

Appendix 7.2: Peat Survey Report

Appendix 7.2

Peat Survey Report

Introduction

7.2.1 Kaya Consulting Ltd was commissioned to undertake a peat depth survey for the proposed An Càrr Dubh Wind Farm project.

7.2.2 The An Càrr Dubh Site is located in Argyll and Bute. The Site boundary is located less than 1km west of Inveraray and 2.5km east of Dalavich, on Loch Awe. Turbine 1 (T1) of the Proposed Development is the closest to Inveraray, located approximately 6km to the north-west, and T13 is the closest to Dalavich, approximately 4.5km to the east.

7.2.3 The Site covers an area of ~1658ha and comprises a mix of upland heath, bog, and rocky areas of grassland (on strips of higher ground) throughout the site. **Figure 7.2.6** (see end of document) shows the site boundary and extent of the survey. The topography of the Site is variable with flatter ground in the west and large areas of ground with slopes greater than 15° in the central and east areas of the site.

7.2.4 This report covers the methodology and output of the Phase 1 (preliminary, low-density survey), and the Phase 2 (detailed, high-density) peat surveys undertaken at the Site. The purpose of the surveys was to establish an understanding of the peat depths at the Site to optimise site design and layout to minimise both the extent of disruption to peatlands and the quantity of peat excavated.

7.2.5 The Phase 1 survey comprised surveying a 100m grid across the full area proposed for infrastructure within the Site boundary. The results of the Phase 1 survey helped inform the initial layout of the Proposed Development.

7.2.6 The Phase 2 survey used a 20m grid to cover areas in detail where there will be infrastructure associated with the Proposed Development. This includes the footprint of the turbine locations, working areas, construction compounds, met mast and borrow pits. Additional survey, at 50m intervals with offsets, was undertaken on the proposed access tracks and the existing access tracks being upgraded.

7.2.7 This document should be read in conjunction with **Chapter 7: Geology, Hydrology, Hydrogeology, and Peat** of the An Càrr Dubh Wind Farm EIA Report.

Methodology

Desk-based Initial Assessment

7.2.8 The Carbon and Peatland 2016 Map¹ was consulted prior to Phase 1 and Phase 2 peat surveys. The map contains information on the likely peatland classes present within the survey area. The Carbon and Peatland map was developed to be used as “a high-level planning tool to promote consistency and clarity in the preparation of spatial frameworks by planning authorities”.

7.2.9 Within the Carbon and Peatland map, Class 1 and Class 2 peatlands are identified as areas of “nationally important carbon-rich soils, deep peat and priority peatland habitat”. Class 1 peatlands are also “likely to be of high conservation value” and Class 2 “of potentially high conservation value and restoration potential”.

7.2.10 The Carbon and Peatland map for the site is shown in **Figure 7.2.6**. The location proposed for infrastructure is located entirely on Class 2 peatland. The existing access track from the east is located on Class 5 peatland. Class descriptions are as below:

- Class 2 – Nationally important carbon-rich soils, deep peat and priority peatland habitat. Areas of potentially high conservation value and restoration potential.
- Class 5 – Soil information takes precedence over vegetation data. No peatland habitat recorded. May also include areas of bare soil. Soils are carbon-rich and deep peat.

7.2.11 The results of the desk-based assessment indicate that peat is likely to be present within the Site boundary.

Survey Methodology

7.2.12 The survey methodology follows current guidance in Scotland².

7.2.13 The field survey was undertaken by a team with the appropriate experience of assessing hydrology, hydrogeology, geology, soil, and peat for onshore wind farms in upland environments.

7.2.14 The Phase 1 peat survey was undertaken on the following dates:

- 22nd to 26th March 2021 (inclusive);
- 9th to 12th August 2021; and
- 30th to 31st August.

7.2.15 The Phase 2 peat survey was undertaken on the following dates:

- 25th to 26th January 2022 (inclusive);
- 21st to 22nd February 2022;
- 7th to 11th March 2022;
- 14th to 17th March 2022;
- 24th to 27th May 2022; and
- 25th October 2022.

7.2.16 The following methods were employed for the Phase 1 peat survey:

- The Site was sampled using a 100m systematic grid. The survey points were aligned to best fit the Ordnance Survey National Grid reference grid. The grid was generated using QGIS software.
- A total of 989 sampling points were surveyed in Phase 1. The extent of the Phase 1 peat survey is illustrated in **Figure 7.2.6**.
- The peat survey was carried out using an extendable fibreglass utility probe capable of sampling to 4.9m. Where the base of the peat could not be detected at 4.9m the depth was simply marked as 4.9m and recorded in the notes. Depth recordings were taken by rounding up to the nearest 0.05m.

7.2.17 The following methods were employed for the Phase 2 peat survey:

- The initial Phase 2 peat probing was undertaken on a 10m grid around areas of proposed infrastructure, including turbine footprints, working areas, construction compounds, met mast and borrow pits.
- However, following review of the initial data and due to the highly variable nature of the peat depths across the Site, it was decided to increase the separation distance between the probes from 10m to 20m for the majority of the Phase 2 peat probing. This was to allow a larger area to be covered at the infrastructure locations therefore giving more flexibility in the options for the final infrastructure locations. This is considered to be a robust approach which has provided a comprehensive data set to inform the final design. The Scottish Environment Protection Agency (SEPA) were consulted throughout the EIA process and agreed that this approach to sampling was successful in obtaining good peat baseline information to inform the layout.
- The survey grid was aligned to best fit the Ordnance Survey National Grid reference grid. The grid was generated using QGIS software.

¹ Scottish Natural Heritage (now NatureScot) (2016) Carbon and Peatland 2016 map [online]. Available at: https://map.environment.gov.scot/Soil_maps/?layer=10

² Scottish Government, Scottish Natural Heritage (now NatureScot) and SEPA (2017) Peatland Survey: Guidance on Developments on Peatland

- The proposed access track route centreline was probed at 50m intervals along the track, with 10m offsets probed on either side of the track. Areas of existing track which are proposed to be widened during the development were also probed with offsets.
- A total of 4,374 sampling points were surveyed during Phase 2. This includes multiple iterations of wind farm layout with some areas sampled not carried forward in the final development plan. The extent of the Phase 2 peat survey is illustrated in **Figure 1**.
- The peat survey was carried out using an extendable fibreglass utility probe capable of sampling to 4.9m. Where the base of the peat could not be detected at 4.9m the depth was simply marked as 4.9m and recorded in the notes. Depth recordings were taken by rounding up to the nearest 0.05m.
- Peat cores were taken using a gouge auger (20mm diameter) to confirm the existence and composition of peat. Cores were taken at proposed turbine locations and other representative locations across the site. The locations of the cores are shown in **Figure 1**.

Results

Peat Depths

7.2.18 Table 7.2.1 and Figure 7.2.1 show the range of results obtained during the Phase 1 and Phase 2 peat surveys. A total of 5,363 probes were collected.

7.2.19 The Scottish Government guidance document on peat landslide hazard and risk assessment³ defines peat as a soil greater than 0.5m in depth, with an organic matter content of more than 60%. Soils of less than 0.5m depth are classified as organo-mineral soils, with soils less than 0.25m not classified as peat. This is further evidenced by the JNCC (2011)⁴, SNH (Bruneau et al, 2014)⁵ and The James Hutton Institute (2019)⁶.

7.2.20 At the An Càrr Dubh Site:

- 21% of probes were recorded as having a depth of less than 25cm. These probes are not classified as peat.
- 18% of probes were recorded as having a peat depth of between 25-50cm. These probes are classified as organo-mineral soils and not formally considered to be peat.
- 26% of probes were recorded as having a peat depth of between 50-100cm.
- 35% of the probes were recorded as having a peat depth of over 100cm.

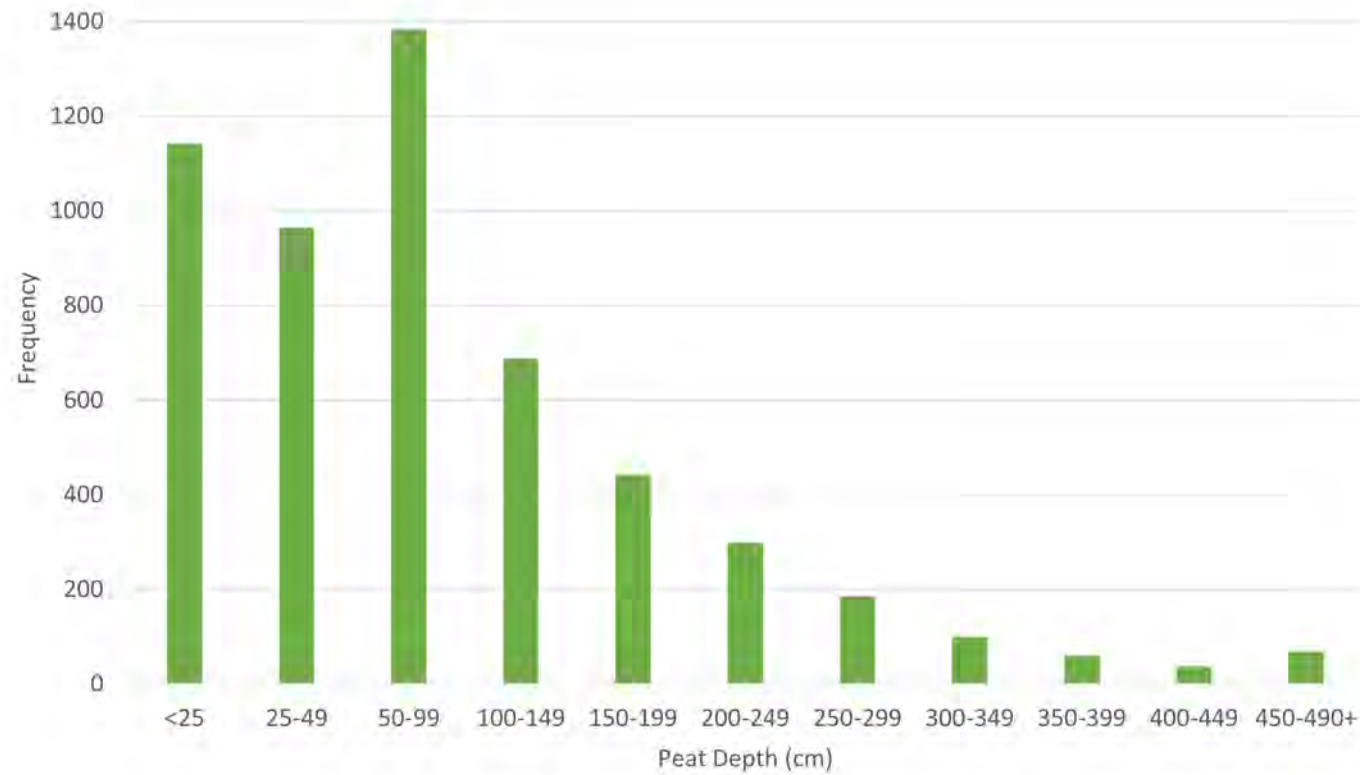
Table 7.2.1: Peat depth summary

Peat Depth Range	Number of Probes	Percentage of Total Probes
<25cm	1,141	21.3%
25cm to 49cm	963	18.0%
50cm to 99cm	1,384	25.8%
100cm to 149cm	687	12.8%
150cm to 199cm	442	8.2%
200cm to 249cm	298	5.6%
250cm to 299cm	185	3.4%
300cm to 349cm	100	1.9%
350cm to 399cm	59	1.1%
400cm to 449cm	36	0.7%
>450cm	68	1.3%
Total	5,363	100%

³ Scottish Government (2017) Peat Landslide Hazard and Risk Assessments Best Practice Guide for Proposed Electricity Generation Developments
⁴ Joint Nature Conservation Committee (2011) Towards an assessment of the state of UK Peatlands (JNCC Report No. 445)

⁵ Bruneau, P. M. C. and Johnson, S. M. (2014) Scotland's peatland – definitions and information resources (SNH Commissioned Report No. 701)
⁶ The James Hutton Institute (2019) Organic Soils [online]. Available at: <https://www.hutton.ac.uk/learning/exploringscotland/soils/organicsoils>

Figure 7.2.1: Peat depth histogram



7.2.21 Figure 7.2.6 shows the locations of all peat probes and cores taken over the Site overlain on the NatureScot (2016) Carbon and Peatland map. Figure 7.2.7 to 7.2.11 shows the spatial distribution of the peat depths over the site and Figure 7.2.12 shows the results of the interpolation of the peat depth data. It should be noted that, as with most interpolation algorithms, the further from a probed point the data is, the less accurate it is likely to be.

Peat Cores

7.2.22 Table 7.2.2 shows the information collected from coring. A total of 18 cores were taken; the locations of which are shown in Figure 7.2.6.

7.2.23 All of the cores were in areas which contained peat. It was determined that the acrotelm layer was between 10cm and 90cm in the cores surveyed. Some open sections of peat hag in eroded areas also allowed for measurement of acrotelm depths, which were noted to be up to 90cm.

7.2.24 A variety of base material was found to underly the areas cored:

- 50% of the cores obtained had a bedrock base;
- 11% had a clay base; and
- The substrate underlying 39% of the cores could not be identified as the lower layers of peat were often too saturated to retrieve.

7.2.25 A representative example of the cores taken is shown in Figure 7.2.2.

Table 7.2.2: Collected core data

Core Number	Peat	Acrotelm Thickness	Catotelm Thickness	Von Post	Notes
1	Yes	70	120	H3-H10	Peat too wet below 90cm to extract.
2	Yes	30	310	H2-H10	Bottom 240cm too wet to extract.
3	Yes	20	140	H4-H6	Clay base.
4	Yes	35	240	H2-H9	Heavily vegetated/fibrous top 100cm, clay base.
5	Yes	40	140	H2-H10	Distinct acrotelm, bottom 80cm H10 peat.
6	Yes	50	50	H1-H10	Bedrock base.
7	Yes	10	90	H3-H5	Bedrock base.
8	Yes	35	155	H4-H6	Below 190cm the depth peat too wet to core.
9	Yes	20	150	H2-H6	Wood fragments in bottom 20cm, bedrock base.
10	Yes	10	130	H5-H10	Bedrock base.
11	Yes	30	260	H4-H10	Bedrock base.
12	Yes	70	130	H2-H10	Bedrock base.
13	Yes	20	80	H7-H10	Bedrock base, bottom 10cm too wet to core.
14	Yes	40	90	H3-H10	Below 130cm peat too wet to extract.
15	Yes	10	90	H5-H10	Below 100cm peat too wet to extract.
16	Yes	90	10	H6-H8	Bedrock base.
17	Yes	30	70	H4-H10	Below 100cm peat too wet to extract.
18	Yes	90	10	H5-H7	Bedrock base.

Figure 7.2.2: Representative peat cores (core number shown)



Peatland Condition

7.2.26 The entire Site is composed mainly of upland bog with which appears to have been only slightly influenced by recent or historic human activity – mainly by sheep grazing. Within the Site there are numerous connected and disconnected patches of peat with depths greater than 100cm and some large areas of undisturbed peatland within the Site boundary (**Figure 7.2.3**). Equally, there are some large areas of eroded peat with peat hags (**Figure 7.2.4**) and areas with visible peat erosion from trampling by sheep and deer (**Figure 7.2.5**).

7.2.27 Local topography on the site affects the peat distribution. Higher linear ridges formed of layers of metamorphic schist are separated by low lying depressions, where watercourses, lochs and areas of deeper peat are likely to be present. The survey data reflects this with generally thin or no peat on the linear ridges (e.g. **Figure 7.2.5**). Deeper peat is generally located in the lower ground, hollows and valleys, between the ridges of schist. Some areas of the flatter ground in the north and west of the Site have more consistent deep peat, while the hillier, undulating terrain in the centre and south of the site has more variable peat as a result of topography.

7.2.28 The drainage on the Site is natural, although some very small areas of artificial drainage, with some small cut channels within the peat were observed in places.

Figure 7.2.3: Disturbed peatland foreground – large undisturbed area in background



Figure 7.2.4: Eroded area of peatland (peat hags)



Summary

7.2.29 Kaya Consulting Ltd was commissioned to undertake a peat depth survey for the proposed An Càrr Dubh Wind Farm project.

7.2.30 This report covers the methodology and output of the Phase 1 (preliminary, low-density survey), and the Phase 2 (detailed, high-density) peat surveys undertaken at the Site. The purpose of the surveys was to establish an understanding of the peat depths at the Site to optimise site design and layout to minimise both the extent of disruption to peatlands and the quantity of peat excavated.

7.2.31 A total of 5,363 probes were collected across the Phase 1 and Phase 2 peat surveys. The Phase 1 survey consisted of 989 probes. The Phase 2 survey consisted of 4374 probes.

7.2.32 39.3% of probes were recorded as having a peat depth of less than 50cm. These probes are classified as organo-mineral soils and not formally considered to be peat.

7.2.33 The majority (65.0%) of probes were recorded as having a peat depth of less than 100cm across the Phase 1 and Phase 2 peat surveys.

7.2.34 35.0% of the probes were recorded as having a peat depth of over 100m across the Phase 1 and Phase 2 peat surveys.

7.2.35 A total of 18 cores were taken across the survey period, all in areas which contained peat. It was determined that the acrotelm layer was between 10cm and 90cm. Generally, bedrock was the dominant source of base material with 50% of the cores containing peat having a bedrock base. The substrate underlying 39% of the cores taken could not be identified as the peat was too saturated to be retrieved.

Figure 7.2.5: Shallow to no peat on higher ridges



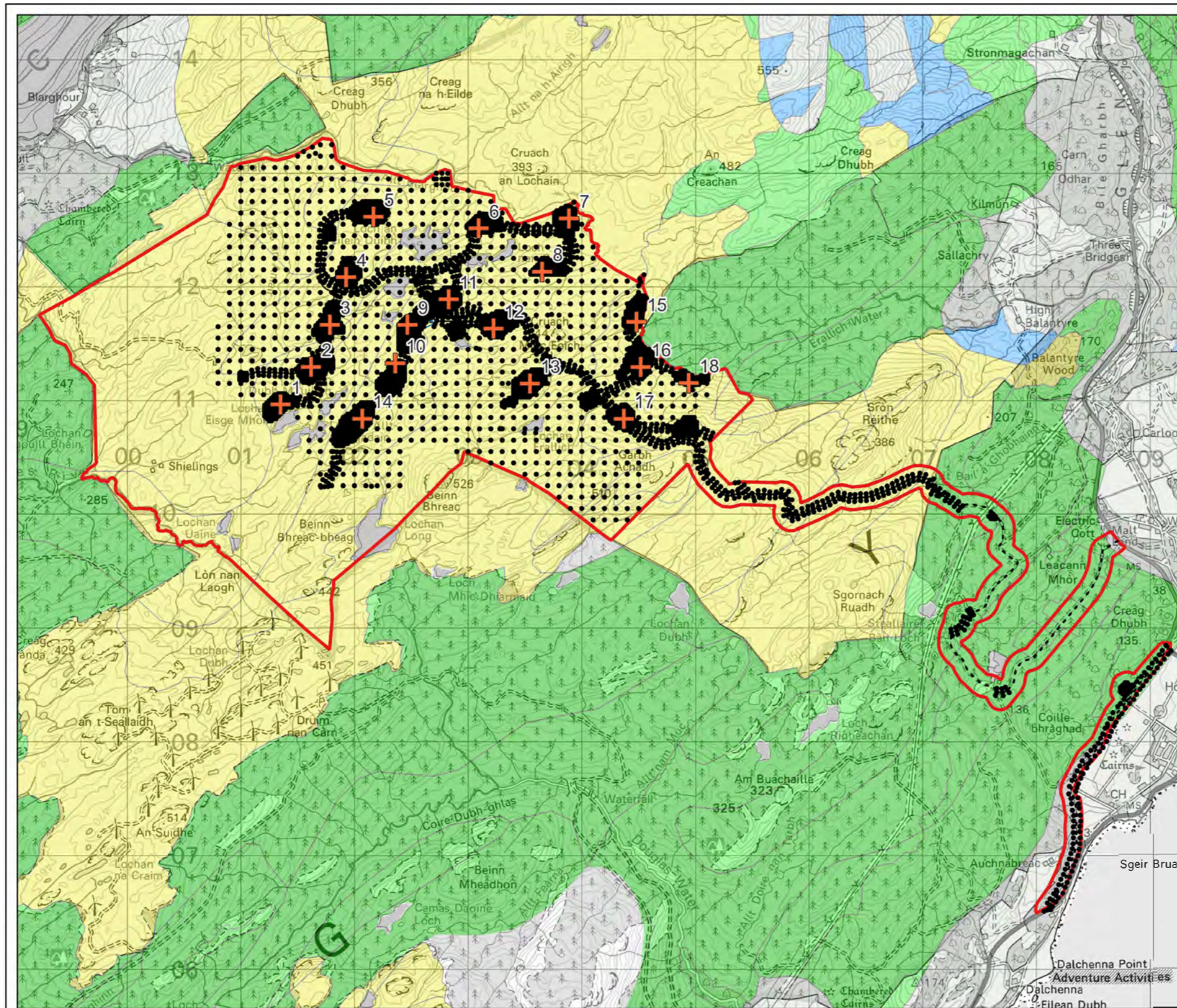


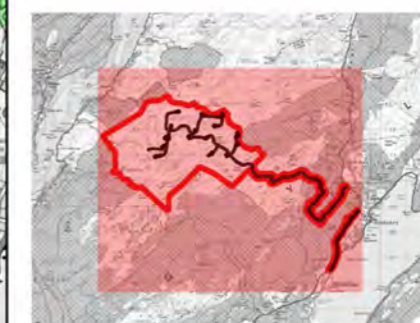
Figure 7.2.6
Peat Survey Overview

Legend

- Site Boundary
- Existing Tracks
- Proposed Tracks
- Proposed Infrastructure
- + Core Location
- Peat Probe Location

SNH Peat Map

- Unknown soil type (Class -1)
- Non-soil (Class -2)
- Mineral Soil (Class 0)
- Class 1
- Class 2
- Class 3
- Class 4
- Class 5



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0 0.5 1 km



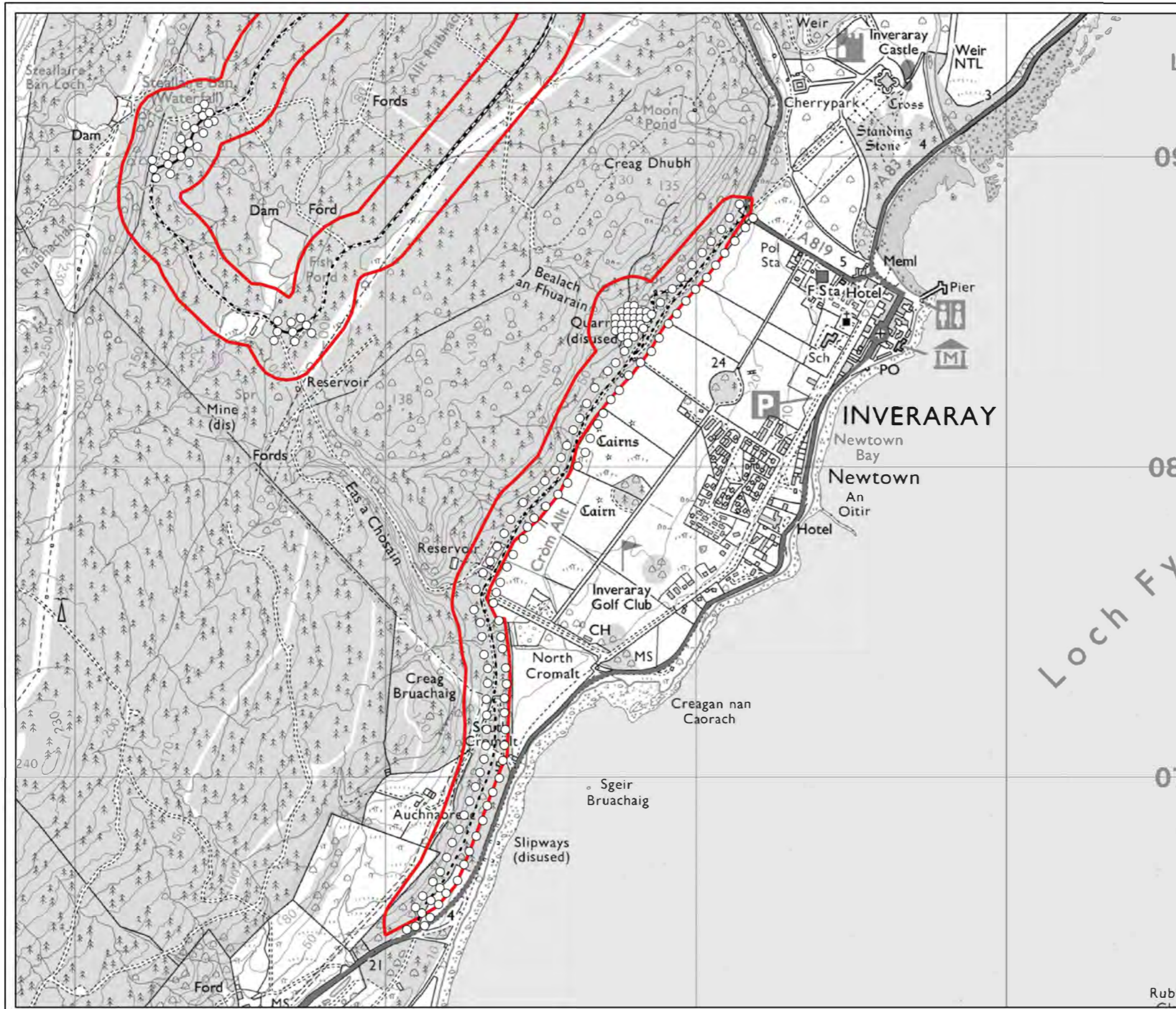


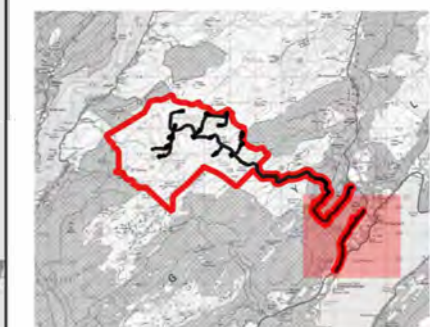
Figure 7.2.7
Peat Depths Closeup

Legend

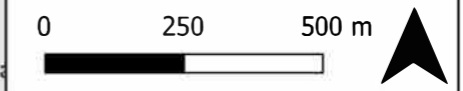
- Site Boundary
- - - Existing Tracks
- Proposed Tracks
- Permanent Hardstanding
- Temporary Hardstanding
- Borrow Pit
- Permanent Met Mast
- Permanent Compound Including Substation and BESS
- Temporary Construction Compound

Peat Depth (cm)

- < 25
- 25 - 50
- 50 - 100
- 100 - 200
- 200 - 300
- 300 - 490
- > 490
- + Core Location



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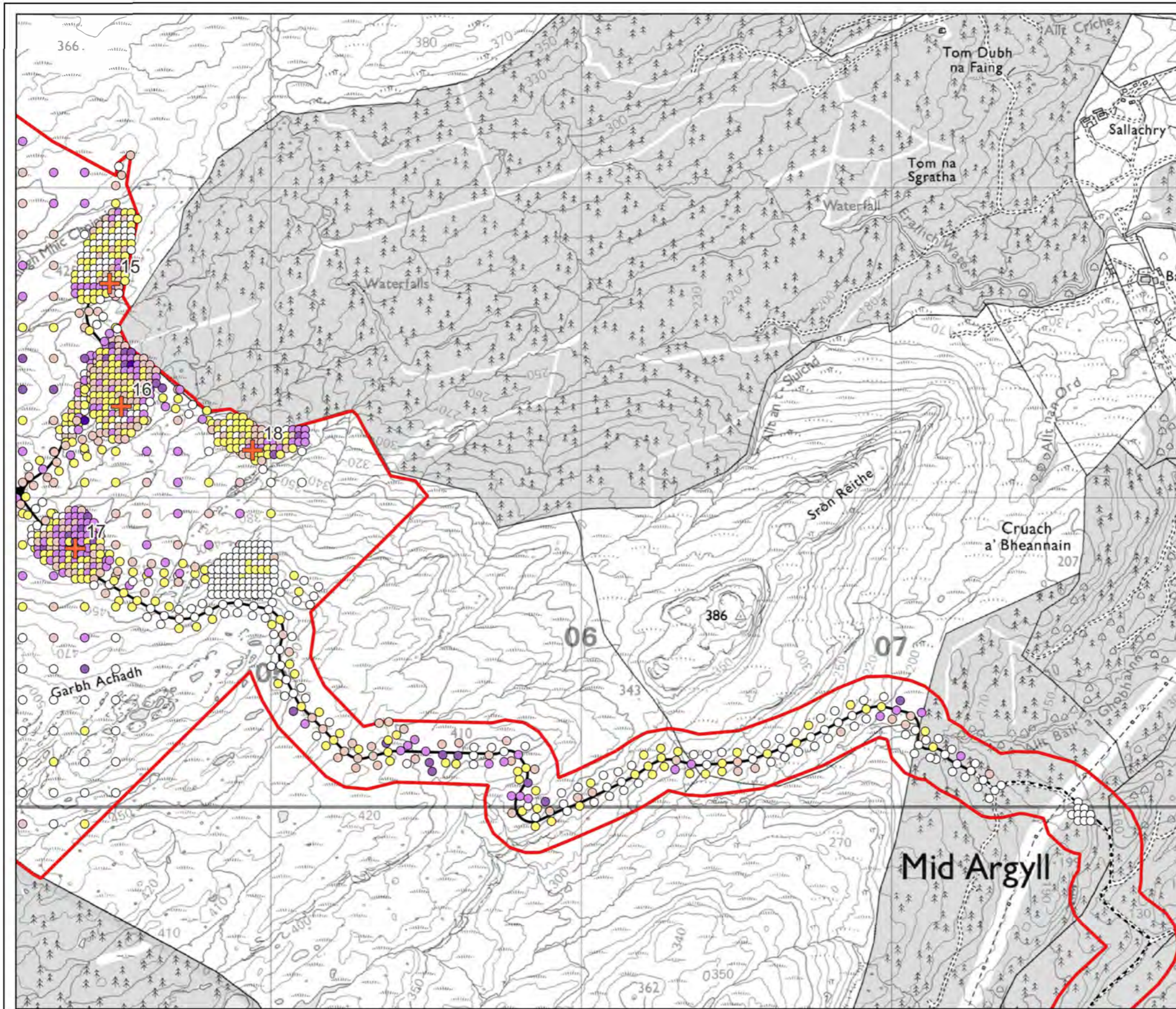


Figure 7.2.8
Peat Depths Closeup

Legend

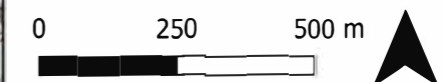
- Site Boundary
- Existing Tracks
- Proposed Tracks
- Permanent Hardstanding
- Temporary Hardstanding
- Borrow Pit
- Permanent Met Mast
- Permanent Compound Including Substation and BESS
- Temporary Construction Compound

Peat Depth (cm)

- < 25
- 25 - 50
- 50 - 100
- 100 - 200
- 200 - 300
- 300 - 490
- > 490
- + Core Location



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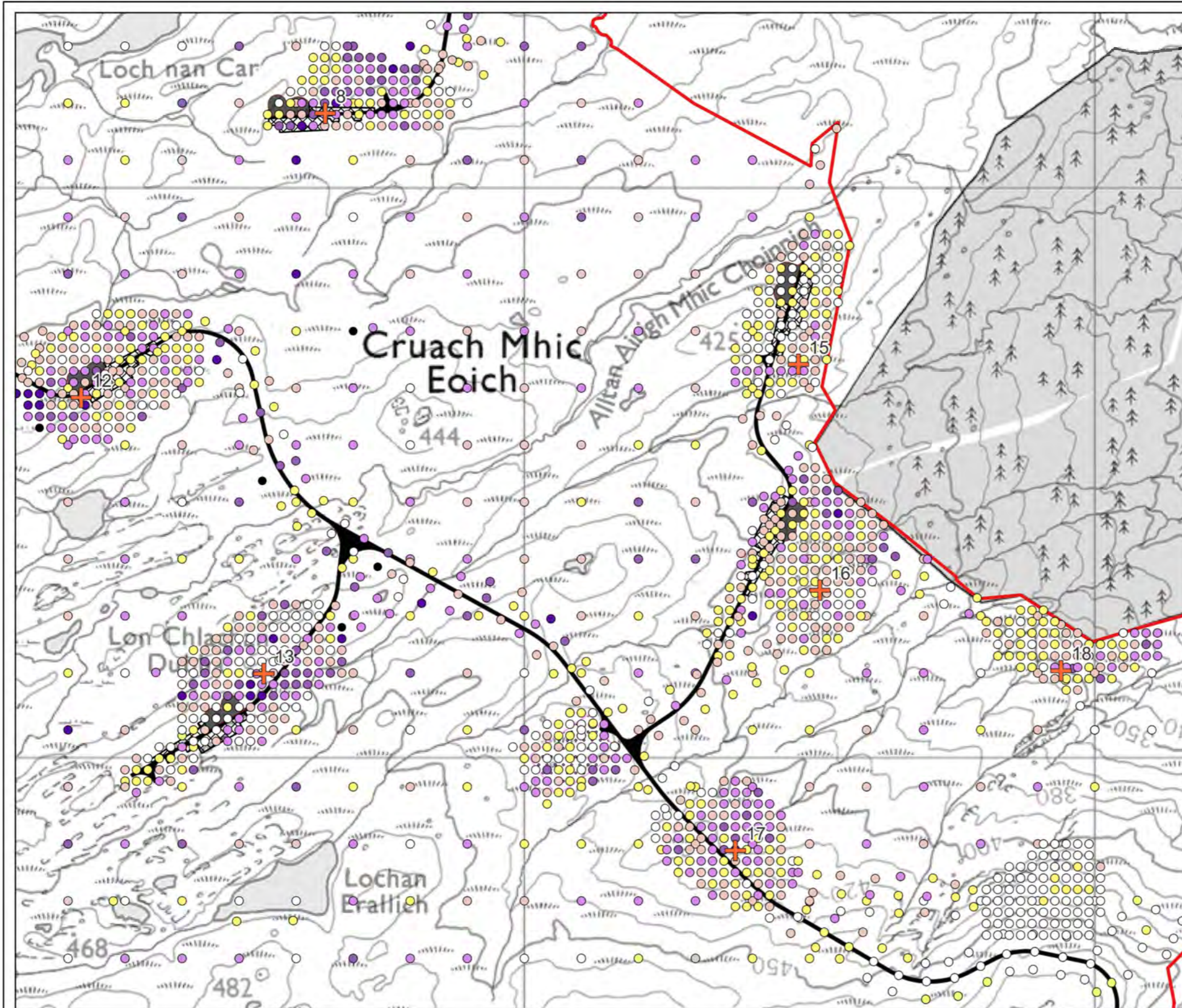
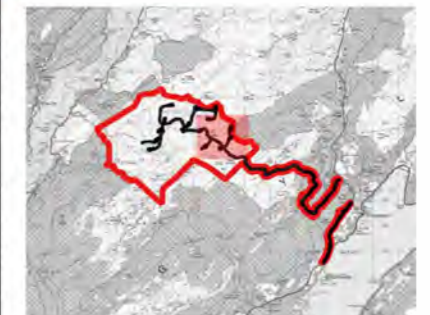


Figure 7.2.9
Peat Depths Closeup

- Legend**
- Site Boundary
 - Existing Tracks
 - Proposed Tracks
 - Permanent Hardstanding
 - Temporary Hardstanding
 - Borrow Pit
 - Permanent Met Mast
 - Permanent Compound Including Substation and BESS
 - Temporary Construction Compound
- Peat Depth (cm)**
- < 25
 - 25 - 50
 - 50 - 100
 - 100 - 200
 - 200 - 300
 - 300 - 490
 - > 490
 - + Core Location



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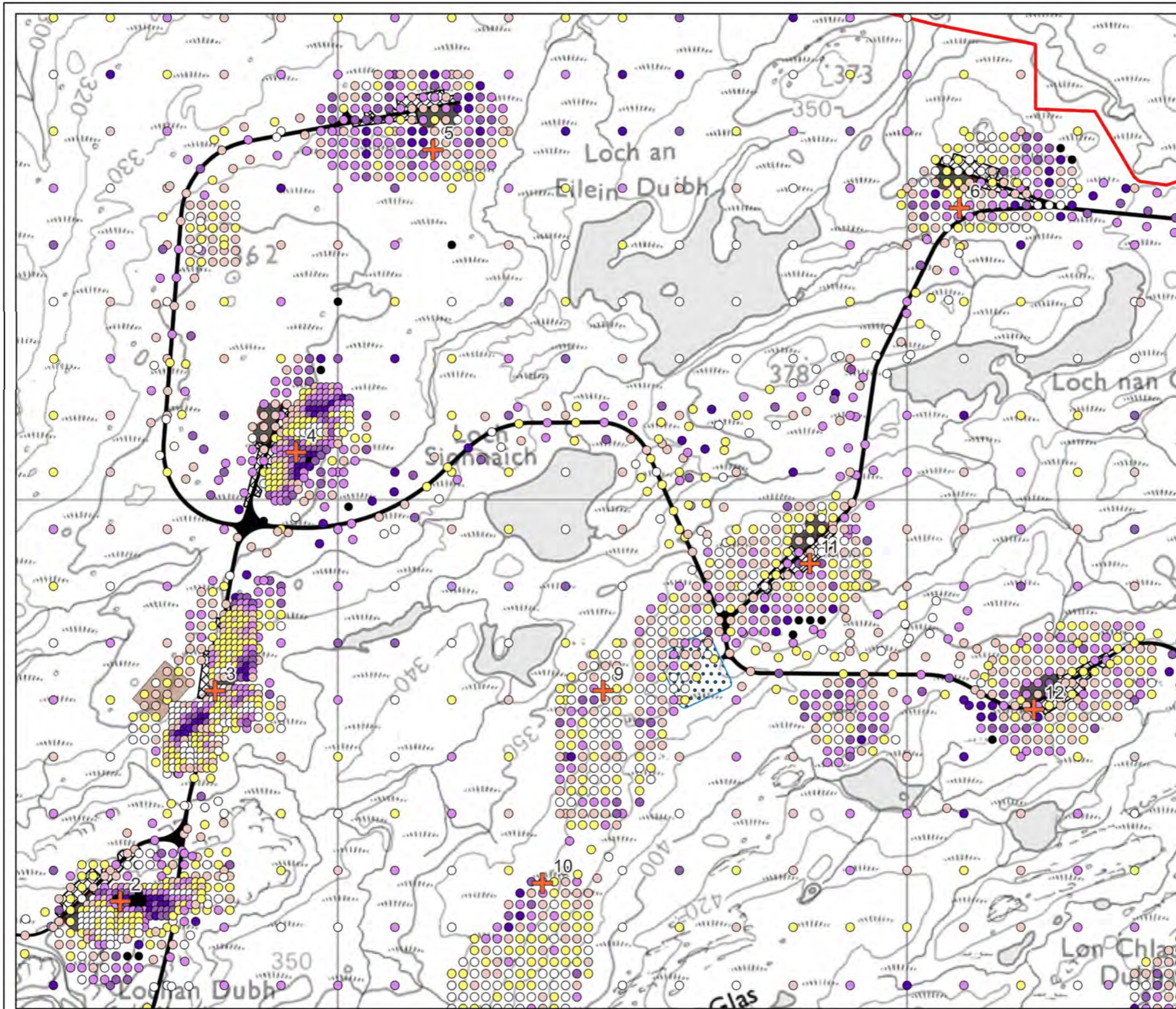


Figure 7.2.10
Peat Depths Closeup

Legend

- Site Boundary
- Existing Tracks
- Proposed Tracks
- Permanent Hardstanding
- Temporary Hardstanding
- Borrow Pit
- Permanent Met Mast
- Permanent Compound Including Substation and BESS
- Temporary Construction Compound

Peat Depth (cm)

- < 25
- 25 - 50
- 50 - 100
- 100 - 200
- 200 - 300
- 300 - 490
- > 490
- + Core Location



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0 100 200 m



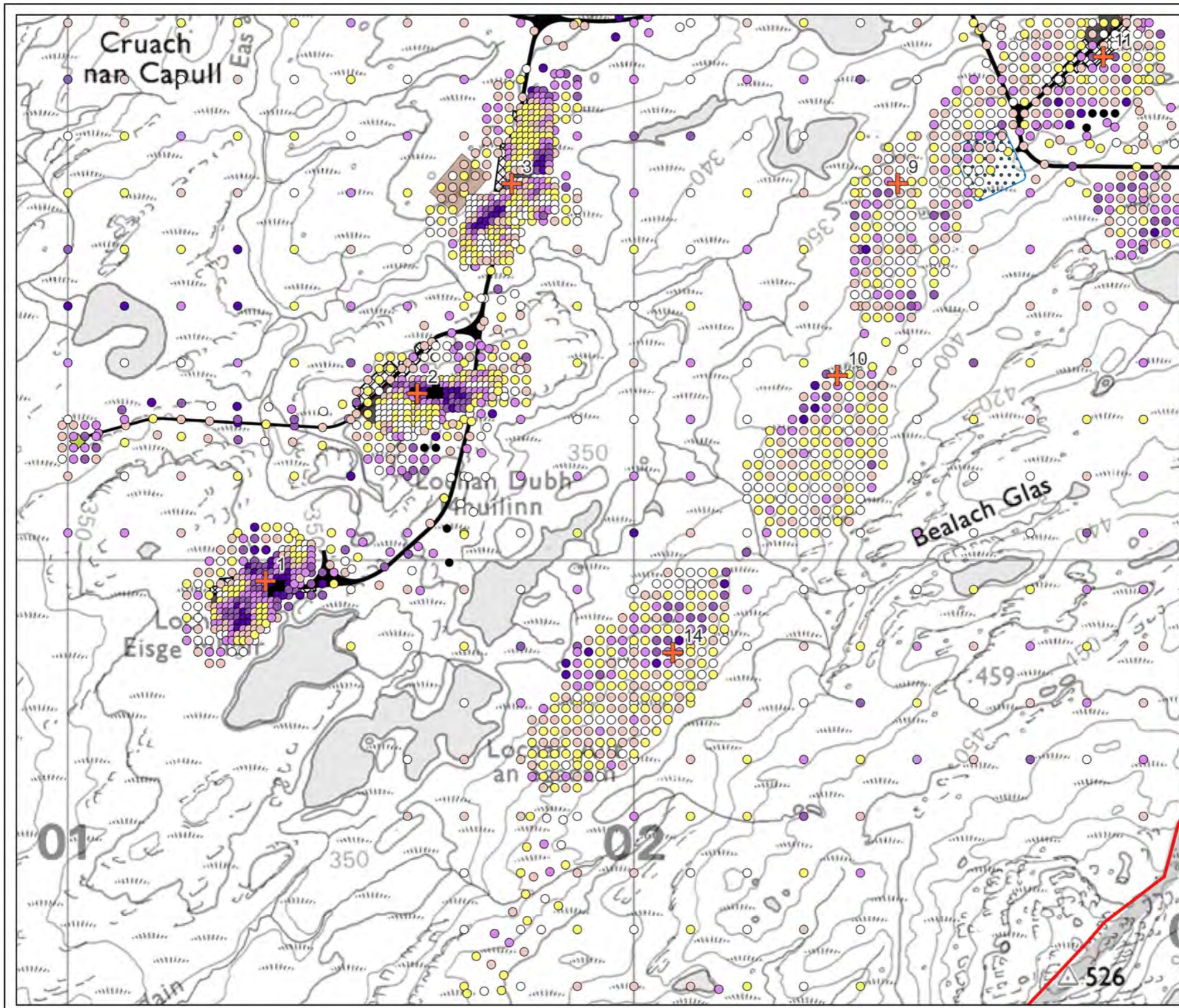


Figure 7.2.11
Peat Depths Closeup

Legend

- Site Boundary
- Existing Tracks
- Proposed Tracks
- Permanent Hardstanding
- Temporary Hardstanding
- Borrow Pit
- Permanent Met Mast
- Permanent Compound Including Substation and BESS
- Temporary Construction Compound

Peat Depth (cm)

- < 25
- 25 - 50
- 50 - 100
- 100 - 200
- 200 - 300
- 300 - 490
- > 490
- + Core Location



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0 100 200 m



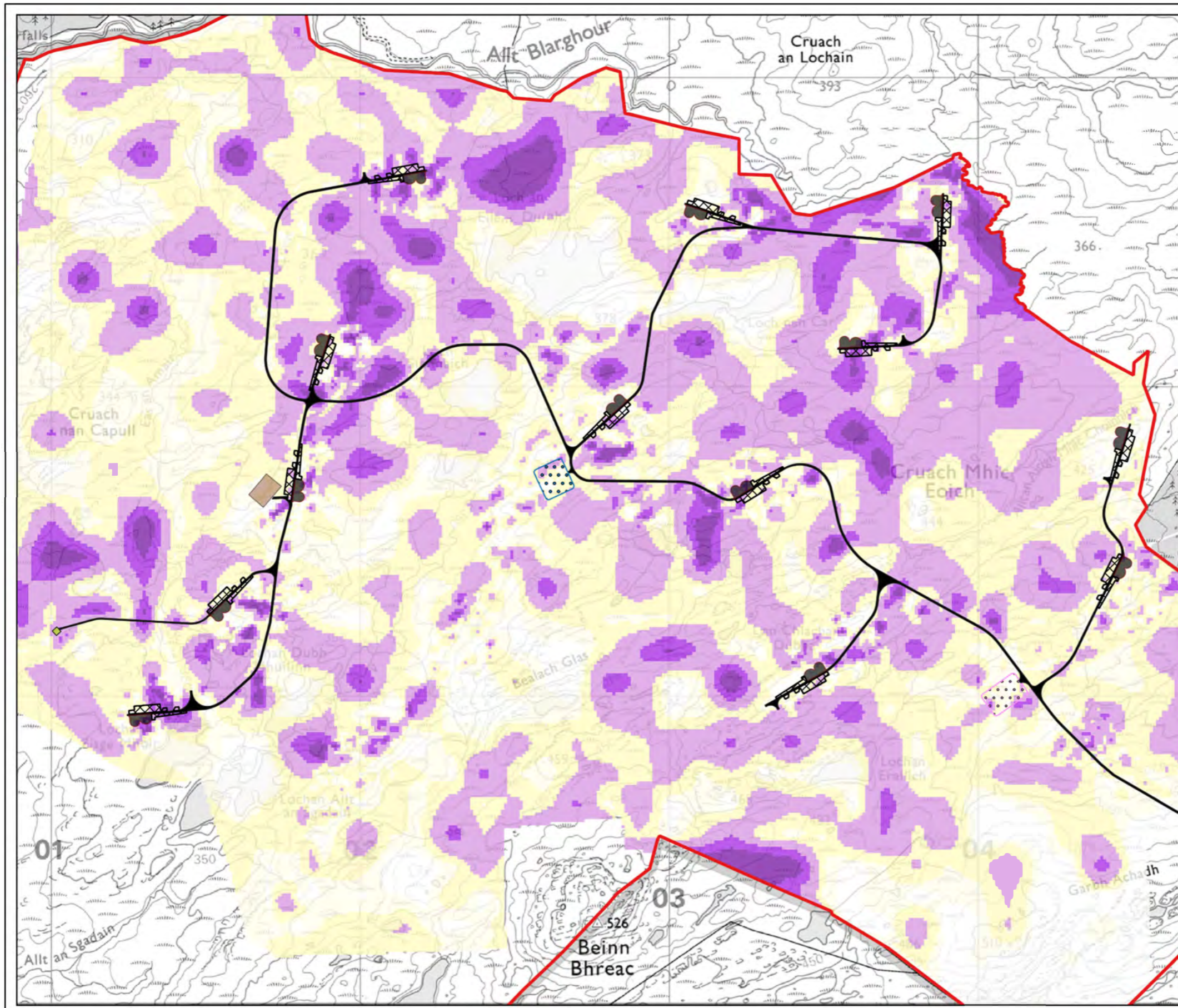


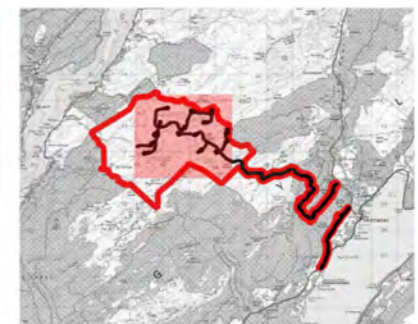
Figure 7.2.12
Peat Depths Interpolated

Legend

- ▭ Site Boundary
- - - Existing Tracks
- Proposed Tracks
- Permanent Hardstanding
- Temporary Hardstanding
- Borrow Pit
- Permanent Met Mast
- Permanent Compound Including Substation and BESS
- Temporary Construction Compound

Interpolated Peat Depth (cm)

- <= 25
- 25 - 50
- 50 - 100
- 100 - 200
- 200 - 300
- 300 - 490
- >490



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0 0.1 0.2 km

