m)	Sample Type	Depth	Recovery (%)	Depth (m) / Discontinuity Detail	Level (mAOD)	Legend	Stratum Description
	0.00 - 1.00	C	0.00 - 1.00	Recovery = 100%				Dark brown spongy fibrous PEAT. Frequent plant remains (H4), (B2).
	1.00 - 1.50	C	1.00 - 1.50	Recovery = 100%	1.50			Peat Core Complete at 1.50m

Remarks:

Peat core recovered using peat auger. Peat core refused on granular material. Samples logged in accordance with BS5930 and Von Post Scale.

Peat Auger 01
0 – 1.0m

Peat Auger 01
1 – 2m

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Melgarve Cluster Project: EIA

Project No. :- 428.011232.00001

Date :- August / November 2023

Peat Auger 02
0 – 1.0m

Peat Auger 02
1 – 2.0m

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Project No. :- 428.011232.00001

Date :- August / November 2023

Peat Auger 03
0 – 1.0m

Peat Auger 03
1 – 1.7m

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Project No. :- 428.011232.00001

Date :- August / November 2023

Peat Auger 04
0 – 1.0m

Peat Auger 04
1.0 – 2.0m

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Peat Auger 05
0 – 1.0m

Peat Auger 05
1.0 – 1.3m

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Peat Auger 06
0 – .1.0m

Peat Auger 06
1.0 – 1.2m

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Date :- August / November 2023

Peat Auger 07
0 – 1.0m

Peat Auger 07
1.0 – 1.5m

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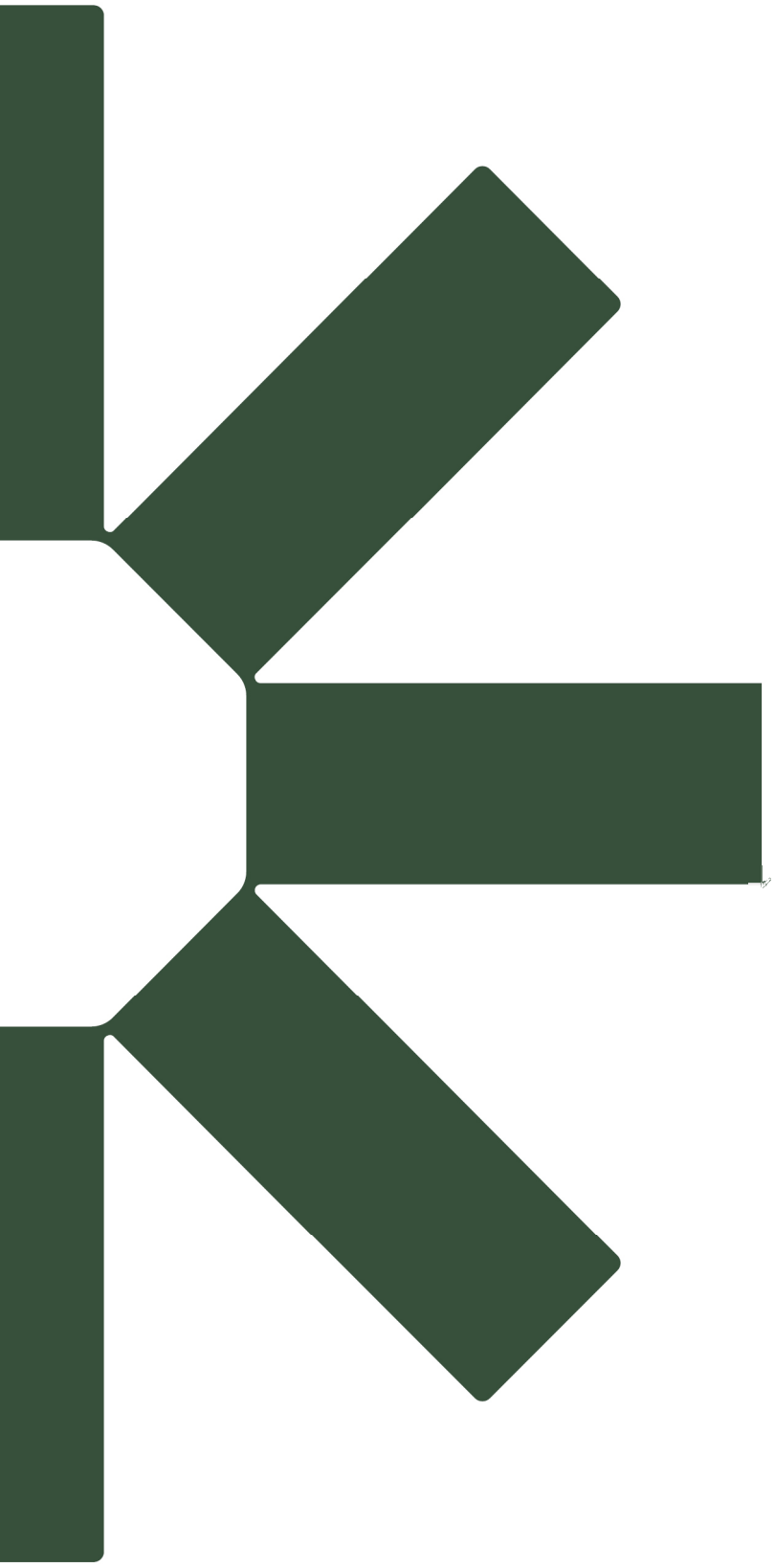
Project No. :- 428.011232.00001

Date :- August / November 2023



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