E.ON Climate & Renewables UK Developments Ltd

Enoch Hill Wind Farm

Peat Management Plan Revision 1 – Further Environmental Information

January 2017

Amec Foster Wheeler Environment
& Infrastructure UK Limited

Report for

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Document revisions

No.	Details	Date
1	Draft for Client Review	17/7/15
2	Final	24/7/15
3	Revision 1	09/01/17

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Executive summary

Purpose of this report

The layout of the proposed Enoch Hill Wind Farm has been amended in response to issues raised by the Local Energy Consents Unit (LECU), consultees and other stakeholders following the section 36 application that was submitted in September 2015.

The revised layout has been designed to reduce potential effects on peat as much as possible. Three of the original 19 turbines have been removed and the proposed locations of the remaining up to 16 turbines have been revised. As a result there is a 25% reduction in the predicted volume of peat that will need to be excavated compared with the original layout. Proposals are presented for peat reinstatement / restoration which demonstrate that all of the excavated peat can be utilised on the Development Site. It was considered more logical, and easier for the reader, to produce a completely revised Peat Management Plan (PMP), rather than outlining specific changes which would have required a lot of cross referencing to the earlier PMP. It also sets out how consultee comments have been addressed.

Control measures are identified to protect peat during stripping and temporary storage / stockpiling activities. These control measures are also designed to ensure that stripped peat remains viable, throughout the construction works.

A description is given of the requirement for *in situ* inspections at specific times during the construction phase and a stockpile inspection checklist is provided.

An auditing process is set out to ensure that the correct checks and inspections are carried out and that non-compliances are identified, reported and rectified. It is expected that the auditing process for recording peat conditions and stockpiling will form part of the Construction Environmental Management Plan for the construction phase. This will include peat stripping, stockpiling and restoration phasing plans and databases.

The PMP also describes the roles and responsibilities of individuals associated with the construction phase of work, including those of the Construction Contractor.

Contents

1. Background

1.1 Introduction

The layout of the proposed Enoch Hill Wind Farm in East Ayrshire (the "Proposed Development") has been amended in response to issues raised by the Local Energy Consents Unit (LECU), consultees and other stakeholders following submission of the section 36 application in September 2015. Three of the original 19 turbines have been removed[1] and the proposed locations of the remaining up to 16 turbines have been revised.

As a result of these changes, E.ON Climate & Renewables UK Developments Ltd ("The Applicant") is now seeking permission to build the Proposed Development as follows:

- Up to 16 wind turbine generators, with a blade tip height of up to 130m and maximum rated output per turbine of up to 3.4 MW. Each requires:
  - Circular turbine foundation (each 490m^2 based upon 25m diameter); and
  - Crane pad (each 1,250m^2 based upon 25m x 50m dimensions).
- Up to two permanent anemometer masts, up to 80m in height, each requiring a 25m^2 base (5m x 5m) and 400m^2 crane pad (20m x 20m);
- Wind Farm Control Building and Compound & Scottish Power Energy Networks (SPEN) Substation and Compound up to 5.5m in height and covering 19,800m^2 (180m x 110m);
- Approximately 12.07km of new onsite access tracks, with a running width of 6m (wider on bends). Total footprint approximately 7.8ha;
- Estimated 24 passing places, each 30m x 5m. Total footprint approximately 3,600m^2;
- Temporary construction compound with a footprint of 10,000m^2 (100m x 100m); and
- Two borrow pit(s) for the extraction of stone (Borrow pits A and B, estimated areas to be excavated 30,000m^2 and 10,000m^2 respectively).

The amended layout together with the methods set out in this revised Peat Management Plan (PMP), which have been developed in line with best practice (Scottish Renewables *et al*., 2012 and 2015), have sought to address consultee concerns, which are summarised in **Table 1.1**.

Table 1.1 Consultee Responses to the Original PMP Submitted with the Enoch Hill Wind Farm ES

Consultee	Summary of Consultee Response	Further Environmental Information (FEI) Response
Scottish Environment Protection Agency (SEPA)	Re-consider proposed construction of wind turbines on deep peat, as discussed in Table 4.1 of the PMP.	Re-design of layout has resulted in a ~25% reduction in the volume of excavated peat
	Consider relocation of the proposed substation and construction compound to the opposite site of the access track.	Further peat probing found that peat depths are similar on both sides of the access track. No change proposed.
	Consider the adoption of floating access tracks more widely.	Floating access tracks are restricted to peat >1m deep

[1] Turbines 15, 16 and 18 of the Original Layout have been dropped, with turbines 17 and 19 of the Original Layout renumbered (to turbines 15 and 16 respectively) to ensure a logical numbering system for the Revised Layout.

Consultee	Summary of Consultee Response	Further Environmental Information (FEI) Response
	Proposed 5m wide verges around the crane pads and peat depths around the turbine bases, crane pads and access tracks appears to be excessive. Depths of 0.5m within such reinstatement proposals are generally accepted as appropriate.	Dressing back revised to 3m width. Depth of peat in these areas restricted to 0.5m.
	Peat should only be reused to create a suitable tie-in with surrounding vegetation and for the reinstatement of adjacent ground which has been disturbed during the construction process.	This is proposed.
	Avoid restoration of the top of concrete turbine bases.	Back filling of turbine bases is accepted practice (Scottish Renewables *et al*., 2015) and is therefore retained. Proposed depth restricted to 0.5m.
	The volume of peat for reinstatement must not exceed that excavated on site.	These are now the same.
	In the absence of a finalised design of the borrow pits, there is uncertainty regarding the capacity of the borrow pits to accept peat for restoration purposes. Borrow Pit assessments are required to enable this to be properly assessed.	See Borrow Pit Assessment (FEI **Appendix 4.A**)
	Proposed reinstatement when peat and the weather is as dry as possible means that close attention should be paid to ensuring that replaced turves are regularly watered to minimise the possibility of failure to establish.	Noted.
RSPB	The development would result in the direct loss of approximately 11ha of blanket bog, which also has an important value as a carbon store. We are concerned that the ES has not taken into account the indirect impacts of the development, which are likely to be the same magnitude as the direct impacts or more.	This is addressed in the Ecology FEI (see **FEI Chapter 11**).

1.2 Baseline Peat Resource

The Development Site lies to the north east of Carsphairn Forest, to the south of the B741 between New Cumnock and Dalmellington in East Ayrshire and consists of a series of hills and summits supporting a mixture of moorland habitats (primarily blanket mire) which have been managed for many years for upland grazing. Fencing to contain livestock is present along the B741 and in the north-west of the survey area but most land within the survey area is unenclosed. There are no roads or other permanent man-made structures of note located within, and in close proximity to, the Proposed Development. Commercial forestry is located close to the western and southern margins of the Development Site and is delineated by fencing.

Land rises steadily southwards from the northern edge of the Development Site in the form of a number of gently rounded ridges and summits, with several intervening small river valleys, to Enoch Hill (569m Above Mean Sea Level) located in the south of the Development Site. Several minor watercourses and their headwaters are located within the Development Site and include; Polmath Burn and Knockburnie Burn in the north-west of the survey area; Littlechang and Catlock Burns located close to the centre of the survey area; and the Trough, Polga, and Blarene Burn located in the north-east of the survey area. There are also some minor watercourses which are located on southern and eastern slopes of Enoch Hill (e.g. Bitch Burn).

The Peatslide Hazard and Risk Assessment report (**Enoch Hill FEI Appendix 6.B**) contains detailed information regarding the baseline peat conditions gathered from a desk study together with Phase 1 and Phase 2 peat surveys carried out in 2014, 2015 and 2016 in accordance with standard guidance (SNH *et al*). The key findings with regard to the baseline peat conditions on the Development Site are set out below:

- Soil Survey of Scotland mapping reveals that the south and west of the Development Site are underlain by Blanket Peat whilst the remainder of the Development Site is underlain by gleyed podzols of the Ettrick Association;

- The SNH Carbon and peatland map 2016[2] indicates that the Development Site is dominated by soils in Classes 1, 2 and 5, which are indicative of potential carbon-rich and deep peat soils;
- Peat surveys of the Development Site comprised a total of 1,752 peat depth measurements. In general peat depths ranged between 0.0m and 3.3m. 48% recorded peat depths >=0.5m;
- At proposed wind farm infrastructure, a total of 596 peat depth measurements were taken with peat depths ranging between 0 and 2.77m. 61% recorded peat depths >=0.5m;
- Russian core sampling during the Phase 1 peat survey revealed that the peat has a typical one or two layer peat profile with only five locations having a triple layer profile. In general moisture content and humification values were found to be low;
- During the Phase 1 and 2 peat surveys, geomorphological features were identified, typically in areas of deeper peat with depths exceeding 1m. The most numerous features identified were man made peat grips and drainage ditches. A limited number of features associated with natural processes of drainage and erosion were identified with localised eroded peat faces and flushes. In addition, a limited number of peat pipes and pipe collapses were identified but these features were found at some distance from proposed infrastructure locations;
- During the Phase 2 peat survey, a relic peat slide and potential soil creep were identified approximately 135m northwest of T4 and in the general locality of T16, respectively; and
- In addition, numerous translational mineral soils slides were identified along the steep sided slopes of various watercourses.

1.3 Potential Impacts on Peat during Construction

Principal types of adverse effect that could potentially occur due to the construction of the Consented Scheme are:

- **Loss of structural integrity and peat strength**. This could result from a wide range of practices such as removing the surface vegetation turf; excavation, handling and transporting peat (particularly wet, subsurface peat); trafficking of heavy plant and vehicles across areas consisting of peat and organic surface horizons and vegetation turf; laydown of materials (including excavated peat and mineral soil) on peat and peatland vegetation; and during reinstatement of peat, organic surface horizons and vegetation turf or other re-vegetation activities to reinstate pre-construction peatland and heathland habitats;
- **Erosion and gullying**. This is principally caused by exposure of bare peat surfaces – primarily caused by water erosion, due to surface runoff after rainfall;
- **Contamination**. This is principally caused by leaks, spillages or inappropriate laydown of materials;
- **Peat slide**. This can result from activities such as 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; and
- **Interruption of peat hydrology**. The principal cause of this is likely to be poorly planned construction activities leading to changes in water flows resulting in a potential indirect adverse effect upon vegetation, such as wet heath, blanket bog and/or flushes.

Section 3 of this PMP sets out a range of control measures that are designed to prevent these effects from occurring.

[2] http://www.snh.gov.uk/planning-and-development/advice-for-planners-and-developers/soils-and-development/cpp/

2. Quantitative Assessment of Peat Volumes

2.1 Key Elements of the Proposed Construction Works

Volumes of stripped and excavated peat have been calculated based upon the averages of expected peat depths at each location combined with the expected footprint of particular elements of infrastructure comprised in the Proposed Development (see **Figures 1.1 to 1.5** and **Figure 2** for peat depth survey data and interpolated peat depth contour maps).

Peat depths are divided into three categories that form a continuum from zero to shallow to deep peat:

- **Carbon-Rich Soils** where the depth of the organic horizon is less than 0.5m;
- **Peat** where the depth of the organic horizon is between 0.5m and 1.00m; and
- **Deep Peat** where the depth of the organic horizon is greater than 1.00m deep. This accords with the definition in "Guidance on Developments on Peatland - Site Surveys" document issued in February 2014 and located on the Scottish Government website[3]. The definition of deep peat in Scotland being more than 1m deep is also referenced in the JNCC Report No. 445: Towards an assessment of the state of UK peatlands (JNCC, 2011).

Table 2.1 summarises the proposed infrastructure that is located within each of these categories.

Table 2.1 Categories Peat at Proposed Infrastructure Locations

Peat Categories	Infrastructure
Carbon-Rich Soils	Turbine Bases at T1, T4, T5, T6, T10, T12, T14
	Crane Pads at T1, T2, T4, T10, T12, T13
	Anemometer Mast 2
	Borrow Pit Search Area A
	Borrow Pit Search Area B
	4,770m of new access track
Peat	Turbine Bases at T2, T3, T8, T9, T11, T13, T15
	Crane Pads at T3, T5, T6, T7, T11, T15
	Anemometer Mast 1
	Wind Farm Control Building and Compound & SPEN Substation and Compound
	5,600m of new access tracks
	24 passing places (assumed to be average peat depth across the Development Site)
Deep Peat	Turbine bases at T7, T16
	Crane pads at T8, T9, T14, T16
	1,700m of new access track

[3] http://www.gov.scot/Topics/Business-Industry/Energy/Energy-sources/19185/17852-1/CSavings/PSG2011

The design of the revised layout has sought to minimise the volume of peat that would need to be excavated (i.e. turbines 15, 16 and 18 of the Original Layout which have been removed were all located in areas of deep peat). As a result, the volume of excavated peat for the 16 turbine layout has reduced by approximately 21,000m^3 (~25%) compared to the 19 turbine layout. **Table 2.2** summarises the total volumes of peat which will be stripped during the construction works. Please see **Appendix A** for dimensions of excavations and a full breakdown of peat stripped per element of infrastructure.

Table 2.2 Total Volumes of Peat Stripped during Construction

Infrastructure	Estimated Acrotelmic4 Peat (Peat Turves) Volume to be excavated (m3)	Estimated Catotelmic5 Peat (Loose Peat) Volume to be excavated (m3)	Estimated Peat Volume to be excavated (m3)
Turbine Foundations	3,107	3,639	6,746
Crane Hard Standings	6,308	5,497	11,806
Sub-station	9,900	2,376	12,276
Tracks (new) including Passing Places	18,600	7,404	26,004
Permanent Anemometer Mast	213	119	332
Temporary Construction Compound	5,000	100	5,100
Borrow Pits A and B	0	0	0
Totals	**43,128**	**19,135**	**62,263**

2.2 Potential Uses of Peat for Site Reinstatement

Potential uses of peat for site reinstatement have been identified in accordance with accepted guidance, notably Scottish Renewables *et al*., 2012 and 2015 and take into account consultee comments, following their review of the previous PMP. Proposed control measures are set out in Section 3.

The principal objective of peat reinstatement at the Development Site is to create conditions alongside, around and within access tracks, turbine bases, crane pads, the sub-station and the temporary construction compound that will promote the establishment of healthy plant communities and habitats that match those prior to construction and tie into adjacent vegetation (primarily bog and heath habitats). A key aim of such reinstatement is also to stabilise the track verges and to prevent peat erosion.

The following general principles apply:

- Reinstated peat will not be placed on intact peatland vegetation and there will be no reinstatement of turbine bases;

[4] Acrotelmic peat is the upper part of the peat profile which supports living plant material. Whilst organic matter decomposes aerobically and, therefore, quite rapidly the acrotelm has physical structure and can usually be cut as peat turves. For the purposes of this PMP the acrotelm is assumed to be the top 0.5m of the peat profile and is referred to as “peat turves”.

[5] Catotelmic peat is the lower part of the peat profile where organic matter decomposes anaerobically and the catotelm has little, or no, physical structure. For the purposes of this PMP the catotelm is assumed to be any part of the peat profile which lies more than 0.5m below the surface and is referred to as “loose peat”.

- Where located within peat, the turbine foundations will be reinstated with peat turves (i.e. 0.5m deep) up to the path around the tower in line with accepted practice (Scottish Renewables *et al*., 2015);
- The extent of dressing back[6] alongside infrastructure takes into account the presence of adjacent access tracks or other infrastructure. The orientation and exact width of this dressing back will be determined by the Site Construction Manager with advice, as necessary, from the Environmental Clerk of Works (ECoW) taking into account local conditions including topography, morphology and peat slide risk;
- For the purposes of this PMP, peat turves will be used for dressing back around turbine bases, crane hard standings, the sub-station / control building and permanent anemometer masts together with verges on both sides of cut access tracks. This dressing back is assumed to be no more than 3m wide and 0.5m deep;
- Dressing back will be tapered to fit smoothly with the adjacent habitat using peat turves that will typically be trimmed to a slope of between 1 in 5 and 1 in 2 (notably where hardstandings need to be cut into the side of a steep sided hill). Loose, wet peat will not be used for this purpose and peat at the edges of deposition areas will be compressed to minimise water loss from lateral flow; and
- Where possible, excavated peat will be reinstated locally to minimise transportation.

However, within the borrow pit search areas, the objective is to restore conditions which will promote the establishment of peatland plant communities that have higher nature conservation importance than those currently found in these areas. Further details are provided below:

- The borrow pit search areas currently support a mix of habitats that predominantly comprise marshy grassland and mire, with the most extensive National Vegetation Classification [NVC] plant communities being M23 *Juncus effusus/acutiflorus – Galium palustre* rush-pasture and M25 *Molinia caerulea – Potentilla erecta* mire. The Enoch Hill Wind Farm Environmental Statement (ES) Chapter 9 – Ecology notes that both of these plant communities have been heavily influenced by past agricultural management, are species poor and generally botanically unremarkable. The underlying substrate is a peaty gley which is less than 0.5m deep and therefore classified as a carbon rich soil, which will be temporarily cleared, as necessary, to access the underlying stone.
- Both borrow pit search areas are located adjacent, or close, to NVC M20 *Eriophorum vaginatum* blanket mire and it is considered that this plant community, or similar, could establish if surplus excavated peat is used to restore the borrow pits with the aim of creating suitable conditions for bog species to flourish.
- A separate Borrow Pit Assessment (included as **Appendix 4.A** of this FEI) identifies that the restored borrow pit profiles will be suitable for this purpose and it is expected that the borrow pits can accommodate surplus excavated peat turves (13,038m^3) and surplus loose peat (19,097m^3). Peat turves must be located on top of loose peat to maximise the likelihood of promoting the growth of peatland vegetation and a water management plan / drainage strategy will need to be developed to ensure that suitable hydrological conditions can be developed and maintained to support the objective of peatland restoration. Supplementary seeding could also be provided, although it is considered that this should not be necessary if peat turves are correctly treated during excavation, storage and restoration.
- Incorporation of the carbon rich soils into the peat profile is likely to be best achieved between the lower catotelmic peat and the upper acrotelmic peat turves, although this would be reviewed prior to restoration. Taking into account reinstatement of the existing carbon rich soils in each of the borrow pit search areas as well as excavated peat from elsewhere, peat depths in each of the borrow pits are expected to be approximately 1.15m, which is likely to be appropriate for the

[6] Dressing back means creation of a receding slope at the edge of excavations to tie in with adjacent vegetation.

purposes of the proposed restoration as it should be deep enough to create a good peat profile and allow the appropriate hydrological conditions to develop, without the risk of excessive drying out that could occur if the profile was too shallow.

- It is recognised that the proposed borrow pit restoration will result in the loss of existing habitats within the borrow pit search areas. However, this is considered to be acceptable on the basis that the existing carbon rich soils in these areas do not currently support intact peatland vegetation but are, instead, dominated by marshy grassland and mire habitats which are generally degraded and of limited importance in nature conservation terms. It is expected that the proposed restoration of the borrow pits will see these habitats replaced by blanket mire, which should require little, if any, subsequent management as long as the initial works are undertaken in accordance with an appropriate method statement prepared by a suitably qualified peatland specialist.
- The proposed use of excavated peat should therefore deliver sustainable biodiversity gain in the form of an additional 4ha of blanket mire, which is a habitat listed on Annex 1 of the Habitats Directive.

Indicative volumes of peat that can be utilised in each of the reinstatement / restoration locations are set out in **Table 2.3**. Please see **Appendix B** for dimensions of proposed reinstatements at or around each element of infrastructure.

Table 2.3 Indicative Volumes of Peat to be used for Peat Reinstatement and/or Restoration

Infrastructure	Estimated Acrotelmic4 Peat (Peat Turves) Volume for Reinstatement (m3)	Estimated Catotelmic5 Peat (Loose Peat) Volume for Reinstatement (m3)	Estimated Peat Volume for Reinstatement (m3)
Turbine Foundations	3,107	1,686	4,793
Crane Hard Standings	1,183	51	1,234
Sub-station	714	0	714
Tracks (new) including Passing Places	18,240	0	18,240
Permanent Anemometer Mast	45	0	45
Temporary Construction Compound	5,000	100	5,100
Borrow Pits A and B	14,838	17,297	32,135
Totals	**43,127**	**19,134**	**62,261**

The scheme outlined in **Table 2.3** indicates that beneficial uses can be found for all of the excavated peat after making allowance for all of the consultee comments. Approximately 24,219m^3 of carbon rich soils will additionally need to be excavated. Further details are provided in **Appendix B** and it is expected that these will be used for reinstatement in similar ways to those identified for peat, although the depths and other dimensions may be less.

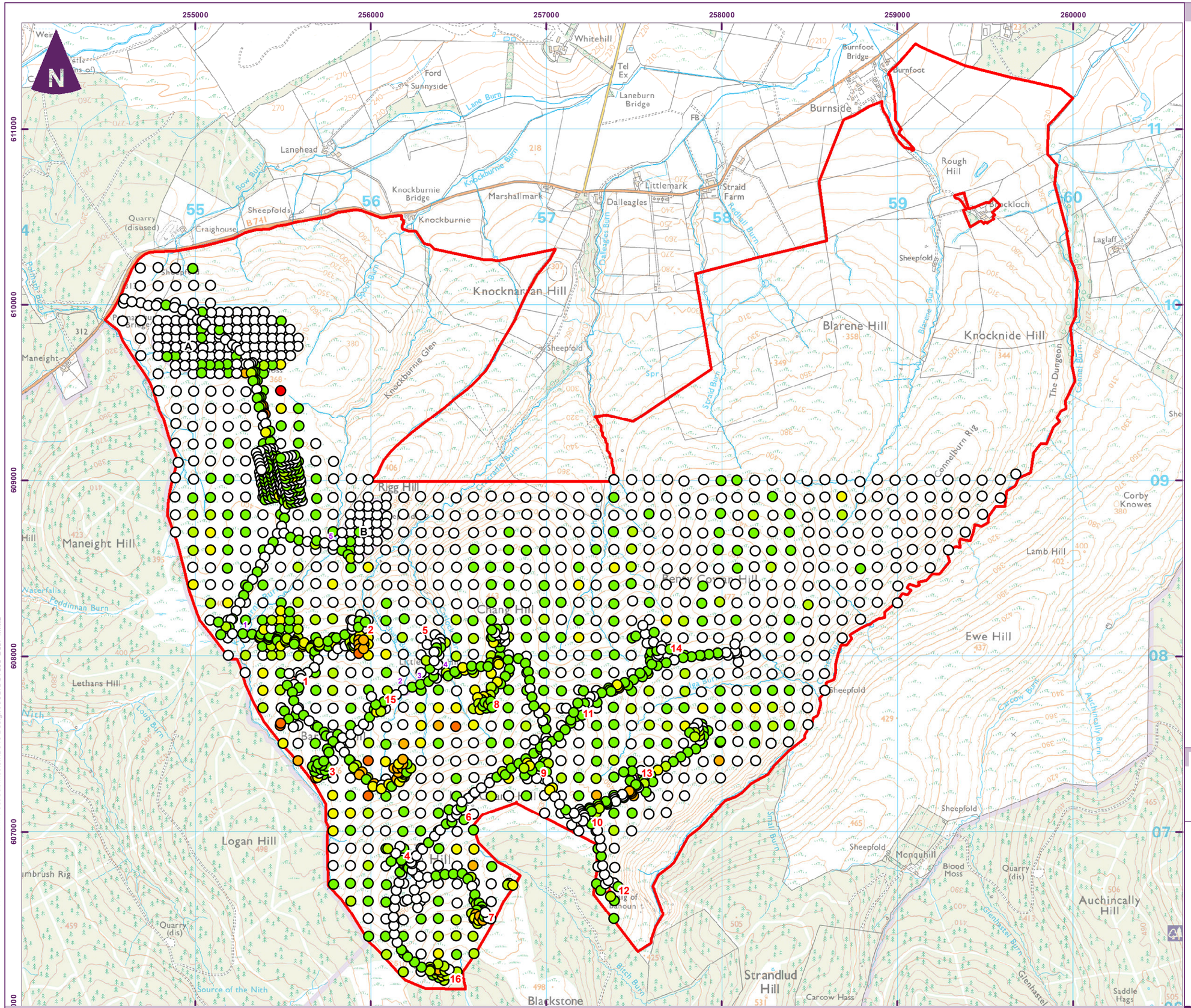
2.3 Temporary Peat Storage

Table 2.4 sets out the indicative requirements for temporary peat storage pending reinstatement.

Table 2.4 Indicative Temporary Peat Storage Requirements

		Area of Peat for Temporary Local Storage (m2)		Volume to Borrow Pits for Restoration (m3)	
Infrastructure	**Description**	**Peat Turves**	**Loose Peat**	**Peat Turves**	**Loose Peat**
Turbine Foundations	All excavated peat turves would be reinstated at the turbine bases and would therefore need to be temporarily stored in designated locations as close as possible to each turbine (see Figure 3). Approximately 45% of excavated loose peat would need to be stored in a nearby storage area (assumed maximum storage depth of 1m). The rest of the loose peat would need to be transported to the nearest borrow pit for restoration.	8,010	1,686	Nil	1,953
Crane Hard Standings	There is limited capacity for the use of peat turves in dressing back crane pad hard standings, which would need to be temporarily stored in nearby designated locations (see Figure 3). The remaining peat turves along with all loose peat would need to be transported to the nearest borrow pit for restoration.	2,366	51	5,125	5,446
Sub-station	There is limited capacity for the use of peat turves in dressing back the sub-station and control building compound, which would need to be temporarily stored in a nearby designated location (see Figure 3). The remaining peat turves along with all loose peat would need to be transported to the nearest borrow pit for restoration.	1,428	Nil	9,186	2,376
Tracks (new) including Passing Places	Where peat is stripped to construct the new cut and fill Development Site tracks, the peaty, intact surface turf will be placed, as it is stripped, on roadside verges immediately adjacent to the tracks (on the down slope side) during construction and will not therefore require temporary storage. Peat turves that cannot be used for track verges along with all loose peat would need to be transported to	Nil	Nil	360	7,404

		Area of Peat for Temporary Local Storage (m2)		Volume to Borrow Pits for Restoration (m3)	
Infrastructure	**Description**	**Peat Turves**	**Loose Peat**	**Peat Turves**	**Loose Peat**
	the nearest borrow pit for restoration.				
Permanent Anemometer Mast	There is limited capacity for the use of peat turves in dressing back the permanent anemometer masts. These would need to be temporarily stored in the closest designated location (see Figure 3). The remaining peat turves along with all loose peat would need to be transported to the nearest borrow pit for restoration.	90	Nil	168	119
Temporary Construction Compound	All excavated peat for the construction compound will be used to reinstate the area following construction and will therefore need to be stored in a nearby designated location (see Figure 3)	10,000	100	Nil	Nil
	TOTALS	**21,894**	**1,837**	**14,839**	**17,298**



Key

- Site boundary
- Turbine location
- Crane pads
- Wind farm access tracks
- Substation
- Watercourse crossing
- Permanent meteorological mast
- Borrow pit search area
- Temporary construction compound

All Peat Depth Data (m)

- 0.00 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50

0 100 200 300 400 500 600 700 800 900 1,000 1,100 m

Scale at A3: 1:21,000

Enoch Hill Wind Farm
Peat Management Plan

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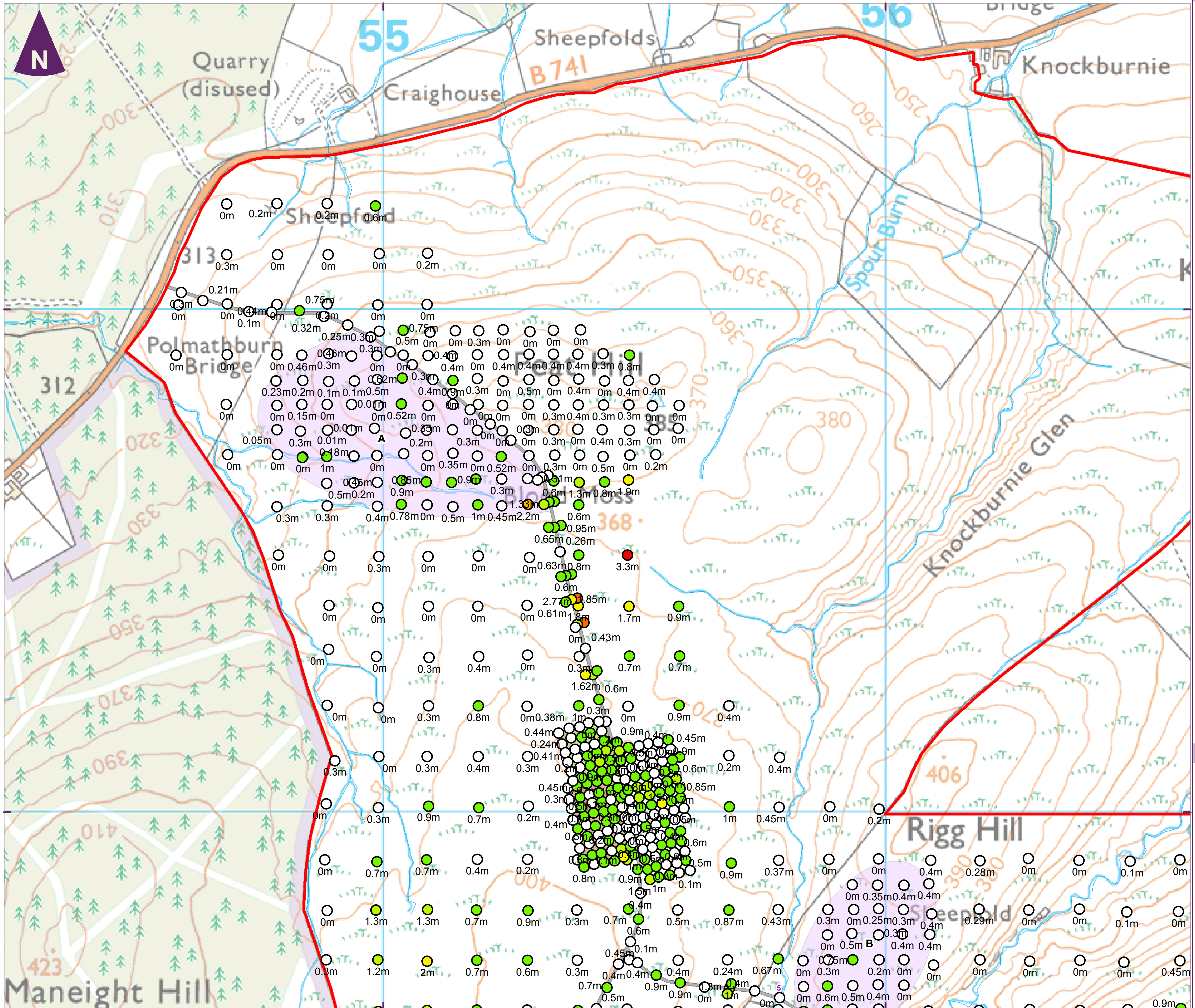
Figure 1.1
Peat depth survey data



Key

	Site boundary
	Turbine location
	Crane pads
	Wind farm access tracks
	Substation
	Watercourse crossing
	Permanent meteorological mast
	Borrow pit search area
	Temporary construction compound

All Peat Depth Data (m)

- 0.00 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50

0 100 200 300 400 m

Scale at A3: 1:7,500

Enoch Hill Wind Farm
Peat Management Plan

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Figure 1.2
Peat depth survey data

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255000 256000 257000

609000 608000

N

Rigg Hill

Chang Hill

Littlecleuchs Hill

Barbeth Hill

Sheepfold

Crocradie Burn

Littlechang Burn

Catlock Burn

Loup Burn

406 395 400 420 440 450 463

Key

- Site boundary
- Turbine location
- Crane pads
- Wind farm access tracks
- Substation
- Watercourse crossing
- Permanent meteorological mast
- Borrow pit search area
- Temporary construction compound

All Peat Depth Data (m)

- 0.00 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50

0 100 200 300 400 m

Scale at A3: 1:7,500

Enoch Hill Wind Farm
Peat Management Plan

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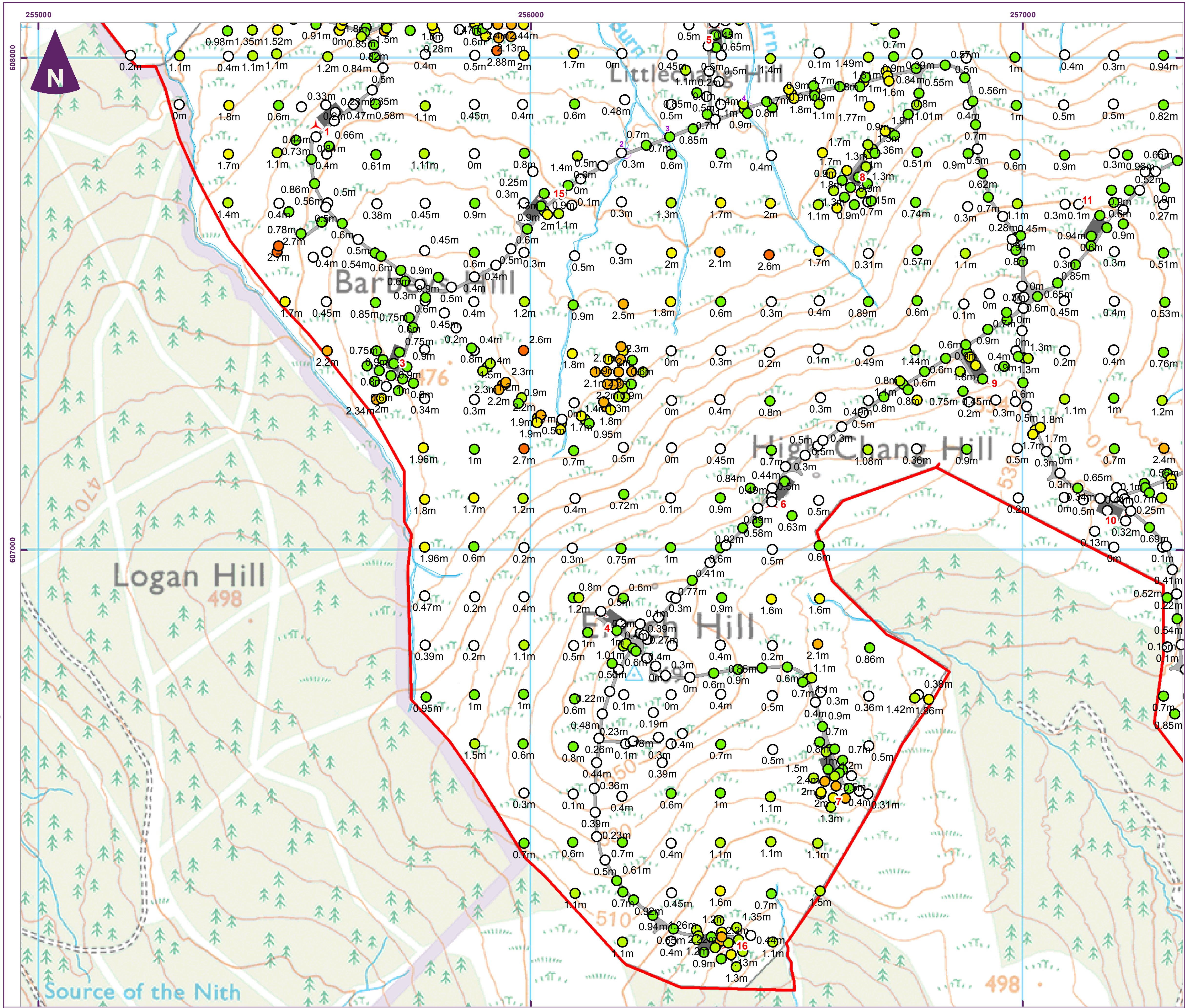
Figure 1.3
Peat depth survey data



Key

- Site boundary
- Turbine location
- Crane pads
- Wind farm access tracks
- Substation
- Watercourse crossing
- Permanent meteorological mast
- Borrow pit search area
- Temporary construction compound

All Peat Depth Data (m)

- 0.00 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50

0 100 200 300 400 m

Scale at A3: 1:7,500

Enoch Hill Wind Farm
Peat Management Plan

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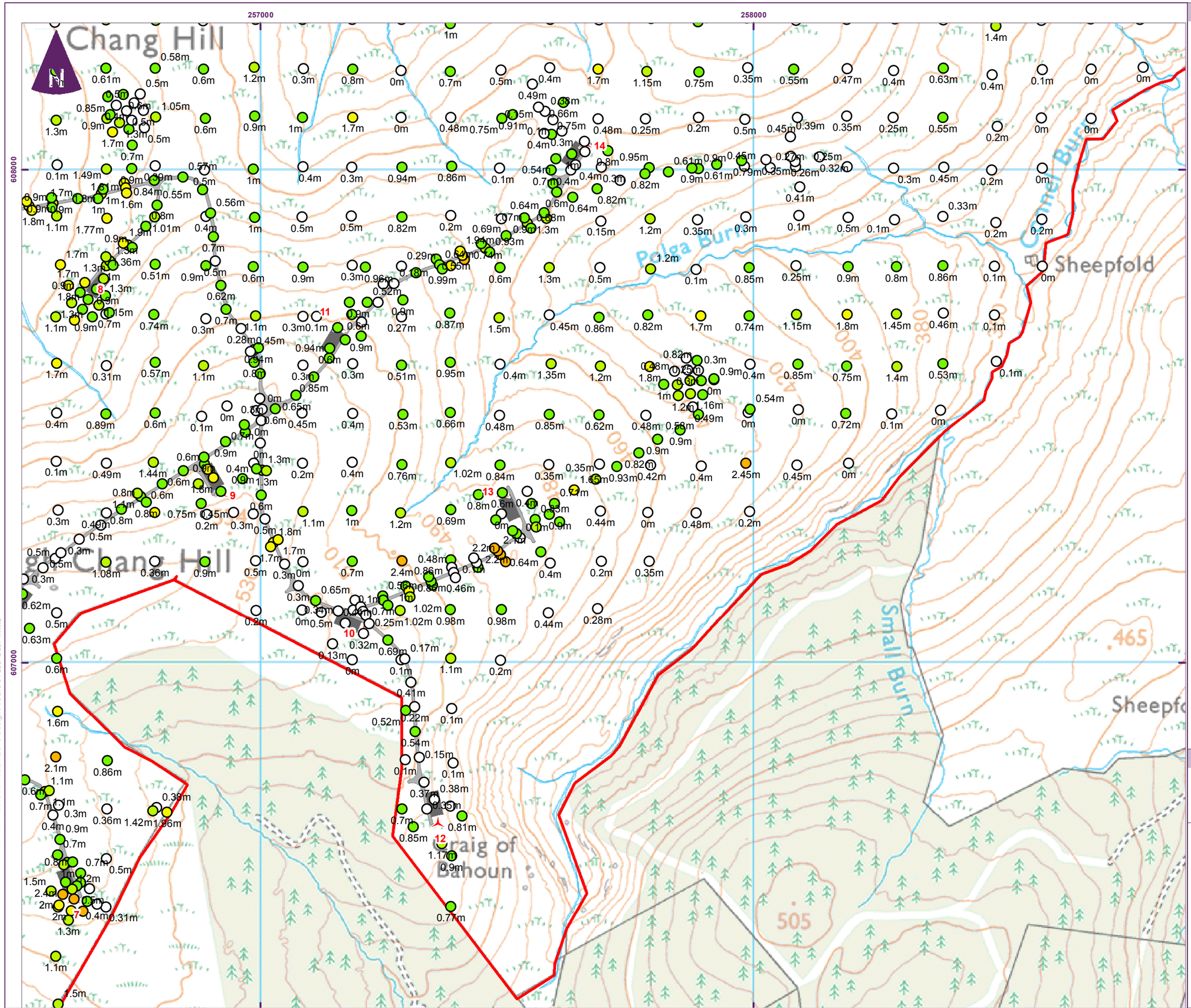
Figure 1.4
Peat depth survey data

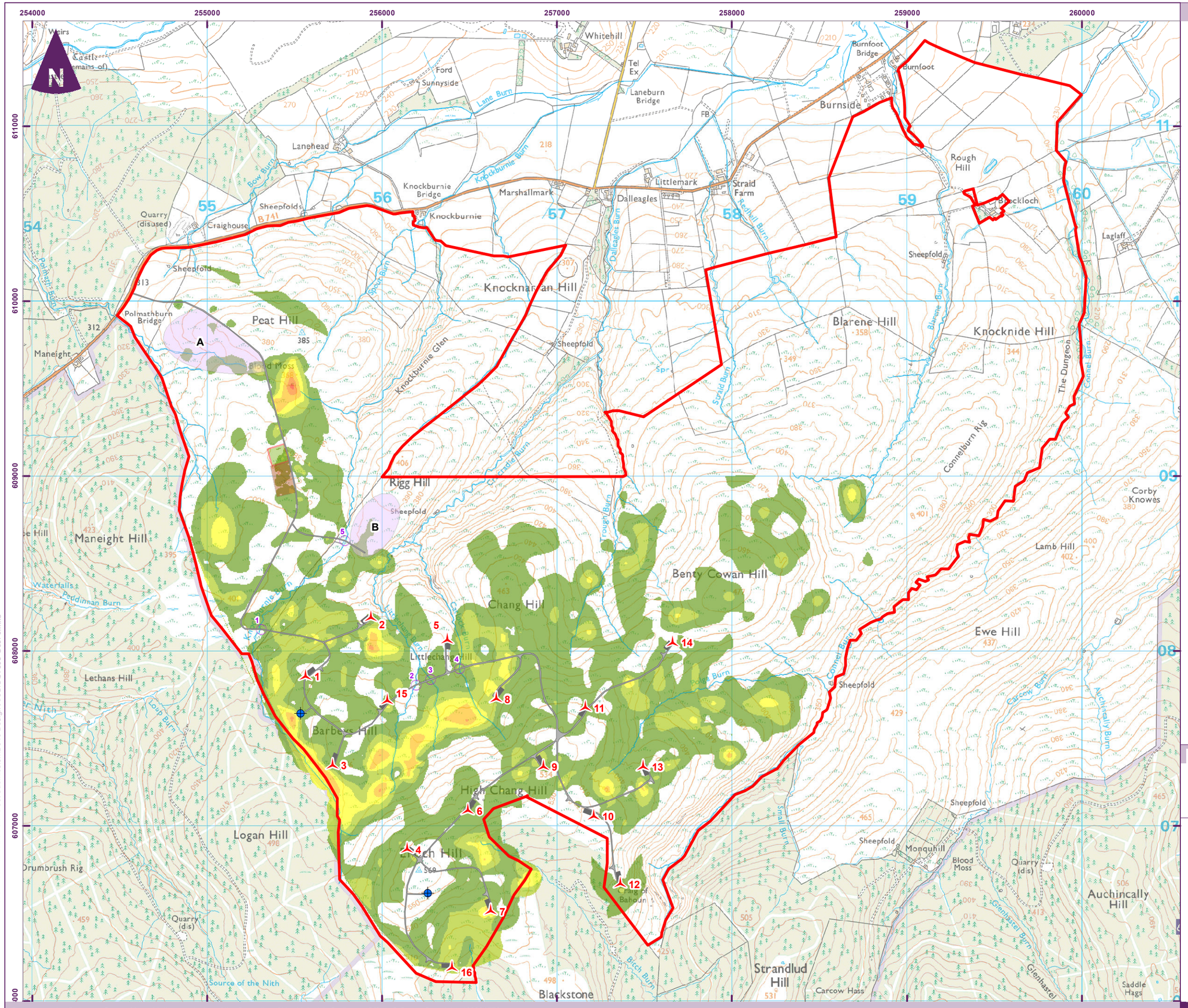
November 2016 37898-Gos74.mxd parkj



Enoch Hill Wind Farm
Peat Management Plan

amec foster wheeler

Figure 1.5
Peat depth survey data



Key

- Site boundary
- Turbine location
- Crane pads
- Wind farm access tracks
- Substation
- Watercourse crossing
- Permanent meteorological mast
- Borrow pit search area
- Temporary construction compound

Interpolated Peat Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5

0 250 500 750 1,000 m

Scale at A3: 1:21,000

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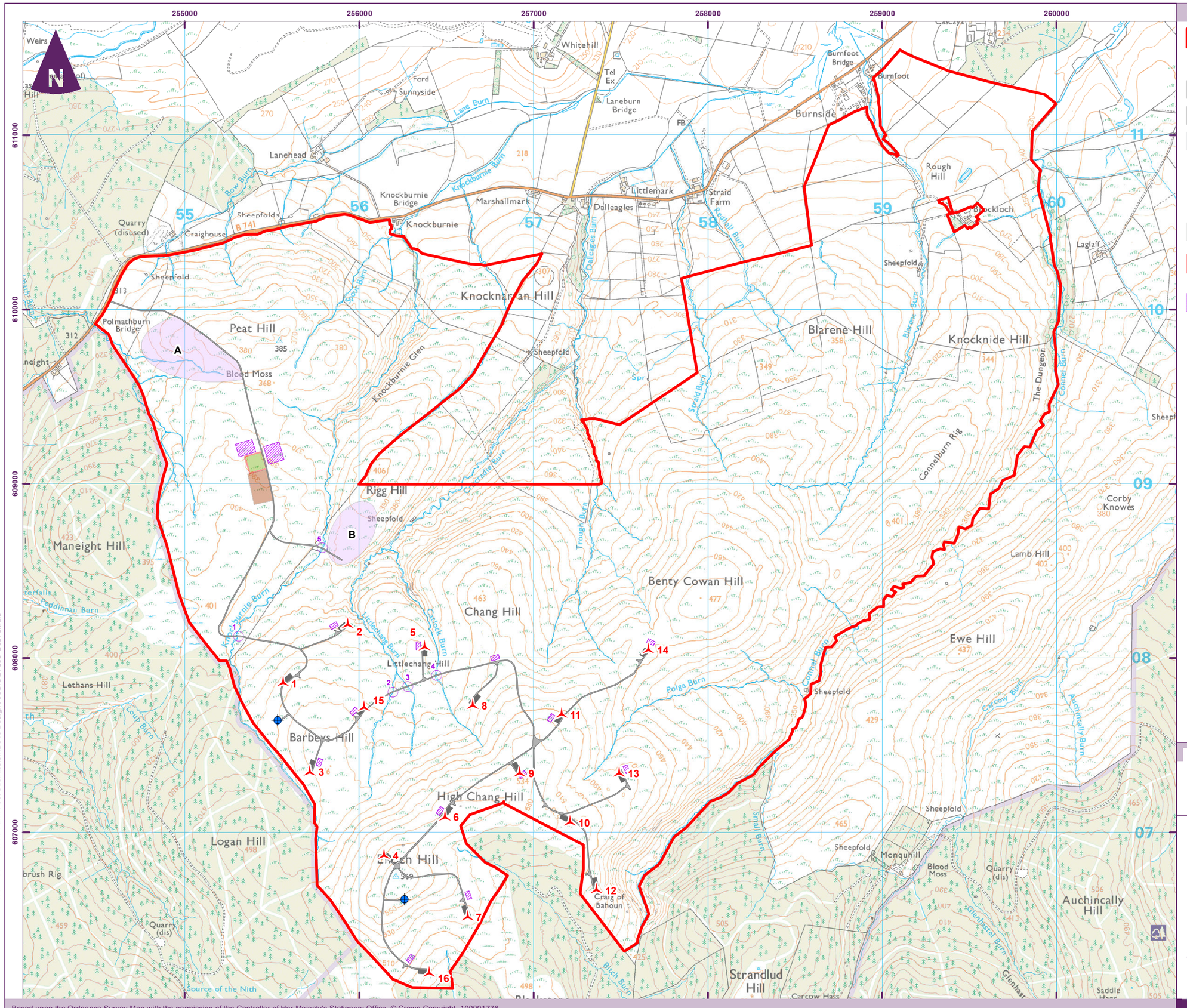
Figure 2
Interpolated peat depth map (by natural neighbour)



Key

- Site boundary
- Turbine location
- Crane pads
- Wind farm access tracks
- Substation
- Watercourse crossing
- Permanent meteorological mast
- Borrow pit search area
- Temporary construction compound
- Potential temporary peat storage areas

0 250 500 750 1,000 m

Scale at A3: 1:21,000

Enoch Hill Wind Farm
Peat Management Plan

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Figure 3
Potential temporary peat storage areas

3. Control Measures

3.1 Construction Works

Excavated peat volumes will be minimised by micrositing infrastructure where possible to avoid areas of deeper peat.

The wind farm layout and access track route will be marked on an Access Plan and demarcated on the ground by temporary fencing. This will provide a designated controlled route for service vehicles and plant prior to peat and topsoil stripping.

Access routes and working areas will be clearly delimited throughout the construction phase.

The construction works will be phased to ensure that peat is stripped in each part of the Development Site ahead of mineral subsoil.

During peat and soil stripping, handling and temporary stockpiling, all efforts will be made to prevent unnecessary trafficking over peat to avoid compaction and any unnecessary damage to peat turves.

Appropriate scale plant will be used, such as 360^0 diggers rather than bulldozers.

Double handling will be avoided as much as possible and a robust planning and monitoring programme will be invoked to ensure that peat and mineral soil are not mixed.

Peat stripping and excavation will be agreed in advance but will generally follow the methodologies recommended for mineral soil by MAFF (2000) and Defra (2009), Wherever possible, a 360^o excavator will be used to permit stripping of large scale surface peat turves, with their vegetation intact. Ideally these should be approximately 0.5m deep and with an area up to a maximum of $1m^2$ subject to the depth, consistency and condition of the surface peat at each location and the plant used for stripping.

For the laying of electrical cables, it is anticipated that the cable trench will be excavated by stripping surface peat in a single process, laying the turf and excavated peat or mineral soil aside temporarily while the cable trench is prepared and cables laid. Excavated peat or mineral soil will be replaced and peat turf reinstated as soon as the cables are laid. No temporary storage of peat is anticipated for this element of the work

3.2 Temporary Peat Storage and Stockpiles

The following general principles will be applied for temporary peat storage areas and peat stockpile stability:

- Peat turves will be temporarily stored in designated locations as close as possible to the area from which they have been cut;
- The number and locations of temporary peat storage areas will be chosen to minimise the distance that stripped and excavated peat will have to be transported;
- Although the maximum temporary storage area requirement is anticipated to be 2.4ha, peat will be excavated and reinstated as quickly as possible in a progressive manner to protect peat as far as possible and therefore minimise the area required for temporary storage at any one time;
- Peat will be excavated and reinstated as quickly as possible in a progressive manner in order to minimise the area required for temporary storage at any one time;
- Storage and stockpiles will avoid sensitive peat vegetation, areas of existing peat erosion and locations with moderate or high risk of peat slide;
- Peat storage and stockpiles will be located at least 50m from watercourse and 25m from any functioning drainage ditches;

- Peat turves will be transferred intact to their temporary storage location where they will be stored, with vegetation upright, in a single layer on geotextile material (to protect underlying vegetation as much as possible). Peat turves may be stored in double layers (separated by geotextile) provided that such storage does not extend beyond two months;
- The Site Construction Manager, with advice as necessary from the ECoW and/or site Engineer, will determine whether special mitigation measures are required, such as orientation of the stockpile, levelling/benching to level the surface, bunding to contain stored materials and site-specific drainage to ensure that runoff waters are sufficiently controlled;
- Loose peat that is not overly wet can be locally stored in stockpiles up to a maximum height of 2m. Loose peat that is very wet (i.e. has little or no structure) would need to be stored in purpose-built, bunded locations with final peat depth no greater than 1m;
- Any bunded storage area would need to be designed with a sedimentation/settling pond to de-water wet peat and aid sediment containment. Each settling pond must be designed with appropriate filtration treatment facilities prior to connection into the construction-phase surface water drainage scheme and Sustainable Drainage System (SuDS) for the Development Site;
- Peat turves and stockpiles will be regularly managed and inspected throughout their lifetime to ensure maintenance of stockpile stability and integrity (see **Appendix C**). Depending on the length of storage and weather conditions, regular watering may be required to protect the peat;
- Temporary drainage of peat stockpiles will be inspected regularly to ensure that it is fit for purpose, that runoff from stockpiles is being appropriately managed and mitigated and that it is not draining directly into any watercourse; and
- Should any problems be observed during regular visual inspections of peat stockpiles, this would invoke implementation of an appropriate corrective action (see **Section 4**) which would be recorded and monitored for effectiveness.

At this stage, a number of potential temporary storage sites have been identified at each of the 12 turbine foundations and / or crane pads where peat is present as well as the sub-station / control building and temporary construction compound (see **Figure 3**). Although considered unlikely to be required, it is possible that crane pads could be used for temporary storage. The final locations and design of each temporary storage area will be determined by the Site Construction Manager with advice as necessary from the ECoW and/or site Engineer.

It is expected that the borrow pits will be restored progressively using peat from the various excavations.

3.3 Peat Reinstatement / Restoration

Dressing back site infrastructure and the creation of verges along access tracks will involve the laying of peat turves in a single layer up to 0.5m deep.

Restoration of the borrow pits will involve two stages to create an appropriate peat profile. The first stage involves the spreading of loose peat and carbon rich soils (to be confirmed by an appropriately qualified peatland specialist prior to restoration) whilst the second stage involves the replacement of peat turves on top to create conditions that should promote the growth of peatland vegetation.

It is anticipated that, if peat turf has been correctly stored, no further re-seeding will be required. However, re-seeding will be carried out if judged to be necessary by the ECoW and Site Construction Manager.

During the habitat reinstatement / restoration works, mitigation is required to reduce damage to peat and peat turves caused by handling and removal of peat from temporary stockpiles, transport and peat placement and re-grading on previously stripped areas. Mitigation measures during this phase of work would closely follow those used during the initial peat stripping phase of work (see **Section 3.1**).

Measures to manage and treat run-off prior to getting into on-site watercourses, and minimise the potential for soil erosion during the works would also be set in place through a series of site specific drainage control measures as set out in the Drainage Management Plan (DMP).

In order to ensure that the minimum amount of peat compaction occurs during placement when heavy machinery is being used, the contractor will develop a method for ‘loose’ tipping and spreading of loose peat in each compartment. Spreading and very light tamping down of placed peat is likely to be, for example, by use of the bucket on a long reach excavator.

Peat handling and placement during reinstatement activities should be carried out while the peat and weather is as dry as possible. Replaced turves may therefore need to be regularly watered.

4. Monitoring and Inspection

This PMP forms part of the Construction Environmental Management Plan (CEMP) and, as such, sets out the methods that will need to be adopted by environmental managers and site contractors to control, record and audit environmental management activities relating to peat conditions, to minimise excavation of peat and, where peat is excavated, to ensure that carbon rich, peaty soils and true peat remain in good condition for future re-use.

Water quality monitoring and regular inspections of restored vegetation conditions and runoff water conditions will be carried out by the ECoW as part of routine site inspections throughout the construction and reinstatement phases of work including.

- Water quality monitoring, which should be undertaken in line with the DMP;
- Temporary peat stockpiles and peat turf storage areas will be inspected weekly to identify features such as bare peat surfaces, erosion and/or ponding so that corrective actions can be taken if necessary; and
- Reinstated peat conditions will be inspected immediately and corrective actions taken if necessary.

An audit checklist is set out in **Appendix D**.

There are certain criteria that may require cessation of works. Specific criteria will be agreed between the Construction Contractor and stakeholders in advance of any works occurring on the Development Site and will be reviewed regularly to ensure that they remain appropriate:

- If sustained heavy rainfall occurs during soil/peat stripping operations, work must be suspended and not restarted until the ground has at least one full dry day to recover. Rainfall quantities and soil/peat wetness conditions considered to be cut-off thresholds for cessation of soil/peat stripping/handling works may differ across the Development Site depending upon the peat conditions and will be informed by the results of detailed site investigations; and
- If sustained snowfall and freezing conditions occur, soil/peat stripping and / or stockpiling, and / or restoration activities will cease. When thawing conditions occur, the Construction Manager and ECoW will use forecast meteorological conditions to determine the appropriate timescale for restarting any peat management activities (stripping, handling, storage, restoration). The decision-making will pay due attention to the potential for rapid and turbulent snowmelt runoff, peat erosion and peat slide risk.

Key roles in the effective delivery of the PMP lie with the Construction Manager (or any designated deputy) who will supervise and provide quality control on peat stripping, stockpiling and reinstatement aspects of work. The Construction Manager will be assisted by an ECoW, who will be responsible for carrying out *in situ* peat inspections of temporary storage/stockpiling areas and peat conditions in restored areas.

Table 4.1 Summary of PMP Roles and Responsibilities

Role	Responsibility
Construction Manager (or designated deputy)	Oversees the implementation of the PMP, checking that prescribed methodologies are being correctly implemented. Provides overall quality control on peat management. Responsible for decision making on any day to day issues or routine non-compliances. Ensures that all peat management and monitoring obligations are met. Ensures joined-up thinking and implementation between proposed mitigation.
ECoW	Carries out regular inspection of: ▶ Peat stripping (checking that peat and mineral soils are not being mixed); ▶ Peat handling; ▶ Methods of peat storage/stockpiling; ▶ Condition of peat in temporary storage/stockpiling areas; and ▶ Peat reinstatement activities and conditions. Reports any non-compliances to the Construction Manager.

A Peat Specialist will be consulted as necessary for assessment of any technical peat issues, including siting of temporary peat storage areas and peat reinstatement methods.

References

Department of the Environment, Food and Rural Affairs (Defra) (2009) Code of Practice on Sustainable Soils on Construction Sites.

Joint Nature Conservation Committee (2011) JNCC Report Number 445: Towards an Assessment of the State of UK Peatlands. http://jncc.defra.gov.uk/page-5861.

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Scottish Government (with acknowledgements to Scottish Natural Heritage, Scottish Environment Protection Agency and the James Hutton Institute) (February 2014) Guidance on Developments on Peatland - Site Surveys. http://www.gov.scot/Topics/Business-Industry/Energy/Energy-sources/19185/17852-1/CSavings/PSG2011.

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Scottish Renewables, Scottish Natural Heritage, Scottish Environment Protection Agency, Forestry Commission Scotland and Historic Environment Scotland (2012) Developments on Peatland: Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste. https://www.scottishrenewables.com/publications/guidance-assessment-peat-volumes-reuse-excavated/.

Appendix A
Soil Excavation Volumes for each Element of Infrastructure

This Appendix provides the raw data used to calculate peat excavation volumes for all elements of the Proposed Development's infrastructure.

Table A.1 Peat Depths and Excavated Volumes at Each Turbine

WIND TURBINES												
Wind Turbines on carbon rich peaty soils					Wind Turbines on peat							
Turbine Number	Total area of turbines (m^2)	Peat Depth m	Volume m^3		Turbine Number	Total area of turbines (m^2)	Battered Back Area (m^2)	Battered Back Volume of Peat (m^3)	Peat Depth m	Volume of Acrotelm (m^3)	Volume of Catotelm (m^3)	Total Peat Volume m^3
1	490.9	0.4	196.4		2	490.9	399.0	179.6	0.9	345.2	276.2	621.4
4	490.9	0.0	0.0		3	490.9	399.0	169.6	0.9	345.2	241.7	586.9
5	490.9	0.4	196.4		7	490.9	399.0	498.8	2.5	345.2	1380.9	1726.1
6	490.9	0.5	220.9		8	490.9	399.0	189.5	1.0	345.2	310.7	655.9
10	490.9	0.3	157.1		9	490.9	399.0	179.6	0.9	345.2	276.2	621.4
12	490.9	0.4	181.6		11	490.9	399.0	169.6	0.9	345.2	241.7	586.9
14	490.9	0.0	0.0		13	490.9	399.0	119.7	0.6	345.2	69.0	414.3
	0.0		0.0		15	490.9	399.0	179.6	0.9	345.2	276.2	621.4
	0.0		0.0		16	490.9	399.0	263.4	1.3	345.2	566.2	911.4
Number of Turbines in shallow organic matter: 7	**Total m2: 3437**	**TOTAL (m^3)**	**Total Volume (m3): 952**		**Number of Turbines in peat: 9**	**TOTAL (m^3)**		**1949**		**3107.1**	**3638.7**	**6745.8**
								Average peat depth across Turbines	**1.09**			

Table A.2 Peat Depths and Excavated Volumes at Each Crane Pad

CRANE PADS											
Crane Pads on carbon rich peaty soils				Crane Pads on peat							
Turbine Number	Total area of hardstanding (m^2)	Peat Depth m	Volume m^3	Turbine Number	Total area of hardstanding (m^2)	Battered Back Area (m^2)	Battered Back Volume of Peat (m^3)	Peat Depth m	Volume of Acrotelm (m^3)	Volume of Catotelm (m^3)	Total Peat Volume m^3
1	1,250	0.23	288	3	1,250	23.4	9.6	0.83	630.8	410.0	1,040.9
2	1250	0.10	125	5	1250	23.4	7.6	0.65	630.85	189.25	820.1
4	1,250	0.40	500	6	1,250	23.4	6.5	0.56	630.8	75.7	706.5
10	1250	0.44	550	7	1250	23.4	10.5	0.90	630.85	504.68	1,135.5
12	1,250	0.38	475	11	1,250	23.4	7.0	0.60	630.8	126.2	757.0
13	1250	0	0	15	1250	23.4	10.5	0.90	630.85	504.68	1,135.5
	0		0	8	1,250	23.4	12.9	1.10	630.8	757.0	1,387.9
	0		0	9	1250	23.4	17.0	1.45	630.85	1,198.61	1,829.5
	0		0	14	1,250	23.4	11.7	1.00	630.8	630.8	1,261.7
	0		0	16	1250	23.4	16.0	1.37	630.85	1,100.19	1,731.0
Number of Cranepads in shallow organic matter: 6	**7500**	**TOTAL (m^3)**	**1938**	**Number of Crane Pads in Deep Peat: 10**		**TOTAL (m^3)**	**109.4**		**6308.5**	**5497.2**	**11805.6**
							Average peat depth across Crane Pads	**0.94**			

Table A.3 Peat Depths and Excavated Volumes for Construction Compound

Construction Compound					
Compound	Total Area (m^2)	Peat Depth	Acrotelmic Peat (m^3)	Catotelmic Peat (m^3)	Volume m^3
Primary	10000	0.51	5000.0	100.0	5,100.0
		TOTAL	**5000.0**	**100.0**	**5,100.0**

Table A.4 Peat Depths and Excavated Volumes for the Substation

Substation Compound					
Compound	Total Area (m^2)	Peat Depth	Acrotelmic Peat (m^3)	Catotelmic Peat (m^3)	Volume m^3
1	19800	0.62	9900.0	2376.0	12,276.0
		TOTAL	**9900.0**	**2376.0**	**12,276.0**

Table A.5 Peat Depths and Excavated Volumes at Permanent Anemometer Masts

Permanent met masts and crane pads					
Mast	Total Area (m^2)	Peat Depth	Acrotelmic Peat (m^3)	Catotelmic Peat (m^3)	Volume m^3
1	425	0.78	212.5	119.0	331.50
2	425	0.18	0.0	0.0	0.0
		TOTAL	**212.50**	**119.00**	**331.50**

Table A.6 Peat Depths and Excavated Volumes at Borrow Pits

Borrow Pit Search Areas					
ID	Total Area (m^2)	Peat depth	Acrotelmic Peat (m^3)	Catotelmic Peat (m^3)	Volume m^3
A	30000	0.33	0.0	0.0	0.0
B	10000	0.34	0.0	0.0	0.0
		TOTAL	**0.0**	**0.0**	**0.0**

Peat Depths and Excavated Volumes on New and Upgraded Access Tracks

The total length of proposed new 6m wide access track amounts to approximately 12.1km (12,070m). Peat will be excavated from approximately 50% of this length as follows:

- 112 points were probed along 5,600m of proposed new excavated road (6m wide) through peat, with an average depth of 0.71m. Passing places along these excavated roads extend to an area of 3,600m^2 for which an average peat depth is assumed to be 0.65m. In total, this equates to **26,004m^3**;

- Peat probes were taken at 34 points along sections extending over 1,700m of proposed new floating road on deep peat. The volume of peat to be excavated along these sections amounts to **Nil**;
- Peat probes were taken at 96 points along sections extending over 4,770m of proposed new excavated road through carbon rich peaty soils. The volume of peat to be excavated along these sections amounts to **Nil**.

Appendix B
Peat Reinstatement Volumes

Table B.1 Indicative Peat Reinstatement Volumes

Element	Number of turbines / cranepads in Deep Peat	Restoration Length (m)	Restoration Width (m)	Area (m^2)	Restored peat depth across element.	Restoration Demand for Acrotelm (m^3)	Restoration Demand of Catotelm (m^3)	Total Demand Estimate (m^3)	Assumptions
Turbine Foundations Dressing Back	9	53	3	1,431	0.5	716	0	716	Assumes that three edges are available for reinstatement. 1.5 metre width assumed
Turbine Foundations Reinstating Batters	9	-	-	3,591	1.1	898	1,059	1,957	Assumes batters are reinstated by backfilling with excavated peat but to the total depth of the foundation, rather than just the previous peat depth. Volumes divided by 2 to account for the triangular shape of batter.
Backfilling top 0.5m of turbine foundations with peat	9	n/a	n/a	4,242	0.5	1,494	627	2,121	Assumes turbine foundations can be backfilled with peat. Using only original 25m diameter as batters already accounted for. Assumes centre upstand has 5m diameter.
Cranepads - reinstating batters	10	n/a	n/a	117	0.9	58	51	110	Assumes that batters can be reinstated completely with peat
Cranepads - Dressing Back	10	75	3	2,250	0.5	1,125	0	1,125	Assumed that one length (50m) and one width (25m) of each hardstanding is available for dressing back. 3 metre width assumed.
New Excavated Access Roads in Peat	n/a	5,600	6	33,600	0.5	16,800	0	16,800	All road verges on both sides are available for reinstatement. 3 metre width assumed.

Element	Number of turbines / cranepads in Deep Peat	Restoration Length (m)	Restoration Width (m)	Area (m^2)	Restored peat depth across element.	Restoration Demand for Acrotelm (m^3)	Restoration Demand of Catotelm (m^3)	Total Demand Estimate (m^3)	Assumptions
New Floating Access Roads	n/a	4	0	0	0.0	0	0	0	No road verges alongside floating roads.
Upgraded Excavated Access Roads in Peat	n/a	0	0	0	0.0	0	0	0	Road verges on both sides are available for reinstatement. 1 metre width assumed (based upon 2m additional road width).
Upgraded Floating Access Roads	n/a	0	0	0	0.0	0	0	0	No road verges alongside floating roads.
Passing Places	24	40	3	2,880	0.5	1,440	0	1,440	Assumes that three verges are available for reinstatement. 3 metre width assumed. Average peat depth on roads across site used.
Substation	n/a	476	3	1,428	0.5	714	0	714	1 length and 2 widths available for dressing back. 3 metre width assumed.
Temporary Compound Verges	n/a	300	0	0	0.5	0	0	0	Assumes no dressing back prior to reinstatement post construction.
Temporary Compound Restoration	n/a	n/a	n/a	10,000	0.5	5,000	100	5,100	Assumed that entire compound is reinstated post construction.
Borrow Pits	n/a	n/a	n/a	40,000	0.8	14,838	17,297	32,135	Assumes that 0.8m of Peat can be reinstated as part of the BP restoration and landscaping
Anemometer Masts	1	30	3	90	0.5	45	0	45	Assumes that three edges are available for reinstatement. 3 metres width assumed
Total ($m^{3)}$						**43,128**	**19,135**	**62,263**	

Appendix C
Soil Stockpile Inspection Checklist

All peat storage areas and stockpiles will be inspected weekly throughout the construction works to confirm appropriate conditions are being maintained.

The inspection checklist will include but may not be limited to the following:

Table C.1 Soil Stockpile Inspection Checklist

No	Criteria To Check
1	Any locations where stockpiles have been constructed to higher than the threshold 2m elevation.
2	Any locations where boundaries between segregated peat and mineral soil stockpiles have become amalgamated, causing contamination of peat with mineral soil.
3	Any signs of surface peat erosion – caused by surface water runoff or wind, or any locations of surface water ponding, indicating that the stockpile is not shedding water correctly.
4	Any signs of inappropriate vehicle tracking, indicating inappropriate access and trafficking, causing additional unnecessary compaction.

Appendix D
Indicative Audit Checklist for the Peat Management Plan

Table D.1 Indicative Checklist for the Peat Management Plan

Element	Indicative Checklist
Access Plan/Trafficking	▶ Inspect to ensure that the Access Plan is being adhered to and that there is no trafficking, stopping of vehicles or refuelling of vehicles or plant outside of permitted areas marked on the Access Plan; ▶ Inspect to ensure that there is no laydown of any materials outside of permitted areas on the Access Plan; ▶ Ensure that no plant traffics across any area of virgin peat and issue non-compliances where this occurs; and ▶ Advise on restoration of any trafficked and/or damaged area.
Peat Stripping Method	▶ Ensure that correct peat turf depth is being adhered to when stripped – to ensure that peat structure and strength is maintained; and ▶ Ensure that correct methods for excavation and transport of 'loose' peat are being adhered to.
Peat Storage/Stockpiling	▶ Inspect peat turf storage areas for each element of infrastructure and ensure that correct storage is being adhered to; ▶ Advise on whether watering of turves is required; ▶ Inspect storage of 'loose' peat and carry out checklist in **Appendix B**; and ▶ Advise on any corrective actions on storage/stockpiles.
Peat Restoration	▶ Inspect replacement of 'loose' peat and peat turves and advise on any necessary corrective actions (e.g. methods for prevention of erosion); and ▶ Advise on whether watering of turves after replacement is required.