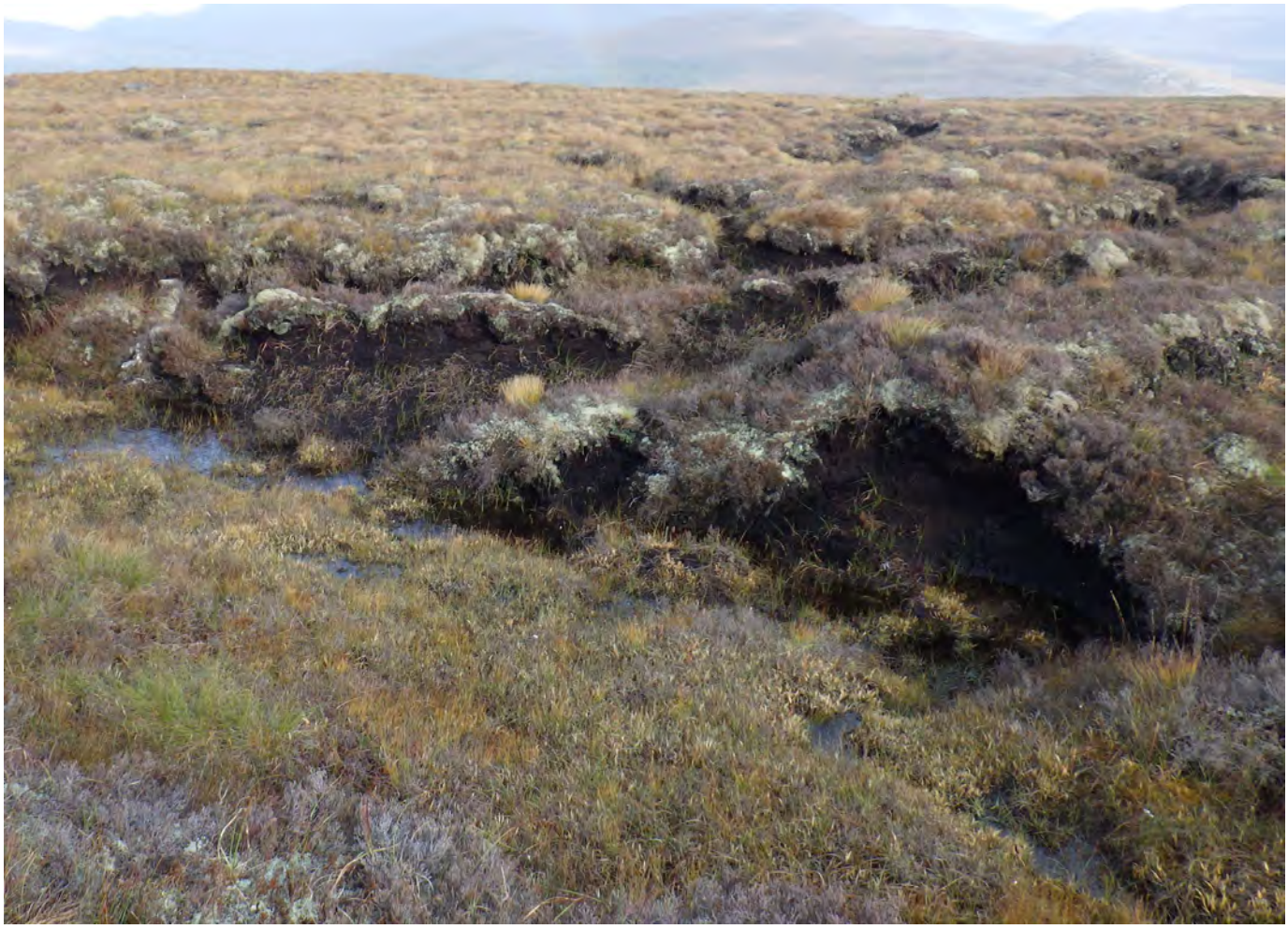

ESB Asset Development UK Limited

Chleansaid Wind Farm: Peat Slide Risk Assessment

Technical Appendix 10.1

655007-P10.1 (00)

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RSK GENERAL NOTES

Project No.: 655007-P10.1 (00)

Title: Chleansaid Wind Farm: Peat Slide Risk Assessment, Technical Appendix 10.1

Client: ESB Asset Development UK Limited

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK Environment Ltd.

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1 INTRODUCTION

1.1 This report provides a Peat Slide Risk Assessment (PSRA) for the Proposed Development and associated development infrastructure.

1.2 The report forms a Technical Appendix to the Environmental Impact Assessment (EIA) Report for the Proposed Development and should be read in conjunction with this document. It has been produced in response to concerns over development in areas of peatland relating specifically to the risk of induced instability within peat caused by the Proposed Development.

1.3 This report describes the existing peatland conditions at the site and identifies and assesses the potential impacts that may be caused by the Proposed Development. This includes potential risks from induced peat instability. Design and mitigation methods to avoid or minimise these risks are set out, along with a number of good construction practices that would be employed during all proposed site works.

Site location

1.4 The Proposed Development is located on the Dalnessie Estate, approximately 13 km to the north-east of Lairg in the Scottish Highlands, near the A836–A838 junction. The Proposed Development falls within The Highland Council (THC) area, in the North, West and Central Sutherland ward. The land is currently used as a shooting estate and for sheep grazing. Surrounding land uses include commercial forestry, sporting and recreational uses.

1.5 The turbine area covers rough moorland and rough grazing with boggy areas and is bounded to the west and south-west by commercial forestry some of which has been recently felled. The eastern side is bounded by the River Brora and the north-eastern side by the pronounced ridge of Leathad Chleansaid. The Proposed Development is underlain by nationally important carbon-rich soils, including areas of deep peat and some priority peatland habitat (NatureScot, 2016).

Development proposals

1.6 The Proposed Development infrastructure would include:

- Up to 16 wind turbines, of approximately 6 MW each, 12 with a maximum tip height of 200 m and four with a maximum tip height of 180 m;
- Hardstanding areas at the base of each turbine, with a permanent area of approximately 2156 m^2;
- One permanent meteorological mast and hardstanding areas for up to two permanent Lidar masts;
- Total length of access tracks is 17,002 m, of which 11,121 m is new access track with associated watercourse crossings and 5,881 m is existing access track and watercourse crossings which will need to be upgraded;
- An operations control building with parking and welfare facilities;
- A substation compound;

- An energy storage facility;
- Telecommunications equipment;
- Up to four temporary construction compounds;
- Two borrow pits, to provide suitable rock for access tracks, turbine bases and hardstandings; and
- Underground cabling linking the turbines with the substation.

1.7 Full details of the Proposed Development design are provided in **Chapter 2** of the EIA Report.

Aims

1.8 This report aims to undertake a review of available relevant baseline information, including all peat depth and peat condition records, in order to provide an assessment of the risk of peat instability within the Proposed Development. Recommendations will be made for mitigation measures and specific construction methods that should be implemented in order to minimise the risk of inducing instability in the peat during construction works.

Assessment method

1.9 The assessment has involved the following stages:

- Desk study;
- Site reconnaissance;
- Peat condition assessment;
- Hazard and risk assessment;
- Detailed assessment; and
- Mitigation.

2 DESK STUDY

Information sources

2.1 The desk study involved a review of available relevant information sources on the ground conditions at the proposed development. Information sources included:

- Ordnance Survey (OS) mapping at 1:50,000, 1:25,000 and VectorMap Local raster mapping, Terrain 5 digital terrain model, and OpenData mapping;
- Historical OS mapping as available to view online;
- High-resolution orthorectified aerial imagery;
- British Geological Survey online geological mapping, 1:50,000 scale;
- Scotland's Soils digital soil mapping, 1:250,000 scale;
- Data provided by the landowners and adjacent landowners;
- Data provided by the applicant relating to wind farm and renewable energy developments nearby;
- Archive data from local newspapers, as available online;
- Peat depth data collected by RSK;
- Archive and extensive site data held by RSK.

Historical information

2.2 There are no available records that indicate any historical peat slides in and around the Proposed Development.

2.3 A detailed inspection of available current and historical satellite and aerial photography has been undertaken to identify any signs of recent or former peat or slope instabilities within the site and its surroundings.

2.4 No indications of historical slope instabilities have been identified within the Proposed Development or surrounding region. Occasional landslides have been reported blocking roads in nearby parts of Sutherland, but there are no records of road blocks from landslides within 5 km of the application boundary.

Climate

2.5 The Proposed Development is located within the UK Meteorological (Met) Office's Northern Scotland regional climatic area. Much of northern Scotland is exposed to the rain-bearing westerly winds, particularly along the west coast. As the Proposed Development is centrally located, it is afforded some protection from the prevailing wet weather by the higher ground to the west. The highest average annual rainfall in the region occurs over the higher, west-facing slopes. The western half of the climatic region receives an average annual rainfall of at least 1,700 mm. The wettest part of the region is immediately north-west of Fort William on the west coast, which receives over 4,000 mm per year.

2.6 Average annual rainfall for the climate monitoring station at Altnaharra Stand Alone Weather Station (SAWS), located approximately 17 km north-north-west of the site, is

1,196 mm. Average annual rainfall for the climate monitoring station at Kinbrace, approximately 25 km north-east of the project area, is 971 mm (Met Office, 2021).

Topography and geomorphology

2.7 The turbine area lies on the south-western slope of Leathad Chleansaid, a prominent ridge extending south-east from the higher ground of Creag Riabhach na Greighe. The highest point within the turbine area is immediately south of the summit at Sròn Leathad Chleansaid, where the application boundary reaches an elevation of 335 m above Ordnance Datum (AOD). From the ridge crest, the ground slopes south-east towards the Allt nan Con-uisge and east towards the River Brora. The lowest ground is located along the Allt nan Con-uisge in the south-eastern part of the turbine area, at 195 m AOD.

2.8 The lower ground around the Allt nan Con-uisge and west towards the A836 is relatively flat with a few low, broad hills providing some relief. There is an overall gentle slope down towards the west and the River Tirry. The access area crosses this relatively flat area, running sub-parallel to the Fèith Osdail which forms a main tributary to the River Tirry. The access area to the west falls to an elevation of 140 m AOD when it joins the A836 adjacent to the River Tirry.

2.9 Slope mapping is provided on Figure 10.1.1 and geomorphological mapping on Figure 10.1.2.

Geology

2.10 Geological information is derived from the BGS GeoIndex online geological mapping and the Geological Survey of Scotland, 1:50,000 geological map series (BGS, 2000; 2004; 2021). Additional information has been derived from Johnstone & Mykura (1989) and Trewin (2002).

Bedrock geology

2.11 The majority of the site and the immediate surrounding area is underlain by the Loch Coire Formation of the Moine Supergroup, comprising metasedimentary bedrock of Neoproterozoic age. This bedrock is made up of migmatitic psammite with migmatitic semipelite, sedimentary rocks that have undergone moderate-grade metamorphism. An intrusion of the Loch Coire Granite rocks of Ordivician age runs the extent of the north-eastern edge of the site forming the higher ground of Leathad Chleansaid and the hills immediately north. This is a silica-rich igneous intrusion comprising foliated leucogranite that has undergone partial metamorphism and shearing.

2.12 Two small amphibolite dykes of Neoproterozoic age are located just outside the application boundary; both are small in footprint.

2.13 There are no mapped faults within the application boundary. However, the wider area has been subject to extensive faulting, mainly by compression (thrust) faults associated with the continental collision and mountain building episode known as the Caledonian Orogeny in the Cambrian and Ordovician periods. A branch of the regionally important Naver Thrust Fault crosses the proposed access route approximately 3 km from the public road and continues both north-west and east-south-east.

Superficial geology

2.14 The site is mainly covered by peat deposits, with these indicated to blanket the flatter and lower-lying areas of the turbine area and much of the surrounding region.

2.15 Much of the higher ground on the top and steeper slopes of Leathad Chleansaid have no superficial deposits. Other parts of the turbine area and most of the access area are underlain by undifferentiated till and moraining deposits consisting of diamicton, sand and gravel. Diamicton is a very variable glacial sediment deposited in the Pleistocene consisting of unsorted material ranging in size from clay to boulders, usually with a matrix of clay to sand.

2.16 Alluvium is also present within the site, principally located within and adjacent to river channels. Alluvium is a mixture of clay, silt, sand and gravel deposited by a watercourse in the Holocene.

Soils and peat

2.17 The Soil Survey of Scotland digital soils mapping shows turbine area soils mainly consist of peat, peaty gleys and peaty podzols, with some humus-iron podzols (Soil Survey of Scotland, 1981). The Soil Survey mapping does not identify extensive blanket peat within the project area, although blanket peat is identified adjacent to and near the turbine area to the west, north and north-east.

2.18 Three phases of peat depth surveying have been undertaken by RSK across the site; details are provided in Section 4. Further details on soils within the application boundary are provided in **Table 10.1.1** and soil distribution is shown on **Figure 10.1.3**.

Table 10.1.1: Soil Types within the Application Boundary

Soil Assoc.	Parent Material	Component Soils	Landforms	Vegetation	Area %
Arkaig	Drifts derived from schists, gneisses, granulites and quartzites principally of the Moine Series	Peaty gleys with blanket peat with peaty podzols	Undulating lowlands and uplands with gentle and strong slopes: non-rocky	Bog and northern bog heather moor; blanket and northern blanket bog; moist Atlantic heather moor	91.8
		Peaty podzols with blanket peat with peaty gleys	Hummocky valley and slope moraines: often bouldery	Bog and northern bog heather moor; blanket and northern blanket bog; moist Atlantic heather moor	7.8
Organic soils	Organic deposits	Blanket peat	Uplands and northern lowlands with gentle and strong slopes	Blanket and northern blanket bog; upland and flying bent bog; deer-grass bog; sedge mires	0.4

2.19 The site is underlain by nationally important carbon-rich soil, deep peat and priority peatland habitat according to the Carbon and Peatland 2016 map (NatureScot, 2016). The peat in the turbine area has been assigned carbon and peatland Classes 1 and 2. Class 1 indicates areas likely to be of high conservation value; Class 2 indicates areas of potentially high conservation value and restoration potential. Class 1 peat is located primarily in the western half of the turbine area, indicating that the peat in the western half of the turbine area is in better condition than the peat in the eastern half of the turbine area. The areas of each carbon and peatland class within the site are provided **in Table 10.1.2** and shown on **Figure 10.1.3**.

Table 10.1.2: Carbon and Peatland Classes Present Within the Application Boundary

Peatland class	Description	Area %
Class 1	Nationally important carbon-rich soils, deep peat and priority peatland habitat. Areas likely to be of high conservation value	56.6
Class 2	Nationally important carbon-rich soils, deep peat and priority peatland habitat. Areas of potentially high conservation value and restoration potential	42.9
Class 5	Soil information takes precedence over vegetation data. No peatland habitat recorded. May also show bare soil. All soils are carbon-rich soil and deep peat.	0.6

2.20 There is widespread evidence of modification to peatland areas to the west of the turbine area within the commercial forestry, and to a smaller extent within the turbine area for improved drainage. Some peatland restoration works were observed in an area immediately south-west of the turbine area, consisting of a series of dams in peat channels and ditches, during the walkover survey in September 2020.

2.21 The entire turbine area is subject to grazing by red deer. A number of signs of deer activity, including droppings and poaching around watercourses and boggy areas, were observed during the walkover survey.

2.22 The peat depth surveys and reconnaissance survey confirm that peat across the turbine area is mainly in a near-natural condition consisting of a patchwork of peaty soils, shallow peat and deeper peat reflecting the underlying topography.

2.23 Very deep peat (>2.5 m) is primarily located in the south-western half of the turbine area, and in some isolated areas in the eastern part of the turbine area. Peaty soils and shallow peat cover the steeper slopes in the north-eastern part of the turbine area. Directly west and south-west of the turbine area, peatland has been considerably disrupted by the plantation of coniferous forestry and is no longer in near-natural condition. Drainage ditches have been excavated throughout the forested areas in an attempt to improve the ground for tree growth. Much of the forestry has recently been clear-felled, resulting in additional disruption to the ground conditions from the felling works. This may have had some influence on the south-western part of the turbine area, as some peat in this area shows signs of active erosion.

Hydrogeology

2.24 The region is underlain by the Moine Supergroup low productivity aquifer, with small amounts of groundwater in the near-surface weathered zone and secondary fractures. The Loch Coire granite, in the north-eastern section of the site, is also classed as a low productivity aquifer with small amounts of groundwater in the near-surface weathered zone and secondary fractures, with rare springs (Scottish Government, 2021).

2.25 The superficial deposits covering the site have a range of potential permeabilities, and their productivity will depend on their composition and connectivity locally, with pockets of sand and gravel having high permeability and clay and silt having low permeability. Alluvial deposits may contain significant groundwater, but its value would be restricted by the small size of the deposits.

2.26 The peat bodies will also hold some groundwater, although peaty gleys are known to have poorly drained characteristics. Flow within peat is known to be extremely slow, although it can contribute some limited baseflow to local burns.

2.27 Regional groundwater flow will tend to mimic the natural topography, flowing mainly south and west towards the Allt nan Con-uisge.

2.28 No springs or seepage lines were identified within the site.

Hydrology

2.29 The Proposed Development lies across two main watercourse catchments: the River Brora and the River Tirry catchments.

River Brora Catchment

2.30 The River Brora catchment has a total area of approximately 67.48 km^2 and drains 86% of the site.

2.31 The Allt nan Con-uisge provides the main drainage for the turbine area. It is located within the broad valley south-west of Leathad Chleansaid and drains south-east into the River Brora approximately 800 m upstream of Dalnessie. A number of minor tributaries and drainage ditches drain into the Allt nan Con-uisge from the slopes of Leathad Chleansaid and the low, poorly defined hills to the south-west of the main channel.

2.32 The River Brora provides the drainage for the eastern end of the turbine area, including the lower slopes of Leathad Chleansaid. The River Brora heads mainly south-east, to reach the North Sea at Brora.

River Tirry catchment

2.33 The River Tirry catchment has a total area of 163.41 km^2 and drains 14% of the site.

2.34 The Abhainn Sgeamhaidh drains the northernmost part of the turbine area, around A' Chleansaid and the slopes below Creag Dhubh. It flows mainly south-west to join the River Tirry west of the A836 before it reaches Loch Shin.

2.35 The Fèidh Osdail provides the drainage for the access area. This watercourse drains west and joins the River Tirry near the access area junction off the A836.

2.36 The Brora and Tirry catchments are not entirely independent. The weir at Dalnessie and associated artificial channel provide a cross-link from the River Brora into the River Tirry catchment via the Fèidh Osdail. This was established to support the hydro-electric scheme downstream of Loch Shin during periods of high flow in the River Brora.

Aerial Photography

2.37 World Imagery mapping, the high-resolution orthorectified colour aerial imagery from ESRI, has been used for this assessment (ESRI, 2021).

2.38 The development area is mainly shown as a series of brown and tan areas, occasionally broken by curved lines. These brown and tan areas represent rough open moorland, with darker areas characterised as being boggier or having more heather and shrub vegetation, while the lighter tan areas have more rushes and dry grasses. The curved lines cutting through the development area variably represent watercourses, ditches, drainage lines in peatland and quad bike or argo tracks.

2.39 The dark brown area between Turbines T1 and T2 represents an area of bare peat that was noted to be actively eroding during peat surveys in 2020 and 2021.

2.40 Areas to the west and south-west of the application boundary are dark green, representing commercial forestry blocks. The tan and brown area between these two blocks with row patterns indicates recently felled forestry. The tan and brown area lacking the row pattern shows an unplanted area of natural moorland between the two forestry blocks.

2.41 The patchy areas of bright green along the Allt Gobhlach represent grassland areas characterised by sheep grazing.

2.42 A few small areas of exposed bedrock are visible along the crest of Leathad Chleansaid, showing as grey. Exposed bedrock is not extensive in any part of the area.

Vegetation mapping

2.43 The site vegetation has been surveyed using a combined Phase 1 habitat and National Vegetation Classification (NVC) survey method and is reported in full in **Chapter 8**, with mapping provided in **Figure 8.3**. The key findings relating to groundwater dependency are summarised below.

2.44 NVC communities identified by SEPA as likely to be highly or moderately groundwater dependent, depending on the hydrogeological setting, are listed in SEPA's publication *"Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems"* (SEPA, 2017). Within the application boundary, the potentially groundwater-dependent NVC communities identified are:

- M15 - *Scirpus cespitosus* - *Erica tetralix* wet heath;
- M23 - *Juncus effusus/acutiflorus* - *Galium palustre* rush-pasture; and
- M25 - *Molinia caerulea* - *Potentilla erecta* mire.

2.45 The list of NVC communities provided in SEPA's (2017) Appendix 4 indicates that M23 is potentially highly groundwater-dependent and M15 and M25 are potentially moderately

groundwater-dependent in Scottish situations. The UKTAG updated Annex 1 (UKTAG, 2009) identifies M15 and M23 as potentially moderate and M25 as potentially low groundwater dependency in Scottish situations.

3 SITE RECONNAISSANCE

3.1 A walkover survey was undertaken by RSK on 10-11 September 2020. The scope of the survey included a reconnaissance survey of the site and its immediate surroundings, plus mapping of the geomorphology and local-scale hydrology of the site. The survey covered the entire application boundary, with a particular focus on locations where infrastructure is planned, as well as potential access routes into and across the Proposed Development. The weather during the survey was sunny with cloudy periods and a strong breeze. Visibility was reasonable throughout.

3.2 The areas described below provide good coverage of the site, detailing the range of landforms, vegetation and erosion patterns encountered.

3.3 Reference is made to peat hagging, a form of erosion specific to peat. The peat develops channels which form breaks in the surface vegetation, exposing bare peat surfaces which are then more susceptible to erosion. Over time, this can lead to the development of a network of complex and sinuous channels through the peat and can lead to the formation of isolated peat 'islands'. In extreme situations, the peat body can be completely removed to leave bare mineral soil. Peat hagging is a natural process but can be exacerbated by poor land management practices including overgrazing and trampling from deer, sheep and cattle, extensive muirburn from grouse moor management, and uncontrolled off-road vehicle activity.

	**(A) View of northern turbine area, NGR NC 6170 2830** View looking NW along Leathad Chleansaid. View includes the northernmost turbine area (Turbines T15 and T16). Peat along the hillside was generally shallow or absent with occasional records up to 1.5 m. In the lower area, peat was more variable – mainly <1 m but in places deeper than 4 m.
	**(B) View of central turbine area, NGR NC 6040 2790** Overview of central turbine area, including Turbines T11 and T9, looking east from the western planning application boundary. Peat depth in foreground is 1.9 m deep, becoming shallower around the watercourse, and then deepening further east.

	**(C) View of southern turbine area, NGR NC 6220 2560** Overview of southern turbine area (Borrow Pit BP1 and Turbine T1), looking north from the southern planning application boundary. Peat in the photo foreground ranges from <0.5 m to 1.2 m. The gentle slopes in this area are characteristic of the main turbine area.
	**(D) View south-east from NGR NC 6133 1695** Photo across the southern part of the turbine area, including Turbines T1, T2 and T5. The dark green in the background is commercial forestry. The Allt nan Con-uisge is to the left hand side. Peat depths range from <0.5 m in parts of the river valley and areas of moraine deposit, to 4 m and deeper in the flat plateau to the right hand side.
	**(E) View north from NGR NC 6198 1588** Photo across the eastern part of the turbine area, including Turbines T5-T8, T12 and T13. The high point to the left side is Sròn Leathad Chleansaid. The Allt nan Con-uisge crosses the photo in the centre, the steep valley sides are visible as shadowed areas. Peat depths vary widely in this area, from <0.5 m to >4 m.
	**(F) View of eroding peat area, NGR NC 6089 1727** Photo of area of eroding peat in west of turbine area near the Allt nan Con-uisge, located approximately 230 m north of Turbine T4. Peat depth was recorded to be 3.8 m deep in this area and was noted to be quite stiff and dried out. This area is a potential option for peatland restoration.

	**(G) View of peat hag in west of turbine area, NGR NC 6083 1750** Photo looking north-east at peat hag, within a large area of eroding peat in the west of development area near the Allt nan Con-uisge. No proposed infrastructure is located here. This peat hag lies between very deep peat to the west (3.5 m deep) and shallow peat to the east (0.6 m deep).
	**(H) View of peat erosion in western development area, NGR NC 6111 9168** Photo of large actively eroding peat channel in the west of turbine area near the Allt nan Con-uisge, located just north of the proposed access track. Photo looking north. Peat depth in this area is very deep. At this location, peat was recorded to be 2.4 m deep, with nearby depths reaching 4.1 m.
	**(I) View over boggy area in south-west turbine area, NGR NC 6161 1593** Looking west toward site boundary fence. The presence of cotton-grass in this area indicates very boggy ground, with visible open water and peat channels. Peat depth in this location is 3.9 m, becoming shallower towards the right hand side of the photograph.
	**(J) View of drainage ditch, NGR NC 6140 1740** View NNW upstream along an artificial drainage ditch running through the central turbine area. Some drainage of this kind is present within the area, although is relatively limited in extent. Peat in this location is 2.5 m in depth. The drainage channels have had relatively limited effect on the peat.

4 MAPPING

Peat depth survey

4.1 Initial peat depth surveying was undertaken by RSK between 22nd and 29th June 2020. This Phase 1 survey consisted of a 100 m grid across the turbine area in order to develop a picture of the overall pattern of peat development across this area. In addition, limited crosshair probing at the scoping turbine locations was undertaken, collecting five depths per turbine base. The survey results were used to inform the infrastructure design, in order to minimise incursion into areas of deeper peat.

4.2 A subsequent phase of peat depth surveying was undertaken by RSK between 19th and 23rd October 2020. For this Phase 2 survey, peat depths were recorded at 50 m intervals along proposed tracks, crosshair probing at turbine base locations and in grids across hardstanding areas, site compounds, buildings and borrow pit areas. Offset records were made alongside existing tracks that would require widening as part of the Proposed Development.

4.3 As a result of infrastructure design layout changes, a third phase of peat depth surveying was undertaken between 3rd and 5th May 2021. For this Phase 3 survey, peat depths were recorded at 50 m intervals along newly proposed tracks, crosshair probing at turbine base locations and in grids across hardstanding areas, site compounds, buildings and borrow pit areas.

4.4 Peat probing point locations were recorded using a handheld GPS with typical accuracy of ±5 m and peat depths were measured to an accuracy of ±0.05 m. All measurements were recorded to full depth/point of refusal.

4.5 The survey results are summarised in **Table 10.1.3.**

4.6 The peat depth survey indicates that approximately two-fifths of the site has no peat, with 35.5% of the measured locations having topsoil or peaty soil cover up to 0.5 m deep. 14.1% of the site has peat depths of 1.5 m or shallower. The deepest recorded peat was 7.75 m.

4.7 The peat depth survey and reconnaissance survey both confirm that peat deeper than 2 m is primarily located in the south-western half of the turbine area, and in some isolated areas in the north-eastern half of the turbine area. Peaty soils and shallow peat cover the majority of the steeper slopes in the north-eastern half of the turbine area.

4.8 There is an area with extensive peat deeper than 2 m in the low-lying area around the Allt nan Con-uisge between proposed Turbines T4, T9 and T11. A less extensive area of very deep peat is present between Turbine T3 and the Allt nan Con-uisge. A third area of very deep peat is present between Turbines T1, T2 and T3 and the planning application boundary, which appears to extend south-west into the forestry area beyond the planning application boundary. This third section produced the deepest peat record for the site, at 7.75 m.

Table 10.1.3: Summary of peat depth probing results

Peat depth range (m)	No. of points	Percentage of points
0.00	0	0.0%
0.01 – 0.50	726	35.5%
0.51 – 1.00	562	27.5%
1.01 – 1.50	288	14.1%
1.51 – 2.00	160	7.8%
2.01 – 2.50	130	6.4%
2.51 – 3.00	82	4.0%
3.01 – 3.50	40	2.0%
3.51 – 4.00	19	0.9%
4.01 +	38	1.9%
Total:	2,046	100.0%

4.9 The slopes of Leathad Chleansaid are largely free of peat, with some small isolated areas of deep to very deep peat. In the eastern part of the turbine area, one notable area of deep peat is present to the south-east of Turbine T12.

4.10 Smaller additional areas of deep peat (2 m or deeper) are present in parts of the development area but are generally not extensive. The probing data indicate that the peat depth can vary very substantially over short distances.

Indicative peat depth mapping

4.11 The combined peat depth survey results were used to produce an extrapolated indicative peat depth map for the Proposed Development. The extrapolated peat depth map was produced using a Gravity interpolation across the site with a 10 m cell size.

4.12 The advantage of using a digital interpolation is that the process is fully objective and there can be no subjective influence. However, the process is not able to allow for known variation in peat development in varying topographical settings. As a result, there may be over-estimation of peat development in areas of steep or well-drained ground, and potential under-estimation of peat development in flatter or poorly drained areas. Owing to the good resolution of the underlying data, the interpolation appears largely to give a representative indication of peat depth across the site.

4.13 The indicative peat depth map for the Proposed Development is provided in **Figure 10.1.4**.

Peat sampling and analysis

4.14 Peat core samples were taken at three locations and the peat cores were logged using the modified Von Post humification and wetness scale. Core logs and photographs are provided in Annex 1.

4.15 Three peat core samples were sent for analysis by Envirolab. Analysis results are provided in **Table 10.1.4** and sampling locations are shown on **Figure 10.1.4.**

Table 10.1.4: Peat sample analysis results

Client Sample ID	Units	Limit of Detection	Method	C1	C2	C3
Depth to Top				1.75	1.20	2.70
Depth to Bottom				1.90	1.40	2.90
Date Sampled				05-May-21	05-May-21	05-May-21
Sample Type				Soil	Soil	Soil
% Moisture at <40°C	% w/w	0.1	A-T-044	88.0	90.5	90.9
% Stones >10mm	% w/w	0.1	A-T-044	<0.1	<0.1	<0.1
pH	pH	0.01	A-T-031s	5.72	5.82	4.61
Total Carbon	% w/w	0.1	A-T-032s	50.4	51.4	51.0
Wet weight of soil	g	0.1		115.1	107.9	105.3
Dry weight of soil	g	0.1		13.8	10.3	9.6
Bulk density	g cm^{-3}			1.08	1.02	0.99

5 PEAT CONDITION

Developments on peat

Definition of peat

5.1 Scotland's Soils (2018a) classifies peat as:

> *An accumulation of partially decomposed organic material, usually formed in waterlogged conditions. Peat soils have an organic layer more than 50 cm deep from the soil surface which has an organic matter content of more than 60%.*

5.2 Organic soils which are 50 cm or thinner can also support peatland vegetation and as a result are also considered within Scotland's broader peatland system in Scotland's National Peatland Plan (NatureScot, 2015). These are often described as 'peaty gleys' or 'peaty podzols', reflecting key aspects of the underlying soil. Peaty soils have a higher plant fibre content and are less decomposed than peat.

5.3 Active peatland typically consists of two layers: the surface layer or *acrotelm* and the deeper layer or *catotelm*. The acrotelm contains the living vegetation and consists of living and partially decayed plant material. It typically has a low but variable hydraulic conductivity and allows some through-flow of water within the plant material. The underlying catotelm is denser, with a very low hydraulic conductivity, and is formed from older decayed plant material. The catotelm varies in structure, in some areas retaining a proportion of fibrous material and in other areas being more humified and amorphous. The degree of humification typically increases with depth.

5.4 Underneath the peat-forming layers, the basal substrate can be a mineral soil, a superficial deposit such as glacial material, or bedrock. There may be a transition zone through a mineral-rich peaty layer at the base of the peat, although this is usually no more than 5 cm in thickness.

Importance of peat

5.5 Peatland forms a key part of the Scottish landscape, covering more than 20% of the country's land area, and forming a significant carbon store (Scotland's Soils, 2018b). In addition, peatland is an internationally important habitat.

5.6 Active and healthy peatlands develop continuously, removing carbon dioxide from the atmosphere and storing it within the peat soil. Peatland protection and restoration form key parts of the Scottish Government's Climate Change Plan, which targets restoration of 250,000 ha by 2030 (Scottish Government, 2018). As of March 2020, over 25,000 hectares of peatland had begun restoration, and in 2020 the government announced a £250 million ten-year funding package to support the restoration of degraded peat (Scottish Government, 2020). Restoration will need to be conducted at a faster pace to reach targets.

5.7 It is therefore important that developments in peatland areas take recognition of the importance of peatland as a habitat and carbon store. Careful planning of developments, and careful infrastructure design, can remove or minimise the disturbance of peat that would be needed to allow the development to proceed.

Peat condition survey

5.8 As part of the peat depth surveys, information was collected concerning the condition of the peat present within the site. NatureScot recognises five categories of peatland condition: (1) Near-natural; (2) Modified; (3) Drained; (4) Actively eroding; and (5) Forested/Previously Afforested (NatureScot, 2017).

5.9 As the Proposed Development is principally within near-natural upland moorland, the majority of the site falls into categories 1 and 2. There are some parts of the site where attempts at drainage have been made (category 3; Photograph 10.1.1) and others that are actively eroding (category 4; Photograph 10.1.2). The areas of active erosion are focused on the high ground between Sròn Leathad Chleansaid and Creag Dhubh, with an additional area between Turbines T4, T9 and T11 spread across both sides of the Allt nan Con-uisge. A further area of active erosion is located between Turbines T1 and T2, near the south-western planning application boundary.

5.10 Peat covers the majority of the site, with very deep peat (>2.5 m) primarily located in the south-western half of the turbine area, and in some isolated parts in the north-eastern half of the turbine area. The peat within the turbine area is mainly in the form of blanket peat.

Photograph 10.1.1: Drainage ditch on the lower slopes of Leathad Chleansaid, looking SSE from NGR NC 6140 1740.

Photograph 10.1.2: Peat hagging and active erosion in the turbine area near Turbines T3 and T4 (NGR NC 6109 1695).

Existing peatland restoration

5.11 Existing peat dams were observed to the south-east of the turbine area in September 2020, to the west of the existing access track (Photograph 10.1.3). This is part of other peatland restoration works that have been put in place within the wider estate. However, high levels of deer grazing and trampling pressure were also observed in this area during the May 2021 site visit which could negatively affect restoration attempts.

Photograph 10.1.3: Existing peatland restoration at the Dalnessie Estate, to the south-east of the turbine area (NGR NC 2686 1572).

Proposed peatland restoration

5.12 The actively eroding area of peat in the western part of the Proposed Development around the Allt nan Con-uisge would benefit from peatland restoration. This restoration work would aim to bring more of this peat body into near-natural condition and to prevent further erosion. Other areas may also be suitable for peatland restoration and blocking of artificial drainage channels.

5.13 This may include blocking of natural or artificial drainage channels to encourage re-wetting and regrowth of *Sphagnum* species, the use of geotextile and/or mulches to prevent erosion and encourage natural regrowth of vegetation, and/or the exclusion of grazers through fencing.

5.14 Peatland restoration proposals for the project are discussed in Technical Appendices 10.2 (Peat Management Plan) and 8.5 (Outline Habitat Management Plan).

6 HAZARD AND RISK ASSESSMENT

6.1 For the purposes of this peat slide risk assessment, the following definition of risk has been adopted:

Risk = Probability of a Peat Landslide x Adverse Consequences

6.2 Probability, or likelihood, can be estimated in a number of ways and should take account of both natural factors and man-made or man-imposed factors that could influence slope stability. Man-made or man-imposed factors can include overgrazing from over-stocking, excavation of drainage ditches or grips, or heather burning for land management purposes. Natural factors can include extreme weather events such as very high intensity rainfall, or prolonged dry periods followed by storms.

6.3 The methods of assessment of likelihood and adverse consequences used here are described below.

Assessing likelihood

6.4 As peat slope failures are mainly considered to resemble planar translational slides, the assessment of likelihood of a peat landslide makes use of the Infinite Slope Model (Boylan & Long, 2014) to assess stability of the peat across the slopes in the Site, in line with the Scottish Government guidance (Scottish Government, 2017). The Infinite Slope Model assesses slope stability by calculating the forces resisting failure (shear strength or cohesion) and the forces inducing failure (shear stress) and taking a ratio of these, known as the Factor of Safety. The modified Infinite Slope Model equation is as follows:

$$F = \frac{c'}{\gamma\, z \sin\beta \cos\beta}$$

where F = Factor of Safety, the ratio of forces resisting a slide to forces causing a slide

c' = undrained shear strength of the material; kPa

γ = specific weight of peat, undrained in situ; kN/m^3

z = peat depth; m

β = slope of ground surface, assumed to be parallel to the slope of the failure plane; degrees

6.5 If F > 1, the slope is stable; if F < 1 the slope is unstable; if F = 1 the forces are exactly balanced. It is possible to state with some confidence, therefore, that if F > 1.3 the slope is stable and would have some resistance to change.

6.6 Values assigned to the parameters are provided in **Table 10.1.5**, along with an explanation for their selection.

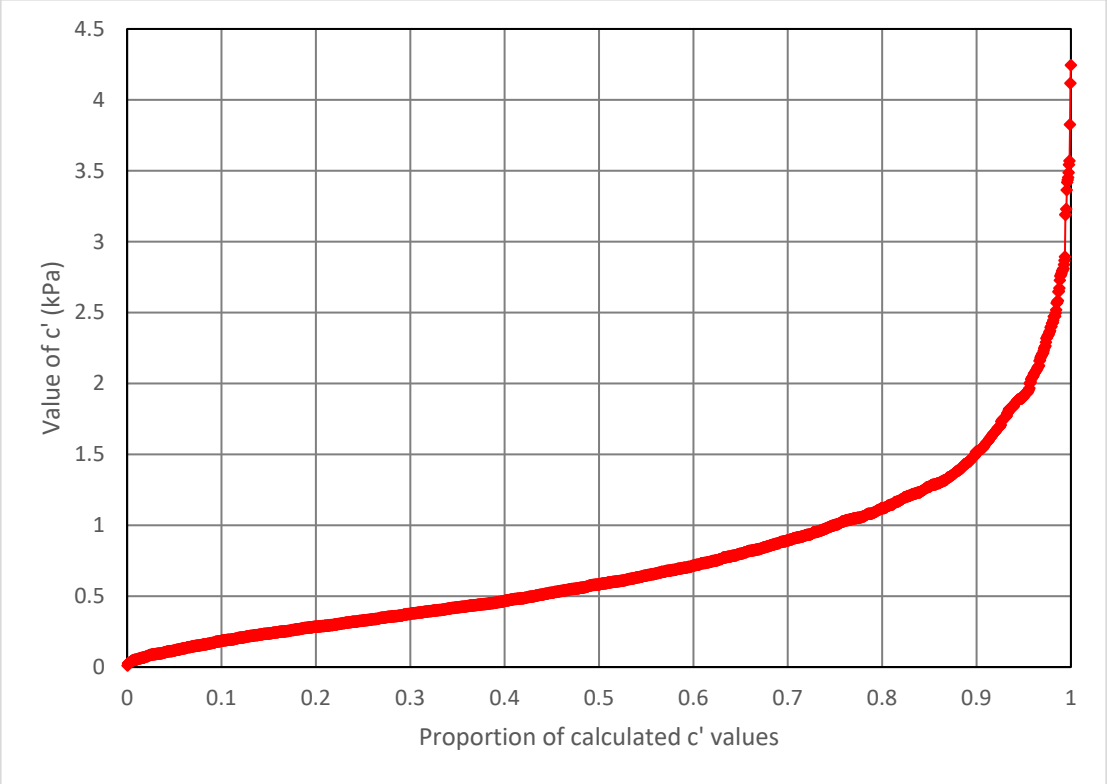
Table 10.1.5: Parameters for the Infinite Slope Model

Parameter	Value and Derivation
F	Calculated value
c'	4.2 kPa Published shear strength values for peat vary from 4.5 to 60 kPa or more (e.g. Long, 2004). Published values from recent field tests tend to cluster between 10 and 20 kPa with some higher and lower values recorded. The selected value represents the maximum of a back-calculated minimum, c' (see explanation below).
γ	10.11 kN/m^3 Derived from density of peat multiplied by acceleration due to gravity (9.81 m/s^2). Density of peat varies depending on degree of decomposition and water content; published values range from 500 to 1,400 kg/m^3. This value is derived from peat core samples collected from the Proposed Development site, which came to a mean value of 1031 kg/m^3.
z	Where available, measured peat depths have been used. For grid analysis, the maximum interpolated depth within the grid has been taken to provide a conservative estimate.
β	Slope angles have been derived from the DTM for the site. Grid cell slopes were all derived from the Site DTM. The DTM used for slope angle generation has a resolution of 5 m. The slope raster map was generated within the GIS software used for the analysis. Average (mean) slope angles were used for each cell.

6.7 The shear strength, c', has been estimated from site data. This is undertaken by assuming that the slope is just marginally stable at each point where peat depth has been measured, i.e. the slope has F = 1. The Infinite Slope Model equation can be rearranged to derive a value for c', using the other parameters as described in **Table 10.1.5**.

6.8 It is important to note that the calculated values of c' for each location represent the minimum shear strength needed for the peat to be stable. In fact, the shear strength may be, and in most cases probably is, considerably higher. For example, on very shallow slopes the peat needs only a very low shear strength to remain stable, whereas on steeper slopes a much higher shear strength is required to hold the peat on the slope. For this reason, the higher estimated values of c' are of more relevance as they are more likely to be representative of the actual shear strength of the peat on the site. For this assessment, the maximum value of the calculated shear strengths has been used in the stability analysis. This gives a value of 5.1 kPa, as stated in **Table 10.1.5**.

6.9 At the Proposed Development, 2,046 locations have been probed during the phases of fieldwork. c' values have been calculated for each of these and the distribution is provided in Graph 10.1.1.



Graph 10.1.1: Estimate of minimum shear strength, c'

6.10 In order to produce a site-wide dataset for Factor of Safety, a grid of 50 x 50 m cells was overlain across the site and a Factor of Safety calculated for each cell. It is a standard and widely recognised GIS technique to use a regular grid for terrain analyses of this kind. It allows a systematic process across the landscape and minimises the subjectivity of the analysis. The 50 x 50 m cells are referred to as 'grid cells' throughout the analysis.

6.11 The Factor of Safety, F, has been calculated for each peat probing location within the site, and for each grid cell within the site. A buffer of 200 m around the application boundary has also been included. The Factors of Safety have been divided into classes, which have been used to map the likelihood of a peat landslide occurring at each point and for each grid cell across the site.

6.12 For most wind farm assessments, the calculated Factor of Safety results are considered together with field observations and geomorphological assessment to take into account additional risk factors including breaks in slope or risk reduction factors such as areas of bedrock exposure. These factors have been applied to the calculated Factor of Safety results and the grid cell classes have been changed as appropriate based on the geomorphological mapping. For cells where additional risk factors and risk reduction factors are both present, no change has been made to the calculated results. The results are presented in **Table 10.1.6**.

Table 10.1.6: Summary of likelihood ratings

Likelihood	Factor of Safety	No. of points	% of points	No. of cells (FoS)	% of cells (FoS)
Nil	No peat	726	35.5%	816 (816)	18.8% (18.8)
Negligible	2.5 +	1,166	57.0%	2949 (3108)	67.8% (71.4)
Unlikely	1.3 to <2.5	144	7.0%	506 (401)	11.6% (9.2)
Likely	1.1 to <1.3	8	0.4%	66 (15)	1.5% (0.3)
Probable	1.0 to <1.1	2	0.1%	6 (4)	0.1% (0.1)
Almost certain	<1.0	0	0.0%	7 (5)	0.1% (0.1)
	Totals	2,046	100%	4,350	100%
N.B. Numbers in brackets for the grid cells are the original results from the Infinite Slope Model analysis, to provide a comparison with the Likelihood Rating results					

6.13 The Likelihood map is provided in **Figure 10.1.5**.

Assessing adverse consequences

6.14 Potential adverse consequences resulting from a peat landslide cover a wide range, from environmental through to economic and, potentially, harm to life. Scottish Government (2017) gives five examples, as follows:

- Potential for harm to life during construction;
- Potential economic costs associated with lost infrastructure or delays in the construction programme;
- Potential for reputational damage associated with the occurrence of a peat landslide in association with construction activities;
- Potential for permanent, irreparable damage to the peat resource, in terms of both carbon store and habitat, through mobilisation and loss of peat in a landslide;
- Potential for ecological damage to watercourses and waterbodies subject to inundation by peat debris.

6.15 Adverse consequences have been assessed taking account of environmental sensitivity, including potential consequences to water quality from peaty debris and habitat loss by peat removal and by blanketing of sensitive areas with peat debris, and economic significance, including damage to infrastructure and construction delays resulting from a peat landslide, in line with current guidance (Scottish Government, 2017).

6.16 Adverse consequence has been assigned as follows:

- **Very high consequence:** buildings, wind turbine foundations, substations, public roads, private water supply infrastructure;
- **High consequence:** watercourses and waterbodies, areas of sensitive habitat, turbine hardstandings, compounds;
- **Moderate consequence:** access tracks, laydown areas, met masts, mobilisation compounds;
- **Low consequence:** areas of low sensitivity habitat, borrow pits;

- **Very low consequence:** damaged or degraded habitat.

6.17 **Table 10.1.7** below provides a summary of the grid cells at the site assigned the various consequence ratings. The adverse consequence map is provided in **Figure 10.1.6.**

Table 10.1.7: Summary of adverse consequence ratings

Adverse consequence	No. of cells	% of cells
Very high consequence	110	2.5%
High consequence	510	11.7%
Moderate consequence	391	9.0%
Low consequence	3,339	76.8%
Very low consequence	0	0%

Risk assessment

6.18 The Likelihood and Adverse Consequence are combined to produce an estimate of risk for each grid cell within the site. The risk assessment matrix used to combine these two parameters is provided in **Table 10.1.8** below.

Table 10.1.8: Risk assessment matrix

		Adverse consequence				
		Extremely high	High	Moderate	Low	Very Low
Peat landslide likelihood	Almost certain	High	High	Moderate	Moderate	Low
	Probable	High	Moderate	Moderate	Low	Negligible
	Likely	Moderate	Moderate	Low	Low	Negligible
	Unlikely	Low	Low	Low	Negligible	Negligible
	Negligible	Low	Negligible	Negligible	Negligible	Negligible

6.19 **Table 10.1.9** below provides a summary of the risk ranking for the grid cells across the site, together with an indication of appropriate mitigation from Scottish Government (2017). The risk ranking map is provided in **Figure 10.1.7**.

Table 10.1.9: Summary of risk ranking and appropriate mitigation

Risk ranking	No. of grid cells	% of grid cells	Appropriate mitigation
High	0	0.0%	Avoid project development at these locations
Moderate	15	0.3%	Project should not proceed unless risk can be avoided or mitigated at these locations, without significant environmental impact, in order to reduce risk ranking to low or negligible
Low	208	4.8%	Project may proceed pending further investigation to refine assessment, and mitigate hazard through relocation or re-design at these locations
Negligible	3,311	76.1%	Project should proceed with monitoring and mitigation of peat landslide hazards at these locations as appropriate
No peat	816	18.8%	No peat landslide hazard

6.20 Most of the site has been assessed as having a negligible risk of peat landslide, or of having no peat (94.9%). Fifteen grid cells have been assessed as having a moderate risk of peat landslide and none with a high risk.

6.21 Of the 15 grid cells assessed as having moderate risk, six are located adjacent to proposed infrastructure. These cells and their immediate surroundings have been the subject of further investigation in order to refine the assessment in these areas.

6.22 The remaining moderate risk cells have been considered in relation to natural peat slide and the risk this may cause to proposed infrastructure.

6.23 Both aspects are detailed in Section 7.

Peat slide risk associated with blasting for aggregate

6.24 For many renewable energy developments, aggregate extraction is achieved by blasting of bedrock. The shock waves from blasting have the potential to travel through the bedrock and could, potentially, be associated with triggering instability in peat areas at some distance from borrow pit sites. All borrow pit sites have been located within areas with minimal or no peat, to restrict the potential for induced peat slide adjacent to the borrow pit areas.

6.25 All blasting will be under the supervision of a qualified and experienced blast engineer. The smallest practicable amount of explosive would be used in order to minimise shock waves resulting from the blast. Additional pre-drilling of the blast face may be appropriate to provide a higher level of control of the blast, particularly if this allowed use of smaller amounts of explosive; this would be undertaken on the advice of the blast engineer operating within the site.

6.26 Significant excavation works would be restricted when blasting for aggregate is planned at either borrow pit, with restrictions affecting Turbine T1, the entrance construction compound and control building for works at Borrow Pit BP1, and Turbines T7, T8, T12 and T13 and the subsidiary construction compound for works at Borrow Pit BP2. Works

would only continue after appropriate inspections have determined that ground instability has not arisen as a result of the blast.

6.27 Visual peat monitoring would be undertaken following periods of blasting, to inspect nearby infrastructure locations for any signs of peat instability. This would include recording any signs of cracking or mounding of peat, which can be the early signs of slippage. It is recommended that infrastructure and peat areas within 500 m of the blasting location are visited, with additional locations if relevant as recommended by the Environmental Clerk of Works.

6.28 Blasting may be restricted in periods of significant wet weather, upon the advice of the blast engineer. Wet weather definitions are provided in Technical Appendix 10.2 Peat Management Plan of the EIA Report.

7 DETAILED ASSESSMENT AND MITIGATION

Detailed assessment

7.1 Six grid cells within the proposed infrastructure footprint have been identified as having a moderate risk of peat landslide. In addition, nine cells forming five small clusters have been identified as having moderate risk of peat landslide. The areas identified for detailed assessment are indicated on **Figure 10.1.7**.

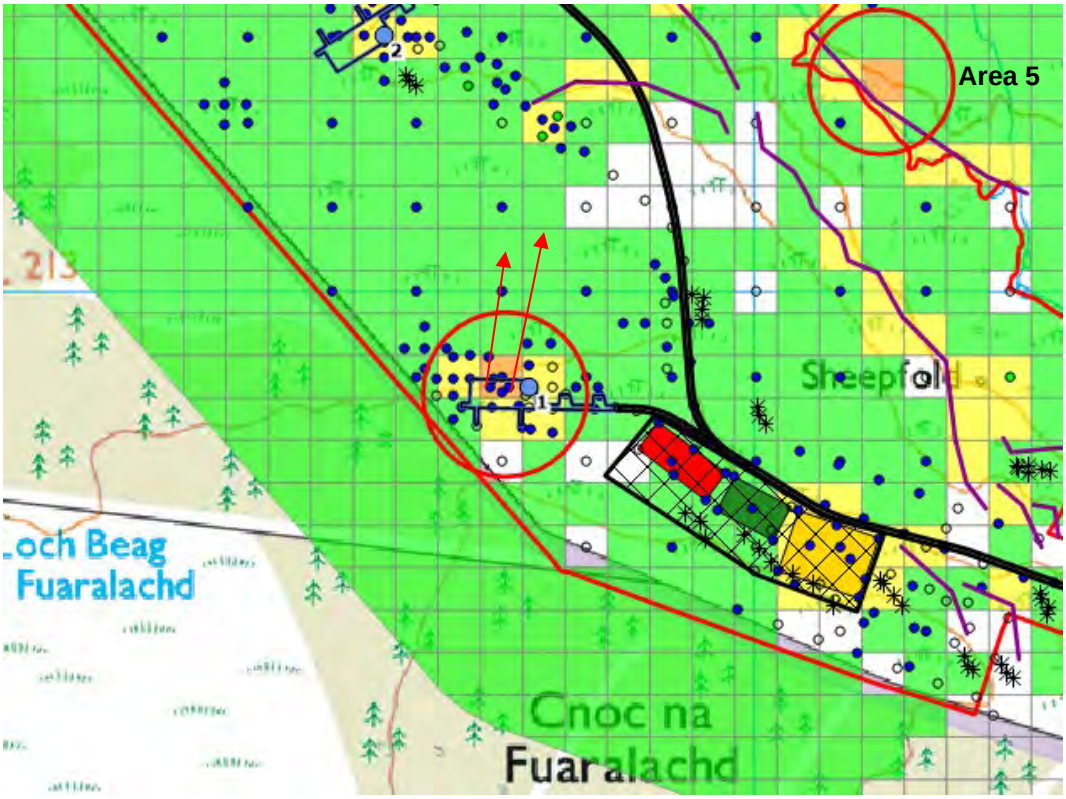
7.2 These cells have been considered in greater detail, as nine separate groups. Areas 1-4 consider the four groups of cells within the proposed infrastructure footprint, with Areas 5-9 considering the five wider cell clusters that are located some distance from the Proposed Development infrastructure. Relevant photographs of the areas are included to provide additional context.

7.3 The inspection for Areas 1-4 include a detailed inspection of the highlighted cells, the cells immediately around and downslope of them, the measured peat depths and slope angles present, drainage features and the nature of the proposed nearby infrastructure. Mitigation measures are recommended to reduce or control the risk for the areas.

7.4 The inspection for the clusters of cells in Areas 5-9 have been further appraised to determine if there is any risk to downslope receptors including the River Brora, the Dalnessie weir and the Proposed Development infrastructure.

7.5 Following detailed consideration, the risk ranking has been re-appraised in the light of the presented information and proposed mitigation. Each description is accompanied by a map of the cells and their immediate surroundings. The grid cells in each map are 50 x 50 m, to give an indication of scale. Green cells have negligible risk; yellow cells have low risk; orange cells have moderate risk; red cells have high risk. Blank cells have no peat as defined in the PLHRA Guidelines (Scottish Government, 2017).

7.6 The points on the maps show the calculated Likelihood rating for all locations with directly measured peat depth, where white is no peat, blue is negligible; green is unlikely; yellow is likely; orange is probable; and red is almost certain.



Area 1:

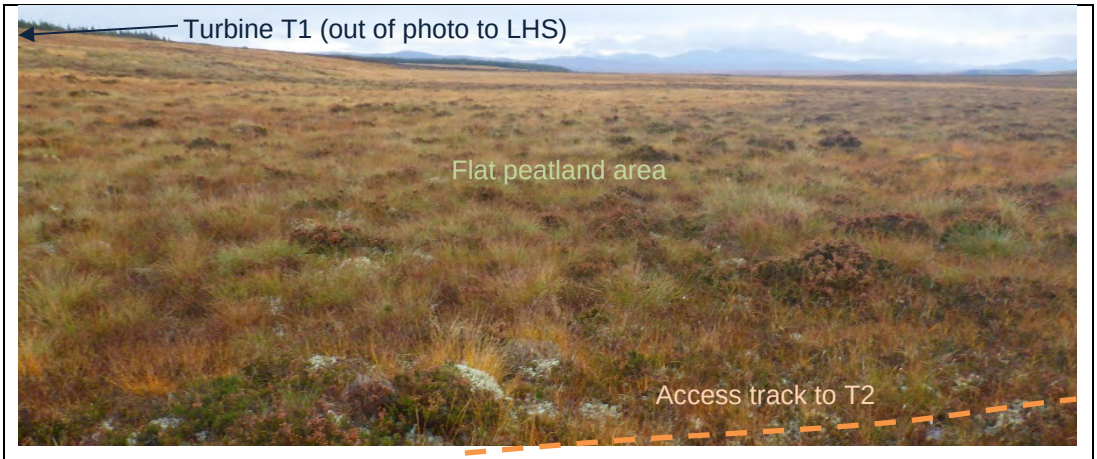
One cell at Turbine T1 hardstanding has been assigned Moderate Risk. The cell underlies the northern part of the hardstanding, immediately west of Turbine T1. The assigned risk level relates to the sensitivity of the turbine and its associated Very High consequence rating.

Calculated Likelihood for the cell is Unlikely, reflecting the combination of measured peat depth and slope present within the cell.

The maximum peat depth record in the cell is 2.5 m, with an average slope angle for the cell of 4.6°.

Potential runout from any failure: Any failure in this or adjacent cells would travel north or north-north-east down the slope. It is anticipated that any failure would terminate quickly on the flat-lying ground north of the location, before reaching the watercourse or any of the infrastructure in the region of Turbine T2.

The nearest proposed infrastructure, the access track, is located east of the cell and is out of the direct line of potential effect.



Photograph looking W across the northern part of Area 1

The slope north of Turbine T1 has shallow to moderate peat depths no greater than 1.0 m and in many areas <0.5 m. In contrast, the flat peatland area shown above has peat depths mostly deeper than 2.5 m, becoming deeper towards the north (right side of photograph).

Calculated likelihood for the measured peat depth points is shown on the figure above. It can be observed that all of the peat depth records have a calculated likelihood no greater than Negligible, based on the actual slope present at that peat depth record. The white points indicate no peat present.

Mitigation

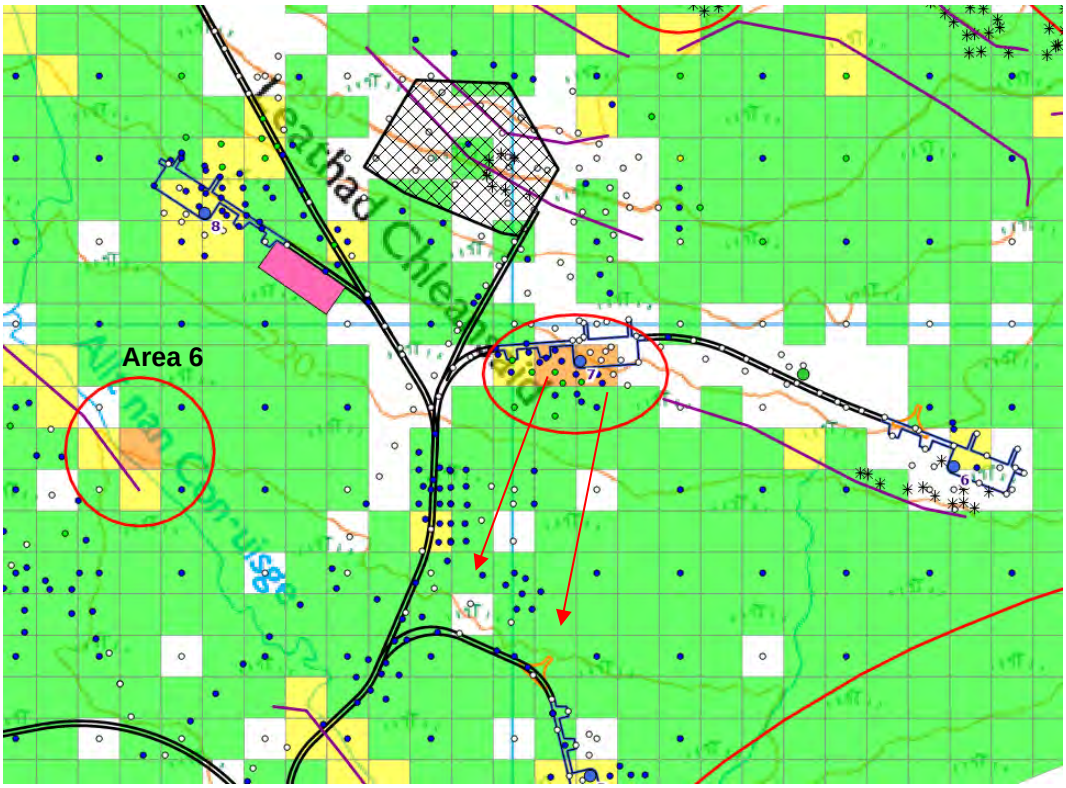
Closer inspection of the highlighted cell indicates that the maximum peat depth record coincides with the lowest slope part of the cell. The areas with steepest slopes and the areas with deepest peat are not coincident in any parts of the highlighted area – the steeper slopes are in the southern part of the cell and the deepest peat is in the very northernmost edge of the cell. The elevated Risk Ranking is considered to be an artefact of the grid-based assessment combined with the Very High consequence rating for the turbine area.

Work in the area will require excavation to form the foundation and crane hardstanding for Turbine T1. The work would be under the supervision of the Environmental Clerk of Works (ECoW) at all times. Micrositing of infrastructure away from areas of peat deeper than 1 m would be undertaken on recommendation by the ECoW based on prevailing site conditions and engineering constraints.

The area along the northern side of the crane hardstanding would be inspected regularly for any signs of developing instability, such as cracking or compression ridge development. Should any concerns arise, consultation would be held with a geotechnical specialist before work can recommence. Good construction methods would be used at all times, following current guidance.

Revised Risk Ranking

Low



Area 2:

Two cells at Turbine T7 and hardstanding have been assigned Moderate Risk. The cells underlie the turbine foundation and much of the hardstanding area. The assigned risk level relates to the sensitivity of the turbine and its associated Very High consequence rating.

Calculated Likelihood for both cells is Unlikely, reflecting the combination of measured peat depth and slope present within the cell.

The maximum peat depth records in the cells are 2.2 m and 2.1 m, with average slope angles of 4.7° and 5.4°.

Potential runout from any failure: Any failure in these or adjacent cells would travel south or slightly west of south down the slope. Given the nature of the slope in this area, it is possible that any failure would continue until reaching the Allt nan Con-uisge at the foot of the slope.

It is possible, therefore, that any failure at Turbine T7 could affect the access track to Turbine T5 and possibly also the access route to Turbines T6, T7 and T8 as both track sections are downslope of Turbine T7.

It is very unlikely that Turbine T5 would be directly affected as it is well out of the direct line down the slope.

Photograph looking N from Turbine T5 showing the rocky ridge where Turbines T6 and T7 are positioned, and the slight undulations in the slope

The ground at and around Turbine T7 has variable peat and soil depths, ranging from bedrock at surface to >2.5 m approximately 75 m downslope. Turbine T7 and its hardstanding are mainly located in peat or peat soils <1.0 m deep. The deeper peat depth records are all from further down the slope, where the slope angle is gentler. The photograph above shows the small rocky ridge line on which Turbines T7 and T6 are located, with the smoother slope below leading down towards the river.

Calculated likelihood for the measured peat depth points is shown on the figure above. It can be observed that all of the peat depth records have a calculated likelihood no greater than Low based on the actual slope present at that peat depth record. The majority of points have Negligible likelihood. The white points indicate no peat present.

Mitigation

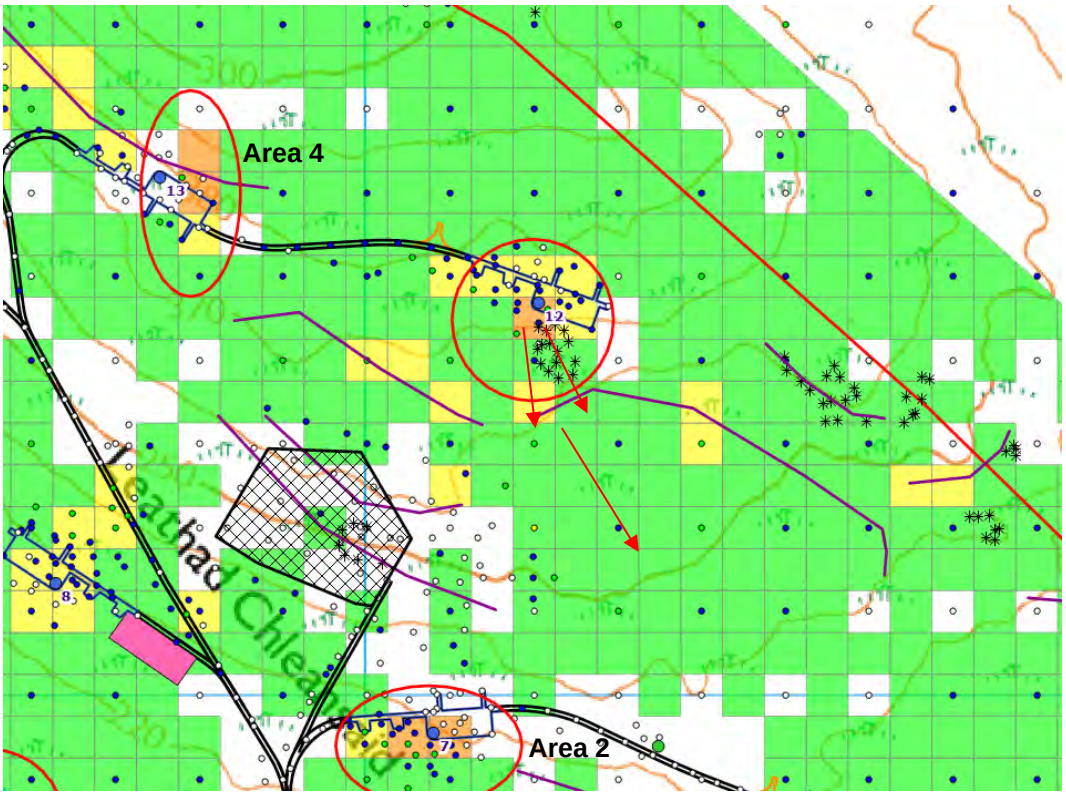
Closer inspection of the highlighted cells indicates that areas with steepest slopes and the areas with deepest peat are not coincident in any parts of the highlighted area – the steeper slopes are in the northernmost part of the area and the deepest peat is in the southernmost part of the cell. Much of the turbine foundation and crane hardstanding is located in an area with no peat. The elevated Risk Ranking is considered to be an artefact of the grid-based assessment combined with the Very High consequence rating for the turbine area.

Work in the area will require excavation to form the foundation and crane hardstanding for Turbine T7. The work would be under the supervision of the ECoW at all times. Micrositing of infrastructure away from areas of peat deeper than 1 m would be undertaken on recommendation by the ECoW based on prevailing site conditions and engineering constraints.

The area to the south of the turbine and crane hardstanding would be inspected regularly for any signs of developing instability, such as cracking or compression ridge development. Should any concerns arise, consultation would be held with a geotechnical specialist before work can recommence. Good construction methods would be used at all times, following current guidance.

Revised Risk Ranking

Low



Area 3:

One cell at Turbine T12 has been assigned Moderate Risk. The cell underlies part of the turbine foundation. The assigned risk level relates to the sensitivity of the turbine and its associated Very High consequence rating.

Calculated Likelihood for the cell is Unlikely, reflecting the combination of measured peat depth and slope present within the cell.

The maximum peat depth record in the cell is 2.6 m, with an average slope angle of 5.6°.

Potential runout from any failure: Any failure in these or adjacent cells would travel south-south-east down the slope. There is an area of almost flat ground approximately 150 m down slope and any failure may terminate in this area. However, it is possible that a failure could continue downslope to terminate either in the large area of flat ground south-east of Turbine 6 or upon reaching the River Brora further downslope.

It is possible, therefore, that any failure at Turbine T12 could affect Turbine T6 and its associated hardstanding and access track. This is considered to be unlikely given the nature of the intervening ground.

Photograph looking N from Turbine T7 showing the rocky ridge where Turbine T12 is located. The main fall line is to the RHS of the photograph

The ground at and around Turbine T12 has variable peat and soil depths, ranging from bedrock at surface to >2.5 m approximately 40 m downslope. Turbine T12 and its hardstanding are mainly located in peat or peat soils <1.0 m deep. The deeper peat depth records are all from further down the slope, where the slope angle is gentler. The photograph above shows the small rocky ridge line on which Turbine T12 is located, with the smoother slope below leading down towards Turbine T7 and the River Brora.

Calculated likelihood for the measured peat depth points are shown on the figure above. It can be observed that all of the peat depth records except one have a calculated likelihood no greater than Negligible, with one record at Low, based on the actual slope present at that peat depth record. The white points indicate no peat present. The black stars indicate areas of bedrock at surface.

Mitigation

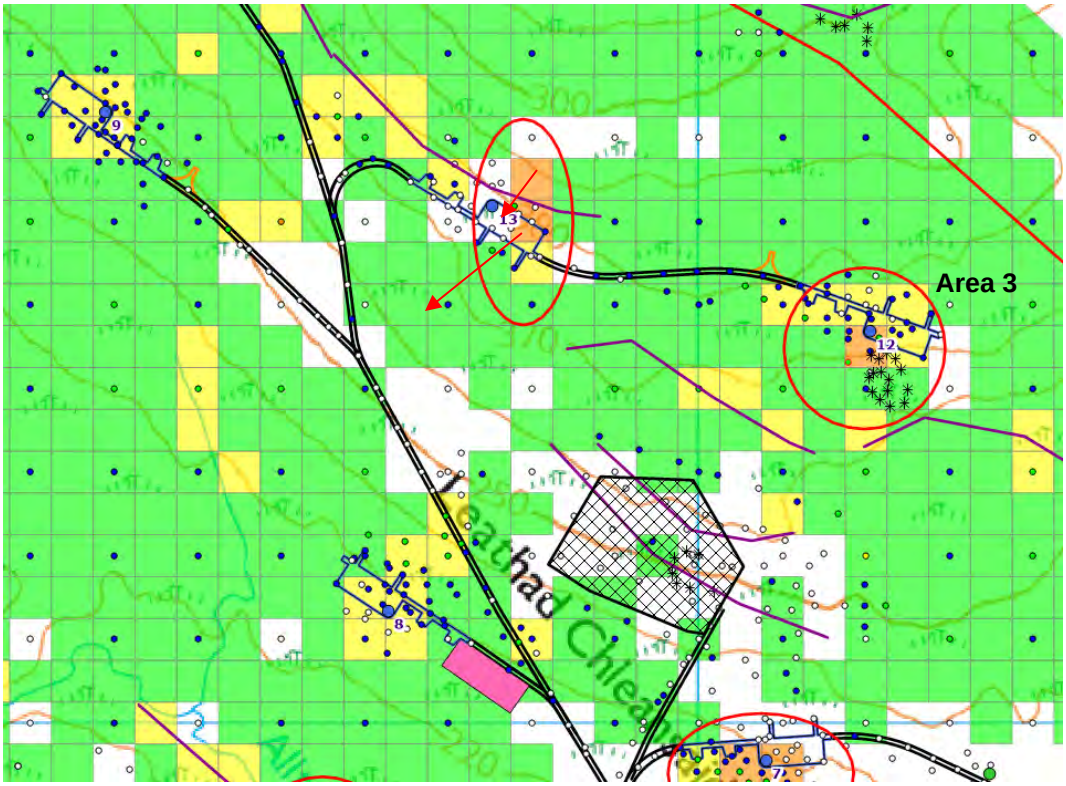
Closer inspection of the highlighted cells indicates that areas with steepest slopes and the areas with deepest peat are not coincident in any parts of the highlighted area – the steeper slopes are in the north-easternmost part of the cell and the deepest peat is in the south-westernmost corner of the cell. Much of the turbine foundation and crane hardstanding is located in an area with no peat and where bedrock is present at the surface. The elevated Risk Ranking is considered to be an artefact of the grid-based assessment combined with the Very High consequence rating for the turbine area.

Work in the area will require excavation to form the foundation and crane hardstanding for Turbine 12. The work would be under the supervision of the ECoW at all times. Micrositing of infrastructure away from areas of peat deeper than 1 m would be undertaken on recommendation by the ECoW based on prevailing site conditions and engineering constraints.

The area to the south and south-east of the turbine and crane hardstanding would be inspected regularly for any signs of developing instability, such as cracking or compression ridge development. Should any concerns arise, consultation would be held with a geotechnical specialist before work can recommence. Good construction methods would be used at all times, following current guidance.

Revised Risk Ranking

Low



Area 4:

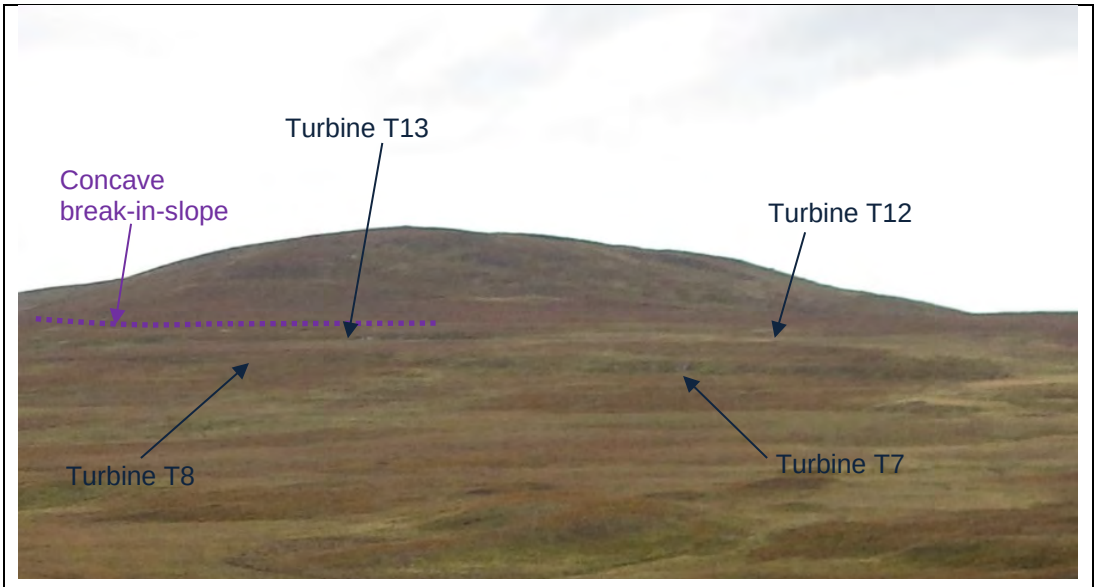
Two cells at Turbine T13 have been assigned Moderate Risk. The cells underlie part of the crane hardstanding. The assigned risk level relates to the sensitivity of the turbine and its associated Very High consequence rating.

Calculated Likelihood for the cell is Unlikely, reflecting the combination of measured peat depth and slope present within the cell.

The maximum peat depth record in the southern cell is 0.8 m, with average slope angles of 10.2° and 8.3°. There are no direct peat depth records from the northern cell.

Potential runout from any failure: Any failure in these or adjacent cells would travel south-west down the slope to reach a minor tributary to the Allt nan Con-uisge. It is likely that any failure would eventually terminate in the river or on the flatter ground near the river.

Any failure at Turbine T13 is likely to affect the section of access track between Turbines T8 and T9, as this lies downslope of the turbine area.



Photograph looking N from near Turbine T1 to Sròn Leathad Chleansaid, giving an overview of the slope around Turbines T12 and T13.

Turbine T13 is located a short distance below a distinct concave break-in-slope that marks the change from the steep ground on Leathad Chleansaid to the more gentle ground between the main ridge and the river.

The majority of Turbine T13 and its crane hardstanding are located in an area with no peat. Occasional records of peat are present away from the hardstanding margins, with depths of 0.75 and 0.8 m recorded north of the hardstanding in the southern highlighted cell. It is evident from the peat depth records that what peat there is present here is patchy and tends to form small pockets. The area immediately above the break-in-slope has no peat recorded for over 100 m upslope.

Calculated likelihood for the measured peat depth points are shown on the figure above. It can be observed that the majority of records have no peat. One record above, plus two below, the crane hardstanding have a calculated likelihood of Negligible, and one record above plus one below have a calculated likelihood of Low, based on the actual slope present at each peat depth record.

Mitigation

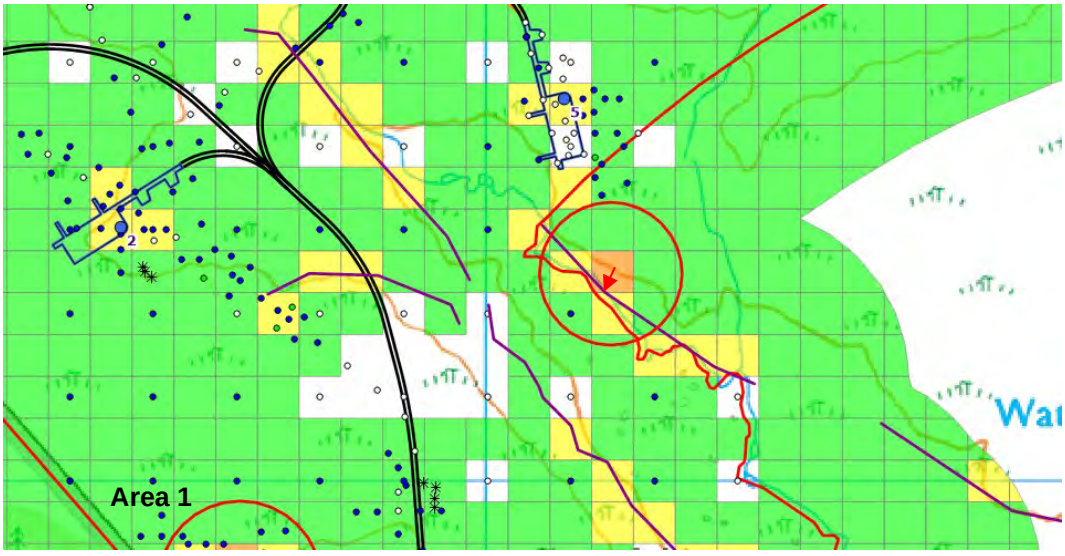
Close inspection of the highlighted risk area indicates that the majority of the immediate area has no peat. Where peat is present, this is mainly in the form of shallow isolated pockets, although more extensive peat deposits are present downslope of the turbine and hardstanding area. The elevated Risk Ranking is a result of the Very High consequence rating for the turbine area plus the increased likelihood rating in recognition of the adjacent break-in-slope. However, the highly localised nature of the peat deposits within the risk area indicates that the potential for peat landslide in this area is minimal owing to the distribution of isolated pockets of peat within areas of mineral soil and peaty soil.

Work in the area will require excavation to form the foundation and crane hardstanding for Turbine T13. The work would be under the supervision of the ECoW at all times.

The areas both above and below the turbine and crane hardstanding would be inspected regularly for any signs of developing instability, such as cracking or compression ridge development. Should any concerns arise, consultation would be held with a geotechnical specialist before work can recommence. Good construction methods would be used at all times, following current guidance.

Revised Risk Ranking

Low



Area 5:

One cell south of Turbine T5 has been assigned Moderate Risk. The cell is not associated with any proposed infrastructure and lies outwith the planning application boundary. The risk level relates to the High consequence rating assigned to all watercourses and the Likely likelihood rating arising as a result of the break-in-slope associated with the watercourse valley.

There are no direct peat depth measurements within the highlighted cell. Interpolated peat depth is 1.6 m. Slope angles range from 1 to 14° reflecting the variation between nearly flat ground in the northern part of the cell and the comparatively steep bank down into the main river valley.

Potential runout from any failure: Any failure in this area would terminate in the Allt nan Con-uisge. Runout distances would be up to 50 m as the risk area is adjacent to the watercourse. Any failure may be entirely outwith the application boundary. No indications of peat instability or developing instability were recorded in nearby areas during the peat depth and reconnaissance surveys.

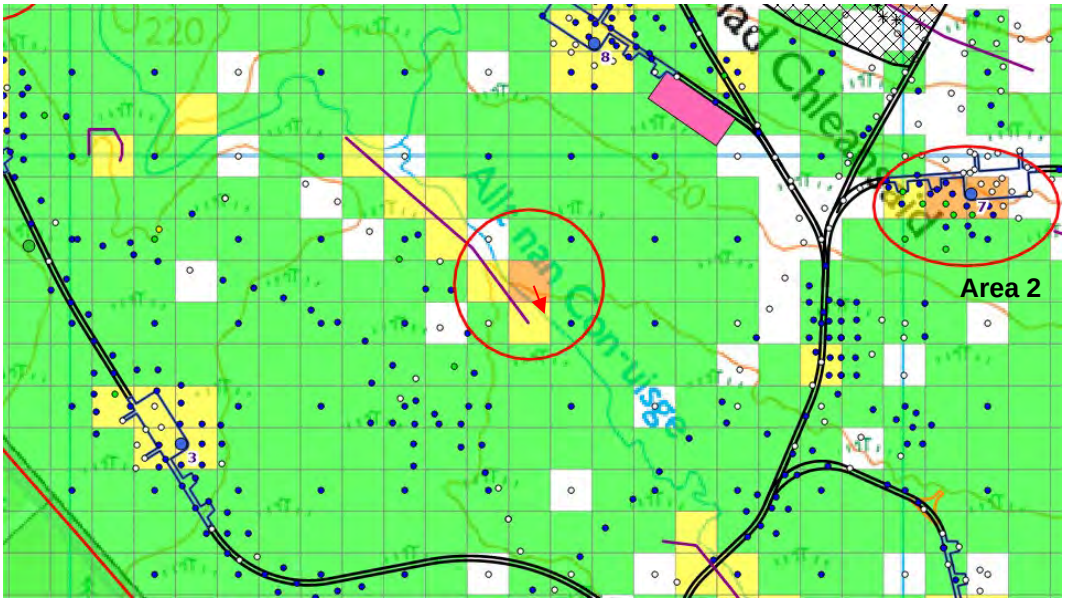
Photograph looking SE (downstream) along the Allt nan Con-uisge near Area 5

Mitigation

There are no plans for any development activity to take place within 100 m of the highlighted cell and no construction work would be directly upslope from the cell. It is unlikely that any construction activity would have any influence on stability in this area.

The most likely cause of natural instability would be undercutting of the slope by the watercourse. As the channel was not obviously mobile at this location, with no signs of recent bank undercutting, this is not considered to pose a risk to the Proposed Development or to the natural environment in this area (see photograph above).

Revised risk ranking: Negligible



Area 6:

One cell on the Allt nan Con-uisge between Turbines T3 and T8 has been assigned Moderate Risk. The cell is not associated with any proposed infrastructure. The risk level relates to the High consequence rating assigned to all watercourses and the Likely likelihood rating arising as a result of the break-in-slope associated with the watercourse valley.

There are no direct peat depth measurements within the highlighted cell. Interpolated peat depth is 2.0 m. Slope angles range from 1 to 12° reflecting the variation between nearly flat ground in the northern part of the cell and the comparatively steep bank down into the main river valley.

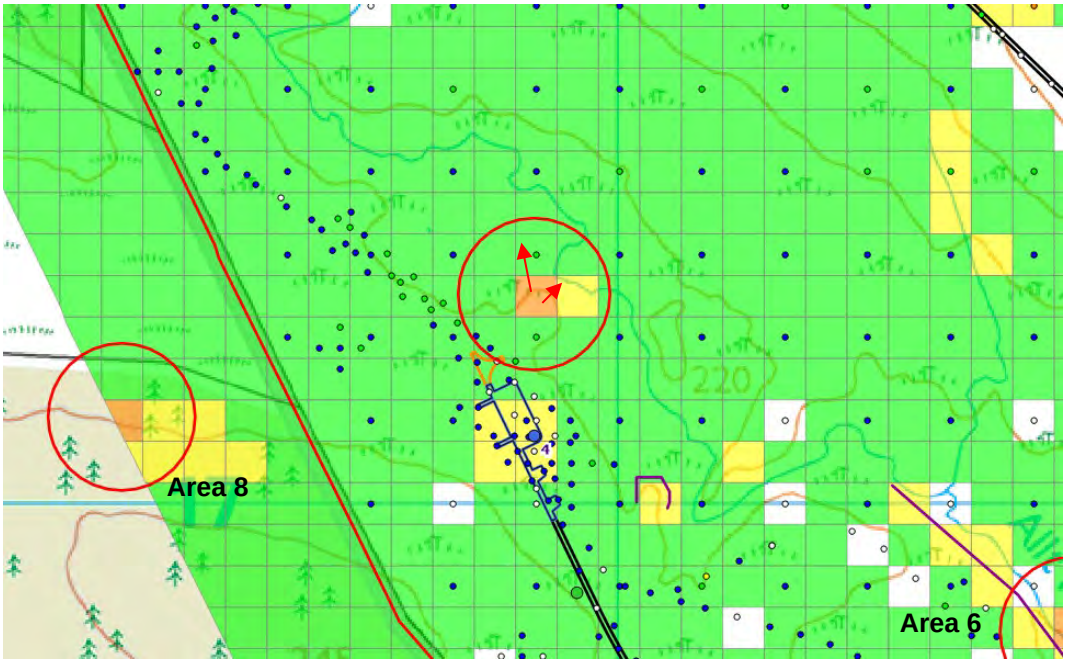
Potential runout from any failure: Any failure in this area would terminate in the Allt nan Con-uisge. Runout distances would be up to 50 m as the risk area is adjacent to the watercourse. No indications of peat instability or developing instability were recorded in nearby areas during the peat depth and reconnaissance surveys.

Mitigation

There are no plans for any development activity to take place within 200 m of the highlighted cell and the nearest construction work upslope from the cell is over 250 m distant. It is unlikely that any construction activity would have any influence on stability in this area.

The most likely cause of natural instability would be undercutting of the slope by the watercourse. As the channel was not obviously mobile at this location, with no signs of recent bank undercutting, this is not considered to pose a risk to the Proposed Development or to the natural environment in this area.

Revised risk ranking: Negligible



Area 7:

One cell near Turbine T4 has been assigned Moderate Risk. The cell is not associated with any proposed infrastructure. The risk level relates to the High consequence rating assigned to all watercourses and the Likely likelihood rating arising as a result of the small but locally steep hill present in this area.

There are no direct peat depth measurements within the highlighted cell. Interpolated peat depth is 3.3 m. Slope angles range from 1 to 16° reflecting the variation between nearly flat ground in the north-western part of the cell and the steep bank on the north-west, north and east sides of the hill.

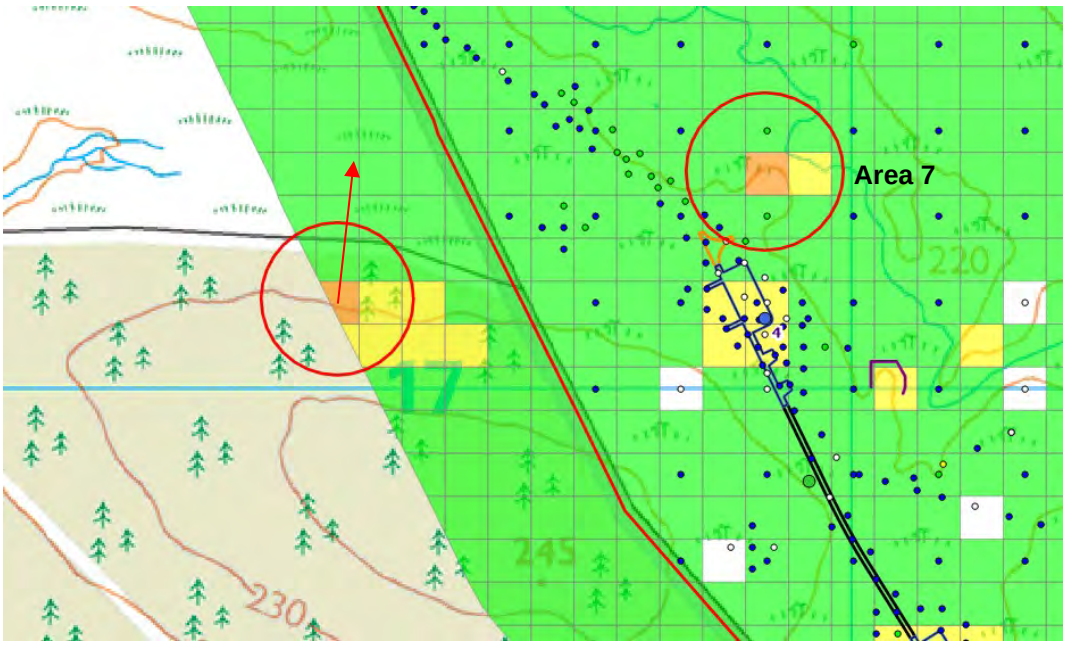
Potential runout from any failure: Any failure in this area would terminate in the Allt nan Con-uisge or on the nearby flat area of peat bog. Runout distances may be up to 100 m. No indications of peat instability or developing instability were recorded in nearby areas during the peat depth and reconnaissance surveys.

Photograph looking SE to Area 7 and downstream along the Allt nan Con-usige

Mitigation

The risk area is located on a small drumlin which forms an island in an area of peat. The drumlin itself has no peat and is characterised by short heather turf, a relatively flat top and steep side slopes. There is no construction activity planned within 50 m of the highlighted cell and the lack of peat present on the side slopes indicates that there is no possibility of peat failure.

Revised risk ranking: Negligible



Area 8:

One cell west Turbine T4 has been assigned Moderate Risk. The cell is not associated with any proposed infrastructure and lies completely outwith the planning application boundary. The risk level relates to the Very High likelihood rating assigned to this cell.

There are no direct peat depth measurements within the highlighted cell and the nearest record is nearly 200 m distant. Interpolated peat depth is 3.7 m. Slope angles range from 6 to 8° reflecting the cell's situation on the northern slope of a low hill.

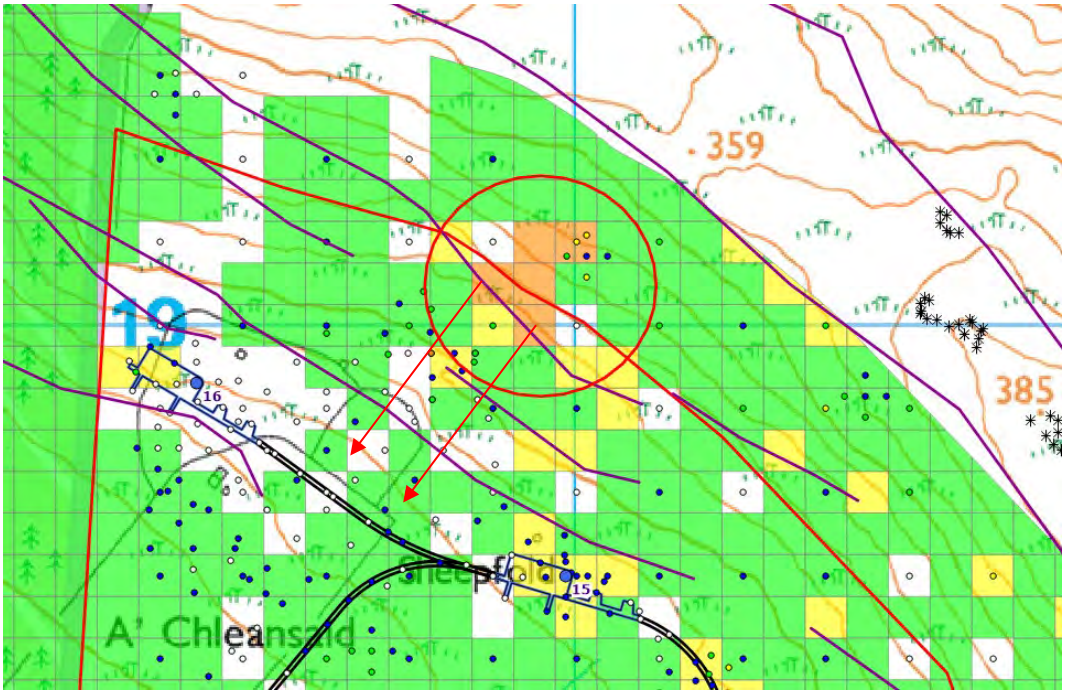
Potential runout from any failure: Any failure in this area would have a runout zone heading north into the wide nearly flat ground in the shallow col. This area is known to have considerable depths of peat, with records up to 5.3 m in places. Any failure would be unlikely to reach the planning application boundary. No indications of peat instability or developing instability were recorded in nearby areas during the peat depth and reconnaissance surveys.

Mitigation

There are no plans for any development activity to take place within 400 m of the highlighted cell and it is unlikely that any construction activity would have any influence on the area's stability. It is likely that the interpolated peat depth considerably over-estimates the actual peat depth on the slopes, as records from nearby areas of the site with similar geomorphology give peat depths typically less than 1.0 m with occasional deeper records.

Recent clear-felling activity around Area 8 has not resulted in any signs of instability in the area.

Revised risk ranking: Negligible



Area 9:

Five cells on the side of Leathad Chleansaid have been assigned Moderate Risk. The cells are not directly associated with any proposed infrastructure and lie across the planning application boundary. The risk level relates to the Very High likelihood ratings assigned to these cells.

For all but one of the highlighted cells there are no direct peat measurements, and peat depths are derived from the interpolation. These depths range from 1.8-2.2 m. Recorded peat depths from the cell with records has peat depths up to 2.9 m. Slope angles in these cells are all steep, ranging between 5 and 21°, reflecting the cells' location on the upper slopes of Leathad Chleansaid.

Potential runout from any failure: Any failure in this area would have a runout zone heading south-west with a probable termination area around the channel of the tributary to the Abhainn Sgeamhaidh downslope from A' Chleansaid farmstead. A failure in this area is likely to affect the access track between Turbines T15 and T16, and may also affect the track section down to Turbine T10. Runout distances of around 800-900 m would be possible. No indications of peat instability or developing instability were recorded in nearby areas during the peat depth and reconnaissance surveys.

Photograph looking N from Turbine T15 towards the col between Sròn Leathad Chleansaid and Creag Dhubh

It is likely that the interpolated peat depth considerably over-estimates the actual peat depth on the slopes, as records from adjacent areas of the slope with similar slope angles have either no peat or peat typically less than 1.0 m with occasional deeper records. The deep peat records from the north-easternmost cell coincide with much shallower slope angles, and this peat is indicated to form a small isolated pocket on the side of the col between Sròn Leathad Chleansaid and Creag Dhubh.

There is a clear gap in peat cover immediately upslope of all proposed infrastructure in this area (see photograph), indicating that there is no risk of undercutting the peat during excavation work for construction.

Mitigation

There are no plans for any development activity to take place within 250 m of the highlighted cells and it is unlikely that any construction activity would have any influence on the area's stability owing to the gap in peat coverage between proposed construction works and the identified risk area.

Works in this area would be under the supervision of the ECoW at all times. The area above the track section would be inspected regularly for any signs of developing instability, such as cracking or compression ridge development. Should any concerns arise, consultation would be held with a geotechnical specialist before work can recommence. Good construction methods would be used at all times, following current guidance.

Revised risk ranking:

Low

Mitigation

7.7 The following mitigation measures would be implemented to ensure that slope stability is maintained across the Proposed Development and to minimise the risk of inducing a peat slide.

7.8 Construction work would make use of current best practice guidance relating to developments in peatland areas. A risk management system, such as a geotechnical risk register, would be developed as part of the post-consent detailed design works. This

would be maintained through all subsequent stages of the project and updated as necessary whenever new information becomes available. During construction, members of project staff would undertake advance inspections and carry out regular monitoring for signs of peat landslide indicators. A geotechnical specialist would be on call to provide advice, if required by site conditions.

7.9 Micrositing would be used to avoid possible problem areas. This would be assisted by additional verification of peat depths, to full depth, in any highlighted areas where construction work is required. Track drainage would be installed in accordance with published good practice documentation and would be minimised in terms of length and depth in order to minimise concentration of flows.

7.10 Construction activities would be restricted during periods of wet weather, particularly for any work occurring within 20 m of a watercourse or within areas of identified deeper peat. Careful track design would ensure that the volume and storage timescale for excavated materials would be minimised as far as practicable during construction works.

7.11 Monitoring checks would be undertaken along identified higher-risk watercourse channels following periods of heavy rain and/or high flow. These would look for any recent signs of bank instability that may affect the flow or lead to a larger destabilisation of the nearby bank area. Any identified instabilities would be brought to the attention of the ECoW as soon as possible.

7.12 Vegetation cover would be re-established as quickly as possible on track and infrastructure verges and cut slopes, by re-laying of excavated peat acrotelm, to improve slope stability and provide erosion protection. Additional methods, including hydroseeding and/or use of a biodegradable geotextile, would be considered if necessary in specific areas.

7.13 Construction staff would be made aware of peat slide indicators and emergency procedures. Emergency procedures would include measures to be taken in the event that an incipient peat slide is detected.

7.14 Key early indicators of peat instability are:

- Tension cracks in the upper layers or to full depth of peat, and may indicate an accumulation of stress in peat soils. In addition, cracking can provide a route for surface water to infiltrate rapidly through the peat body, contributing to elevated pore water pressure and lubrication along lines of weakness.
- Compression ridges, usually indicative of displacement upslope which has led to formation of ridges within the peat body.
- Peat creep, usually visible as tilting of fence posts or young trees. This may be accompanied by tension cracking and/or compression ridges.

Infrastructure design

7.15 Careful and informed infrastructure design forms a key measure for prevention of induced instability in peat. The collated peat depth information has been used to inform the proposed infrastructure layout throughout the design process. Incursion into areas of deeper peat has been kept to a practical minimum by careful design and will be reinforced by careful micrositing, in order to minimise disruption to peatland ecosystems and hydrology, and to avoid the risk of induced peat instability.

7.16 Access tracks are anticipated to be constructed using established cut-and-fill construction methods. Careful design has avoided crossing any longer sections of peat where floating construction might be suitable. Any peat present along the cut-and-fill track routes would be excavated and stored for use in reinstatement of trackside verges and other elements of project infrastructure where appropriate.

7.17 Trackside ditches would be constructed as required. For tracks parallel or sub-parallel to contours, best practice recommendations are for a ditch along the uphill side only, with cross-drains installed at regular intervals below the track to minimise flow concentration. Cross-drains would discharge onto vegetated ground where possible, to encourage spread of surface flow rather than focused flow and the consequent development of new drainage channels. Tracks crossing contours may require ditches or swales on both sides. In all cases, lengths and depths of trackside drainage would be minimised, particularly in areas where peat deeper than 1.0 m is present. There would be a requirement for some trackside drainage to minimise track surface erosion and damage.

8 CONCLUSIONS

8.1 A detailed assessment of peat slide risk has been carried out for the Proposed Development. All proposed new and upgraded infrastructure has been covered by the assessment.

8.2 The assessment found that the majority of the Proposed Development has a negligible or low risk of peat landslide.

8.3 Four areas, each consisting of one or two individual cells and located adjacent to proposed infrastructure, have been identified as having a Moderate risk of peat instability. These have been individually appraised in greater detail taking into account location-specific details. In all cases, the apparent risk is an artefact of the assessment mechanism, which uses maximum peat depth and average slope for each grid cell. In the highlighted cells, the areas of measured or interpolated deep peat and areas of steeper slope were not coincident, meaning that the actual risk of instability is Negligible or Low rather than the initial assessment of Moderate.

8.4 Five additional areas, including four single cells and one cluster of five cells, of apparent Moderate risk have also been identified. In all areas, the apparent coincidence of steep slopes with deep peat have been identified as an artefact of the assessment method, typically arising from the interpolated peat depths in areas where direct records are not available. Inspection of similar areas with site-specific peat depth records indicates that the interpolated peat depths over-estimate the actual peat depths on the ground, particularly in areas with steeper slopes.

8.5 These areas are all distant from proposed infrastructure and there would be no requirement for construction activity to approach these areas. It is recommended that construction areas are demarcated and all site staff are made aware of the requirement to stay within the marked construction corridor at all times.

8.6 For all nine areas, mitigation measures have been recommended to control the peat landslide hazard. For all areas, the peat landslide hazard can be controlled by use of good construction practice and micrositing. Revised risk rankings taking into account location-specific details and mitigation measures are Negligible or Low across the Proposed Development.

8.7 Good construction methods and appropriate micrositing would also be effective at controlling residual peat landslide risk for lower risk locations at the Proposed Development. Providing that the recommended mitigation measures are put in place and adhered to, the risk of peat landslide as a result of the Proposed Development is not significant.

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10 FIGURES

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Legend:

- Proposed Turbine Locations
- Permanent Lidar Location
- Permanent Met Mast
- Turning Head
- Hardstanding
- Access Track
- Application Boundary
- Control Building and Substation Compound (100m x 75m)
- Substation Construction Compound and Battery Energy Compound (75m x 45m)
- Main Construction Compound (100m x 40m)
- Additional Construction Compound (100m x 40m)
- Mobilisation Compounds
- Borrow Pit

Slope Angles (°)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 20
- 20 - 45
- >45

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter

Rev	Date	Description	Drn	Chk	App
00	17/11/2021	First Draft	CM	CI	CI
01	20/01/2022	Update BP1 and Figure No.	CM	CI	CI
02	25/01/2022	Mobilisation Compounds	CM	CI	CI

Chleansaid Wind Farm

TITLE:

Figure 10.1.1:
Slope Mapping

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Kilometres
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N W E S

REV 02

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Creag Dhubh
Old Shielings
Allt Gobhlach
A' Chleansaid
Bròn Leathad Chleansaid
Allt Bad Ra'fin
Bad Ra'fin
Coire na Bruaiche
Dail na Copaig
Leathad na Cloiche Moire
Abhainn Sgeamhaidh
Rhian Bridge
Loch na Fuaralachd
Loch Dail na Copaig
Loch Beag na Fuaralachd
Cnoc na Fuaralachd
Leathad Chleansaid
Allt Nan Eachdraidh
Dail na Ceardaich
Loch Coire na Bruaiche
Allt Coire an Eich Ghlais
Waterfall
Dalnessie
Weir
Sheep wash
Allt an Fèidh
Feith Bhaidhe
Feith Osdail
Bad Seasg Mòr
Bad Seasg Beag
Lòn na Cloiche-buaile
Creag nam Fiadh Bheag
Allt Gail
River Tarry
Blarbuie
Cattle Grid
Enclosure
Cairn
Ruin
Quarry (dis)
Quarry (disused)
Quarries (dis)
Sheepfold
Weirs
MS
FB
A836

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Legend:

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- Borrow Pit
- Application Boundary

Geomorphology

- Bedrock Outcrops
- Breaks in Slope
- Ditches Drawing

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter

Rev	Date	Description	Drn	Chk	App
00	14/12/2021	First Draft	CM	CI	CI
01	20/01/2022	Update BP1 and Figure No.	CM	CI	CI
02	25/01/2022	Mobilisation Compounds	CM	CI	CI

Chleansaid Wind Farm

TITLE:

Figure 10.1.2:
Geomorphology

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- Main Construction Compound (100m x 40m)
- Additional Construction Compound (100m x 40m)
- Mobilisation Compounds
- Borrow Pit

Soil Type

- Humus-iron Podzols
- Peat
- Peaty Gleys
- Peaty Podzols

Carbon and Peatland 2016 (SNH)

- Class 1
- Class 2
- Class 3
- Class 4
- Class 5
- Mineral Soil (Class 0)

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter

Rev	Date	Description	Drn	Chk	App
00	17/11/2021	First Draft	CM	CI	CI
01	20/01/2022	Update BP1 and Figure No.	CM	CI	CI
02	25/01/2022	Mobilisation Compounds	CM	CI	CI

Chleansaid Wind Farm

TITLE:

Figure 10.1.3:
Soils, Peat and Carbon Mapping

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Kilometres
SCALE: 1:25,000 @ A3

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- Main Construction Compound (100m x 40m)
- Additional Construction Compound (100m x 40m)
- Mobilisation Compounds
- Borrow Pit
- Core Locations

Depth (m)

- < 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.50
- > 5.50

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter

Rev	Date	Description	Drn	Chk	App
00	15/12/2021	First Draft	CM	CI	CI
01	20/01/2022	Update BP1 and Figure No.	CM	CI	CI
02	25/01/2022	Mobilisation Compounds	CM	CI	CI

Chleansaid Wind Farm

TITLE:

Figure 10.1.4a:
Peat Depth Overview

0 0.5 1
Kilometres
SCALE: 1:25,000 @ A3

N W E S

REV 02

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258000

259000

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Sheepfold

MS

Bad

0.25 0.75 0.4 0.5 0.2 0.4 0.3 0.2 0.2 0.3 0.25 0.7 0.25 0.3 0.3 0.35 0.35 0.45 0.4 0.6 0.6 1 0.65 0.45

2.1 0.45 0.25 0.45 0.1 0.7 0.7 0.2

140 150 160 170 180 190 210

Legend:

Application Boundary

Measured Peat Depth (m)

- <0.50
- 0.50 - 1.00
- 1.00 - 1.20
- 1.20 -1.50
- 1.5 - 2.00
- 2.0 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.5 - 4.00
- 4.00 - 4.50
- 4.50 - 5.50
- >5.50

Peat Depth Contours (m)

- < 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.50
- > 5.50

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter

Rev	Date	Description	Drn	Chk	App
00	19/01/2022	First Draft	CM	CI	CI

Chleansaid Wind Farm

RSK ESB

TITLE:

Figure 10.1.4b:
Peat Depth Mapping

0 0.1 0.2
Kilometres
SCALE: 1:5,000 @ A3

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Quarry (dis)

Fèith Osdail

Bad Seasg Mòr

ad Seasg Beag

165

170

209

14

0.65 1.1 0.2 0.2 0.85 1.05 1.4 0.6 0.55 0.35 1.3 0.2 0.2 0.4

1.1 2 0.2 0.6 0.25 0.2 0.8 0.65 0.8 1.4 0.2 0.8 0.95 0.1 0.3 0.4 0.45 0.1 0.4 0.35 0.55 0.45

Legend:

Application Boundary

Measured Peat Depth (m)

- <0.50
- 0.50 - 1.00
- 1.00 - 1.20
- 1.20 -1.50
- 1.5 - 2.00
- 2.0 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.5 - 4.00
- 4.00 - 4.50
- 4.50 - 5.50
- >5.50

Peat Depth Contours (m)

- < 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.50
- > 5.50

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter

Rev	Date	Description	Drn	Chk	App
00	19/01/2022	First Draft	CM	CI	CI

Chleansaid Wind Farm

TITLE:

Figure 10.1.4c:
Peat Depth Mapping

0 0.1 0.2
Kilometres
SCALE: 1:5,000 @ A3

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261000

262000

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Osdail

Lòn na Cloiche-buaile

14

1.3 0.2 0.2 0.4 0.25 0.2 0.55 0.5 0.2 0.3 0.5 0.2 0.5 0.3 0.4 0.75 0.55 0.25 0.3 0.3 0.4 0.25 0.95 0.9 0.45 0.5 0.25 0.1 0.05 0.3 0.5 3.55 2.5 0.5 1.8 0.6 0.95 0.45 0.2 1 0.1 1.2 1.3 0.3

Legend:

Application Boundary

Measured Peat Depth (m)

- <0.50
- 0.50 - 1.00
- 1.00 - 1.20
- 1.20 -1.50
- 1.5 - 2.00
- 2.0 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.5 - 4.00
- 4.00 - 4.50
- 4.50 - 5.50
- >5.50

Peat Depth Contours (m)

- < 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.50
- > 5.50

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter

Rev	Date	Description	Drn	Chk	App
00	19/01/2022	First Draft	CM	CI	CI

Chleansaid Wind Farm

TITLE:

Figure 10.1.4d:
Peat Depth Mapping

0 0.1 0.2
Kilometres
SCALE: 1:5,000 @ A3

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