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Technical Appendix 10.2: Outline Peat Management Plan

Aultmore Wind Farm Redesign

Vattenfall Wind Power Limited

Prepared by: **SLR Consulting Limited** 4/5 Lochside View, Edinburgh Park, Edinburgh, EH12 9DH

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Making Sustainability Happen

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Revision Record

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1.0 Introduction

1.1 General

SLR Consulting Ltd (SLR) was commissioned by Vattenfall Wind Power Limited (The Applicant) to undertake a Stage 1 Outline Peat Management Plan (PMP) for the proposed Aultmore Wind Farm Redesign ('the proposed development').

It is anticipated that the proposed development would comprise of up to 16 wind turbines with associated infrastructure including access tracks, crane hardstandings, borrow pits, substation and temporary construction compounds. Full details of the proposed development are provided in **Chapter 2: Proposed Development Description** of the EIA Report. The location and layout of the red line boundary which define "the Site" are detailed on **Figure 10.2.1** and Figure **10.2.2**.

This report presents the findings of data obtained from peat depth probing surveys conducted by SLR Consulting in July 2021, September 2022, December 2022 and June 2023. A desk study and comprehensive programme of soils and peat probing has been completed for the Proposed Development and the results are detailed within **Technical Appendix 10.1: Peat Landslide and Hazard Risk Assessment** (PLHRA).

The work has been undertaken by a team of Geotechnical Engineers and Geologists, with over 10 years' experience in undertaking peat assessments. The team was led by a Chartered Hydrogeologist with 30 years' consultancy experience and specialising in the assessment of soils, geology and water for renewable power projects in Scotland.

The report has also considered current FLS guidelines^{1,2} which at the time of writing are currently being reviewed. The final PMP will be updated based on any future updated guidance.

1.2 Site Description

The Site is located within the administrative boundary of Moray Council in the northeast of Scotland, approximately 6km north of Keith and 7km southeast of Buckie. The Site is currently an active commercial forestry area with ongoing harvesting and replanting operations.

1.2.1.1 Historic Land Use

Information and historic maps from the National Library of Scotland indicate that the Site has experienced limited changes over time. Using the OS One Inch 1885-1900, the Site previously generally consisted of open, undulating, undeveloped land with minor areas of forestry. There are mapped quarries within the site boundary during this period that are still mapped in present day, such as Tarrymount Quarry and Park of Raffin Quarry in the west of the Site. In addition, on review of the OS One Inch 1955-1961, the Site is still predominantly undeveloped land and it is evident that the development of commercial forestry is in recent years.

² FLS Peatland Management Considerations and Conditions FLS Peatland Management Considerations and Conditions. Philippa Murphy.15/11/2022.



¹ Forestry and Land Scotland (FLS), Interim FLS Guidance on design principles for renewable energy development on peatland on the National Forests and Land (March 2021);

1.3 Objectives

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

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

The PMP seeks to identify that appropriate proposals to re-use the surplus peat can be accommodated within the proposed development and associated Outline Biodiversity Enhancement and Restoration Plan (OBERP) proposals, without significant environmental or health and safety implications, to minimise risk in terms of carbon release and human health.

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

1.4 Role of the Peat Management Plan

The PMP is intended to be a working document to be used throughout the key stages of the design, construction, operation, decommissioning and re-instatement phases of the proposed development as part of an overall Construction Environmental Management Plan (CEMP). These stages are outlined below.

1.4.1 Stage 1: Environmental Impact Assessment (EIA)

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

1.4.2 Stage 2: Post Consent / Pre-Construction

As part of the EIA it will have been demonstrated that, based on the investigation and data collected, it is likely that the excavated materials for the proposed development can be managed in an appropriate manner. The peat mass balance calculations may be further developed, and prior to the relevant works commencing, because of any further or more detailed ground investigation or survey works required to inform detailed design, or that may be required under planning conditions.

1.4.3 Stage 3: Construction Stage

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

1.5 Legislation and Guidance

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

• National Planning Framework for Scotland 4 (NPF4) (Scottish Government, February 2023);



- Advising on peatland, carbon-rich soils and priority peatland habitats in development management. NatureScot. June 2023.
- SEPA Regulatory Position Statement Developments on Peat (Scottish Environment Protection Agency, 2010);
- Good Practice during Windfarm Construction, 4th Edition (Scottish Renewables, Scottish Natural Heritage (now NatureScot), Scottish Environment Protection Agency, Forestry Commission Scotland, Historic Environment Scotland, Marine Scotland Science and AEECoW, 2019);
- Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste (Scottish Renewables and SEPA, 2012);
- Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Scottish Government, January 2017);
- Floating Roads on Peat Report into Good Practice in Design, Construction and Use of Floating Roads on Peat with reference to Wind Farm Developments in Scotland (Forestry Commission Scotland & Scottish Natural Heritage, 2010);
- The Waste Management Licensing (Scotland) Regulations 2011;
- Developments on Peat and Off-Site Uses of Waste Peat (SEPA, 2017); and
- The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011.

Additional consideration has also been given with regards to Forestry and Land Scotland internal peat notes as follows:

- FLS Guidance on design principles for renewable energy development on peatland on the National Forests and Land (2021)
- FLS Peatland Management Considerations and Conditions. (Philippa Murphy.15/11/2022).

1.5.1 Requirements of National Planning Policy 4

The intent of Policy 5 (Soils) of National Planning Policy 4 (NPF4)³ is "*to protect carbon rich soils, restore peatlands and minimise the disturbance of soils from development*".

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

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

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

- essential infrastructure and there is a specific locational need and no other suitable site;
- the generation of energy from renewable sources that optimises the contribution of the area to greenhouse gas emissions reductions targets;

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



- small-scale development directly linked to a rural business, farm or croft;
- supporting a fragile community in a rural or island area; or
- restoration of peatland habitats.

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

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

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

This stage 1 PMP considers the protection and safeguarding of peat and seeks to fulfil the requirements of Policy 5(d).

NPF4³ provides published guidance regarding the mitigation hierarchy for developments on peat.

"The mitigation hierarchy indicates the order in which the impacts of development should be considered and addressed. These are:

- Avoid by removing the impact at the outset
- Minimise by reducing the impact
- Restore by repairing damaged habitats
- Offset by compensating for the residual impact that remains, with preference to onsite over off-site measures."

1.5.2 SEPA Guidance

SEPA^{4,5} also has published guidance which is summarised below:

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

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

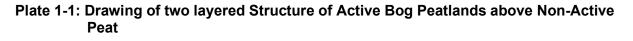


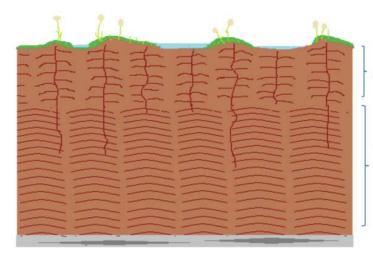
⁴ Scottish Environment Protection Agency. 2010. Regulatory Position Statement – Developments on Peat.

1.5.3 Definition of Peat

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

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





Acrotelm - Layer of living *Sphagnum* and newer peat material

Catotelm - lower layer of an active peatforming mire which remains permanently waterlogged, and through which water usually moves less freely

Non active peat forming layer – basal substrate

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

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

2.0 Site Work

2.1 Peat Depth Survey

Peat depth surveys have been undertaken across two phases by SLR. The surveys carried out followed best practice guidance for developments on peatland^{1,6,7,}.

Phase 1 peat probing resulted in probing on a 100m grid in developable areas to allow for initial assessment of the proposed development which was used in preliminary site layout designs. The Phase 2 peat probing involved detailed probing undertaken across the proposed development, focussing on access tracks, turbine locations and other site infrastructure in response to design changes. Probing was not possible in areas of dense forestry or areas of felled forestry or wind blown trees with no safe walking access and SLR acknowledge that there are limited gaps in the probing dataset.

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

Where the probing recorded less than 0.5m thick, this has been considered to be an organic/peaty soil rather than peat.

Where the peat probing met refusal on a hard substrate, the 'feel' of the refusal can provide an insight into the nature of the substrate. The following criteria were used to assess material:

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

2.2 Peat Depth Results

The results from all probing phases are detailed in the following sections and displayed on Figures 10.2.3 and 10.2.4. A total of 3,795 peat probes were undertaken across all survey phases, with the results summarised in **Table A**.

⁷ Scottish Natural Heritage (SNH), SEPA, Scottish Government & James Hutton Institute. (2014)' Peat Survey Guidance; Developments on Peatland: Site Surveys'.



⁶ Scottish Renewables & SEPA (2012) 'Developments on Peatland Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste'.

Table A: Peat Probing Results

Peat Thickness (m)	No. of Probes	Percentage (of total probes undertaken on-site)
0 (no peat)	268	7.1
0.01 – 0.49 (peaty soil)	2,881	75.9
0.50 - 0.99	250	6.6
1.00 – 1.49	284	7.5
1.50 – 1.99	19	0.5
2.00 - 2.49	58	1.5
2.50 – 2.99	12	0.3
3.00 - 3.49	11	0.3
3.50 - 3.99	8	0.2
> 4.00	4	0.1
0 (no peat)	268	7.1

2.3 Peat/Material Depth at Infrastructure

The average peat / underlying material thickness across each proposed infrastructure elements is summarised below and presented in Annex A:

- Site Track (New) 7m wide average thickness of 0.31m;
- Site Track (New) 5m wide average thickness of 0.31m;
- Site Track (Upgraded) 7m wide average thickness of 0.37m;
- Site Track (Upgraded) 5m wide average thickness of 0.37m;
- Turbines average thickness of 0.23m;
- Hardstandings an average thickness of 0.25m;
- Substation Option 1 average thickness of 0.26m;
- Substation Option 2 average thickness of 0.33m;
- Temporary Compound 1 average thickness of 0.11m;
- Temporary Compound 2 average thickness of 0.48m; and
- Borrow Pits average thickness of 0.12m.

2.4 Peat Condition

Peat is described using BS5930⁸ and the von Post classification⁹. Peat samples were collected by SLR in September 2022, using a peat auger and used to inform interpretations of the peat condition and underlying substrate.

Based on interpretations from probing and peat core samples, the peat within the proposed development is predominantly fibrous and pseudo-fibrous.

⁹ Von Post, L. and Grunland, E., (1926), 'Sodra Sveriges torvillganger 1' Sverges Geol. Unders. Avh., C335, 1-127.



⁸ BS 5930:2015+A1:2020, Code of practice for ground investigations

Based on field descriptions at augering points, most of the peat would be classified as between H2 and H5 in the von Post⁹ classification, showing insignificant to moderate decomposition. Peat samples were collected by SLR in November 2022, using a peat auger and used to inform interpretations of the peat condition and underlying substrate.

The peat augering logs and photographs are provided within Annex B.

It was noted during the surveys that there was significant disruption to the acrotelmic layer across parts of the site (where peat was identified) – either impact from recent harvesting activities or from historic forestry activities. In more open areas where forestry had not taken place the acrotelm was more intact.

3.0 Potential Impacts on Peat During Construction

The initial construction phase for energy projects will often include soil and peat stripping and excavation activities associated with constructing the foundations for turbine bases, crane pads, access tracks, control compound and substation, temporary construction compounds, and borrow pits.

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

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

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

4.0 Peat and Peaty Soils Management Proposals

The proposed development design required to take account of a number of environmental and technical constraints. The design sought to avoid areas of known or potential deep peat where possible, taking into account other environmental and technical factors such as ecology, ornithology, archaeology, hydrology, topography and existing infrastructure. The proposed development has largely avoided areas where peat is >1m and efforts have been made through the iterative design process to minimise the footprint of site infrastructure on peat>0.5m as far as practicable. For clarity, the below section details the processes applicable to peat that is >0.5m deep. Material under 0.5m in depth is considered organic/carbon or mineral soils.

All peat and peaty soil excavations are to be overseen and monitored by the appointed ECoW. Extra caution is required when excavating peat within previously afforested areas. The peat in these areas have the potential to be drier, losing structural integrity and may have very little vegetation if recently felled.

The excavated peat must be handled, moved and stored in line with best practice and relocated to an appropriate location which will maintain hydrology of the peat and where necessary appropriate techniques applied to aid recovery; location of reinstated peat and methodology to be agreed with FLS. Where peat and peaty soils are to be excavated, re-used or reinstated, the following good practice applies.

4.1 Excavation

Excavated peat should be excavated as turves, including the acrotelm (surface vegetation) and a layer of adjoining catotelm (more humified peat) typically up to 500mm thick in total, or as blocks of catotelm; the acrotelm should not be separated from its underlying peat;

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

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

It is noted that the acrotelm across much of this site is degraded or effectively missing due to the impact of commercial forestry activities. While best efforts will be made to retain the peat in turves during excavation, it is recognised that this may not be possible in felled areas where the thin acrotelm layer has already been disturbed or removed by forestry activity making it very difficult to distinguish. Stump removal will further disturb remaining peat resulting in it being more likely that predominantly catotelmic peat will be removed in a disturbed state than would be expected in areas where stump removal does not take place.

Classification of whether a material that is excavated is peat, or a peaty soil, will be determined by the depth of the material being excavated in consultation with the ECoW.

4.2 Storage

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

• stripped materials should be carefully separated to keep peat and other soils apart;



- to minimised handling and haulage distances, excavated material should be stored local to the site of excavation or end point of reinstatement;
- peat turves should be stored in wet conditions or irrigated in order to prevent desiccation (once dried, peat will not rewet);
- stockpiling of peat should be in large volumes to minimise exposure to wind and sun (and desiccation), but with due consideration for slope stability, but should not exceed 1 m in height to maintain stability of stockpile;
- stockpiles should be isolated from watercourses or drains with appropriate bunding to minimise pollution risks;
- excavated peat and topsoil stored separately, should be stored to a maximum of 1 m thickness;
- stores of non-turf (catotelm) peat should be bladed off to reduce the surface area and desiccation of the stored peat; and
- peat storage areas should be monitoring during periods of very wet weather, or during snowmelt, to identify early signs of peat instability.

4.3 Temporary Storage

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

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

For crane pads, borrow pits and compounds (with longer term storage requirements), the following good practice applies:

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

Identification of suitable areas for peat storage will be undertaken in later stages of the PMP, once detailed designs are completed.

4.4 Transport

The following good practice applies to transport:

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

4.5 Handling

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

- best estimate excavation volume at each infrastructure location (including peat volumes split into area/volume of 'acrotelm' or 'turf', and volume of catotelm) which would be achieved by undertaking additional probing in line with current guidance following removal of trees post-consent;
- volume to be stored locally and volume to be transferred directly on excavation to reinstatement areas elsewhere (e.g. disused quarries, borrow pits or forest drains) in order to minimise handling;
- location and size of storage area relative to turbine foundation, crane hardstanding and natural peat morphology / drainage features; and
- irrigation requirements and methods to minimise desiccation of excavated peat during short term storage.

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

4.6 Reinstatement

During reinstatement, the following best practice should be followed:

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

4.7 Access Tracks

There is much guidance^{10,11} available to support access track design in peatlands. Guidance is generally focused on floating tracks and excavated tracks and is summarised below. Based on the avoidance of significant areas of deep peat with tracks all typically present on peat <1.0m and only limited sections of track on localised areas of peat >1.0m then the use of excavated tracks is proposed across the majority of the site, with limited sections of floating tracks potentially used where ground conditions suit the floating track methodology.



¹⁰ Scottish Renewables, Scottish Natural Heritage, Scottish Environmental Protection Agency, Forestry Commission Scotland, Historic Environment Scotland, Marine Scotland, AEECoW (2019)., Good Practice During Wind Farm Construction. 4th Edition.

¹¹ Scottish Natural Heritage, Forestry Commission (August 2010)., Floating Roads on Peat

Excavated tracks require complete excavation of soil/peat to a competent substrate.

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

- trackside ditches should capture surface water (within the acrotelm) before it reaches the road;
- interceptor drains should be shallow and flat bottomed (and preferably entirely within the acrotelm to limit drawdown of the water table);
- any stripped peat turves should be placed back in the invert and sides of the ditch to assist regeneration and prevent erosion to the peat and wash out that could occur; and
- culverts and cross drains should be installed under excavated tracks to maintain subsurface drainage pathways (such as natural soil pipes or flushes). Discharge from constructed drainage should allow for as much diffuse dispersion of clean (silt free) water as possible while minimising disturbance to existing peatland as far as possible. Silt mitigation measures will be incorporated into all constructed drainage as per the requirements of the Construction and Environmental Management Plan (CEMP).

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

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

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

4.8 Monitoring and Inspection

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

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

Monitoring and any follow up remedial action should continue over the length of the lease with methodology provided and agreed by FLS.

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

• peat surface, peat profile and peat consistency conditions would be carried out as part of ground investigations prior to the start of construction. This information would



provide detailed information on the baseline conditions for each part of the infrastructure footprint;

- restored peat conditions would be inspected immediately after reinstatement to ensure that the methods detailed in the PMP had been correctly implemented and to inform any corrective actions should they be required; and
- the physical condition of peats would be retained as carefully as possible both at the peat storage and the peat reinstatement stages. This is particularly important for vegetation establishment.

5.0 Estimation of Peat Volumes

Table B provides an estimate of peat and peaty soil volumes to be excavated and re-used during the construction of the proposed development. The peat and peaty soil excavation and re-use volumes are detailed for each infrastructure element in Annex A. The excavated materials data from Annex A indicates that the areas of infrastructure within the Proposed Development are typically located in areas of peaty soils, with very limited infrastructure present in areas of peat >0.5m.

The table also demonstrates the following:

- the avoidance of areas of deep peat where possible;
- re-use of the excavated materials is minimised where possible;
- sufficient reuse opportunities across the site for excavated materials to be used in restoration and reinstatement such that no material should be removed from site;
- any excavation and re-use is undertaken in line with updated industry good practices and guidance; and
- limitations and consideration for future work.

Table B: Excavated Materials Management Plan

Method	Volume of Excavated Material (m ³)	Opportunity for Avoidance or Minimisation of Excavated Material	Volume of Re- use Material (m³)	Re-use Requirements	Hierarchy Adherence	Limitations and Considerations
Access Tracks New and Upgraded New 7m Wide 2km New 5m Wide 6.4km Upgrade 7m Wide 7.15km Upgrade 5m Wide 8.75km	4,340m ³ 9,920m ³ 10,582m ³ 6,475m ³ Total 31,317m ³	The access track route has been subject to a number of design iterations to avoid deeper peat and steep slopes.	2,000m ³ 6,400m ³ 7,150m ³ 8750m ³ Total 24,300m ³	Verge reinstatement and visual screening, particularly along access track. Sections of the route may require cut and fill and these slopes would require reinstatement to minimise visual impact. Excavated peaty soil would be temporarily stored along access tracks limited to 0.5m height.	Avoidance was first level of screening to avoid areas of thicker peat. Routing has been planned on thinner peat or peaty soils where possible. The layout design has been guided by constraints which highlight ecological, hydrogeological and geomorphological - all of which identify the peat areas to avoid.	Requires detailed ground investigation to fully characterise extent of peat and peaty soils. Detailed assessment may identify lengths of floating access tracks, which would further reduce requirement for excavation.
Turbine Foundations 16 No. turbines with average excavation of 25m diameter.	1,792m ³	Turbine locations have been subject to a number of design iterations to avoid thicker peat and steep slopes.	1,280m ³	At turbine foundations topsoil would be stripped keeping top 200mm of turf intact. This would be stored adjacent to the base working area and would be limited to 0.5m height.	Avoided areas of thick peat for turbine bases where possible to minimise removal of excessive materials.	Requires detailed ground investigation to fully characterise peat and peaty soils.

Method	Volume of Excavated Material (m³)	Opportunity for Avoidance or Minimisation of Excavated Material	Volume of Re- use Material (m³)	Re-use Requirements	Hierarchy Adherence	Limitations and Considerations
Permanent Hardstanding 16 No. with an average excavation area of 3296m ² .	13,313m ³	Hardstanding locations have been influenced by the turbine design iterations to avoid thicker peat and steep slopes.	3,200m ³	At crane hardstandings topsoil would be stripped keeping top 200 mm of turf intact. This would be stored adjacent to the base working area and would be limited to 0.5m height.	Avoided areas of thick peat for turbine crane pads to minimise removal of excessive materials. Orientation of crane hardstandings to be designed following detailed ground investigation, to avoid constraints and further minimise requirement for peat excavation.	Requires detailed ground investigation to fully characterise peat and peaty soils.
Temporary Hardstanding 16 No. with an average excavation area of 3197m ² .	12,914m ³	Hardstanding locations have been influenced by the turbine design iterations to avoid thicker peat and steep slopes.	12,914m ³	At temporary crane hardstandings materials would be re-used on site to reinstate working areas and for appropriate landscaping.	Avoided areas of thick peat for turbine crane pads to minimise removal of excessive materials. Orientation of crane hardstandings to be designed following detailed ground investigation, to avoid constraints and minimise requirement for peat excavation.	Requires detailed ground investigation to fully characterise peat and peaty soils.
Substation Option 1 with an approximate area of 20025m ² and 0.26m thickness of peat.	5,207m ³	The proposed substation compound would largely be located on peaty soils adjacent to the	560m ³	Materials would be re-used on site to reinstate working areas and for appropriate landscaping.	Avoided siting substation on thick peat areas where possible.	Requires detailed ground investigation to fully characterise ground conditions.

Method	Volume of Excavated Material (m³)	Opportunity for Avoidance or Minimisation of Excavated Material	Volume of Re- use Material (m³)	Re-use Requirements	Hierarchy Adherence	Limitations and Considerations
		proposed access tracks.				
Substation Option 2 with an approximate area of 19975m ² and 0.33m thickness of peat.	6,592m ³	The proposed substation compound would largely be located on peaty soils adjacent to the proposed access tracks.	560m ³	Materials would be re-used on site to reinstate working areas and for appropriate landscaping.	Avoided siting substation on thick peat areas where possible.	Requires detailed ground investigation to fully characterise ground conditions.
Temporary Construction Compound 1 with an approximate area of 5375m ² and 0.11m thickness of peat.	607m ³	The proposed construction compound would largely be located on peaty/glacial soils adjacent to the proposed access tracks.	2,688m ³	Materials would be re-used on site to reinstate working areas and for appropriate landscaping.	Avoided siting Construction Compound on thick peat areas where possible.	Requires detailed ground investigation to fully characterise ground conditions.
Temporary Construction Compound 2 with an approximate area of 4975m ² and 0.48m thickness of peat.	2,390m ³	The proposed construction compound would largely be located on peaty/glacial soils adjacent to the proposed access tracks.	2,488m ³	Materials would be re-used on site to reinstate working areas and for appropriate landscaping.	Avoided siting Construction Compound on thick peat areas where possible.	Requires detailed ground investigation to fully characterise ground conditions.
Borrow Pits There are 4 No. borrow pit options,	Borrow Pit 1: 908m ³ Borrow Pit 2: 4,806m ³	There is limited peaty soils overlying the	Borrow Pit 1: 15,250m ³ Borrow Pit 2: 18,100m ³	Limited peaty topsoil can be stockpiled and used for reinstatement.	Site selection avoided areas of peat for borrow pits, identified sites on bedrock or close to	Current calculations are based on conservative re- use and based on the use of all four borrow pits.

Method	Volume of Excavated Material (m³)	Opportunity for Avoidance or Minimisation of Excavated Material	Volume of Re- use Material (m³)	Re-use Requirements	Hierarchy Adherence	Limitations and Considerations
generally covered by peaty soils.	Borrow Pit 3: 507m ³ Borrow Pit 4: 1,372m ³	selected borrow pits.	Borrow Pit 3: 5,675m ³ Borrow Pit 4: 23,025m ³	Peat/peaty soils from elsewhere on-site could be used to restore the proposed borrow pits.	minimise removal of excessive materials.	Detailed ground investigation is required to assess the ground conditions at each site.
Total Excavated	81,776m ³		Total Re-use	110,039m ³		

6.0 Peat Classification

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

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

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

The majority of the excavated peat is therefore entirely re-useable as it is predominantly fibrous and easily re-used on-site. Areas of deep peat have been avoided by design, where possible.

Excavated Material	Indicative Volume on Site by % of total excavated soils	ls there a suitable use for material	Is the Material required for use on Site	Material Classified as Waste	Re-use Potential	Re-use on Site
Mineral Soil	25	Yes	Yes	Not classified as waste	Yes	Will be re-used in reinstatement of floated access track verges, cut and fill verges,
Turf (Surface layer of vegetation and fibrous matt)	35	Yes	Yes	Not classified as waste	Yes	road verges, side slopes and check drains. Peripheral embankments of turbine bases, crane hardstandings and reinstatement of borrow pits.
Acrotelmic peat	35	Yes	Yes	Not classified as waste	Yes	Will be re-used in reinstatement of floated access track verges, cut and fill verges, road verges, side slopes and check drains. Peripheral embankments of turbine bases, crane hardstandings and reinstatement of borrow pits.
Catotelmic Peat (amorphous material unable to stand unsupported when stockpiled >1m)	5 Very limited as it has been avoided by design.	Potentially	Potentially*	Potentially if not required as justifiable reinstatement of habitat management works	Limited	If peat does not require treatment prior to re-use it can be used on-site providing adequate justification and method statements are provided and approved by SEPA. If it is unsuitable for use without treatment then it may be regarded as a waste. However every attempt to avoid this type of peat has been incorporated into the design.

Table C: Excavated Materials – Assessment of Suitability

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

7.0 Conclusion

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

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

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

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



Figures

Technical Appendix 10.2: Outline Peat Management Plan

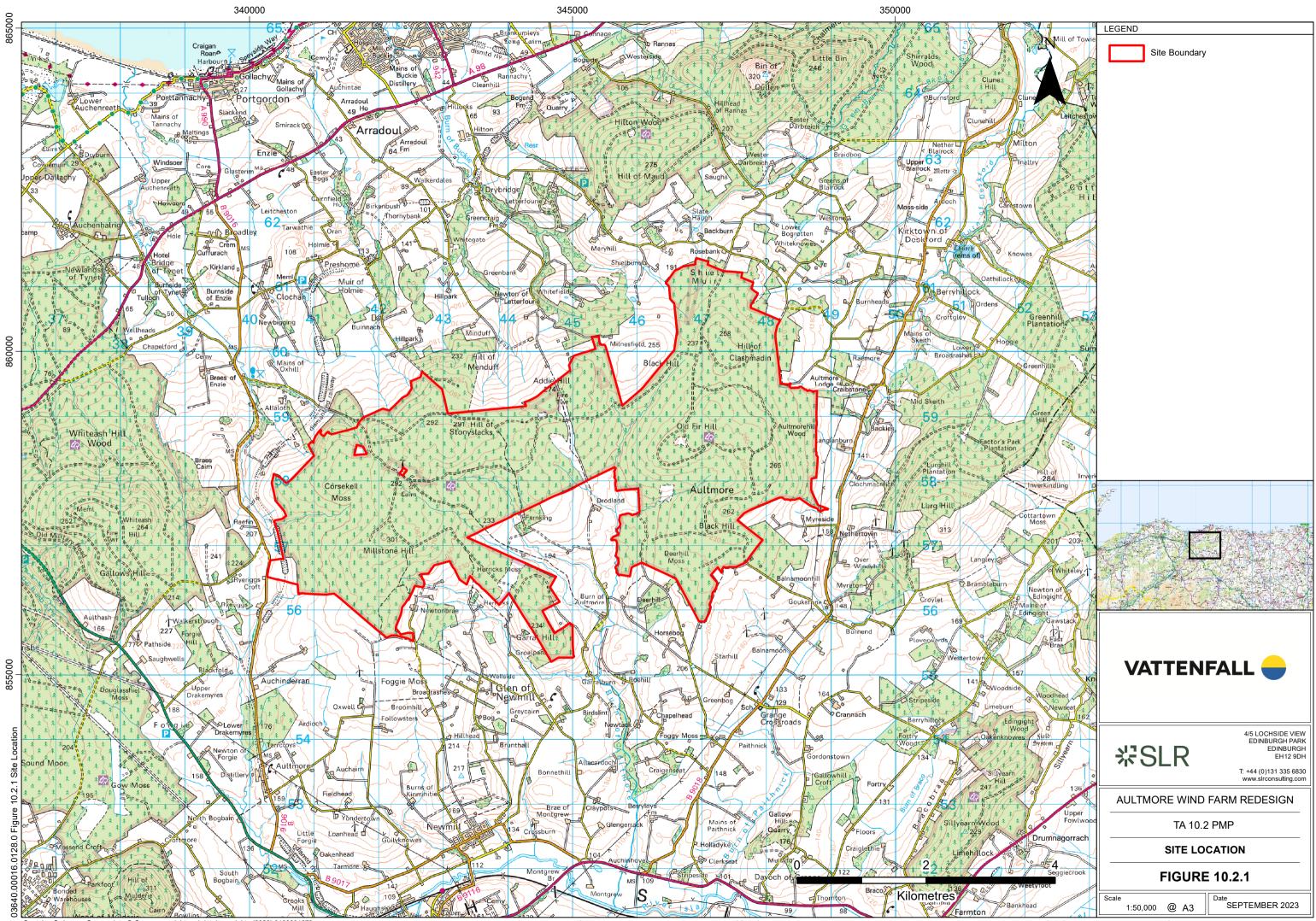
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Vattenfall Wind Power Limited

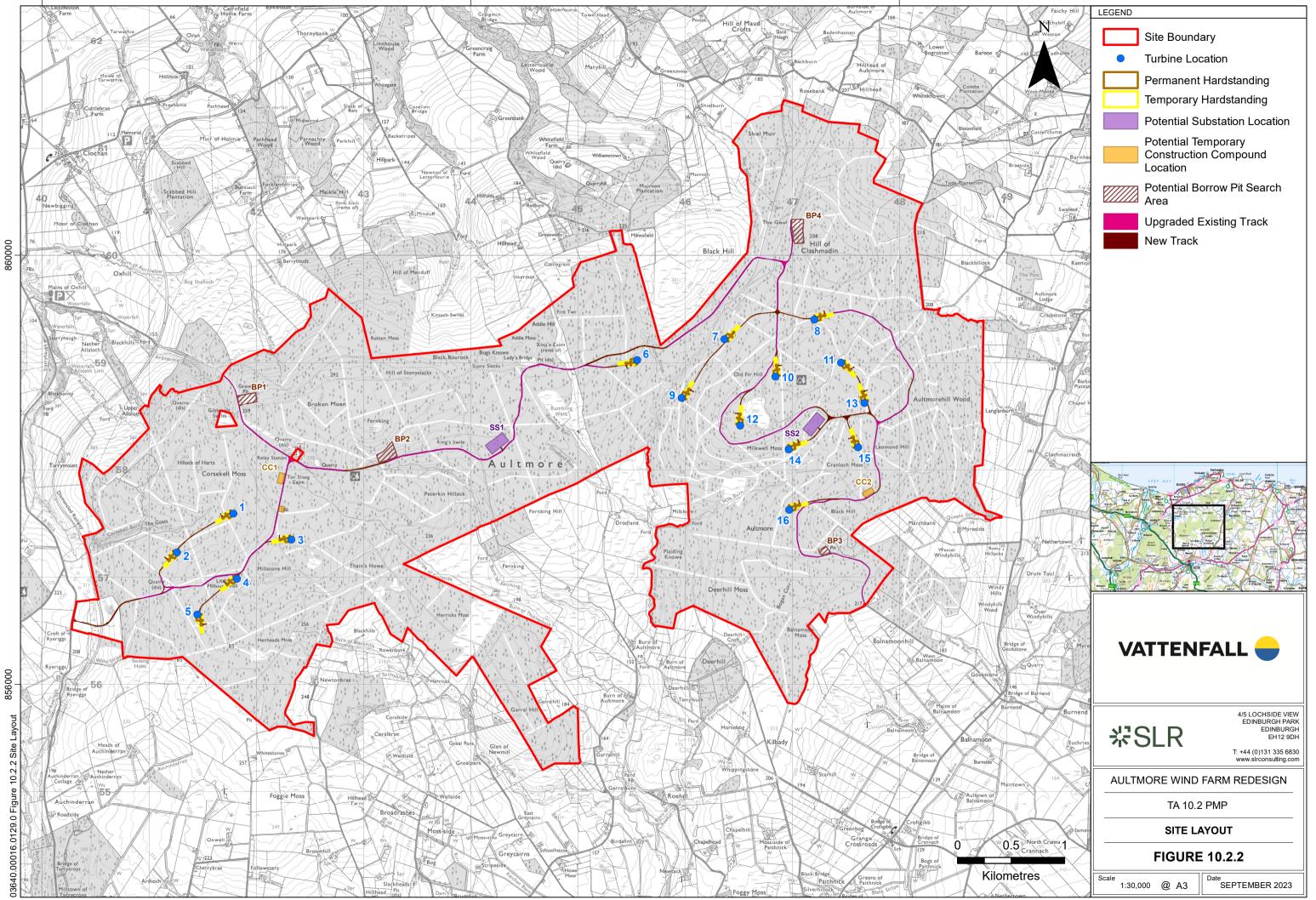
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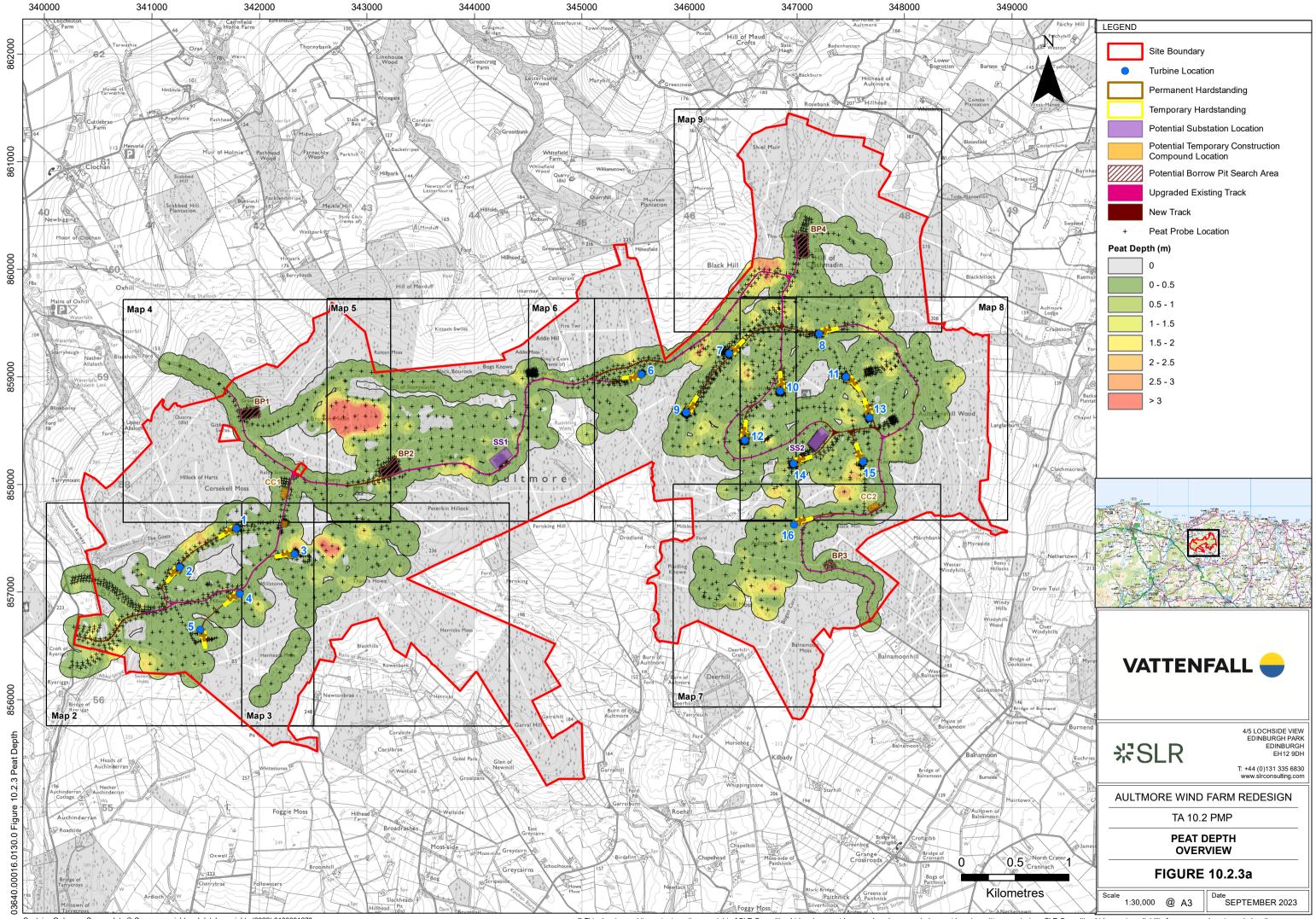


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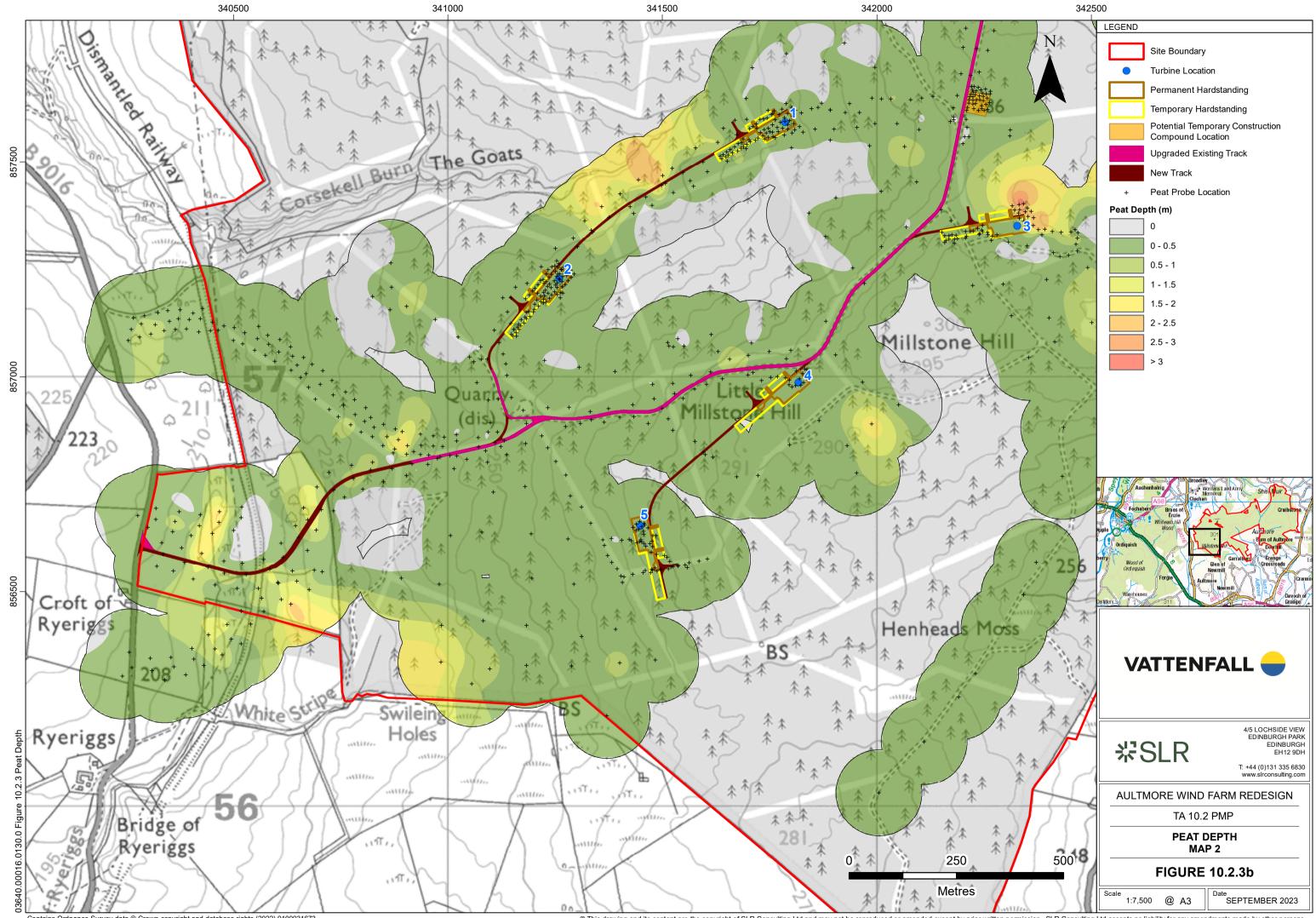
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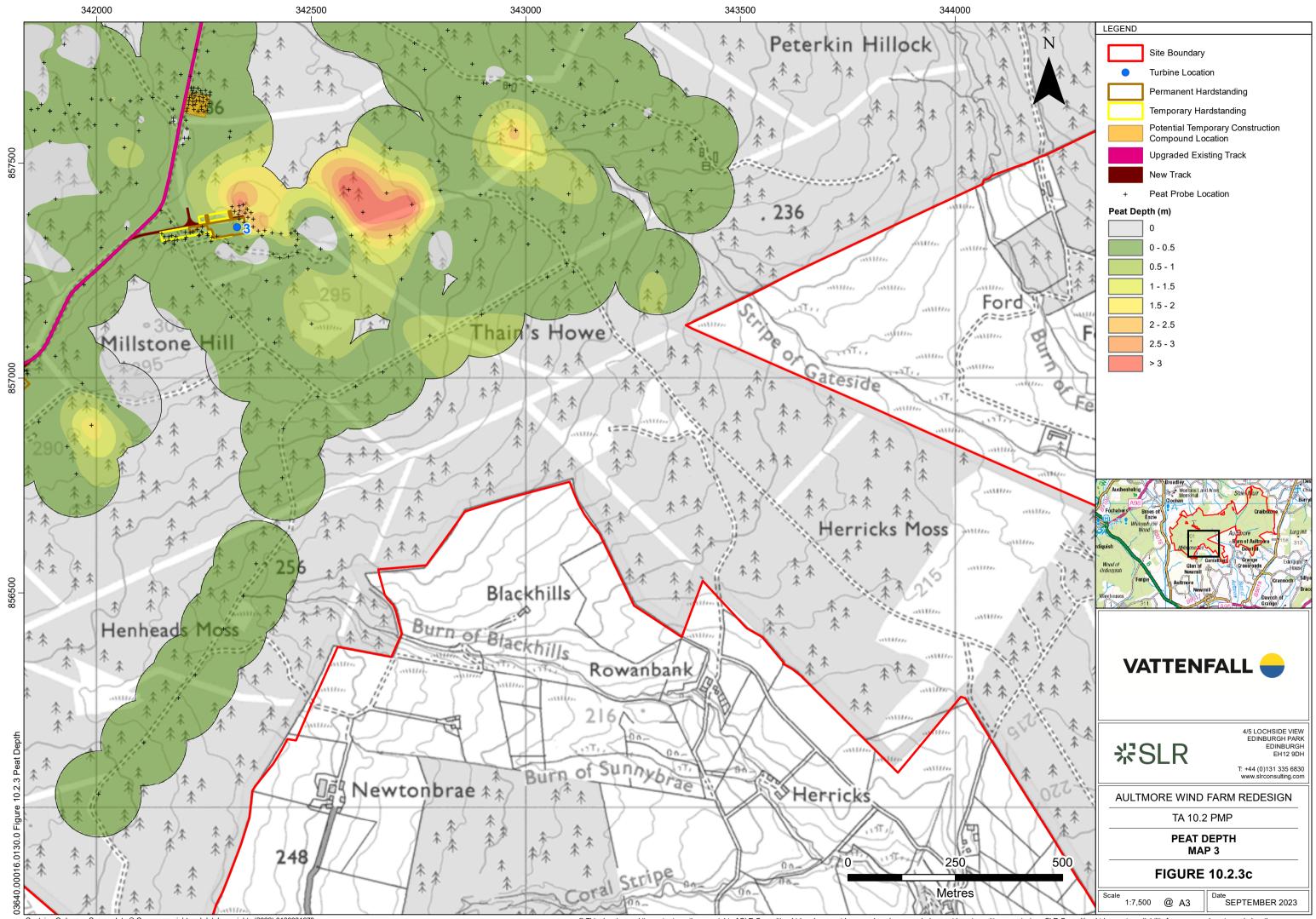
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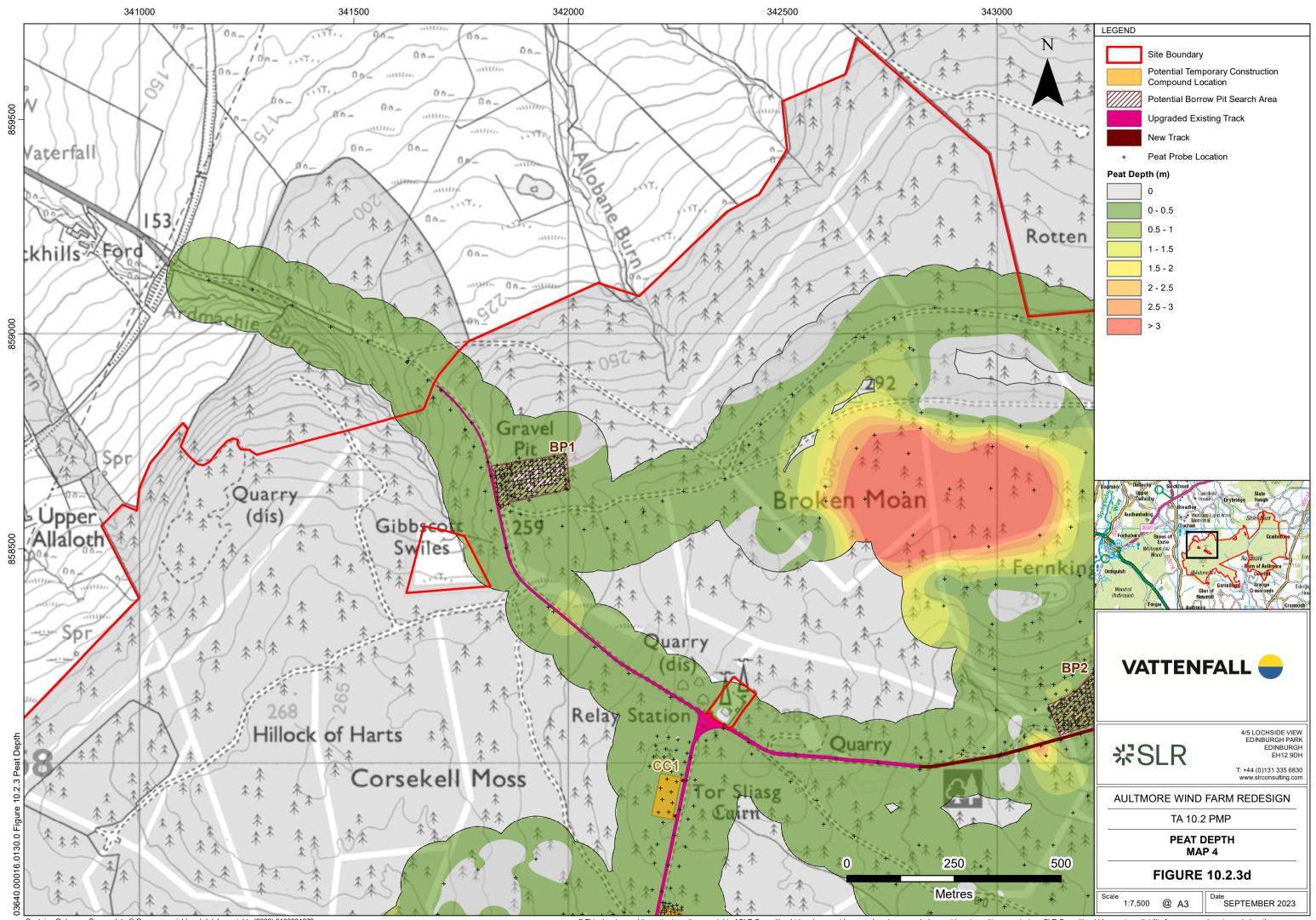
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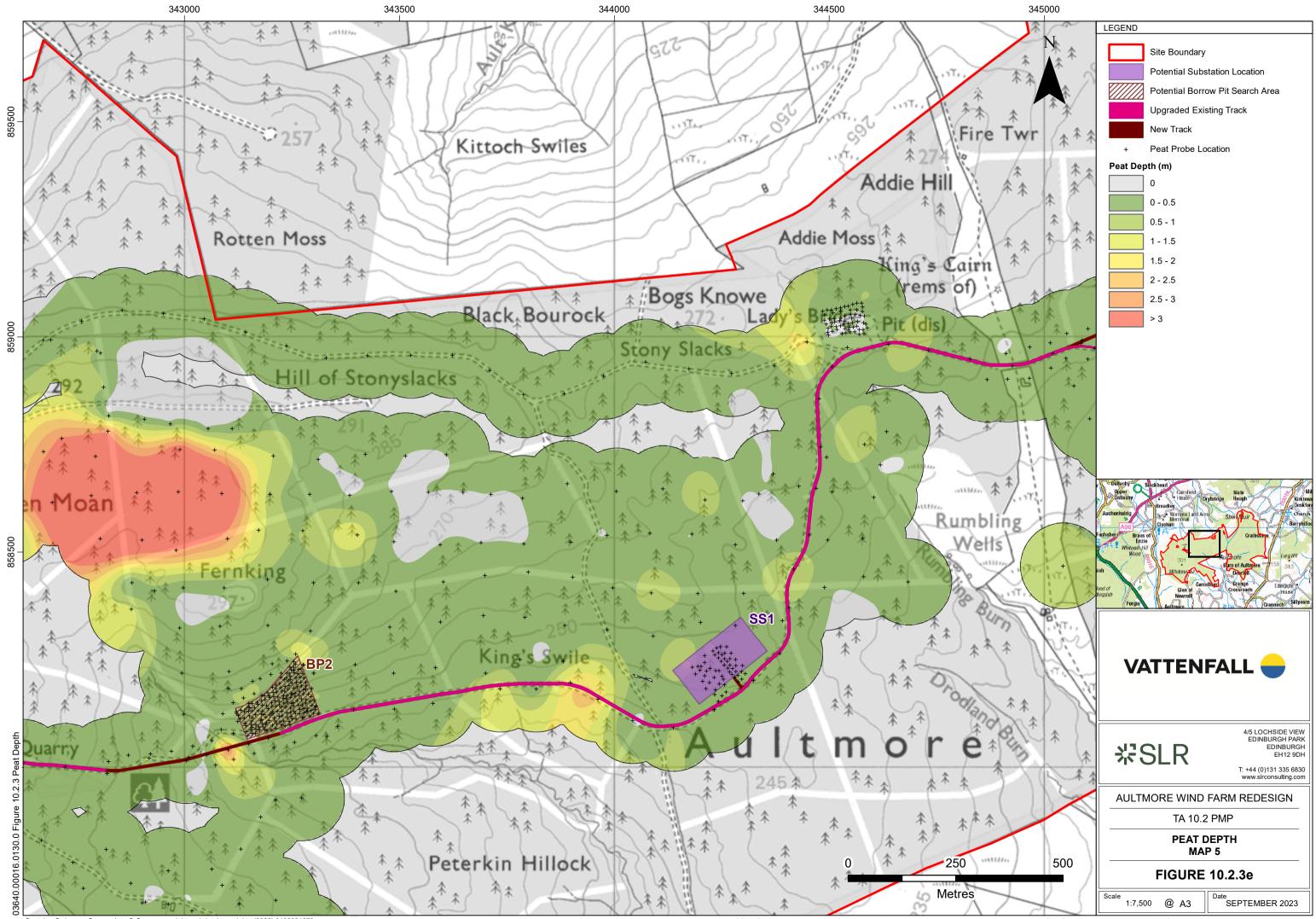


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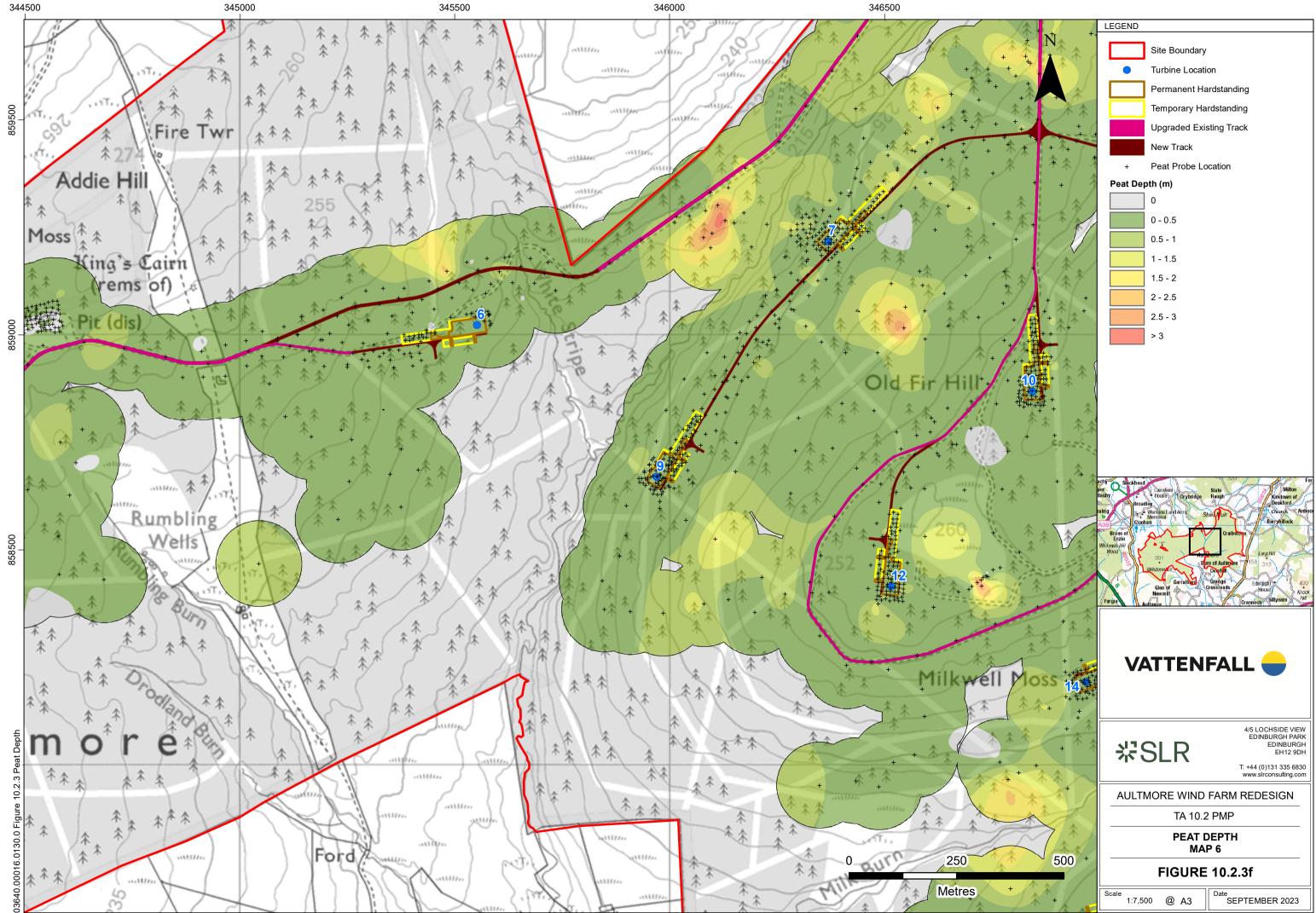
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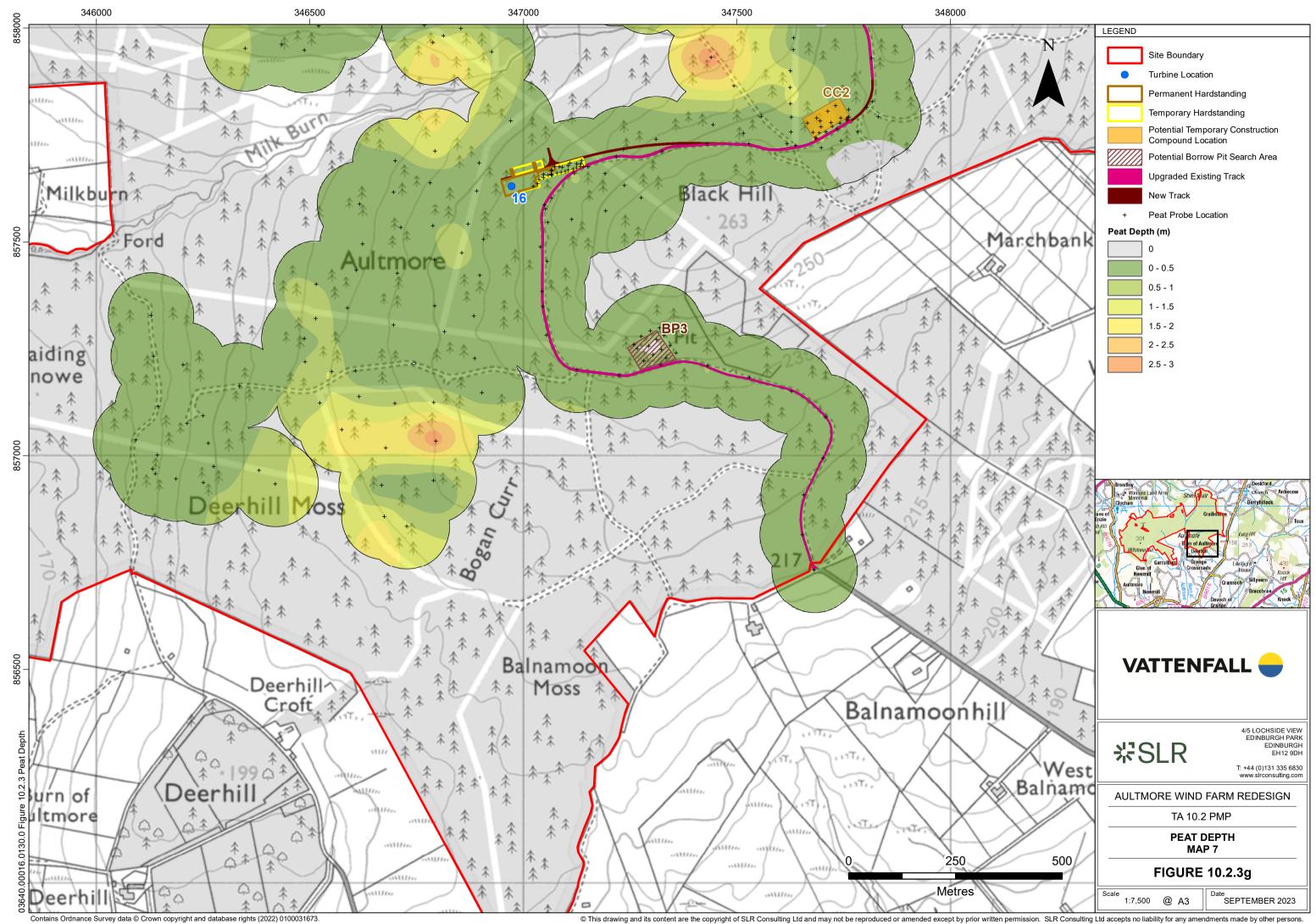
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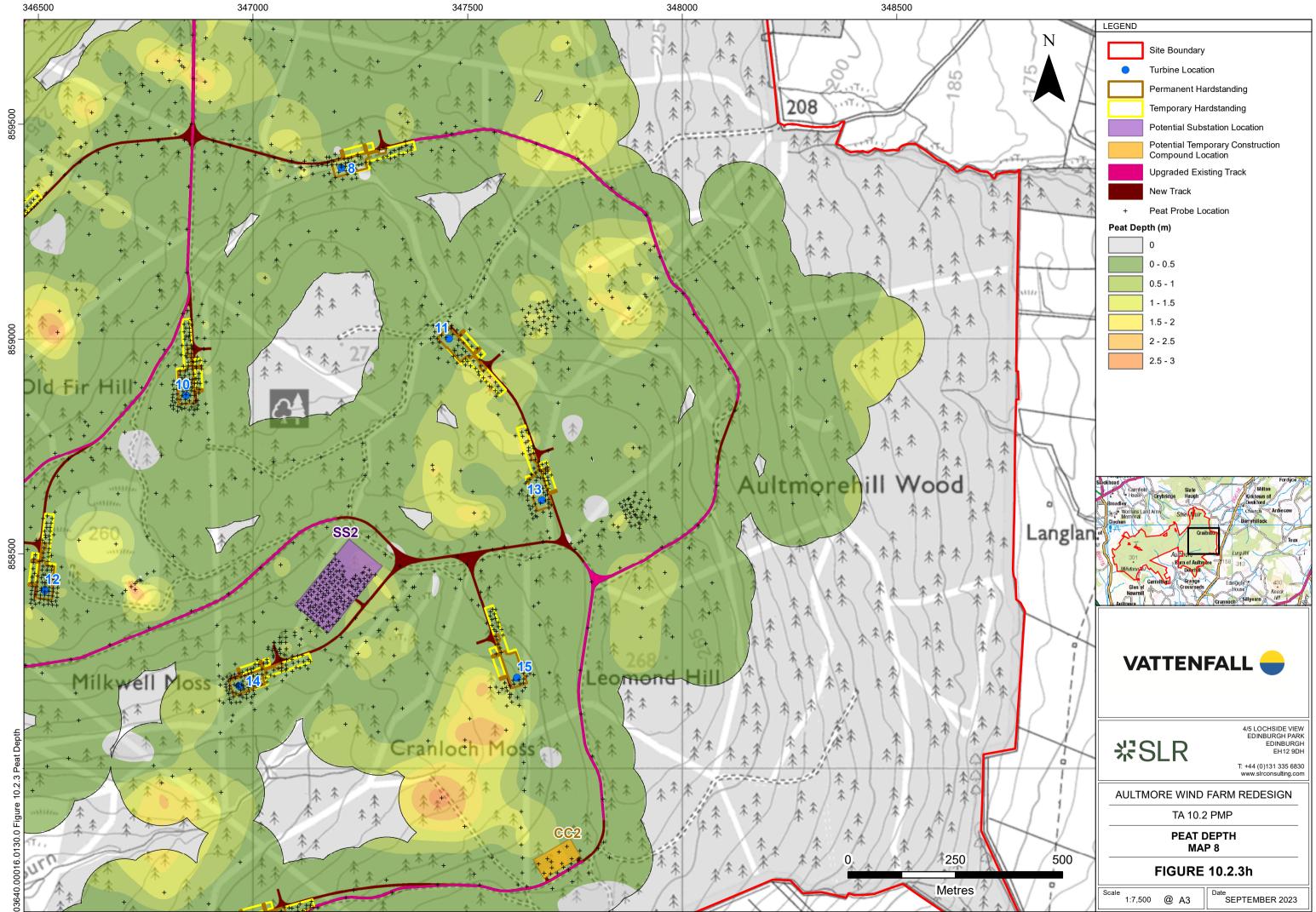




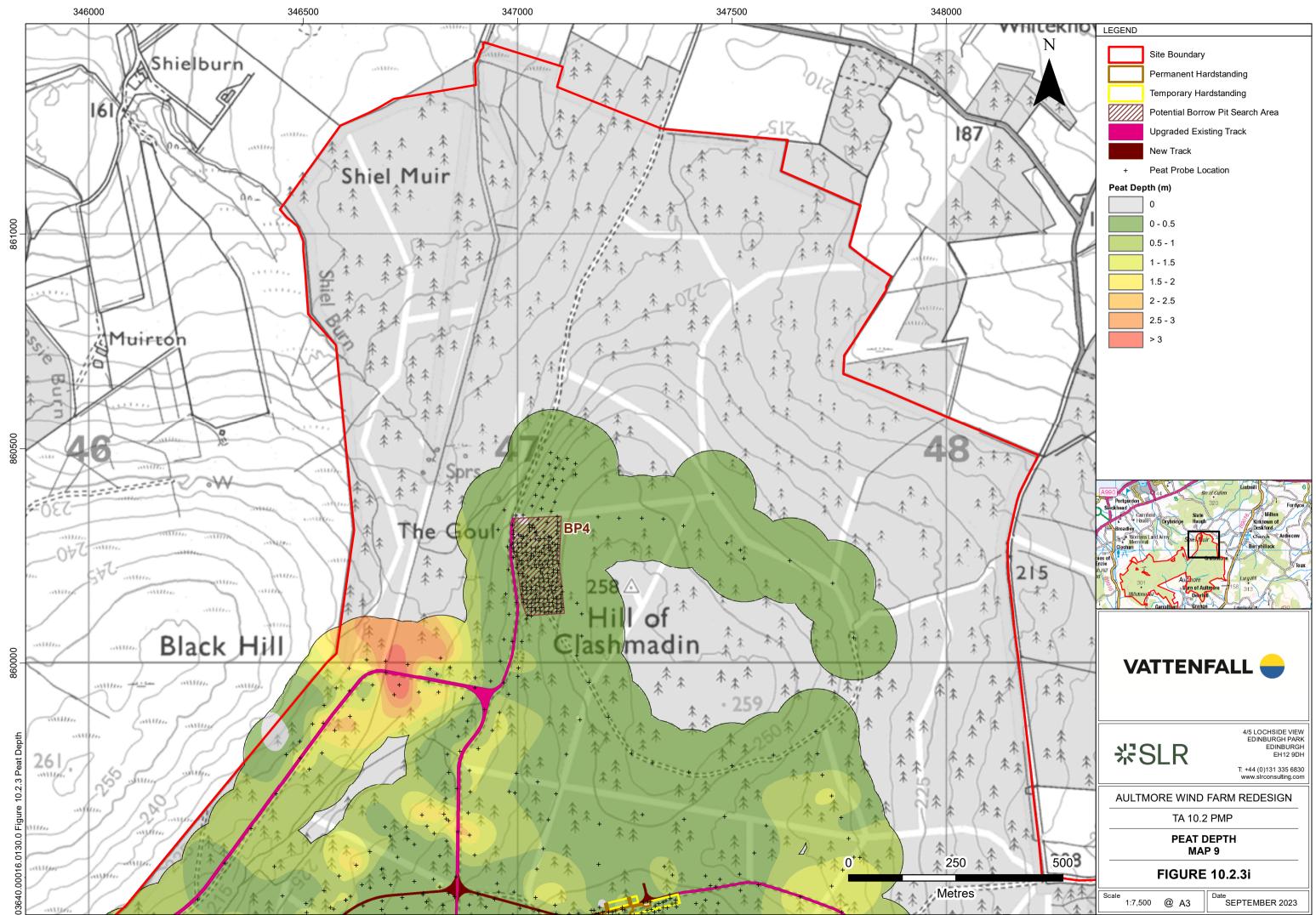
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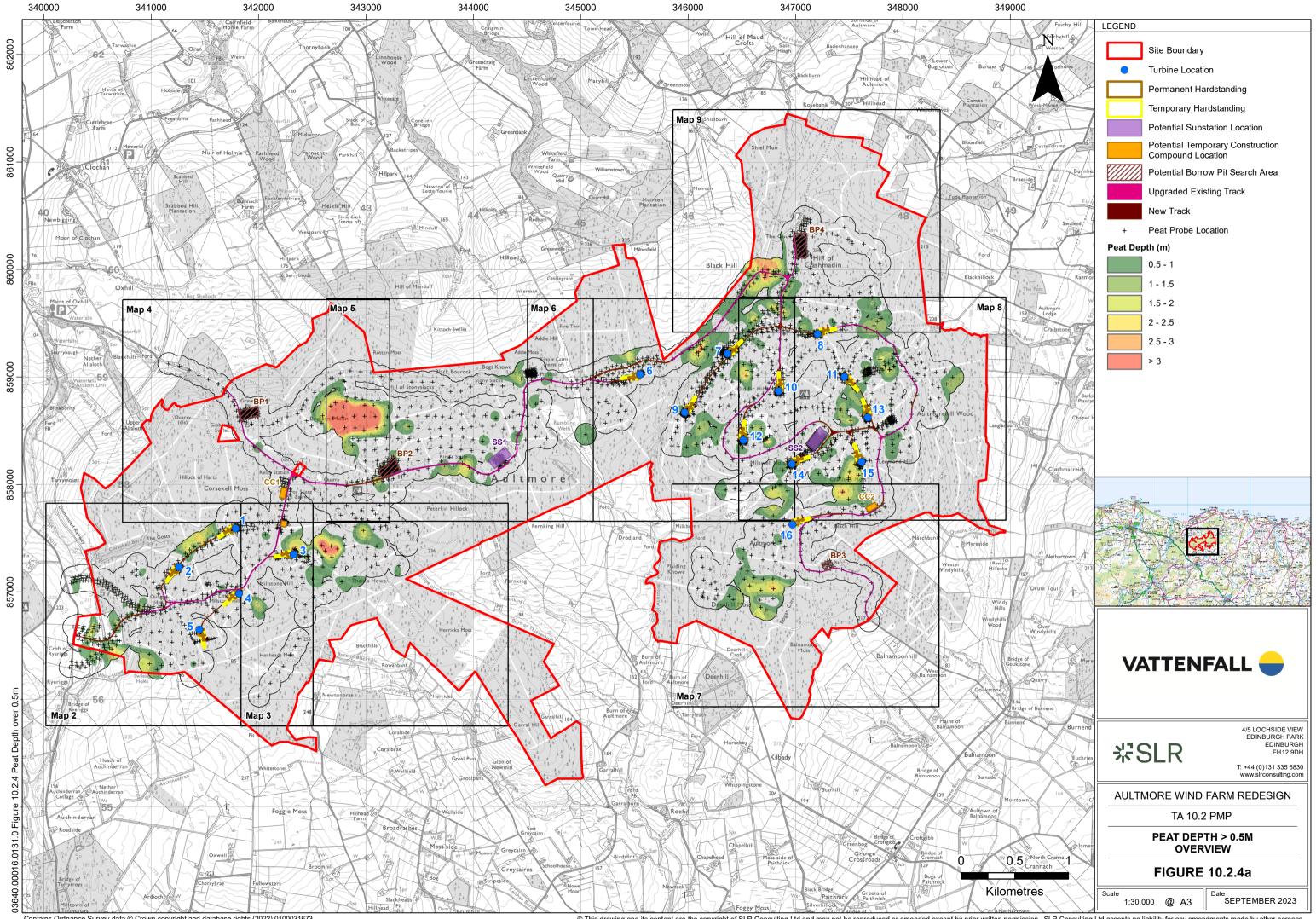


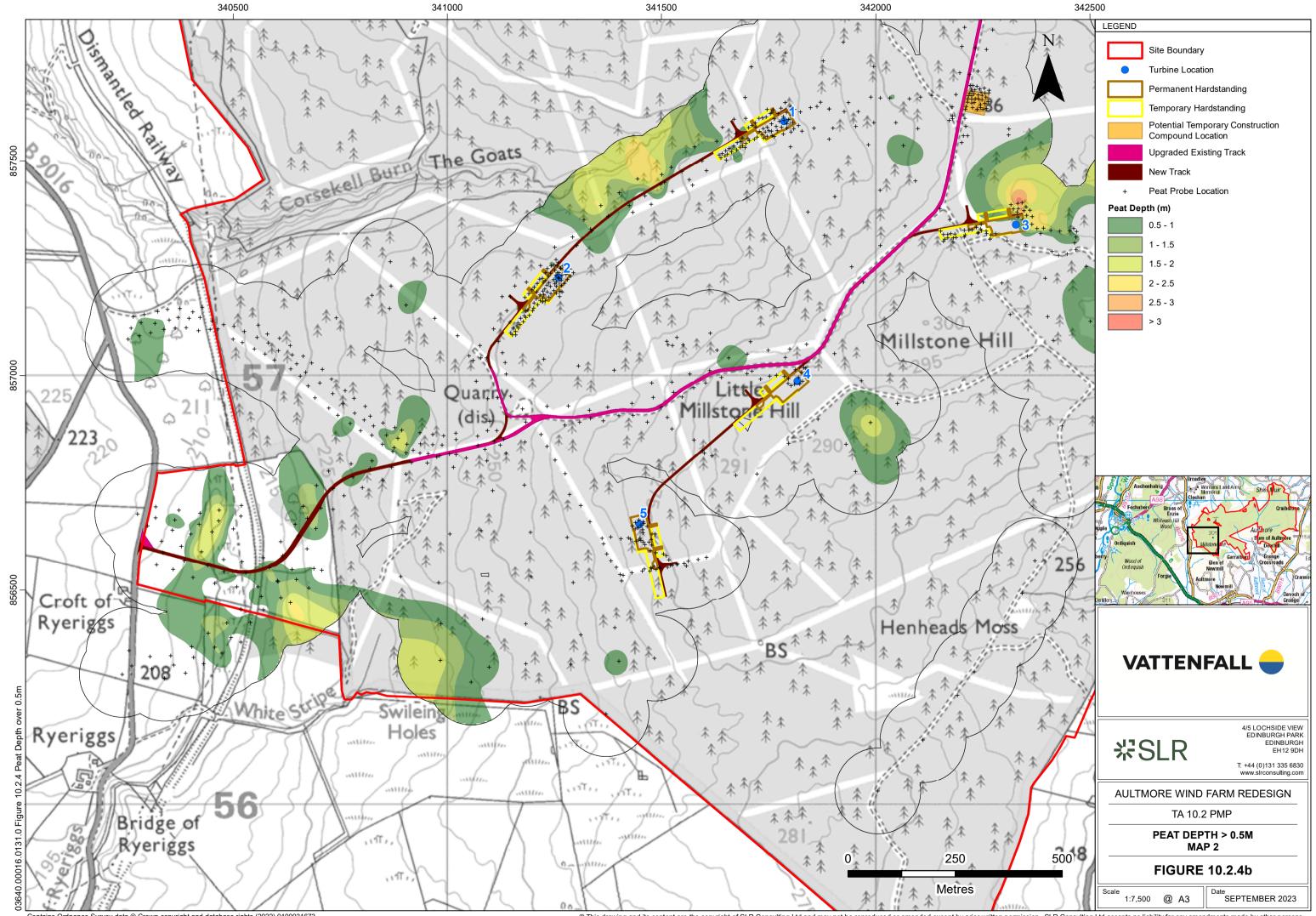
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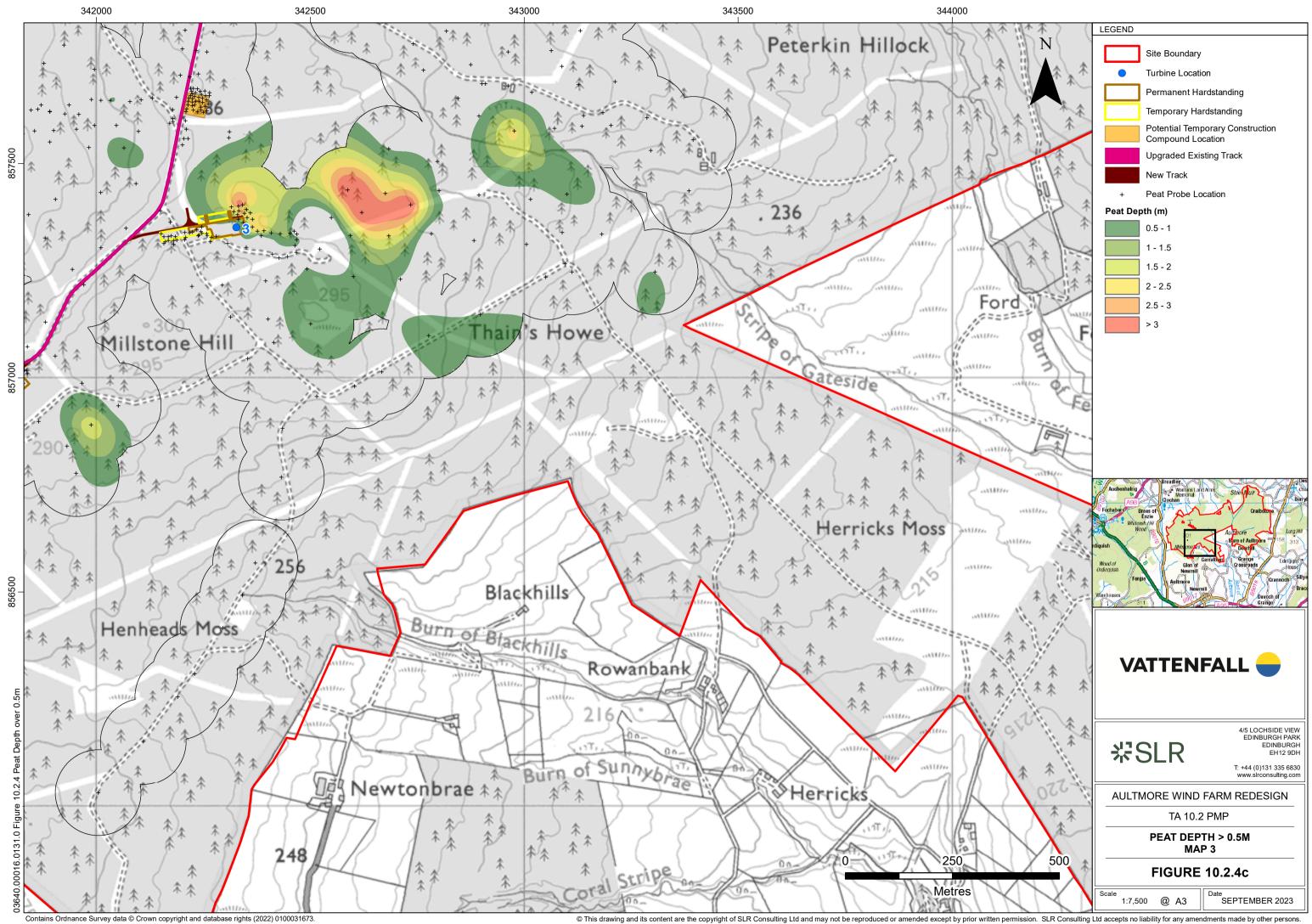
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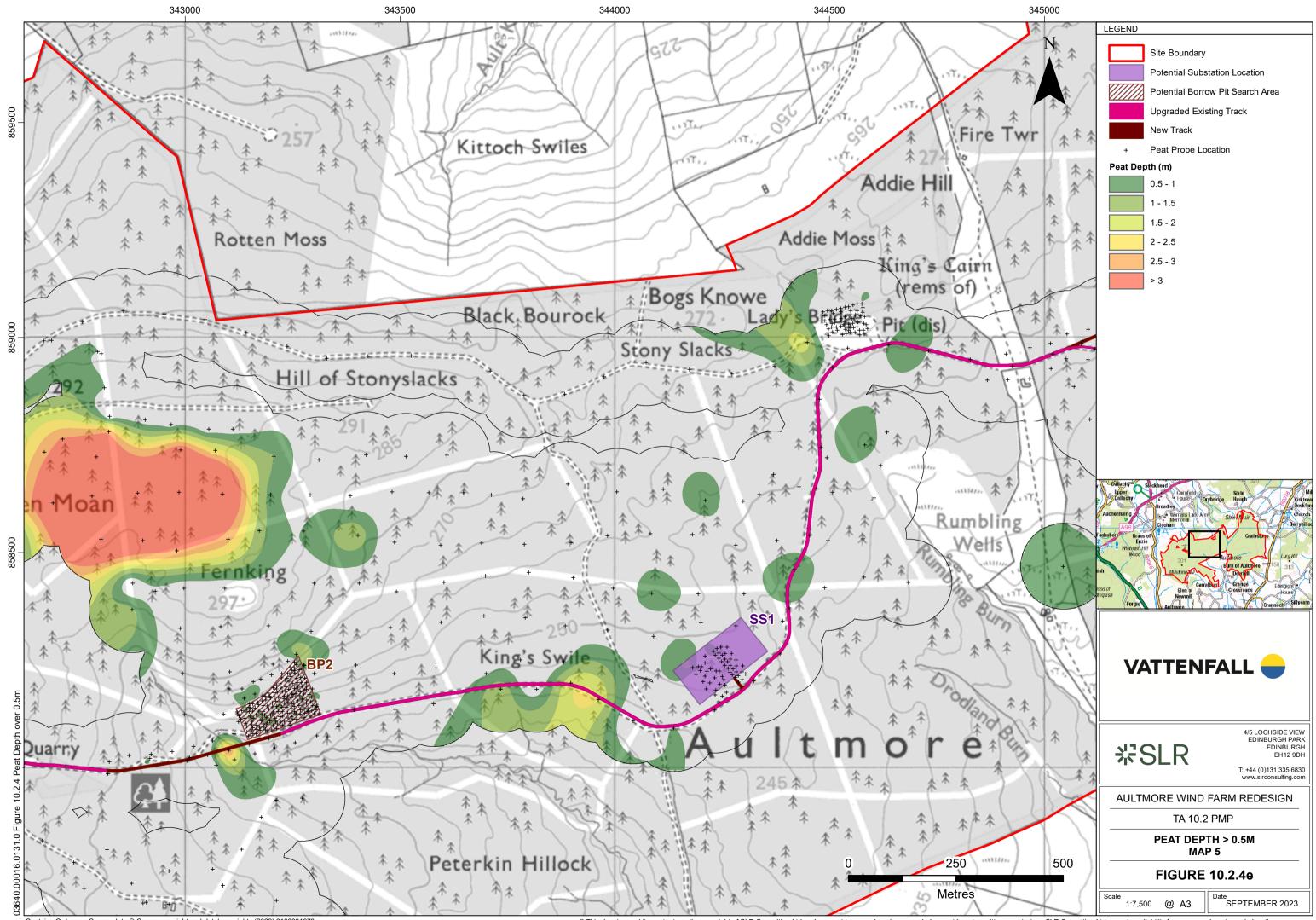
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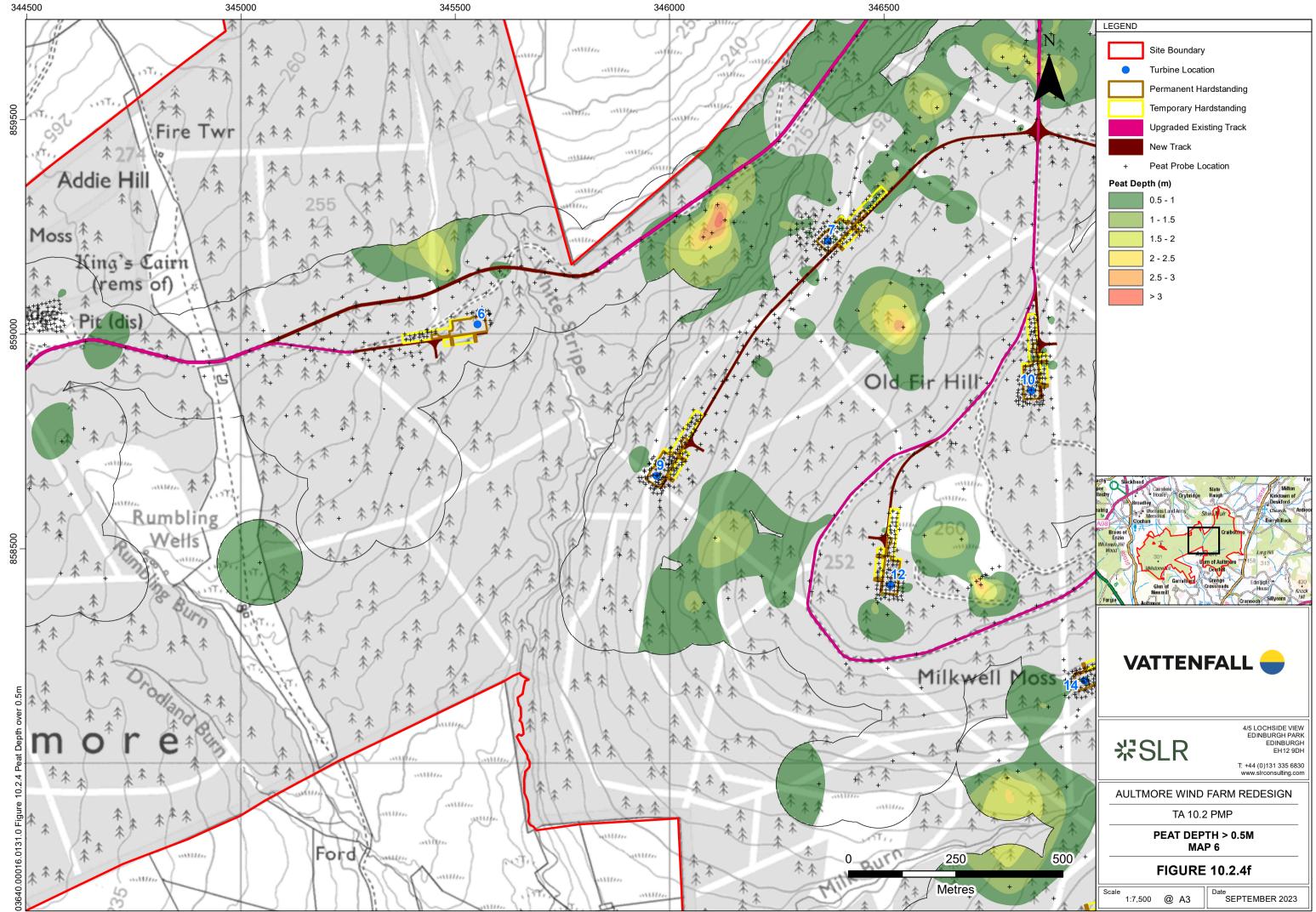
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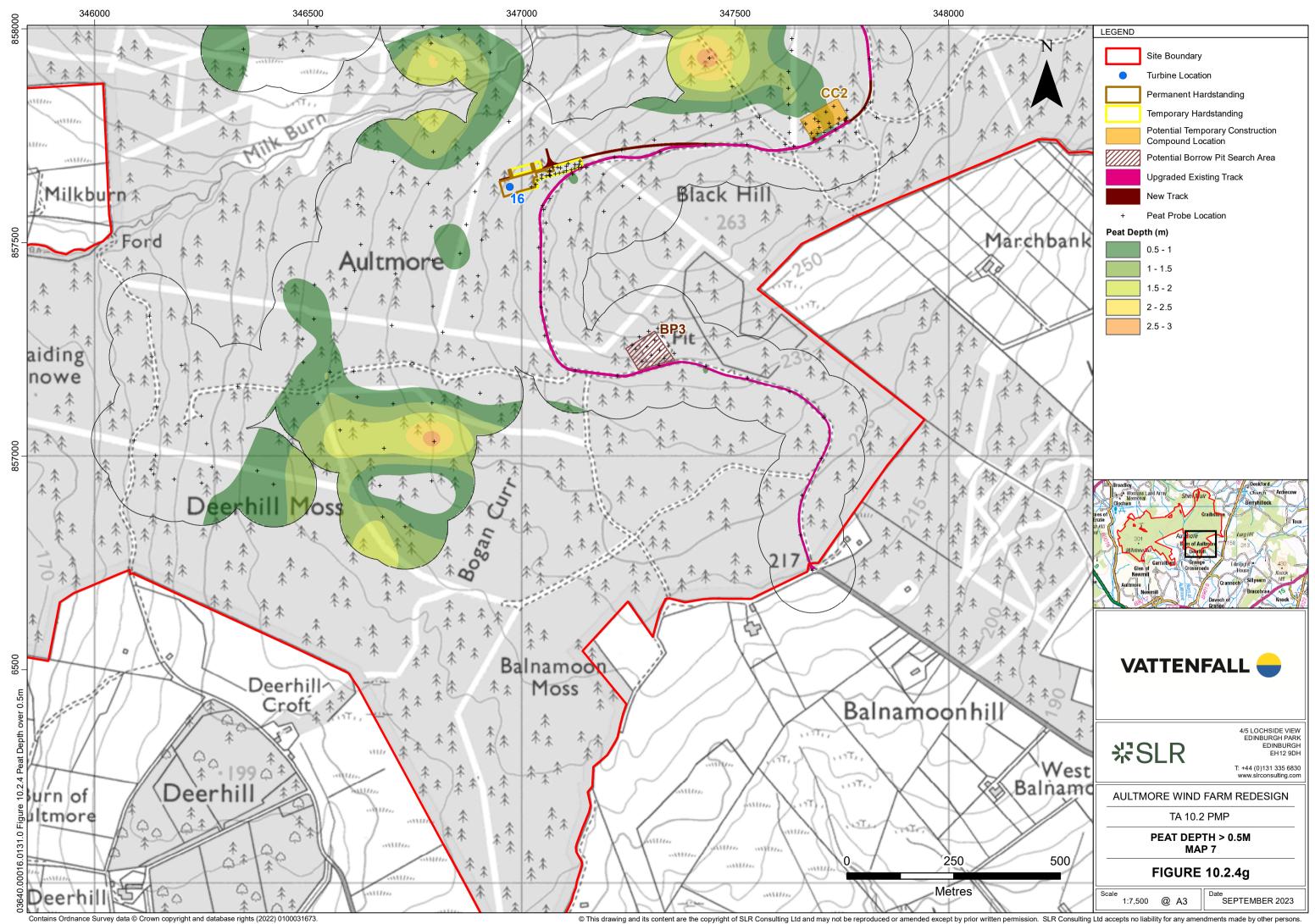
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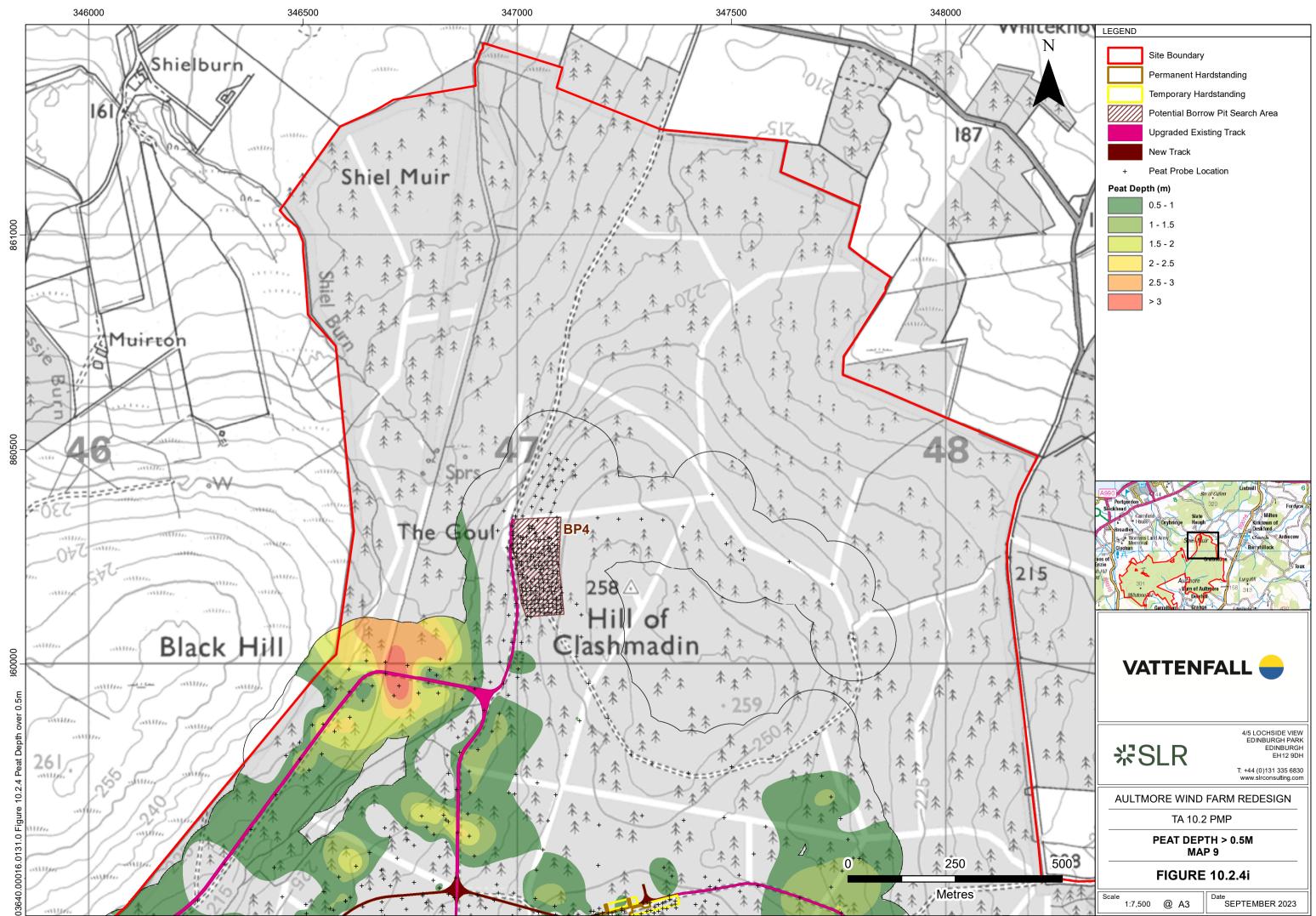








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Annex A Excavated Materials Calculations

Technical Appendix 10.2: Outline Peat Management Plan

Aultmore Wind Farm Redesign

Vattenfall Wind Power Limited

SLR Project No.: 405.03640.00016

21 November 2023



Infrastructure	Length (m)	Width (m)	Area (m ²)	Average Depth (m)	Number	Total Excavated Volume Soils (m ³)	Total Excavated Volume Peat (m ³)	Length (m)	Width (m)	Area (m²)	Average Depth (m)	Number	Total Re-use Volume of Peaty Soils (m ³)	Total Re-use Volume of Peat (m ³)	Balance of Peaty Soils (m ³)	Balance of Peat (m ³)	Notes
ite Track (New) 7m wide	2000	7	14000	0.31	1	4340		2000	1	2000	0.50	2	2000		2340		
ite Track (New) 5m wide	6400	5	32000	0.31	1	9920		6400	1	6400	0.50	2	6400		3520		
ite Track (Upgraded) 7m wide ite Track (Upgraded) 5m wide	7150 8750	4	28600 17500	0.37	1	10582 6475		7150 8750	1	7150 8750	0.50	2	7150 8750		3432		
urbine Base - formation only - T1	8750	2	491	0.14	1	69		8750	2	160	0.50	1	8750		-2275		
urbine Base - formation only - T2			491	0.21	1	104		80	2	160	0.50	1	80		24		
urbine Base - formation only - T3		-	491	0.37	1	182		80	2	160	0.50	1	80		102		
urbine Base - formation only - T4	-	-	491	0.20	1	99		80	2	160	0.50	1	80		19		
urbine Base - formation only - T5	-	-	491	0.08	1	41		80	2	160	0.50	1	80		-39		
urbine Base - formation only - T6	-	-	491	0.11	1	54		80	2	160	0.50	1	80		-26		
urbine Base - formation only - T7	-	-	491	0.18	1	86		80	2	160	0.50	1	80		6		
urbine Base - formation only - T8	-	-	491	0.47	1	230		80	2	160	0.50	1	80		150		
urbine Base - formation only - T9	-	-	491	0.23	1	114		80	2	160	0.50	1	80		34		
urbine Base - formation only - T10	-	-	491	0.16	1	78		80	2	160	0.50	1	80		-2		
urbine Base - formation only - T11	-	-	491	0.12	1	60		80	2	160	0.50	1	80		-20		
urbine Base - formation only - T12	-		491	0.13	1	66		80	2	160	0.50	1	80		-14		
urbine Base - formation only - T13 urbine Base - formation only - T14		-	491 491	0.19	1	93 136		80 80	2	160 160	0.50	1	80 80		13 56		
urbine Base - formation only - 114			491	0.28	1	150	380	80	2	160	0.50	1	00	80	50	300	>0.5m peat noted
urbine Base - formation only - T15		-	491	0.10	1	51	500	80	2	160	0.50	1	80		-29	500	. o.om peut noteu
ardstanding Permenant - T1		-	3296	0.20	1	669		200	2	400	0.50	1	200		469		
ardstanding Permenant - T2		-	3296	0.21	1	704		200	2	400	0.50	1	200		504		
ardstanding Permenant - T3	-	-	3296	0.38	1	1260		200	2	400	0.50	1	200		1060		
ardstanding Permenant - T4	-	-	3296	0.09	1	306		200	2	400	0.50	1	200		106		
ardstanding Permenant - T5	-	-	3296	0.09	1	302		200	2	400	0.50	1	200		102		
ardstanding Permenant - T6	-	-	3296	0.17	1	568		200	2	400	0.50	1	200		368		
ardstanding Permenant - T7	-	-	3296	0.35	1	1153		200	2	400	0.50	1	200		953		
ardstanding Permenant - T8	-	-	3296	0.38	1	1269		200	2	400	0.50	1	200		1069		
ardstanding Permenant - T9	-		3296	0.20	1	663		200	2	400	0.50	1	200		463		
ardstanding Permenant - T10	-	-	3296	0.24	1	790		200	2	400	0.50	1	200		590		
ardstanding Permenant - T11 ardstanding Permenant - T12		-	3296	0.51	1	520	1669	200	2	400	0.50	1	200	200	220	1469	>0.5m peat noted
arostanding Permenant - 112 lardstanding Permenant - T13		-	3296 3296	0.16	1	538 626		200	2	400	0.50	1	200 200		338 426		
ardstanding Permenant - 113			3296	0.19	1	740		200	2	400	0.50	1	200		540		
ardstanding Permenant - T15			3296	0.48	1	1597		200	2	400	0.50	1	200		1397		
ardstanding Permenant - T16	-	-	3296	0.14	1	459		200	2	400	0.50	1	200		259		
ardstanding Temporary - T1	-	-	3197	0.20	1	649			-	3197	0.20	1	649		0		
ardstanding Temporary - T2	-		3197	0.21	1	683		-	-	3197	0.21	1	683		0		
ardstanding Temporary - T3	-	-	3197	0.38	1	1222		-	-	3197	0.38	1	1222		0		
ardstanding Temporary - T4	-	-	3197	0.09	1	296		-	-	3197	0.09	1	296		0		
ardstanding Temporary - T5	-	-	3197	0.09	1	293		-	-	3197	0.09	1	293		0		
ardstanding Temporary - T6	-		3197	0.17	1	551			-	3197	0.17	1	551		0		
ardstanding Temporary - T7	-	-	3197	0.35	1	1119		-	-	3197	0.35	1	1119		0		
ardstanding Temporary - T8	-	-	3197	0.38	1	1231			-	3197	0.38	1	1231		0		
lardstanding Temporary - T9	-	-	3197	0.20	1	643		-	-	3197	0.20	1	643		0		
lardstanding Temporary - T10			3197 3197	0.24	1	766	1618		-	3197 3197	0.24	1	766	1618	0	0	>0.5m peat noted
lardstanding Temporary - T11 lardstanding Temporary - T12		•	3197	0.16	1	522	1018		-	3197	0.51	1	522	1618	0	U	>0.5m peat noted
ardstanding Temporary - 112			3197	0.18	1	607			-	3197	0.18	1	607		0		
ardstanding Temporary - 115			3197	0.19	1	717			-	3197	0.19	1	717		0		
ardstanding Temporary - 114 ardstanding Temporary - 115			3197	0.48	1	1550			-	3197	0.22	1	1550		0		
ardstanding Temporary - T16			3197	0.14	1	446		-	-	3197	0.14	1	446		0		
ubstation Option 1			20025	0.26	1	5207		560	2	1120	0.50	1	560		4647		
ubstation Option 2		-	19975	0.33	1	6592		560	2	1120	0.50	1	560		6032		
emporary Compound 1	-	-	5375	0.11	1	607		-	-	5375	0.50	1	2688		-2081		
emporary Compound 2			4975	0.48	1	2390			-	4975	0.50	1	2488		-98		
orrow Pit 1	-	-	15250	0.06	1	908		-	-	15250	1.00	1	15250		-14342		
orrow Pit 2	-	-	18100	0.27	1	4806		-	-	18100	1.00	1	18100		-13294		
orrow Pit 3	-	-	5675	0.09	1	507		-	-	5675	1.00	1	5675		-5168		-
orrow Pit 4	-	-	23025	0.06	1	1372		-	-	23025	1.00	1	23025		-21653		
otals						78109	3667						108140	1898	-30031	1768	
						81	776	l					110	039	-282	263	
otal Excavated Volume (m³) otal Re-use Volume (m³)	81776																
	110039																



Annex B Peat Coring Data

Technical Appendix 10.2: Outline Peat Management Plan

Aultmore Wind Farm Redesign

Vattenfall Wind Power Limited

SLR Project No.: 405.03640.00016

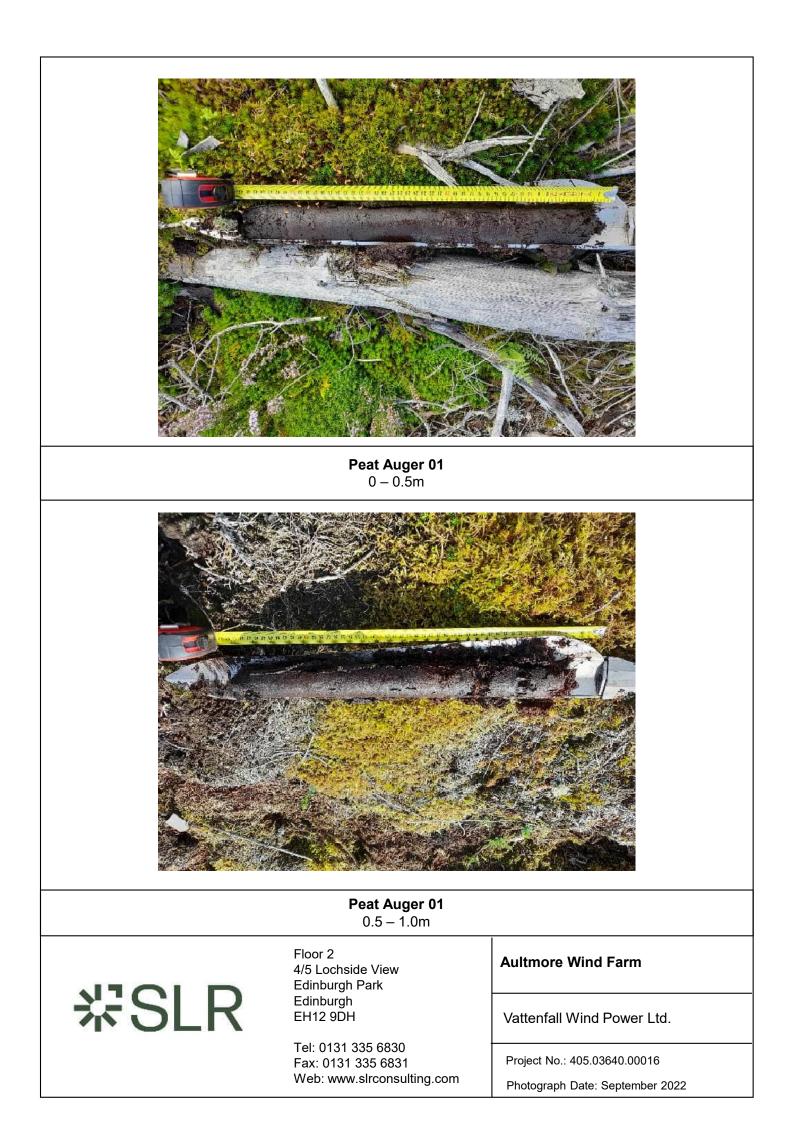
21 November 2023



				Peat Core Log									
Project: A	ultmore Wind Fa	rm		Client: Vattenfall	Wind Powe	r Ltd			Date: 07/09/2022				
Project No	o: 405.03640.000	016		Logger: RW		Approv	ved By:		Coordinates: E: 346709.00 N: 859427.00				
ocation:	Moray, Scotland			Hole Type: PC	Metho	d:			Vertical Scale:	1:11			
Water	Depth (m)	Sample Type	Depth	Recovery (%)	Depth (r Discontinuit		Level (mAOD)	Legend	Stratum Desc	cription			
	0.00 - 0.50	C	0.00 - 0.50 0.50 - 1.00 1.00 - 1.50	Recovery = 100% Recovery = 100% Recovery = 75%		1.00			Dark brown fibrous PEAT with freemains (H2, B2).	with frequent roots and			

Remarks:

Peat core recovered using peat sampler.

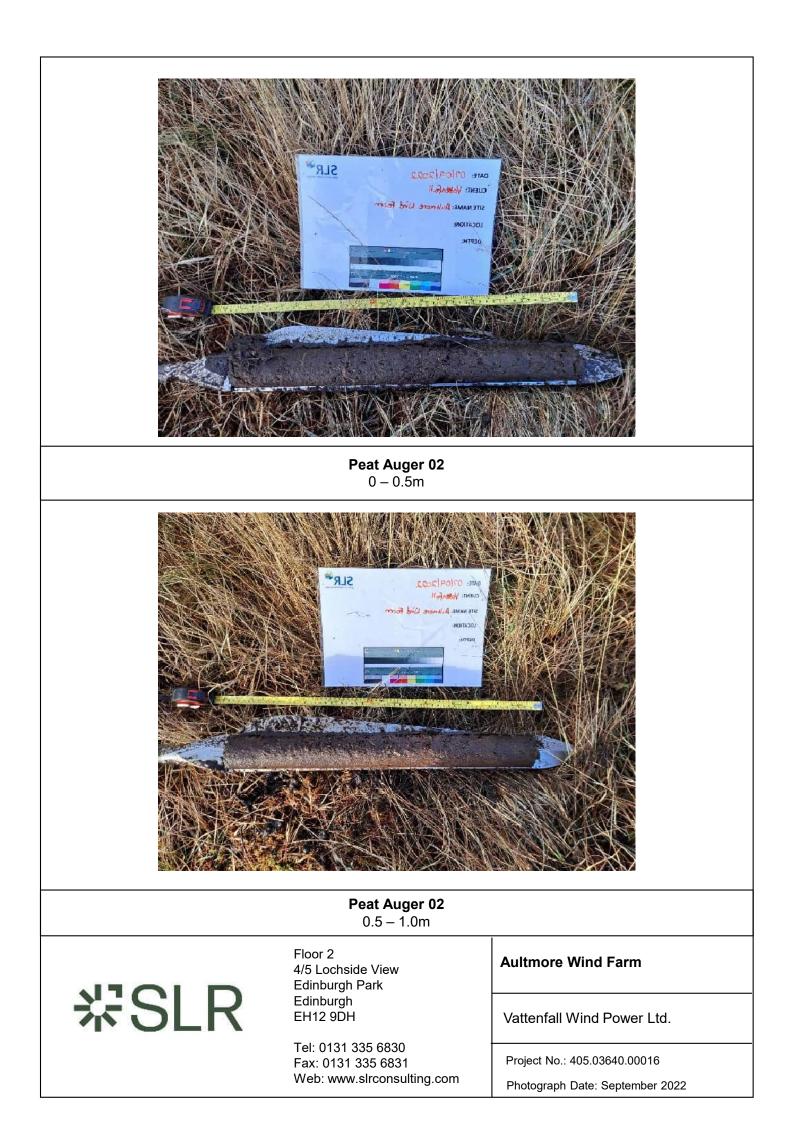


	<image/> <image/>	
	Peat Auger 01 0.5 – 1.0m	
尜SLR	Floor 2 4/5 Lochside View Edinburgh Park Edinburgh EH12 9DH Tel: 0131 335 6830 Fax: 0131 335 6831	Aultmore Wind Farm Vattenfall Wind Power Ltd. Project No.: 405.03640.00016

Project /	Aultmore Wind Fa	rm		Client: Vattenfall	Peat Co		og		Date: 07/09/2022	Hole No. PCO2 Sheet 1 of	
	o: 405.03640.000)16		Logger: RW	Approv			Coordinates: E: 347315.0			
ocation:	Moray, Scotland			Hole Type: PC	1	Metho				Vertical Scale:	1:11
Water	Depth (m)	Sample Type	Depth	Recovery (%)	Depth (r Discontinuit		Level (mAOD)	Legend	Stratum Descr	iption	
	0.00 - 0.50	C	0.00 - 0.50	Recovery				ا معاد مالد الماد مالد مال مالد مالد مالد	Park brown fibrous PEAT with free	quent roots and plant	
	0.50 - 1.00			= 100%		1.00					
	1	C	0.50 - 1.00	Recovery = 100%		1.00		6 - 316 - 316 -	Peat Core Complete	at 1.00m	

Remarks:

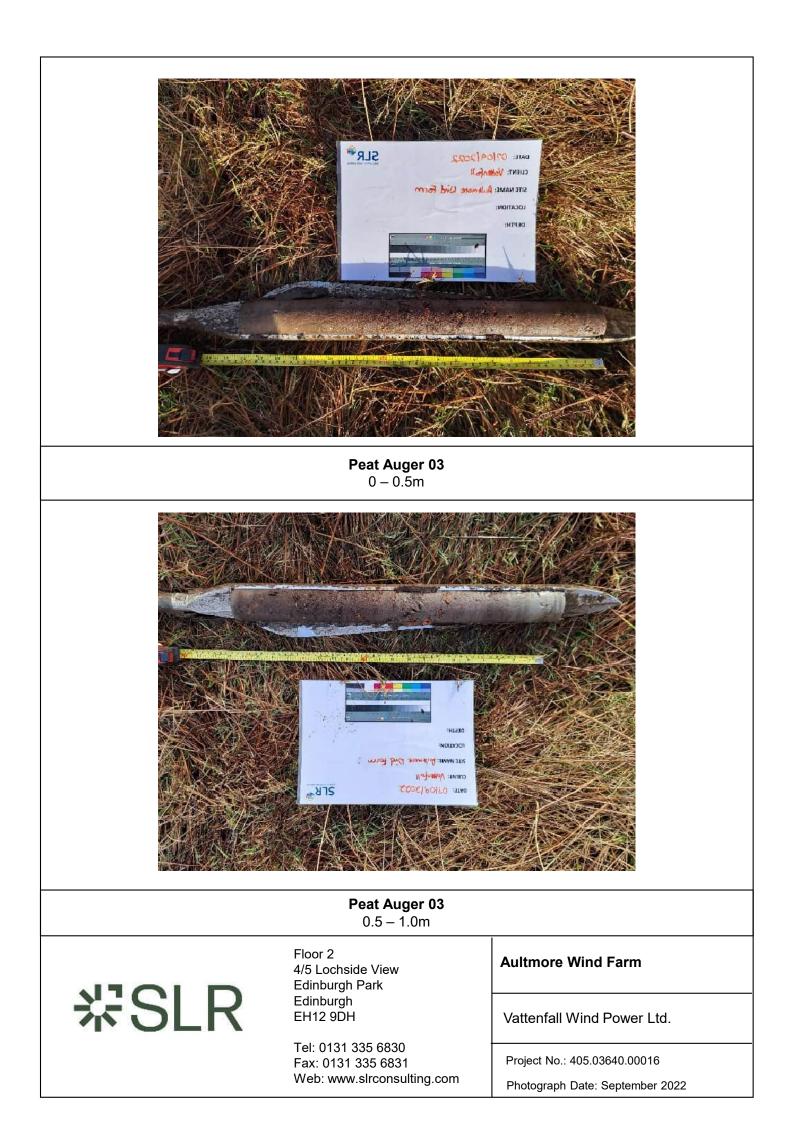
Peat core recovered using peat sampler.

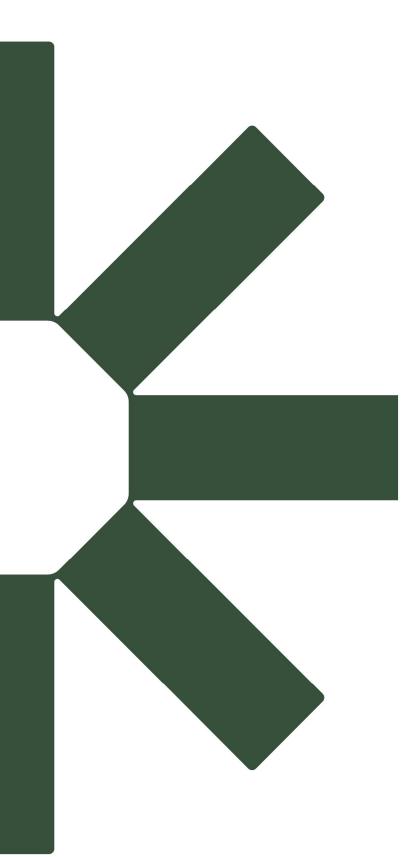


				I	Peat Co	ore l	og		1	Hole No. PC03 Sheet 1 of		
Project: A	Aultmore Wind Fa	rm		Client: Vattenfall	Wind Powe	er Ltd			Date: 07/09/2022			
Project N	lo: 405.03640.000	016		Logger: RW	Approv	ved By:		Coordinates: E: 346856.0	00 N: 858958.00			
ocation:	Moray, Scotland			Hole Type: PC	Method:				Vertical Scale:	1:11		
Water	Depth (m)	Sample Type	Depth	Recovery (%)	Depth (Discontinuit		Level (mAOD)	Legend	Stratum Descr	iption		
	0.00 - 0.50	C C	0.00 - 0.50	Recovery = 100% Recovery = 100%		0.80			ark brown fibrous PEAT, with free emains (H3, B3). rey clayey fine to medium SAND. Peat Core Complete a	·		

Remarks:

Peat core recovered using peat sampler.





Making Sustainability Happen