Technical Appendix

Drummarnock Wind Farm

Technical Appendix 8-3: Outline Peat Management Plan

Drummarnock Wind Farm Limited

July 2024

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Glossary of Terms

Term	Definition
The Applicant	Drummarnock Wind Farm Ltd
The Agent	Atmos Consulting Limited
Environmental Advisors and Planning Consultants	Atmos Consulting Limited
Environmental Impact Assessment	Environmental Impact Assessment (EIA) is a means of carrying out, in a systematic way, an assessment of the likely significant environmental effects from a development.
Environmental Impact Assessment Regulations	Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017
Environmental Impact Assessment Report	A document reporting the findings of the EIA and produced in accordance with the EIA Regulations
The Proposed Development	Drummarnock Wind Farm
The Proposed Development Site	The land enclosed by the red line shown on Figure 1-1

List of Abbreviations

Abbreviation	Description
AOD	Above Ordnance Datum
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
FoS	Factor of Safety
GIS	Geographical Information Science
Ha	hectare
HMP	Habitat Management Plan
NGR	National Grid Reference
NVC	National Vegetation Classification
OPMP	Outline Peat Management Plan
PLHRA	Peat Landslide Hazard Risk Assessment
SEPA	Scottish Environmental Protection Agency

1 Introduction

1.1 Background

Drummarnock Wind Farm Limited ('the Applicant') is intending to apply for Consent under the Town and Country Planning (Scotland) Act 1997 (as amended) ('the Planning Act') to develop a wind farm consisting of 4 wind turbines at up to 180m to tip height and associated infrastructure (the 'Proposed Development').

The Proposed Development would be located at National Grid Reference (NGR) NS 75471 87114, circa 10km south-west of Stirling, in the Fintry, Gargunnock and Touch Hills, within the planning authority area of Stirling Council. A detailed description of the Proposed Development is provided in Chapter 3 Description of Development.

This Outline Peat Management Plan (OPMP) follows guidance (Scottish Renewables & SEPA, 2012) on the assessment of peat excavation and reuse for wind farms in Scotland. The OPMP was prepared in parallel with a Peat Landslide Hazard and Risk Assessment (PLHRA, Technical Appendix 8-2) and is informed by peat depth probing undertaken by Atmos Consulting.

1.2 Scope of Work

The scope of the PMP is as follows:

- Summarise the principles adopted for design of the wind farm with respect to peat soils, including the approach to peat characterisation and the identification of opportunities taken to minimise impacts on peatlands within the Proposed Development Site;
- Calculate the potential volumes of peat that may be excavated in association with wind farm construction, both acrotelmic and catotelmic peat;
- Identify and justify reuse of acrotelmic and catotelmic peat where it cannot be reinstated at source; and
- Identify good practice measures to ensure excavated peat is stored safely and with minimal loss of function prior to its reinstatement.

The OPMP follows the advice issued in SEPA's Scoping Opinion response of 01/09/2020 (SEPA Ref PCS/172780).

1.3 Report Structure

This report is structured as follows:

- Section 2 provides an outline of relevant guidance relating to the excavation, storage and reuse of peat;
- Section 3 provides an overview of the Proposed Development Site and proposed wind farm infrastructure based on the scheme described in the main EIA chapters and on desk study review of site information;
- Section 4 describes the approach to and results of peat excavation calculations and summarises opportunities for reuse of excavated peat soils within the Proposed Development Site; and

- Section 5 provides general good practice measures and measures specific to the conditions at the Proposed Development.

Where relevant information is available elsewhere in the Environmental Impact Assessment Report (EIA), this is referenced in the text rather than repeated in this report.

2 Context to Peat Management

2.1 Peat as a Carbon Store

Priority peatland habitats comprise blanket bog, lowland raised bog, lowland fens, and part of the upland flushes, fens and swamps, as listed in the UK Biodiversity Action Plan (UK BAP). Blanket bog is the most widespread of these habitat types in Scotland, and therefore it is blanket bog that is usually of relevance for proposed developments/wind farms in upland areas.

Blanket bogs in the UK started forming in the early Holocene, with most UK bogs initiating prior to 6,000 years ago under cooler and wetter conditions than at present. Where bogs remain waterlogged and peat forming plant species persist, blanket bog is still considered to be actively forming and accumulating organic matter, and therefore can be considered a carbon sink.

A bog that is not losing carbon/peat but is no longer accumulating organic matter can be considered a carbon store, and a degrading bog can be considered a carbon source (Mills et al, 2021).

A peatland may change state between sink, store and source through natural processes or as a result of human activity. The purpose of the peat management plan is to avoid impacts on the peat carbon stores at wind farm sites by avoiding peat, where possible, or by minimising impacts where peat cannot be avoided.

Where there are opportunities to improve peat condition, e.g. through restoration, and in so doing, help convert carbon sources into stores or sinks, this may also be facilitated by the peat management plan (usually in conjunction with the Habitat Management Plan).

2.2 Good Practice Guidance

Where peat is to be excavated in association with built infrastructure, it may be considered a waste product under the following legislation:

- Environmental Protection Act 1990 (as amended);
- Landfill (Scotland) Regulations 2003 (as amended); and
- The Waste Management Licensing (Scotland) Regulations 2011.

In order to address this legislation, a number of guidance documents have been issued to assist applicants in responsibly planning, installing and operating infrastructure in peatland settings. This PMP has been informed by this collective good practice, which includes the following documents:

- Advising on peatland, carbon-rich soils and priority peatland habitats in development management (NatureScot, 2023);
- Good Practice during Wind Farm Construction, Version 4 (Scottish Renewables, Scottish Natural Heritage, Scottish Environmental Protection Agency, Forestry Commission Scotland, 2019);
- Developments on Peat and Off-Site Uses of Waste Peat, WST-G-052 (SEPA, 2017);
- Peatland Survey. Guidance on Developments on Peatland (Scottish Government, Scottish Natural Heritage and SEPA, 2017a);

- Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments (Second Edition) (Scottish Government, 2017);
- Carbon and Peatland 2016 Map (GIS) (Scottish Natural Heritage, 2016a);
- Carbon-rich Soils, Deep Peat and Priority Peatland Habitat Mapping, Consultation Analysis Report (Scottish Natural Heritage, 2016b);
- Scotland's National Peatland Plan - Working for our future (Scottish Natural Heritage, 2015a);
- Constructed Tracks in the Scottish Uplands, 2nd Edition (Scottish Natural Heritage, 2015b);
- Developments on Peatland: Guidance on the assessment of peat volumes, reuse of excavated peat and the minimisation of waste (Scottish Renewables and SEPA, 2012);
- Floating Roads on Peat - A Report into Good Practice in Design, Construction and Use of Floating Roads on Peat with particular reference to Wind Farm Developments in Scotland (Scottish Natural Heritage and Forestry Commission Scotland, 2010); and
- Annex 1: Precautions to protect drinking water and Scottish Water assets in peatland areas (Scottish Water, 2020).

In general terms, the guidance considers appropriate activities to be undertaken at the planning (Environmental Impact Assessment (EIA)), post-consent/pre-construction and construction stages. The overarching principles are generally the same across the different guidance documents and are set out below.

During planning (EIA):

- Determine at a sufficient level of detail the distribution of peat within a site in order to assess the likely level of impact of proposed works;
- Calculate the volumes of peat likely to be excavated during construction; and
- Demonstrate how excavated peat will be managed (ii and iii together comprising an assessment of the "peat and soil balance").

These activities are normally considered within an OPMP, delivered as part of the Environmental Impact Assessment at the planning stage.

Given consent, during the pre-construction period:

- A refined peat and soil mass balance should be calculated through further site investigation works (including intrusive works such as detailed probing across final infrastructure footprints and/or trial pits to verify the nature of probed materials);
- Further detailed topographic survey and design level excavation, storage and reuse plans should be drafted to enable contractors to bid for and implement the works; and
- Key good practice measures should be identified within the PMP that integrate with other related plans or control documents for construction, including, where applicable, the Construction and Decommissioning Environmental Management Plan, Site Waste Management Plan, Habitat Management Plan (where relevant) and Geotechnical Risk Register.

During the construction stage:

- Utilise micro-siting to optimise infrastructure locations relative to final pre-construction information gathered on site;
- Monitor, adjust and implement the PMP to accommodate deviations in expected peat volumes and adapt reuse measures to actual site volumes; and
- Set-up monitoring programmes to identify the new post-construction baseline and provide a basis for monitoring the success of the PMP and identify appropriate mitigation where necessary.

Through the different stages of the project, the strategy should be to prevent disturbance to and losses of peat through appropriate reuse, wherever possible.

2.3 Approach at the Proposed Development

The strategy for peat management for the Proposed Development follows SEPA's guidance for developments on peat and uses of waste peat (SEPA, 2017). The hierarchy is as follows:

- **Prevent** the creation of waste peat by minimising overlap of infrastructure with peat where it is possible to do so, and given other site and design constraints that may influence turbine locations and associated infrastructure (such as tracks), where avoidance is not possible, minimise excavation (e.g. through the use of floating tracks);
- **Reuse** peat on site in construction, or by **reinstatement** in temporary excavations;
- **Restore**, using peat to improve eroded or damaged areas outwith the area of direct and indirect construction impact (restoring off-site will require environmental authorisation);
- **Recycle** as a soil substitute or for use in other works (where on-site or off-site use in restoration is not possible).

No disposal of peat (i.e. export from the Proposed Development Site as waste) is proposed.

At the Proposed Development, a combination of prevention and reuse has formed the peat management strategy. Outline details of this strategy are provided below, and full detail of excavation, reuse and restoration proposals are provided in Section 4.

2.3.1 Prevent

Prevention involves minimising the amount of peat excavated during construction by informed layout planning.

The extent to which this is possible is not just a function of the amount of peat on site, but also of the presence of other constraints (please see individual EIAR chapters for details) and the practical requirements of wind farm construction (e.g. minimum turbine spacings, feasible gradients for tracks / hardstandings, buffer distances from watercourses, etc).

At the Proposed Development, peat is relatively widespread in the main infrastructure area, however, efforts have been made to minimise overlap with the deepest deposits as far as possible. This has resulted in:

- Avoidance of all peat >1.0m in depth by excavated infrastructure (with the exception of two very small pockets at Turbine 3); and

- Routing of tracks in thinner areas of peat or in areas of organic soil, with adoption of floating track (to minimise excavation) where gradients allow.

As a result, the proposed layout minimised peat excavation insofar as possible given other constraints.

2.3.2 Reuse

The primary reuse strategy for peat management is to reuse peat to reinstate borrow pits excavated adjacent to peatland areas within the Proposed Development Site.

There are very limited opportunities to reuse peat for other purposes at the Proposed Development.

2.3.3 Restore

There are no suitable restoration targets for use of excavated peat due to an absence of eroded gullies, peat pans, artificial drainage or cuttings on the Proposed Development Site.

2.3.4 Disposal

No disposal of peat or soil is required as part of the Proposed Development.

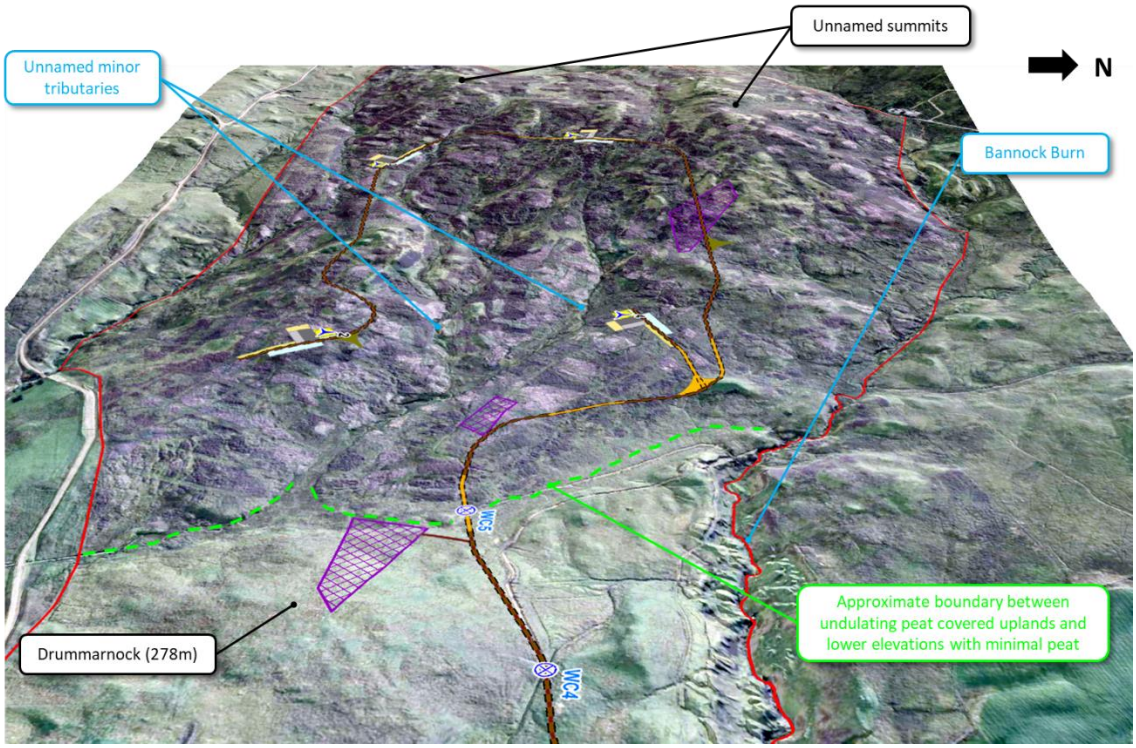
3 Desk Study

3.1 Site Overview

The Proposed Development Site is located over low hills that fall east from a minor road connecting the B818 (in the south) to the Polmaise Road in the north. The highest points (in the west) are two unnamed summits at 373m AOD and 357m AOD, and elevations fall fairly continuously towards the confluence of a series of minor watercourses that deflect south of Drummarnock (278m AOD) (Figure 8-3-1).

Plate 8-3-1 shows a perspective view of the Site with key site features annotated.

Plate 8-3-1: 3D perspective view of the Site with key features annotated



Imagery © ESRI, Google, Maxar Technologies and Earthstar Geographies 2024

Slope angles are low to moderate (2.5-7.5°) over the western half of the Proposed Development Site, and locally steep (>10°) around Turbine 2 and along the main access track in the east of the Proposed Development Site. There are few areas of flat or gently sloping (<2.5°) terrain. Figure 8-3-2 shows slope angles across the Proposed Development Site.

The proposed turbines have generally been sited above 270m with tracks running directly upgradient and in parallel to minor watercourses and flushed areas that flow from west to east. The track linking the southern and northern turbines is routed to avoid the headwaters of these watercourses. The easternmost borrow pit lies on the western flank of Drummarnock.

3.2 Peat Depth

Peat depth probing was undertaken by Atmos Consulting in multiple phases between 2021 and 2023 in accordance with Scottish Government (2017) guidance:

- Phase 1 was undertaken in a number of phases, initially in the main turbine area and then subsequently at lower elevations in the vicinity of potential access tracks – in total c. 230 probes were taken on the 100m grid; and
- Subsequent probing focused on refining infrastructure locations using a variety of grid spacings with the final locations assessed using a 10m grid – in total, across Phase 1, interim and final Phase 2 surveys, 2,340 locations were probed.

Interpolation of peat depths was undertaken in the ArcMap GIS environment using a natural neighbour approach.

This approach was selected because it preserves recorded depths at each probe location, unlike some other approaches (e.g. kriging) is computationally simple and minimises 'bullseye' effects. The approach was selected after comparison of outputs with three other methods (inverse distance weighting, kriging and TIN).

The interpolated peat depth model is shown on Figure 8-3-3 with probing locations superimposed and layouts shown as wirelines. Peat depth variation can be summarised as follows:

- Peat is relatively widespread over much of the Proposed Development Site, more so in the western half (main infrastructure area) than in the east, where elevations increase;
- While peat is present over much of the main infrastructure area, it is fairly shallow, rarely exceeding 1m in depth, and where it does so, only in isolated pockets – the fragmented and disparate nature of the peatland means that it is difficult to avoid entirely; and
- In the eastern half of the Proposed Development site, peat is generally absent, except for a few localised areas typically centred on watercourses (and in which field drains have been cut, though these seem to be fairly ineffective).

The inset map on Figure 8-3-3 shows the Carbon and Peatland (2016) Map, which indicates the Proposed Development Site to comprise Class 4 (area unlikely to be associated with peatland habitats) and Class 5 soils (no peatland habitat recorded) in the western hills and mineral or Class 3 soils (dominant vegetation is not priority peatland habitat) in the east.

In contrast, NVC mapping (see Chapter 5 of the EIAR) for the Proposed Development Site shows priority peatland habitats across much of the western half of the site.

3.3 Peat Geomorphology and Condition

Technical Appendix 8-2 (PLHRA) provides a detailed description of site geomorphology, which comprises gently undulating peatland of variable peat depth, with flushy areas of diffuse drainage within topographic lows and very limited evidence of erosion or other typical peatland geomorphological features that might be suitable for restoration using standard Peatland ACTION techniques.

Much of the peatland comprises heather-rich communities, with rushes and grasses dominating the flushed zones. Sphagnum is locally present.

3.4 Drainage

Artificial drainage is present within the site, but is fairly limited in extent, with many drains well vegetated and exhibiting limited function (e.g. Plate 8-3-2).

Plate 8-3-2: a) active moor drain in heather-rich rolling uplands (west), b) ineffective moor drain in east, c) burned ground, d) flushed ground with flattened grasses

3.5 Land Use

Large areas of the undulating peat covered hills have been burnt (Plate 8-3-2c), and multiple phases of burning are visible on satellite imagery in Google Earth™.

There is no evidence of cutting on the site and therefore no suitable accommodation space for excavated materials.

4 Peat Excavation and Storage

4.1 Excavation Calculations

The majority of infrastructure comprising the Proposed Development will require full excavation of the peat or soils underlying the infrastructure footprints during construction.

However, some infrastructure is not required post-construction (the temporary construction compound, blade, nacelle, tower storage area, boom assembly area, borrow pits) and the peat or soil excavated from these areas will be directly reinstated.

In this section, the following terms are used to describe groundworks associated with peat / soil and wind farm infrastructure:

- **Permanently excavated:** peat / soil will be permanently removed from the infrastructure footprint, stored locally and reused elsewhere;
- **Temporarily excavated:** peat / soil will be temporarily removed from the infrastructure footprint, stored locally and fully reinstated at the point of excavation post-construction; and
- **Landscaping:** the process of using soil to 'dress' the boundaries of infrastructure.

Excavation volumes have been calculated as the product of the average peat depth under each footprint (derived from the peat model) and the indicative footprint area (detailed for each infrastructure type and its associated earthworks, below).

For this site, for each infrastructure item, the upper 0.3m of the peat profile is assumed to be acrotelm and any remaining depth is assumed to be catotelm. A 0.3m thickness of turf and underlying peat is a sufficiently thick continuous layer to avoid damaging the roots of the excavated vegetation and provide a coherent 'turf' to relay.

Soils less than 0.5m in depth are assumed to be organic (or other) soils other than peat and are classed as 'soil' for the purposes of this assessment.

4.1.1 Turbines, Hardstandings, Ancillary Crane Pads and Blade Laydowns

Each turbine location will comprise a circular turbine foundation (27.4m diameter), a primary hardstanding (36m x 40m) for the main crane and auxiliary crane, tower storage area, and secondary hardstandings for the nacelle storage area, blade storage area and working areas during construction.

The foundation, primary hardstandings and tower storage area will be permanently excavated to substrate and peat and soil replaced with construction fill materials, as will any secondary hardstandings set substantially within earthworks. These hardstandings must remain in place for routine maintenance and decommissioning.

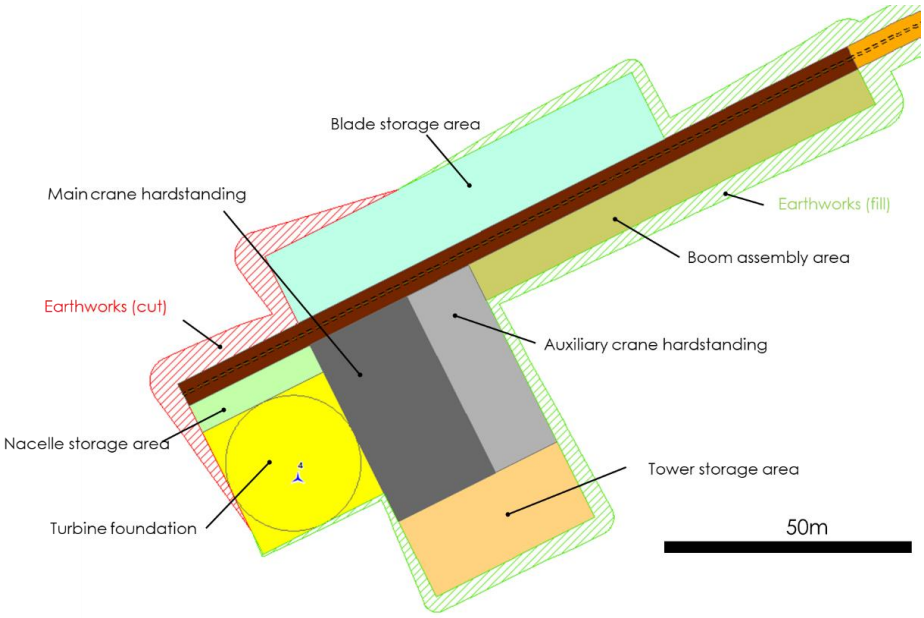
All other infrastructure turbine-related infrastructure will be temporarily excavated and any peat or soils excavated will be directly reinstated.

Earthworks extents have been designed around each infrastructure element, comprising either 'cut' works (where the ground must be lowered to a level surface to enable construction), or 'fill' works (where the ground must be built up to the same end).

Although earthworks are 'cut' and 'fill', in all cases, the underlying soil or peat must be removed to accommodate either the 'cut' or provide a sound substrate for 'fill' materials. Earthworks around temporary infrastructure are treated as temporary footprints (unless they must remain in place for the operational life for stability of construction).

Plate 8-3-3 shows the layout for these infrastructure components.

Plate 8-3-3: Typical infrastructure layout at turbine location



The temporary and permanently excavated volumes for turbines and hardstandings are based on each infrastructure footprint multiplied by the average peat depth determined from detailed infrastructure probing (see Figure 8-3-3). Temporarily excavated volumes for the blade laydowns, nacelle storage areas and boom assembly areas are calculated in the same way.

Table 8-3-1 shows the calculated excavation volumes for all infrastructure and earthworks, both temporary and permanent, subdivided into acrotelm, catotelm and organic soils. No amorphous peat was found on Site.

Figures are quoted to the nearest m^3 to avoid rounding errors leading to inaccurate totals in later tables rather than to imply accuracy of calculations to $1m^3$. Earthwork excavation requirements are not divided by infrastructure type since many of the earthworks serve a multitude of infrastructure components.

4.1.2 Access Tracks

Access tracks comprise a minimum of 5m wide running surface. Two types of track construction are proposed: floating and cut and fill.

The Proposed Development includes the provision for 6.59km of new access tracks, which includes two onsite access options (Option A and Option B). However, only one of these onsite access options will be constructed, and therefore of the 6.59km of proposed new tracks, a maximum of up to 5.8km would be constructed, dependent

upon the access option utilised. To ensure a robust and conservative assessment, the EIA has assessed the full 6.59km to support the full appraisal of both access options.

Floating tracks have generally been specified where peat depths exceed 0.9m, where gradients allow and where lengths and cut and fill requirements do not preclude their construction.

Floating tracks involve no excavation, and therefore no peat is generated from this element of site infrastructure. In some cases, earthworks will be required to 'build up' to the running surface of the floating track, and in these cases no 'cut' of underlying materials is required (in common with the construction method for the track).

Cut tracks have generally been specified elsewhere on depths <0.5m, and therefore for the much of the Proposed Development Site, no peat will be excavated in association with them.

A small number of localised areas of cut track are required in peat, but these are typically on the approaches to hardstandings or over short distances of peat where transition pieces between cut and fill and floating track would limit the length of floating track to the point of it offering little excavation saving.

Table 8-3-1 shows the excavation volumes associated with new cut and fill tracks. These volumes will be permanently excavated.

Approximately 6,340m^3 of peat excavation has been avoided through the use of floating track.

Table 8-3-1: Peat excavation volumes for all infrastructure

Infrastructure	Type of Excavation	Excavation Volume (m^3)			
		Acrotelm	Catotelm	Peat Total	Soil
Turbine foundation	Permanent	384	457	841	426
Main crane hardstanding	Permanent	513	983	1,495	725
Auxiliary crane hardstanding	Permanent	320	540	860	393
Tower storage area	Permanent	184	281	465	774
Substation	Permanent	0	0	0	125
Borrow Pits	Permanent	1,065	923	1,988	10,904
Cut and fill track	Permanent	1,625	1,972	3,597	6,426
Turning head	Permanent	36	35	71	773
Earthworks – cut	Permanent	3,651	4,678	8,329	8,962
Earthworks – fill	Permanent	387	542	929	1,854
	Subtotal	**8,165**	**10,411**	**18,575**	**31,362**
Nacelle storage area	Temporary	274	337	611	28
Blade storage area	Temporary	639	737	1,376	1,150
Boom assembly area	Temporary	443	576	1,019	646
Construction compound	Temporary	464	679	1,143	1,775
	Subtotal	**1,820**	**2,329**	**4,149**	**3,599**
	Total	**9,985**	**12,740**	**22,724**	**34,961**

4.1.3 Cable Trenches

Cable trenches are to be excavated alongside access tracks and all peat excavated prior to cable placement will be directly reinstated after installation. Reinstatement is likely to be undertaken immediately after installation with very short-term sidecasting of materials, and therefore peat disturbed in this activity is not considered in the overall peat mass balance calculations.

4.1.4 Construction Compound

The construction compound (100m x 80m) will provide storage for site plant and materials and will be reinstated post-construction. Therefore it is temporarily excavated, with all excavated materials stored locally and reinstated. Table 8-3-1 shows the volume of temporary excavation of soil associated with this infrastructure.

4.1.5 Substation

The substation will be permanently excavated to substrate over a footprint of 30m x 35m.

4.1.6 Total volumes

Based on the above, the total temporary and permanent excavation volumes for acrotelm, catotelm and soil are as shown on Table 8-3-2 below.

Table 8-3-2: Totals for all infrastructure

	Excavation Volume (m^3)			
Type	**Acrotelm**	**Catotelm**	**Total Peat**	**Soil**
Permanent	8,165	10,411	18,575	31,362
Temporary	1,820	2,329	4,149	3,599
Totals	**9,985**	**12,740**	**22,724**	**34,961**

Section 4.2 considers the reuse volumes for the above materials.

4.2 Reuse

Excavated peat and soil will be re-used as follows:

1. Reinstatement of temporary excavations for infrastructure;
2. Landscaping of permanent infrastructure to minimise visual impacts of infrastructure; and
3. Reuse in borrow pits.

There are no other opportunities for reuse or reinstatement within the Site boundary.

4.2.1 Reinstatement

In total, 4,149m^3 of peat will be temporarily excavated from proposed infrastructure locations. This material will be set to one side during construction, kept under suitable moisture-controlled conditions for the duration of storage and then reinstated at the point of excavation. This leaves 18,575m^3 of peat requiring reuse elsewhere on site.

A total of 3,559m^3 of soil will be temporarily excavated, and this will also be reinstated at source. Although soil excavated from the borrow pits is counted as permanent

excavation in the mass balance calculations it will also form part of the reinstatement plan for each borrow pit.

4.2.2 Landscaping of Infrastructure

No peat will be used in landscaping infrastructure. Instead, the top surfaces of cut and fill earthworks, which in many cases will have low gradients, will be top-dressed with organic soils excavated from infrastructure and earthworks footprints.

In total, 20,458m^3 of permanently excavated soil is available for reuse in landscaping after allowing for soil excavated from borrow pits (10,904m^3). This will be distributed over the c. 56,500m^2 of earthworks footprints across the site to an average depth of c. 0.36m allowing infrastructure to be 'tied in' to the surrounding landscape. Where necessary, a locally appropriate seed mix will be used to encourage revegetation and stabilisation of the landscaped margins.

4.2.3 Reuse in Borrow Pits

Four borrow pits have been identified to support the extraction of aggregate for construction (West-North, West-South, Central and East), the westernmost pit being split into north and south areas across the access track between Turbines 1 and 4.

Borrow pits will be excavated to substantially below ground level over most of their footprints and will therefore naturally collect moisture, increasing their viability as permanent peat stores for materials excavated from infrastructure locations. Careful borrow pit design will ensure peat stays wet (see below).

Available accommodation space for peat has been calculated based on the footprints of each borrow pit, and target volumes of acrotelmic and catotelmic peat have been calculated in order to store the permanently excavated peat volume.

Table 8-3-3: Peat reuse volumes in borrow pits

Location	Areas and Volumes					
	Area (m^2)	Target Acrotelm Depth (m)	Acrotelm Volume (m^3)	Target Catotelm Depth (m)	Catotelm Volume (m^3)	Total Peat Reuse (m^3)
West (North)	8,034	0.3	2,410	0.5	4,017	6,427
West (South)	8,807	0.3	2,642	0.4	3,523	6,165
Central	3,782	0.3	1,135	0.4	1,513	2,647
East*	12,079	0.3	1,812	0.25	1,510*	3,322
Totals			7,999		10,563	18,561

* In the East borrow pit, 50% of the pit will be reinstated with peat

The following design principles will be adopted for borrow pits reinstated with peat derived from elsewhere on site:

- Following return of non-peat overburden to the floor of the borrow pit, the borrow pit base will be levelled with a minor reverse incline towards the pit headwall to ensure moisture retention;
- The unfinished base will then be lined with impermeable fill (clay or equivalent) to preclude free draining / dewatering from the base of the peat fill;
- Depending on the borrow pit footprint and the degree of remoulding of catotelmic peat excavated during construction, mineral berms will be constructed to create

retention cells, within which peat will be placed – berm crests will be set to the top level of anticipated catotelmic fill;
- Catotelmic fill will be placed within each cell, directly over the impermeable liner and between mineral berms; and
- Acrotelmic turves will then be placed over the catotelmic fill and berms to produce a continuous vegetated top surface.

In order to ensure the reinstated borrow pits function as intended, a monitoring programme will be established to track vegetative recovery of the finished borrow pit surfaces, effectiveness of constructed berms in holding peat in place, and moisture content of the peat deposits.

4.3 Peat and Soil Balance

The peat and soil balance for the Proposed Development is shown in Table 8-3-4 below. The table indicates that there is sufficient peat to fully reinstate temporary infrastructure and enough soil to provide dressing of permanent infrastructure and earthworks.

Table 8-3-4: Peat and soil balance

	Volume (m^3)		
Heading Left	**Acrotelm**	**Catotelm**	**Soil**
Excavation			
Total Permanent	8,165	10,412	31,362
Total Temporary	1,820	2,328	3,599
Totals	**9,985**	**12,740**	**34,961**
Reuse			
Directly Reinstated	1,820	2,328	3,599
Borrow Pits	7,999	10,563	10,904
Landscaping Earthworks	0	0	18,683
Totals	**9,819**	**12,891**	**34,961**
Balance	**164**	**-150**	**0**
	Surplus	**Deficit**	**Balance**

Breakdown of the peat volumes into acrotelmic and catotelmic peat also shows the two different types of peat to be largely balanced.

The small volumetric difference (<2% of acrotelm and c. 1% catotelm) is considered a reasonable degree of precision for the peat balance at the pre-consent stage, with sufficient accommodation space within the borrow pit footprints available for additional reinstatement if required.

The next section summarises good practice for excavation, handling, storage re-use and monitoring associated with peat excavations at the Proposed Development.

5 Good Practice

5.1 Background

Good practice measures in relation to peat excavation and reuse are now generally well defined following a number of years of practice (at wind farm sites) across the UK and Ireland. In Scotland in particular, there is an increasing body of experience relating to peat restoration, facilitated by Peatland Action (Scottish Natural Heritage, 2017).

As a result, there are a number of specialist contractors who have experience in the planning, design and implementation of peat restoration works in the Scottish uplands. A key step in delivering the restoration proposals described above is identification of appropriate contractors to implement the restoration plans at each location.

The sections below outline good practice measures related to excavation and handling, storage, and reinstatement and restoration of peat in association with wind farm construction.

5.2 Excavation and Handling

The following good practice measures are proposed for excavation and handling:

- A minimum thickness of 300mm of acrotelmic peat or turved organic soil will be excavated where sufficient soil is present; where less than 300mm is present, the full depth of soil and surface vegetation will be excavated;
- Large bucket excavators will be utilised to maximise turf sizes and reduce the number of open edges on reinstatement;
- Excavation and transport of peat/soil shall be undertaken to avoid cross-contamination between soil horizons (e.g. organic soil and underlying mineral soil / substrate);
- Where possible, cross-tracking of plant over undisturbed vegetation will be minimised, and excavated materials transported to their storage locations along constructed track;
- If working is required away from constructed roads / tracks, the use of low ground pressure long reach excavators will be encouraged in order to minimise cross-tracking;
- If landscaping of road / track margins is required for temporary works, it will be deemed preferable for vegetated organic soils to be used for this purpose rather than acrotelmic peat (which would be stored); and
- Wherever possible, double handling of peat will be minimised (in particular for catotelmic peat) by direct transport of materials to their point of storage.

5.3 Storage

The following good practice measures are proposed for storage:

- Eliminate storage where possibly by single handling from the point of excavation to a location of reuse;

- If storage cannot be avoided, minimise storage time by taking a holistic approach to excavation and reinstatement such that catotelmic peat (in particular) is used as soon as possible after excavation;
- Store excavated acrotelmic and catotelmic peat separately during excavation works, ideally to be undertaken by an experienced contractor specialising in peat groundworks and restoration;
- Acrotelmic peat and turved soil blocks should be stored turf side up to prevent damage to vegetation;
- Storing in areas of minimal gradient where 'runoff' or drainage away from the point of storage is minimised (these areas will also satisfy to avoid areas of lower stability);
- Fewer, larger stores will be preferable to a greater number of small stores, since the total potential area of drying surface will be less;
- Where storage is required in the medium term, preparing the peat to minimise the surface exposed to drying (e.g. through blading off of catotelmic peat and use of appropriate cover to minimise moisture loss);
- The Environmental Clerk of Works (EnvCoW) will work with an appointed Geotechnical Engineer (GE) to review the placement and condition of stored peat;
- Storage areas will be outside any area identified in the PLHRA (Technical Appendix 8-2) as of 'Moderate' likelihood or greater or Factor of Safety (FoS) <2.0 and will be more than 50m away from watercourses, away from sensitive habitats and away from the edge of excavations;
- Peat and soil stores will be appropriately bunded to prevent risks from material instability and prevent runoff of sediment and water from the stockpiles;
- The condition of the excavated peat, in particular its moisture content, will be regularly monitored and local water utilised to periodically 'refresh' stored peat and prevent desiccation; and

5.4 Reinstatement and Restoration

The following good practice measures are proposed for reinstatement:

- Any bare peat exposed at the surface of a reinstated area will be seeded with a seed mix or translocated vegetation appropriate to the locality;
- Where insufficient turves are available to full cover reinstated soils, a checkerboard pattern of turf blocks will be used, with turf squares no less than 1m^2 to act as seed points interspersed amongst the bare areas;
- Reinstated ground levels will tie in with the surrounds, and any bulking up will be avoided by tamping down soils and turves; and
- If appropriate, temporary fencing may be required to enable vegetation to establish following reinstatement works and prevent damage by livestock, deer or rabbits.

5.5 Monitoring

During construction, monitoring will be undertaken in any areas where peat is stored, as follows:

- Regular visual inspection of the outer peat surface of any stored peat to identify any evidence for drying or cracking;
- Regular coring of stored peat to log the moisture content of stored peat (using the von Post scale to monitor changes in moisture content for peat on the outside and within the peat mound);
- Clear specification of an action plan in response to these observations, including modifications to coverings, implementation of watering, or construction of temporary berms to retain water in the storage footprint; and
- Acceleration of reuse for vulnerable stores if so identified.

Key to the success of the strategy for peat management will be careful monitoring of the post-construction works and any reinstatement activities. A monitoring programme will be initiated once peat reinstatement works have been completed, to include:

- Review of % vegetation cover and vegetation composition in areas of bare peat that have been reinstated or in any areas that have been seeded (due to a lack of available turved material);
- Review of stability of deposits in their new locations; and
- Fixed point photography in order to aid review over a series of monitoring intervals.

If required, mitigation recommendations will follow from the monitoring and include:

- Specification of seeding appropriate to the target vegetation or stabilisation with geotextile if revegetation is not occurring naturally (which will assist re-wetting and retention of moisture contents); and
- Construction of wood or mineral dams (or equivalent) if any creep of peat soils is evident at any reinstated location.

Monitoring will be carried out after construction and reinstatement works have concluded.

6 References

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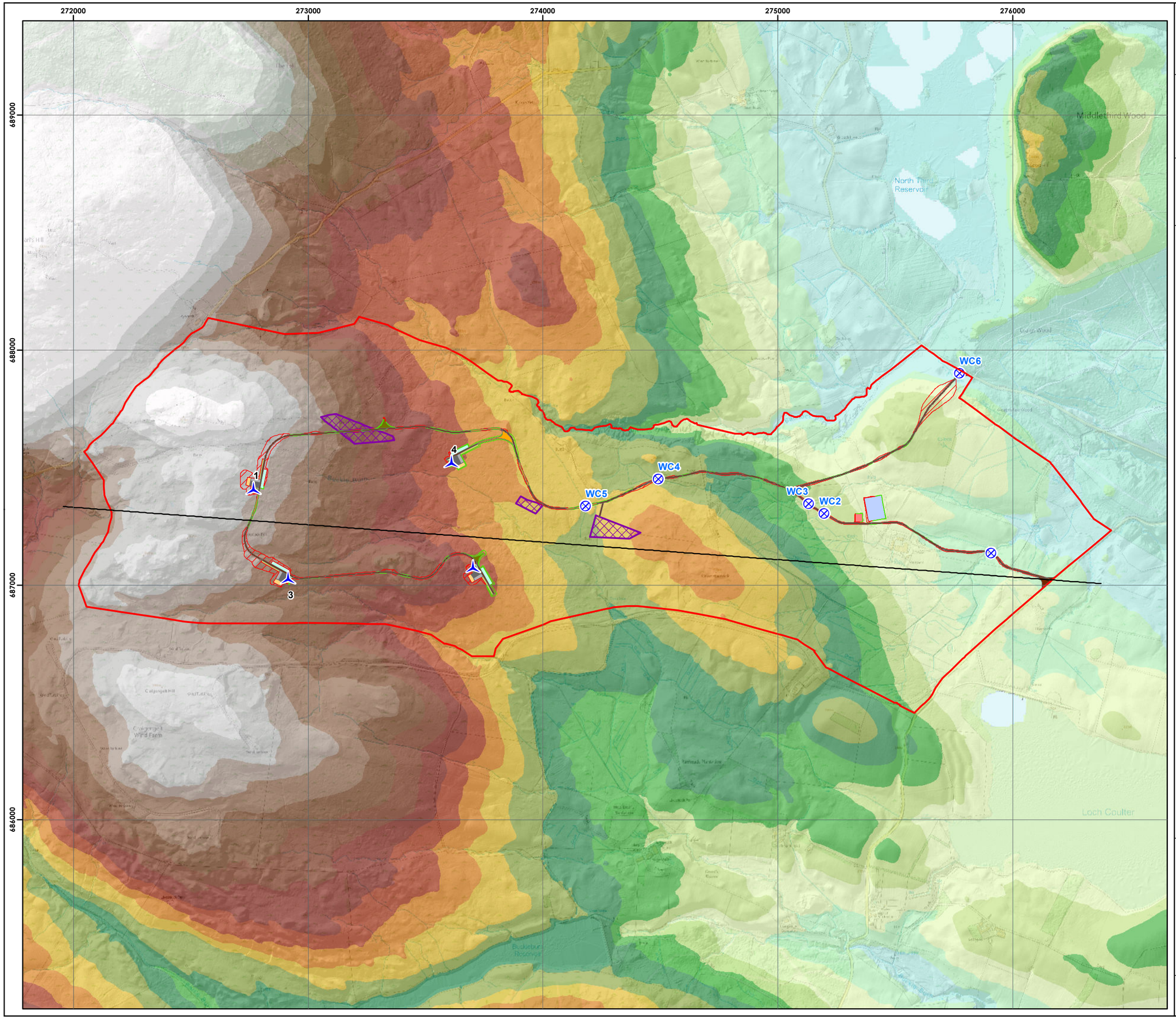
Drummarnock Wind Farm

wind2

Figure 8.3.1
Elevation



Key

- Site boundary
- Turbines
- Turbine foundation
- Crane hardstanding
- Auxiliary crane hardstanding
- Blade storage area
- Nacelle storage area
- Tower storage area
- Boom assembly area
- Turning head
- Onsite access track - cut
- Onsite access track - floating
- Onsite access track - upgraded
- Earthworks - cut
- Earthworks - fill
- Borrow pit
- Substation
- Construction compound
- Watercourse crossing - Existing
- Watercourse crossing

Elevation (m)

< 200	280 - 290
200 - 210	290 - 300
210 - 220	300 - 310
220 - 230	310 - 320
230 - 240	320 - 330
240 - 250	330 - 340
250 - 260	340 - 350
260 - 270	350 - 360
270 - 280	> 360

EAST POINT GEO
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0 125 250 500
Metres

N

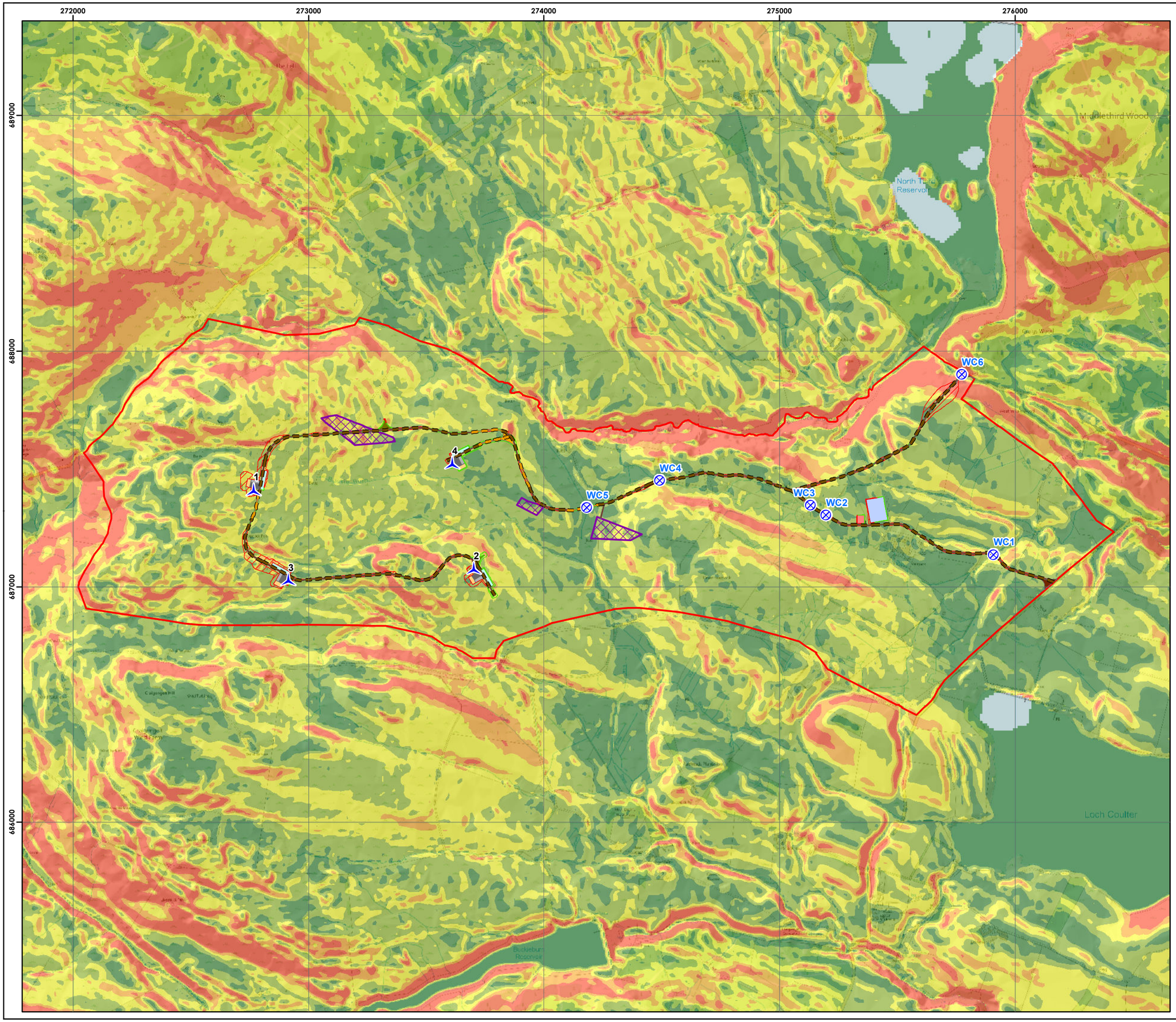
Scale @ A3:
1:15,000

28/03/24	Turbine layout 26	Drawing number
Drawn by: AM	Checked by: LK	Approved by: LK

Drummarnock Wind Farm

wind2

Figure 8.3.2
Slope Angle



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- Onsite access track - upgraded
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- Earthworks - fill
- Borrow pit
- Substation
- Construction compound
- Watercourse crossing - Existing
- Watercourse crossing

Slope angle (degrees)

- 0.0 - 2.5
- 2.5 - 5.0
- 5.0 - 7.5
- 7.5 - 10.0
- >10.0

EAST POINT GEO
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0 125 250 500
Metres

N

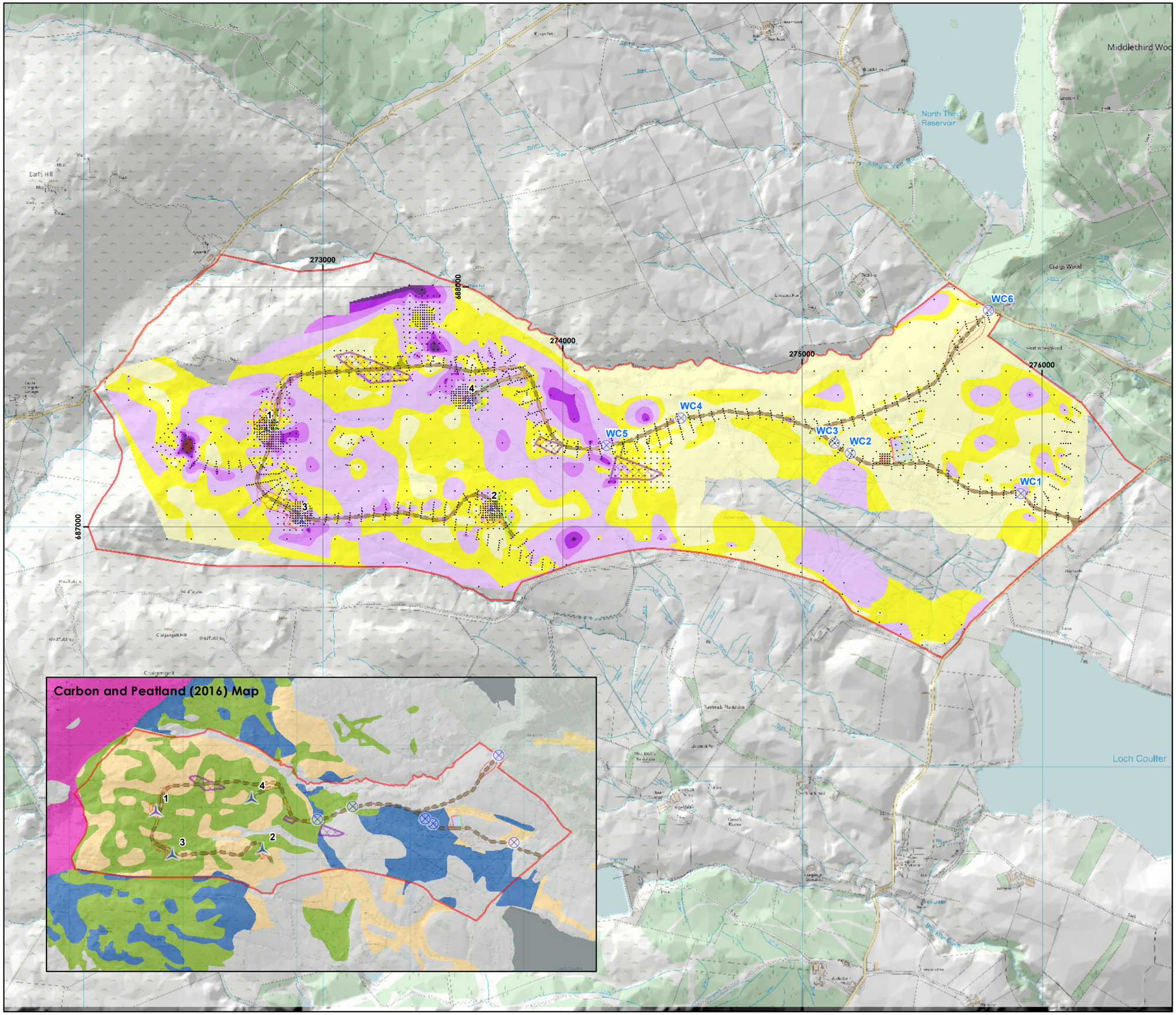
Scale @ A3:
1:15,000

28/03/24	Turbine layout 26	Drawing number
Drawn by: AM	Checked by: LK	Approved by: LK

Drummarnock Wind Farm

wind2

Figure 8.3.3
Peat Depth



Key

- Site boundary
- Turbines
- Turbine foundation
- Crane hardstanding
- Auxiliary crane hardstanding
- Blade storage area
- Nacelle storage area
- Tower storage area
- Boom assembly area
- Turning head
- Onsite access track - cut
- Onsite access track - floating
- Onsite access track - upgraded
- Earthworks - cut
- Earthworks - fill
- Borrow pit
- Substation
- Construction compound
- Watercourse crossing - Existing
- Watercourse crossing

Peat depth (m)

- 0.0 - 0.3 (soil)
- 0.3 - 0.5 (soil)
- 0.5 - 1.0 (peat)
- 1.0 - 1.5 (peat)
- 1.5 - 2.0 (peat)
- 2.0 - 2.5 (peat)
- >2.50 (peat)
- Probe location

Carbon and Peatland (2016) Map (inset)

- Class 1
- Class 2
- Class 3
- Class 4
- Class 5
- Mineral Soil
- Unknown Soil
- Non Soil

EAST POINT GEO
An ABL Group Company

atmos CONSULTING

0 125 250 500
Metres

N

Scale @ A3:
1:15,000

28/03/24	Turbine layout 26	Drawing number
Drawn by: AM	Checked by: LK	Approved by: LK