AI Technical Appendix 8.2 Peat Survey Report

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1 Introduction

Fluid Environmental Consulting Ltd (Fluid) were commissioned by Galileo 05 Limited (the Applicant) to complete depth of penetration probing and coring at the Lynemore Wind Farm. The site is located south of A9 public road near Moy in Highland, Scotland and covers an area of approximately 8km^2. The site is characterised by open moorland with some forestry in the west. Terrain is gradually rising southwards and reaching summits of Carn na h-Easgainn (616m) and Beinn nan Cailleach (557m). The area is located within Creag Bheithin, Moy Burn and Loch Moy surface water catchment.

2 Depth of Penetration Survey

Depth of penetration surveys, considered to be equivalent to peat depth, were completed By Fluid Environmental Consulting between November 2023 and November 2025. This was undertaken in accordance with the guidance in Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey. Guidance on Developments on Peatland.

A total of 10,097 probing locations and 41 cores were completed.

Survey 1

A total of 826 probes and 12 cores were completed in November 2023 at the following specification:

- on a 100m across the survey area.

Two proposed probing locations were on an existing track and two alternative probes were therefore undertaken near the proposed points as substitutes.

Survey 2

A total of 2,987 peat probes and 20 cores were completed in July 2024 at following specifications:

- at 50 m intervals with 10 m offsets on each side along a proposed access track.
- across the footprint of all infrastructure on a 10 m grid and probing within a 50 m buffer area on a 20 m grid.

Fourteen proposed locations were on an existing track and not suitable for probing, therefore seven alternative probing locations were selected where there was a benefit for interpolation.

Survey 3

Following a review of the layout and adjustment due to various constraints, additional 840 peat probes and 9 cores were completed in August 2024 at the following specification:

- at 50 m intervals with 10m offsets on each side along a proposed access track.
- across the footprint of all infrastructure on a 10 m grid and probing within a 50 m buffer area on a 20 m grid.
- on a 100 m across additional survey area.

Survey 4

Following further review of the layout and adjustment due to various constraints, additional 1,233 peat probes were completed in November 2024 at the following specification:

- at 50 m intervals with 10m offsets on each side along a proposed access track.
- across the footprint of all infrastructure on a 10 m grid and probing within a 50 m buffer area on a 20 m grid.

One proposed probing location was on an existing track and an alternative probe was therefore undertaken near the proposed point as substitutes.

Survey 5

Following further review of the layout and adjustment due to various constraints, additional 2,112 peat probes were completed in December 2024 at the following specification:

- at 50 m intervals with 10m offsets on each side along a proposed access track.
- across the footprint of all infrastructure on a 10 m grid and probing within a 50 m buffer area on a 20 m grid.

One proposed probing location was on an existing track and one within a pool. Two alternative probes were therefore undertaken near the proposed points as substitutes.

Survey 6

Further adjustment of the layout and adjustment due to various constraints, additional 600 peat probes were completed in January 2025 at the following specification:

- at 50 m intervals with 10m offsets on each side along a proposed access track.
- across the footprint of all infrastructure on a 10 m grid and probing within a 50 m buffer area on a 20 m grid.

Survey 7

Subsequent to the application submission and consultation with SEPA the layout was adjusted to move some infrastructure slightly to reduce effects on peat. An additional 925 peat probes were completed in October 2025 at the following specification:

- at 50 m intervals with 10 m offsets on each side along a proposed access track.
- across the footprint of all infrastructure on a 10 m grid and probing within a 50 m buffer area on a 20 m grid.

Five proposed probing locations were on an existing track. One alternative probe was undertaken near one proposed point as substitute. The other four locations have completed probes nearby.

Survey 8

A final adjustment of the layout was undertaken to explore the potential for further layout impact reductions. An additional 574 peat probes were completed in November 2025 at the following specification:

- at 50 m intervals with 10m offsets on each side along a proposed access track.
- across the footprint of all infrastructure on a 10 m grid and probing within a 50 m buffer area on a 20 m grid.

The survey included completion of the following:

- Record the depth of penetration at each probe location along with an estimate of the geology at the limit of penetration.
- Collect data from 41 cores on total peat depth, Von Post measurements every metre, the thickness of the acrotelm, catotelm and amorphous peat (if present) and comments on water table if possible.
- Record the underlying geology at all probe locations: e.g. bedrock, clay, silt, sand.
- Record the vegetation at all probe locations: bare ground, grass, heather, cotton grass, mixed mosses or sphagnum moss.
- Record the ground firmness at all probe locations: 0 – too soft to walk on, 1 – surface just passable, 2 – surface fairly firm, and 3 – surface firm.
- Record location comments at all probe locations: (e.g. D - drain, DD - diffuse drainage, ET - existing track, EG - erosional gully, PC - peat cutting, PH - peat hag, PS - potential peat slide, W - water course, P - pool/pond, SP - sphagnum pool).
- Take a photographic record of all cores.
- Present all data in tables with appropriate labelling of locations according to the specification document.
- Provide a peat depth contour plan across the area of probing and coring.
- Provide a factual report detailing the work completed and the data collected.

The data collected by Fluid are presented in detail in the attached annexes:

- A gps linked photographic record of peat locations and other peat features was taken and provides a detailed record across the site. Typical peat equipment and characteristics are presented in **Annex I** Example Photographs of Typical Ground Conditions.
- A record of the data collected by Fluid Environmental Consulting at all 10,121 probe locations is presented in **Annex II** Peat Penetration Probing Data. This includes 24 probing locations where probing was not possible due to existing track (23 locations) or a waterbody (one location)
- The data collected from each of the 41 cores is presented in **Annex III** Peat Core Data: Peat Data and Von Post Measurements.
- A photographic record and log of the peat for each core is presented in **Annex IV** Peat Coring Logs.

3 Methodology

3.1 Site Visits and Field Work

Depth of penetration probing has been completed using narrow diameter fibre glass probes of up to 7m length that do not allow a sample to be obtained. They are pushed into the ground until there is sufficient resistance to prevent further penetration, and the depth recorded as the depth of penetration. A description of the resistant substrate below is made based on the feel of the resistance (e.g. grit, bedrock, clay, sand, rock or resistance where unable to differentiate).

This probe provides the depth of penetration in soft formations and if peat is present is often representative of the actual peat depth when the formation underlying the peat is sands and gravels or bedrock. However, the depth of penetration can be an overestimate of the depth of peat where the substrate below is soft and penetrable, such as soft clay or silt. In some cases,

peat may not be present and the whole of the probe penetrates through silt or clay sediments. Coring is therefore necessary to verify some of the probe results by extracting a core of the deposits for examination.

A total of 41 cores have been obtained using a gouge auger to determine the actual depth of the peat and obtain a sample of the underlying formation. Observations on the soil and peat characteristics were determined from the cores using recognised criteria (Von Post assessment). The acrotelm, catotelm and amorphous layers (if present) within the peat have also been identified within the peat where possible. Observations on underlying geology, nearby water features, ground conditions and habitat were also noted.

Probe locations were located and recorded using a handheld global position system (GPS) device, with Birdseye aerial imagery, to a six figure grid reference (to 1m) and georeferenced photographic records were obtained for all cores. The probes and gouge auger used at this site are of the types shown in **Annex I**.

The data obtained from the current site investigation was verified with the coring data and is presented in **AI Figure 8.8**.

A shaded contour interval of 0 –0.5m, >0.5m – 1m, >1m – 1.5m, >1.5m – 2m, >2m – 3m and >3m – 4m, >4m – 5m, >5 – 6m and >6m has been used on the figures as the deepest probe encountered 6.5m of peat.

The data obtained is presented within this factual report on peat occurrence and properties across the site along with the contour plot. The results of the probing and coring have been tabulated in Annexes I to IV along with photographs and a table of peat conditions.

3.2 Limitations

It should be noted that the peat depth probes were undertaken at up to 100m spacing and there may therefore be more localised peat depth variations between each probing point. It is also possible that some overestimation of peat depth can occur if soft silty clay is present underlying the peat that is indistinguishable from peat using just a peat probe.

4 Results

4.1 Depth of Penetration Probing

A total of 10,097 probes were undertaken across the site with each probe recording the depth of penetration (Annex II).

Of the 10,097 locations probed a total of 2,234 probes (22.1%) recorded depths of 0.5 m or less (no peat), 2,831 probes (28.0%) recorded depths of penetration between 0.5 m and 1.0 m and 5,032 probes (49.8%) recorded depths of penetration >1.0 m, as shown in **Table 1**.

Table 1 Depth of Penetration Distribution

Depth Range (m)	Number of Probes	Percentage of Probes
0 – 0.5	2,234	22.1%
0.5 - 1.0	2,831	28.0%

Depth Range (m)	Number of Probes	Percentage of Probes
1.0 – 1.5	2,036	20.2%
1.5 - 2.0	2,280	22.6%
2.0 – 3.0	700	6.93%
3.0 – 4.0	10	0.10%
4.0 – 5.0	2	0.02%
5.0 – 6.0	3	0.03%
>6	1	0.01%
Total	**10,097**	**100%**

The depth of penetration at each probe location is presented on **AI Figure 8.8**.

4.2 Coring

A total of 41 locations have been cored during the peat survey and the data collected included Von Post test results, acrotelm and catotelm thickness, observations on the peat structure and any observations on water features nearby as presented in Annex III. Comparison of the probe depth of penetration and the peat depth verified from the core is also presented in **Annex III** and full logs of each core including photographic record are presented in **Annex IV**.

Of the 41 locations cored all identified peat greater than 0.5 m depth. Comparison of the depth of peat in the cores to the depth of penetration probes validated the probing results in 40 of the 41 locations. It is assumed that if the difference between the peat depth from coring and from probing is less than 0.1 m then it is an acceptable variation due to the accuracy of the measurements.

In one location the probe overestimated the peat depth by 0.25 m. The probe recorded 1.35 m compared to 1.10 m observed in core A_591. This was due to substrate of clay mixed with peat below 1.10 m.

The variations in the results of coring and probing typically occur when clay deposits are present underlying the peat. These are not usually very thick (a few 10s of cms) and although they do reduce the overall peat thickness this tends to only make a significant difference at shallower peat depths.

The cores identified a distinctive acrotelm layer in 37 of the 41 coring locations that ranged between 0.05 m and 0.25 m thick and averaged 0.11 m where present. The catotelm thickness ranged from 0.55 m to 1.95 m in the 41 cores.

4.3 Substrate

A total of 10,097 probes were undertaken across the site with each recording the potential substrate at the limit of penetration (**Annex II**).

The probes recorded substrate information based on feel as the probe made contact with the formation underlying the peat as follows in **Table 2**:

Table 2 Substrate across all probe locations

Substrate	Number of Probes	Percentage of Probes
Rock	5,985	59.3%
Silt	2,090	20.7%
Grit	1,036	10.3%
Gritty silt	775	7.68%
Sand	79	0.78%
Silty grit	30	0.30%
Sandy silt	29	0.29%
Sandy grit	18	0.18%
Clay	16	0.16%
Clayey silt	13	0.13%
Gritty sand	8	0.08%
Resistance	4	0.04%
Silty clay	4	0.04%
Sandy clay	4	0.04%
Gritty clay	3	0.03%
Silty sand	2	0.02%
Clayey grit	1	0.01%
Total	**10,097**	**100%**

4.4 Sampling Results

Samples of peat were observed in the field as part of the peat depth probing programmes and descriptions noted with respect to its characteristics, including fibre content, decomposition and moisture content.

The Von Post test was also carried out at core locations. Von Post scores for the acrotelm ranged between H1 and H5. A score of H1 is defined by Ekono (1981) (1981) as *'Completely undecomposed peat which, when squeezes, releases almost clear water. Plant remains easily identifiable. No amorphous material present.'*

H2 is defined as *'Almost entirely undecomposed peat which, when squeezed, releases clear or yellowish water. Plant remains still easily identifiable. No amorphous material present.'*

H3 is defined as *'Very slightly decomposed peat which, when squeezed, rleases muddy brown water, but form which no peat passes between fingers. Plant remains still identifiable, and no amorphous material present.'* This means that there is no amorphous peat in category H1, H2 and H3. H scores of 5 or more begin to have amorphous material, with significant amorphous material occurring at scores of H9 and above.

H4 is defined as *'Slightly decomposed peat which, when squeezed, releases very muddy brown water. No peat is passed between the fingers but plant remains are slightly pasty and have lost some of their identifiable features.'*

H5 is defined as '*Moderately decomposed peat containing a fair amount of amorphous material. Plant structure recognisable though somewhat vague. On squeezing, some peat but mainly muddy water issues. Residue is strongly pasty.'*

For the catotelm, Von Post scores ranged between H5 and H8 with an average of H6. A score of H5 is defined as '*Moderately decomposed peat containing a fair amount of amorphous material. Plant structure recognisable though somewhat vague. On squeezing, some peat but mainly muddy water issues. Residue is strongly pasty.'*

H6 is defined as '*Moderately highly decomposed peat with a very distinct plant structure. When squeezed, about one-third of the peat escapes between the fingers. The residue is very pasty but shows the plant structure more distinctly than before squeezing.'*

H7 is defined as '*Highly decomposed peat. Contains a lot of amorphous material with very faintly recognizable plant structure. When squeezed, about one-half of the peat escapes between the fingers. The water, if any is released, is very dark and almost pasty.'*

H8 is defined as '*Strongly decomposed peat with much amorphous material and very indistinct plant structure. On squeezing, two thirds of the peat and some water passes between the fingers. Residue consists of plant tissues capable of resisting decomposition (roots, fibres, wood, etc.).'*

No amorphous peat was identified on site.

In terms of reuse, consideration has to be given to the increasingly amorphous and plastic nature of that catotelm with Von Post scores of H7 and above.

5 Summary

The following summarises the results of the peat survey:

- Peat depth probing was first completed within on a 100 m grid across the survey area followed by detailed probing across all infrastructure on a 10 m grid and probing within a 50 m buffer area on a 20 m grid as well as at 50 m intervals with 10m offsets on each side along proposed access track.

- Peat has been determined to be present up to a depth of 6.5m based on 10,097 depth of penetration probes and 41 cores.

- A distinct acrotelm layer was identified in 37 of the 41 coring locations that ranged between 0.05 m and 0.25 m thick and averaged 0.11 m where present.

- Coring for peat depth verification and assessment of peat characteristics was completed at 41 locations. The coring verified the peat probing depths in 40 locations. In one location the probe overestimated the peat depth by 0.25 m in core A_591 where the probe recorded 0.35 m compared to 1.10 m observed in the core. This was due to substrate of clay mixed with peat below 1.10 m.

- No amorphous peat was identified at site.

- The data collected has been used to produce an interpreted maximum depth of peat contour map using ArcGIS (**AI Figure 8.9**)

- **AI Figure 8.9** of the EIA Report shows that the deepest peat (>5.0 m) is located in the central northern area of the site, though it is not associated with the proposed infrastructure. Peat depth across the site is almost entirely absent in the north of the site with the exception of some isolated deep pockets and some scattered areas of shallow peat. Peat is more continuous although variable in depth across the south of the site with peat depth varying between about 0.5 m and 3 m in general. The peat depth is highly variable due to the presence of numerous erosional gullies.