

Balliemeanoch Pumped Storage Hydro

Environmental Impact Assessment Report

Volume 5: Appendices
Appendix 10.2: Outline Peat
Management Plan

ILI (Borders PSH) Ltd

July 2024

Quality information

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1. Introduction

As part of the assessment of the effects on geology and ground conditions, an Outline Peat Management Plan (PMP) has been prepared to set out the principles to be adhered to during design, construction operation and decommissioning of the Development in relation to peat management.

This Outline PMP should be read in conjunction with Chapter 10 Geology and Soils (Volume 2), which outlines the effects, mitigation and significance of peatlands due to the construction of the Development. Most of the mitigation for reducing the impact on peatlands is embedded into the design of the scheme, however, the excavation of peat is unavoidable for the Development. As such, it is understood that peat will be excavated for the construction of the Development and this Outline PMP outlines how it will be managed.

The Outline PMP seeks to avoid waste peat by applying the waste hierarchy of The Waste Management Licensing (Scotland) Amendment Regulations 2016, which is defined as follows:

- Prevention
- Preparing for reuse
- Recycling
- Other recovery e.g. energy recovery
- Disposal

This Outline PMP provides details on the anticipated approximate volumes of peat that may be excavated during construction, the characteristics of the peat that would be excavated, and the principles and methods of how and where this excavated peat would be stored, reused and managed.

This Outline PMP will be further developed and agreed subsequent to the Development receiving consent. Further details and specific plans would be determined during the detailed design process and once further pre-construction ground investigation (GI) have been undertaken. These details would then be included in a detailed final PMP, which it is assumed will be agreed with ABC as a condition of the S36 consent.

1.1 Policy and Guidance for Peat Management

The significance of peatlands is most evident in their protection by various legislation, policy and local, national or international initiatives including, but not limited to; the United Kingdom Biodiversity Action Plan (UKBAP) , Scotland's National Peatland Plan (SNH, 2015) , European Council Habitats Directive 92/43/EEC (Council of the European Communities, 1992) , the Scottish Biodiversity List (SBL) (Scottish Government, 2013), the European Council Water Framework Directive 2000/60/EC (Council of the European Communities, 2000) , Scottish Government discussion paper on the Management of Carbon-Rich Soils (Scottish Government, 2010) , Scottish Soil Framework (Scottish Government, 2009), the Climate Change Plan (2017-2032) (Scottish Government, 2017) and Advising on peatland, carbon-rich soils and priority peatland habitats in development management (NatureScot, 2023).

Scottish Environmental Protection Agency (SEPA) has a statutory and legislative duty to ensure that where peat spoil is generated during construction; that it is stored, re-used, treated or disposed of correctly; which may require authorisation or permits.

As such, this Outline PMP has been prepared in accordance with the following policy and best practise guidance:

- Guidance on Developments on Peatland: Site Surveys (Scottish Government, NatureScot and SEPA, 2017);
- SEPA Regulatory Position Statement – Developments on Peat (SEPA, 2010);
- Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste (Scottish Renewables and SEPA, 2012); and
- Developments on Peat and Off-Site Uses of Waste Peat (SEPA, 2017).

- Good Practice during Windfarm Construction (Scottish Renewables, SNH, SEPA & Forestry Commission Scotland, 2019);

Additionally, the publication of the NPF4 (Scottish Government, 2023) has illustrated the importance of more considered practices within peatlands. Policy 5 of NPF4 states:

c) Development proposals on peatland, carbon-rich soils and priority peatland habitat will only be supported for: i) Essential infrastructure and there is a specific locational need and no other suitable site; ii) The generation of energy from renewable sources that optimises the contribution of the area to greenhouse gas emissions reductions targets; iv) Restoration of peatland habitats.

d) Where development on peatland, carbon-rich soils or priority peatland habitat is proposed, a detailed site specific assessment will be required to identify: i) the baseline depth, habitat condition, quality and stability of carbon rich soils; ii) the likely effect of the development on peatland, including on soil disturbance; iii) the likely net effect of the development on climate emissions and loss of carbon.

As such, the details provided in NPF4 have been considered in this Outline PMP along with Chapter 10: Geology and Soils (EIAR Volume 2).

1.2 Definition of Peat – Acrotelmic and Catotelmic Layers

Peat is defined as ‘an organic soil which contains more than 60% of organic matter and exceeds 50 cm in thickness’ (NatureScot, 2023). Scotland’s National Peatland Plan also encompasses organic soil less than 50 cm, which can support typical peatland vegetation. Organic deposits less than 50 cm in thickness are therefore considered in this and related aspects of the DMRB Stage 3 EIA as ‘peaty soils’. Joint Nature Conservation Committee (JNCC, 2011) and Scottish Government guidance on peat surveys also follows this peaty soil definition. ‘Deep peat’ is considered to be a peat soil with a surface organic layer greater than 1.0 m thickness (Bruneau & Johnson, 2014)

Peatland survey: Guidance on Developments on Peatland states that the acrotelmic layer (the surface layer) of peatland within which all living vegetation exists, is usually less than 300 millimetres (mm) thick but may be up to 500 mm.

SEPA’s guidance on the development on peat and off-site uses of waste peat described the two peat layers as follows:

- Acrotelmic – quite fibrous and contains plant roots etc. acrotelmic peat is relatively dry and has some tensile strength; and,
- Catotelmic – highly amorphous, with very high water content and tend to have very low tensile strength. The structure of catotelmic peat tends to disrupt completely on excavation and handling.

Therefore, in the absence of detailed peat characteristics within the Development Site (as no GI has been completed), it has been assumed that the acrotelmic layer is 450 mm thick with the remaining peat below this depth being catotelmic.

2. Peat Conditions

2.1 Peat Survey

As described in Chapter 10: Geology and Ground Conditions (EIAR Volume 2) two peat probing surveys have been completed for the Development and these are described below.

2.1.1 Northern Access Route Peat Probing – August 2021

An initial Peat Probing Survey of the Northern Access in Keppochan and Upper Sonachan Forest was undertaken in August 2021 by AECOM. Two areas of proposed access tracks were surveyed at 50 m centres with 10 m perpendicular offsets.

In total, 50 probes were taken, with a range of depths between 0 m – 3.2 m. Where 0 m depth was recorded, it is assumed that rock is at or near surface level.

2.1.2 Main Site Peat Probing

The Peat Probing Survey was undertaken in September 2023 by AECOM. Prior to commencing the survey, a desk-based assessment was undertaken to assess the estimated presence of peat across the Development Site. A review of the BGS Onshore GeoIndex indicated that no peat or peaty soils were present across the site. Further investigation through the National soil map of Scotland indicated that a large, isolated outcrop of peaty podzols and peaty gleys was present around the proposed Headpond area.

Following consultation with SEPA on the proposed peat probing plan, the following approach was adopted for the peat survey:

- 100 m x 100 m grid across Headpond;
- 10 m offsets at 50 m centres along existing Access Tracks; and,
- Check probes in areas of deeper peat across the survey area.

766 probes were taken during the Phase I Survey, with a range of peat depths between 0 m – 7.3 m.

2.1.3 Peat Probing Summary

In total, 816 probes have been taken for the Development, as summarised in Table 1 and shown on *Figure 10.4 – Peat Probe Results (Volume 3 Figures)*.

Table 1. Peat Probing Summary

Peat Probing Exercise	No. of Probes	Maximum Depth Recorded (m)	Average Depth (m)
August 2021	50	3.2	0.84
September 2023	766	7.3	1.10
Total	816		

The results of the peat probing were used to create an interpolated peat surface to determine the peat depths across the development – as detailed in *Figure 10.5 – Peat Surface (Volume 3 Figures)*.

3. Peat Excavation

The approach set out in this Outline PMP follows the mitigation hierarchy listed below:

- Prevent the creation of waste peat by avoiding execution of peat;
- Minimisation through reuse on site to support construction;
- Minimisation through use on site or off-site for peatland restoration (is applicable);
- Recycling / recovery for agricultural benefit or recycled through blending with other materials to form a soil substitute or used in other relevant works (is applicable); and
- Disposal, only after all other options have been explored and discounted.

3.1 Measures to Minimise Peat Excavation

NPF4 has been carefully considered throughout the design process of the Development. The infrastructure has been specifically designed throughout the iterative EIA process to minimise the impacts on peat by reducing the volume of peat excavated.

From the scoping stage to the final design, a number of changes in the proposed layout have been made to avoid deeper peat and are detailed below:

1. Access tracks have been realigned / altered to avoid areas of deep peat (> 1.0 m depth);
2. Where realignment was not possible, floating access tracks have been identified in all areas of deep peat (> 1.0 m depth); and,
3. Resizing and relocation of temporary construction compounds to avoid deep peat (> 1.0 m).
4. Peat located within the Headpond, below the bottom water level (BWL) of 374 m AOD will not be excavated and essentially 'flooded' - details of the flooding of peat is located in Section 3.3.

3.2 Floating and Use of Existing Access Tracks

A total of 26km of access tracks are needed for the construction and operation of the Development.

Floating access tracks, where tracks are constructed directly on the top surface of soft ground, are specified for approximately 5.5 km (21 %) of the 26.3 km total track length to minimise peat excavation.

Floating access tracks have been specified in areas of deep peat (> 1.0 m) to minimise peat excavation - in line with current SEPA guidance.

The floating tracks will be designed and constructed with best practice guidance set out in Floating Roads on Peat (Forestry Civil Engineering & NatureScot, 2010).

Existing access tracks are to be used where feasible and are specified for approximately 12.9 km (49 %) of the total track length to minimise peat excavation.

3.3 Peat Flooding

As noted in Section 3.1, the peat within the Headpond that is located below 374 m AOD will be left in-situ and flooded.

Prior to flooding, the surface (approximately 465,000 m²) will be prepared and overlaid with a geotextile / geogrid before being covered with excavated rock. The peat will then be left in place permanently.

3.4 Peat Excavation Volumes

Table 2 details the construction activities that will generate the peat excavation and the approximate associated (maximum) volumes based on the assumed worst-case scenario. These details are also presented in *Figure 10.2.1 – Peat Excavation* at the end of this report.

The volumes detailed in

Table 2 are outputs from the peat excavation assessment undertaken using GIS and are based on the results of the peat probing surveys.

Table 2. Peat Excavation Volumes

Infrastructure Type	Surface Area (m ²)	Average Peat Depth (m)	Estimated Acrotelm Volume (m ³)	Estimated Catotelm Volume (m ³)
Embankment 1	366,265	1.14	164,819	207,519

Infrastructure Type	Surface Area (m ²)	Average Peat Depth (m)	Estimated Acrotelm Volume (m ³)	Estimated Catotelm Volume (m ³)
Embankment 2	14,032	1.22	6,314	9,419
Borrow Pit 1 (BP01)	508,629	1.43	228,883	413,573
Headpond Basin	650,111	1.02	292,550	280,090
New Access Tracks (Excavated)	25,312	0.63	11,390	2,166
New Access Tracks (Floating Transitions)	3,932	0.95	1,769	2,185
Switching Station	22,500	1.16	10,125	13,980
Compounds	61,011	0.73	27,455	7,411
Subtotal (m³)			743,305	936,343
Total (m³)				1,679,648

It is estimated that over 1,685,000 m³ of peat will be excavated, of which 743,305 m³ would be acrotelm and 936,342 m³ would be catotelm.

4. Peat Reuse

This section sets out the measures to reuse peat and the expected peat reuse volumes. Where possible, peat will be re-used adjacent to where it has been excavated to avoid excessive handling. Details of the re-used volumes and supporting details are shown in Table 3, which has been determined in accordance with Scottish Government Guidance.

For the purpose of this Outline PMP, the locations of peat reuse are largely based on the guidance referenced throughout this appendix. However, it is acknowledged that post consent a ground investigation will be undertaken. At this stage, and in line with the completion of detailed design, the final PMP will be prepared for approval. At this stage, the areas for peat reuse will be reviewed and updated to ensure that the most appropriate approach is used.

Table 3. Peat Re-use Volumes

Location	Length (m)	Width of Peat (m)	Depth of Peat (m)	Cross-sectional Area of Peat (m ²)	Plan Area of Peat (m ²)	Quantity	Volume of Acrotelmic Peat Re-used (m ³)	Volume of Catotelmic Peat Re-used (m ³)	Reason for Re-use
Excavated Access Track Verges	9,896	4.0	1.5	6.0	n/a	1.0	59,378		Required to create a bund to prevent natural run-off mixing with track run off. Required throughout the site on both sides of the track and tying the access track into landscape.
Floating Access Track Verges	8,447	4.0	1.5	6.0	n/a	1.0	50,681		Required to create a bund to prevent natural run-off mixing with track run off. Required throughout the site on both sides of the track and tying the access track into landscape.
Floating Access Track Transitions	1,490	4.0	1.5	6.0	n/a	1.0	8,938		Required to create a gradual change (6 deg) in stiffness of road construction from floating road to excavated road.
Temporary Construction Track	n/a	n/a	1.0	n/a	13,364.2	1.0	13,364		Used to reinstate temporary construction compounds to pre-construction state.
Temporary Construction Compound Reinstatement	n/a	n/a	1.0	n/a	62,343.8	1.0	62,344		Used to reinstate temporary construction compounds to pre-construction state.
Permanent Compound Verges	2,571	4.0	1.5	6.0	n/a	1.0	15,428		Required to create a bund to prevent natural run-off mixing with permanent compound run off. Additionally, required to tie the permanent compounds into the landscape and to encourage vegetation re-growth in keeping with the surrounding habitat.
Borrow Pit 01	n/a	n/a	1.8	n/a	295,821.6	1.0	532,479		Used to reinstate borrow pit profile up to bottom water level (BWL) of 374m AOD.
Borrow Pit 01	n/a	n/a	2.0	n/a	295,821.6	1.0		939,231	Used to reinstate borrow pit profile up to bottom water level (BWL) of 374m AOD.
Total							742,612	939,231	

5. Peat Balance

Table 4 shows the peat balance for the Development. It is anticipated that 1,681,843 m³ of peat can be re-used within the Development Site, with a waste of -2,195 m³ (0.13 %).

Where a negative surplus is shown i.e., excavated volume is less than the used volume, the reuse volume depth will be reduced accordingly, in line with the volume of available material.

Table 4. Peat Re-use Volumes Summary

Infrastructure Type	Volume of Acrotelmic Peat (m ³)	Volume of Catotelmic Peat (m ³)	Total (m ³)
Excavated	743,305	936,343	1,679,648
Re-Used	742,612	939,231	1,681,843
Waste	693	-2,888	-2,195

5.1 Peat Reuse with Peatland Restoration

While on site for the Phase I Peat Probing survey, a number of eroded peat gullies were identified across the Development. Whilst not included in the calculations above, peatland restoration could be considered as a method for peat reuse on site within these gullies.

The suitability of using excavated peat to support peatland restoration in these areas will depend on a number of factors, including presence of vegetation and quality of bog, but primarily the timing and extent of any proposed peatland restoration in relation to the timing of peat being excavated.

Annex A of this report details the potential areas identified for peatland restoration and a general methodology for the Development.

5.2 Borrow Pit Restoration

As the borrow pit is located within the Headpond and below the BWL (374m AOD) peat will be restored within these areas and 'flooded' upon commission of the scheme.

The peat will be excavated prior to all blasting activities within the Headpond borrow pits and temporarily stored within the Headpond. Upon completion of all quarrying activities and construction of the embankments, the peat will be restored to the borrow pit areas to a maximum depth of 4 m (maximum 2 m depth of catotelmic and acrotelmic peat). A geogrid / geotextile will be laid atop the peat before being covered with quarried rock – to act as a covering and stabilising layer.

5.3 Peat Handling Method Statement

It will be necessary for the final PMP to detail precise methods and timing involved in handling, storing, and reusing excavated peat materials. The final method statement will follow the principles detailed below, in accordance with the best practice guidance.

- The surface layer of peat and vegetation (Acrotelm) will be stripped separately from the Catotelmic peat.
- Acrotelmic material will be stored separately from Catotelmic material.
- Careful handling is essential to retain any existing structure and integrity of the excavated materials and thereby maximise the potential for excavated material to be reused.
- Less humified Catotelmic peat (consolidated peat), which maintains its structure upon excavation, will be kept separate from highly humified amorphous peat.
- Acrotelmic material will be replaced as intact as possible once construction is complete.

To minimise handling and transportation of peat, Acrotelmic and Catotelmic peat will be replaced, as far as is reasonably practicable, in the location from which it was removed. Acrotelmic material must always be placed on the surface.

During peat handling, efforts will be made to prevent unnecessary trafficking over peat. Appropriate scale plant (including low pressure equipment) will be used, double handling will be avoided, and a monitoring programme will be installed to ensure mixing of peat and mineral soil is avoided.

5.4 Temporary Peat Storage

It will be necessary for the final PMP to detail precise methods and timing involved in temporary storage, should this be required, the preference being that peat is placed at its end use location directly from it being excavated. The final method statement will follow the principles detailed below, in accordance with the best practice guidance.

- Temporary storage of peat will be minimised. Excavated soils would be stored at no greater than 3 m in height, directly adjacent to, or near the tracks on ground appropriate for storage of materials i.e., relatively dry, and flat ground, a minimum of 50 m away from any watercourses. Wherever possible, reinstatement will be carried out as track construction progresses.
- Suitable storage areas will be sited in areas avoiding watercourses, stability risk, groundwater dependent terrestrial ecosystems or other sensitive areas.
- Reinstatement will, in all instances, be undertaken at the earliest opportunity to minimise storage of turves and other materials.
- Timing the construction work, as much as possible, to avoid periods when peat materials are likely to be wetter.
- Where sustained snowfall and freezing conditions occur, peat excavation will also be halted. The decision to restart work will be based on the thawing condition of the site and general meteorological conditions.
- Temporary storage and replacement of peat excavated from borrow pits will occur within the 'source' pit.
- Transport of peat on site from excavation to temporary storage and restoration site will be minimised.

Consistent inspection of peat conditions during construction and restoration will be undertaken by the Ecological Clerk of Works (ECoW), and in line with the CEMP, as follows;

- Temporary stockpiles will be inspected weekly. If non-compliance is noted, corrective actions must be taken; and
- Restored peat conditions will be inspected during and immediately after restoration to ensure that best practice is followed.

6. Conclusion

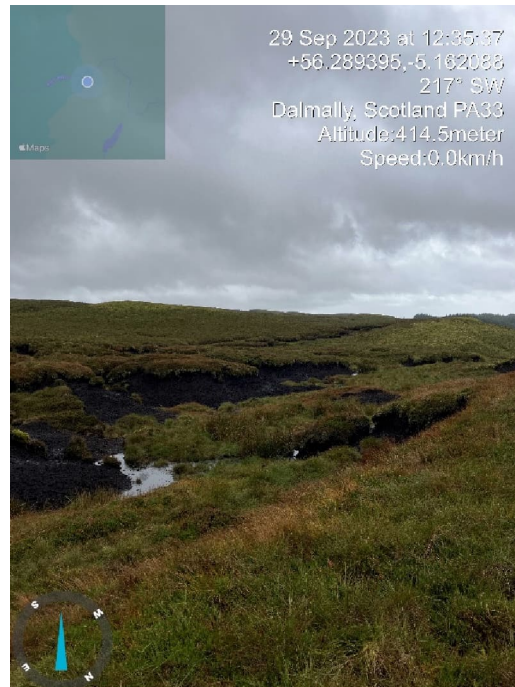
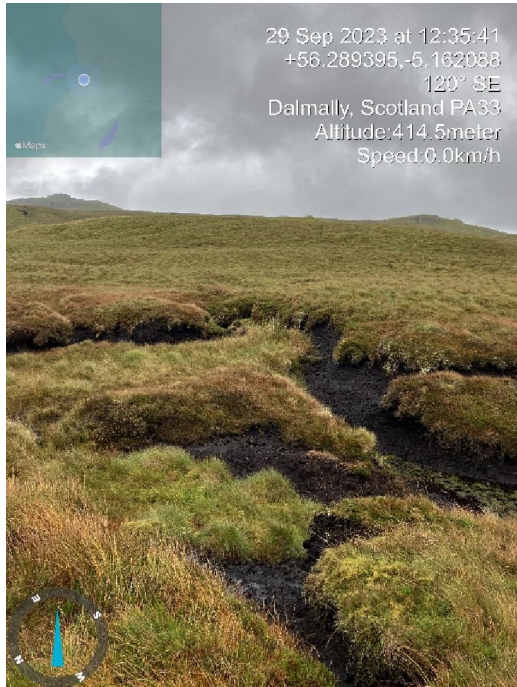
It is estimated that all 1,679,648 m³ of excavated peat will be reused within the Development.

Policy 5 of NPF4 looks to prevent developments on peatland, carbon rich soils and priority habitats. As detailed in this Outline PMP, the Proposed Varied Development will require development on and excavation of these soils. However, Policy 5 does confirm that developments will be supported if they are for the "...the generation of energy from renewable sources that optimises the contribution of the area to greenhouse gas emissions reductions target."

The Outline PMP will be developed into a final PMP following a detailed ground investigation, including use of peat cores, as well as the detailed design of infrastructure, post-planning consent.

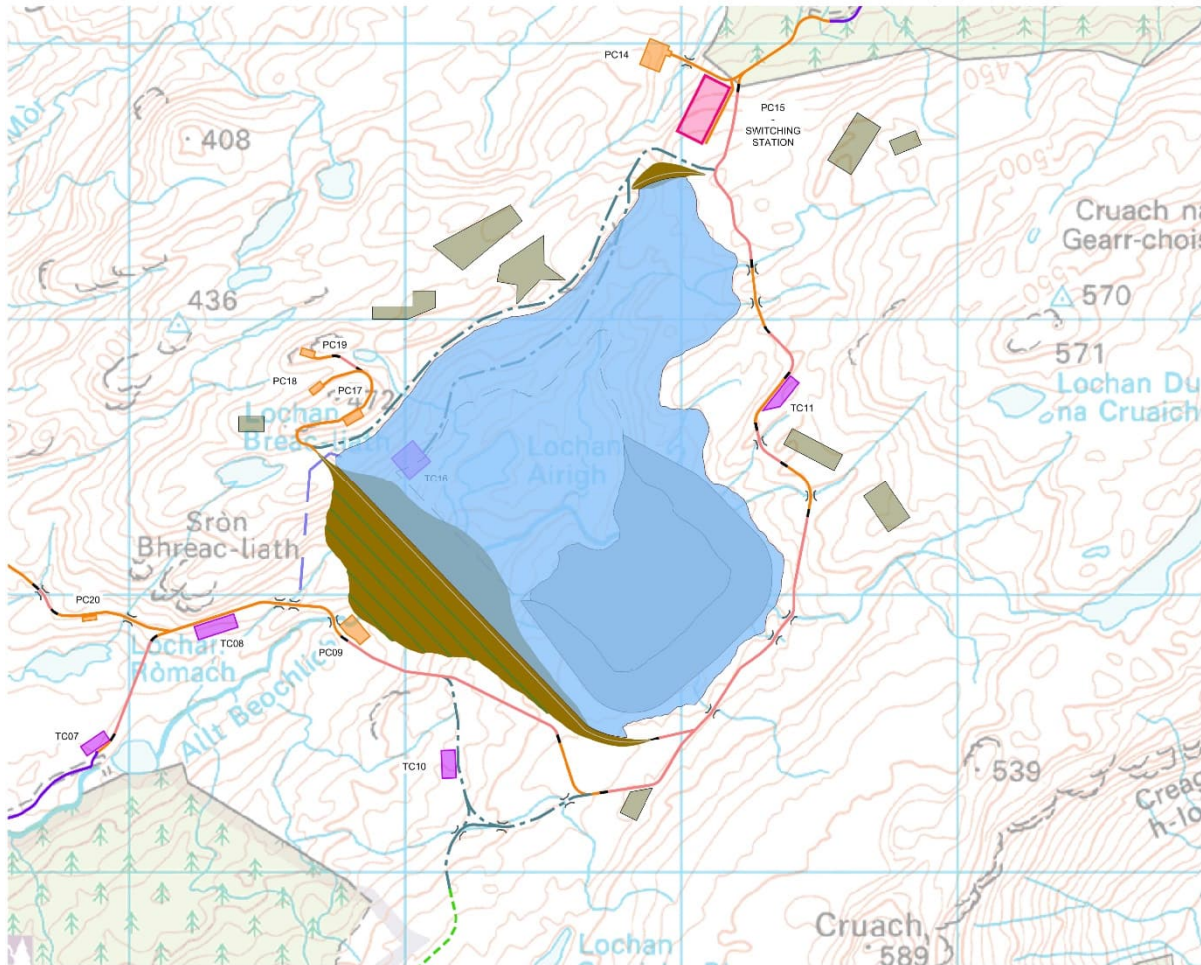
7. Annex A - Potential Peatland Restoration

As detailed in Section 5.1, while on site for the Phase I Peat Probing survey, a number of eroded peat gullies were identified across the Development – as exemplified by the photographs below in Insert 1.



Insert 1 Eroded Peat Gullies

From a review of aerial imagery and on-site observations, these features are present across the Development – largely to the northeast and south of the Headpond, respectively. Insert 2, below, shows locations earmarked for peatland restoration based on the following methodology.



Insert 2 Proposed Peatland Restoration Zones (Green)

Peatland Restoration Methodology

The methods summarised below will be considered to restore peatlands within the eroded peat gullies across the Development Site.

1. Grip Blocking
2. Gully Management
3. Bare peat restoration

Initially, reprofiling of the eroded banks will be undertaken to lower the bank gradient. Slopes would then be revegetated with previously undermined vegetation with turves used to fill small gaps. Once completed, excavated peat will be used to reprofile the gullies – promoting regeneration of the peatland.

For the purpose of the peat excavation in Table 10.3, the peatland restoration has been omitted as the volume of peat that could be used in the abovementioned peatland restoration is not possible to estimate at this stage. As such, further investigation post consent will be required to confirm the suitability of these areas.

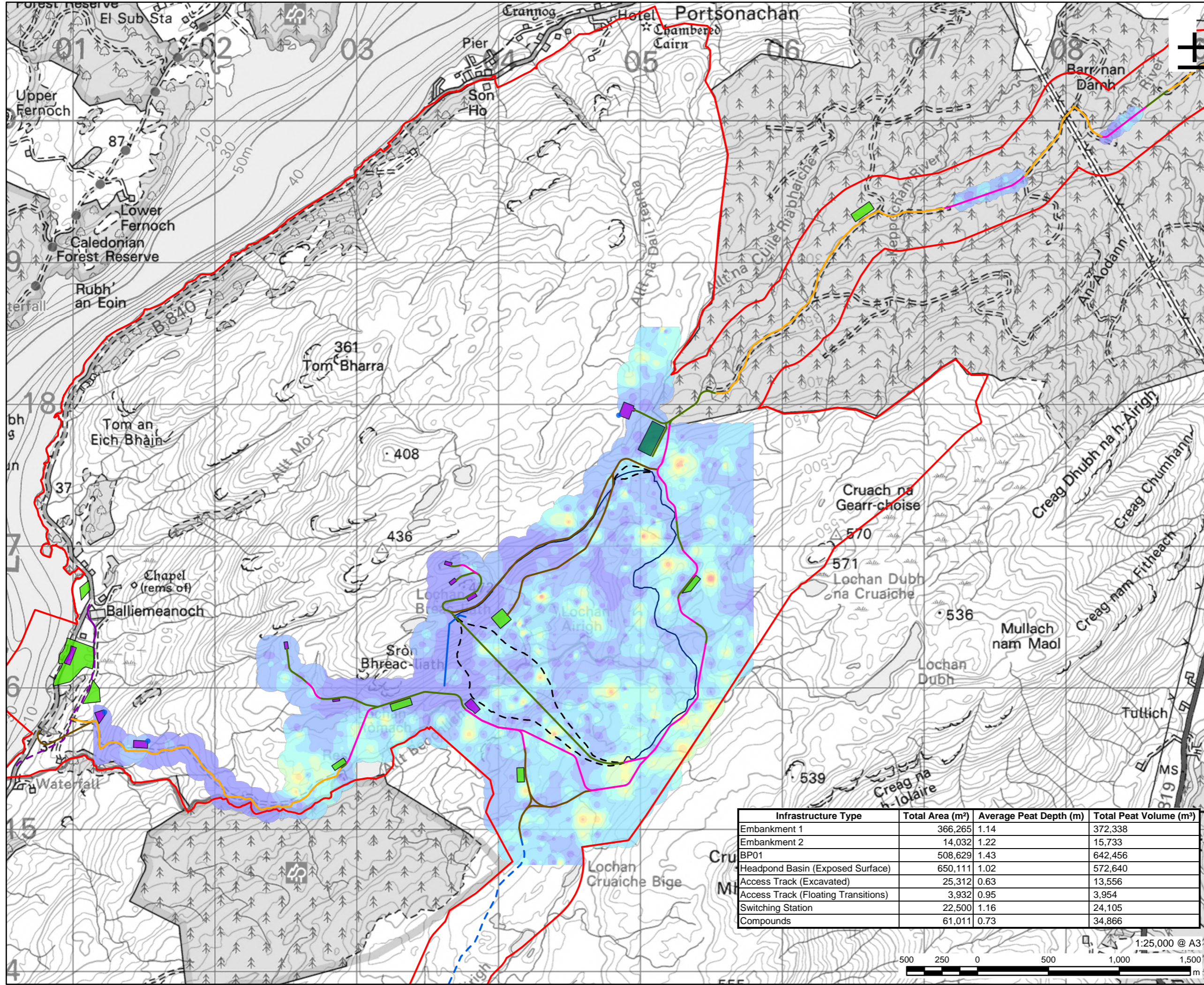
During the moving and handling of peat, efforts will be made to prevent unnecessary trafficking over undisturbed peat, ensure the use of appropriately scaled plant (including low pressure equipment) and to prevent peat from drying out (spraying with water).

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9. Figures

Figure 10.2.1 Peat Excavation



PROJECT
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PUMPED STORAGE
HYDRO

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LEGEND

- Development Boundary
- Headpond
- Headpond Embankments
- Peat Probes**
- 0.00 - 0.50
- 0.51 - 1.00
- 1.01 - 1.50
- 1.51 - 2.00
- 2.0 - 3.00
- 3.0 - 4.00
- 4.01 - 5.00
- 5.01 - 6.00
- 6.01+
- Above Ground Infrastructure**
- B840 Diversion - Permanent, New, Excavated
- B840 Diversion - Permanent, Upgrade, Excavated
- Spillway
- Access Track - Temporary, New, Excavated
- Access Track - Permanent, New, Excavated
- Access Track - Permanent, New, Floating
- Access Track - Permanent, Upgrade, Excavated
- Proposed Blarghour wind farm access track
- Tunnel Portals
- Switching Station
- Temporary Construction Compound
- Permanent Construction Compound

NOTES

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ISSUE PURPOSE

FINAL

PROJECT NUMBER

60570241

FIGURE TITLE

Peat Excavation

FIGURE NUMBER

Figure 10.2.1

Infrastructure Type	Total Area (m ²)	Average Peat Depth (m)	Total Peat Volume (m ³)
Embankment 1	366,265	1.14	372,338
Embankment 2	14,032	1.22	15,733
BP01	508,629	1.43	642,456
Headpond Basin (Exposed Surface)	650,111	1.02	572,640
Access Track (Excavated)	25,312	0.63	13,556
Access Track (Floating Transitions)	3,932	0.95	3,954
Switching Station	22,500	1.16	24,105
Compounds	61,011	0.73	34,866



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