



Deucheran Hill 2 Wind Farm

Appendix 10.4 Peat Slide Risk Assessment

RWE Renewables

April 2026

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List of Abbreviations

Abbreviation	Description
AOD	Above Ordnance Datum
B	Water Content
BGS	British Geological Survey
BP	Borrow Pit
CMS	Construction Management System
Cu	Undrained Shear Strength
DTM	Digital Terrain Model
EIA	Environmental Impact Assessment
EIZ	Environmental Impact Zones
FOS	Factor of Safety
GIS	Geographic Information System
GPS	Global Positioning System
H	Von Post Classification
kPa	Kilopascal
kN/m ³	Kilonewtons per cubic metre
M	Metres
PLHRAG	Peat Landslide Hazard and Risk Assessments Guidance
PSRA	Peat Slide Risk Assessment
PWP	Pore Water Pressure
SEPA	Scottish Environment Protection Agency
T	Turbine
WTG	Wind Turbine Generators
γ	Unit Weight
Z	Depth
β	Terrain slope angle

Glossary

Term	Definition
Acrotelm	The thin aerobic zone at the surface of the mire usually fibrous and containing the majoring of groundwater flow through the peat mass, underlain by the thick anaerobic zone called the catotelm, usually a higher degree of humification and lower shear strength.
The Applicant	RWE Renewables UK Onshore Wind Limited.
Application Site Boundary	The red line boundary that encompasses the whole of the Proposed Development.
Blanket Bog	A type of peatland typically forming where there is a cool, wet and oceanic climate allowing peat to develop over large expanses of ground
Bog Burst / Flow	Failure of a raised bog (i.e. bog peat) involving the break-out and evacuation of (semi-) liquid basal peat. A flow is formed of highly humified basal peat from a clearly defined source area.
Bulk Density	The normal in situ density of a soil, i.e. its mass divided by its volume.
Catotelm	The waterlogged and compacted layer of peat permanently below the water table.
Consolidation	The process by which a soil decreases in volume.
Construction Method Statement	(CMS), a detailed written description of how a particular construction activity will be carried out safely and in an environmentally compliant manner.
Diamicton	Glacially derived soil which is poorly sorted and contains soil particles ranging in size from clay to boulders.
Geographical Information System (GIS)	Form of technology capable of capturing, storing, retrieving, editing, analysing, comparing and displaying spatial environmental information.
Geo-hazard	Geological hazard, either natural or man-made, which threatens either humans or the environment in which they live.
Geo-membrane	Non-porous sheet that has a very low permeability (in engineering terms impermeable) usually formed of polyethylene.
Geo-textiles	Man-made fabrics, generally made from plastics but also may be made from natural materials, used in construction.
Groundwater	Water located beneath the ground surface in soil pore spaces and in the fractures of rock formations.
Ground Investigation	Specialist intrusive phase of site investigation with associated monitoring, testing and reporting to a national standard.
Hagg	Natural gully or weathering structure in surface of peat mass.
Hazard	Something with a potential for adverse consequences / harm.
Humification	The process of decomposition of a peat soil.
Hydrological regime	The statistical pattern of a river's constantly varying flow rate.

Term	Definition
Mitigation	The limitation of undesirable effects / impact of a particular event.
Mitigation Measures	Actions in place to limit the undesirable effects / impact of a particular event.
Natural Power	Natural Power Consultants Limited, the lead EIA Co-ordinator.
Overland flow	Water passing rapidly over or through the surface layer of soil.
Peat	A largely organic substrate formed of partially decomposed plant material
Peat Slide	Failure of a blanket bog involving sliding of intact peat and the mineral substrate material or immediately above the contact with the underlying mineral soil substrate.
Peat debris slide	Shallow translational failure of a hillslope with a mantle of blanket peat in which failure occurs by shearing wholly within the mineral substrate and at a depth below the interface with the base of the peat such that the peat is only a secondary influence on the failure.
Permeability	The rate at which water and air moves through a soil.
Pore water	The water filling the voids between grains of soil
Precipitation	Deposition of moisture including dew, hail, rain, sleet and snow.
Primary consolidation	The process by which a soil decreases in volume through the expulsion of internal pore water
Proposed Development	The Proposed Development refers to all components of the Deucheran Hill 2 repowering and extension, which includes up to 14 wind turbines, 3 with a maximum tip height of 220 m, 4 with a maximum tip height of 200 m and 7 with a maximum tip height of 180 m, and associated ancillary infrastructure.
Proposed Wind Farm Development Area	The area within which the proposed wind farm will be located.
Residual Risk	The risk remaining after mitigation measures have been undertaken.
Risk	The combination of the probability of an event and the magnitude of its consequences
Rockhead	The upper surface of rock mass beneath the superficial soil cover.
Runoff	Surface runoff is the flow of water over the surface that can result due to the surrounding soils lacking the capacity to infiltrate further water or due to the surface water flowing off infrastructure such as access tracks and hardstands.
Secondary Consolidation	The compression of a soil that takes place after primary consolidation due to creep, compression of organic matter etc.
Sedimentation	The tendency for particles in suspension to settle out of the fluid in which they are entrained.
Site Investigation	The overall process of discovery of information concerning a site, the appraisal of data, assessment and reporting. Can include desk, non-intrusive and intrusive investigation.
Shear strength	The maximum shear stress which a material can withstand without rupture/ failure
Shear vane	In situ test using a x4 blade steel vane pushed into the ground and rotated to provide an indication to the undrained shear strength of a soil.
Superficial Deposits	Young, sediments and soil deposits occurring at the surface.

Term	Definition
Surcharge	An additional mass of material or load applied to an existing soil or structure
Topography	The physical features of a geographical area.
Undisturbed Sample	A sample of soil whose condition is sufficiently close to the actual condition of the soil in situ to be used to approximate the properties of the soil in the ground.
Water resources	The supply of groundwater and surface water in a given area.

1. Introduction

This report considers peat slide risk assessment at Deucheran Hill 2 Wind Farm (herein referred to as the Proposed Development). The Proposed Development comprises up to 14 wind turbine generators (WTGs) with tip heights up to and not exceeding 220 m Above Ordnance Datum (AOD), crane hardstandings, laydown areas, underground cabling, on-site substation and control building, external transformers, temporary construction compound, temporary borrow pit(s), batching plant, access tracks and associated water crossings and a permanent meteorological mast. The report is accompanied by the following map information which is presented in Annex A at the end of this document;

- **Figure A.1 Regional Setting**
- **Figure A.2 Site Layout**
- **Figure A.3 Geomorphological Features**
- **Figure A.4 Interpolated Peat Depth**
- **Figure A.5 Slope Angle**
- **Figure A.6 Superficial Deposits**
- **Figure A.7 Solid Geology**
- **Figure A.8 Factor of Safety**
- **Figure A.9 Peat Stability Risk Zonation**
- **Figure A.10 Environmental Impact Zonation**
- **Figure A.11 Peat Slide Pathways**

The report is also accompanied by data for peat cores, hand shear vane and lab testing results which are presented in Annex B at the end of this document;

1.1. Statement of Competence

Author: Orrin Bryers is a Geo-Survey Engineer at Natural Power and experienced geoscientist by training (holding a PhD, MSc, and BSc in the Geosciences). Orrin has also gained work experience as a Geoscience Intern (Capricorn Energy) and as a Research Associate working with geospatial data within a university research group. Orrin has conducted field work and reporting of numerous peat slide risk assessment studies for onshore wind and solar energy projects of similar terrain and ground conditions to Deucheran Hill 2 Wind Farm.

Approver: Gavin Germaine is a Principal Geotechnical Engineer at Natural Power and an engineering geologist by training (MSc Engineering Geology) with greater than 15 years of relevant geotechnical experience. Gavin is a Chartered Geologist (CGeol) and a Fellow of the Geological Society of London. Over the last decade he has completed multiple peat slide risk assessments for energy and infrastructure projects across the UK and Ireland. Gavin has further provided expert technical advice as part of public inquiry and joined international teams examining new geotechnical investigation techniques for in-situ testing and sampling of peat.

The survey team comprised of a multi-disciplinary group of geo-scientists, engineers and hydrologists with relevant experience.

1.2. Objectives and Scope

This Peat Slide Risk Assessment (PSRA) is a semi-quantitative. The primary objectives of this report are:

- Present a desk study pertinent to the subject of peat stability assessment at the Proposed Development.
- Report on walkover survey and geomorphological mapping exercise to inform the assessment.
- Identify any areas of existing instability or which may pose a risk to the Proposed Development.
- Qualitative and quantitative peat slide risk assessment.
- Provide robust and targeted recommendations for any future construction process and mitigate any potential contributory factors to elevated risk of instability.

This report and survey work has been undertaken in general accordance with the Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Development, second edition, published by the Scottish Government in April 2017.

Table A1.4.1: PSRA Data Sources

Data Source	Location	Date
BGS – Onshore Geological Map Data: (Linear Features, Mass movement deposits, Artificial ground, superficial deposits, hydrogeology, bedrock geology, faulting, 1:50,000 scale, 1:1 M Superficial Engineering Geology; 1:1 M Bedrock Engineering Geology)	https://mapapps2.bgs.ac.uk/geoindex/home.html	2025
Historical Aerial Photograph Data ESRI Satellite World Imagery Google Earth Professional.	https://server.arcgisonline.com/ArcGIS/rest/services/World_Imagery/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D	2025
Online news archival search	Various web-based search engines	2025

Source: Natural Power, 2026

Assessment of potential peat slide at the Proposed Development was carried out according to the following work programme:

- **Phase I Survey:** Development-wide peat probing survey: Initial site wide peat probe survey within the turbine envelope on a grid resolution of 100 m (April 2022 and February 2025),
- **Phase II Survey:** Detailed peat probing surveys covering areas of peatland and designed infrastructure at higher resolution (10 x 10 m) and proposed access track probing at 50 m spacing with 10 & 20 m offsets (July and November 2025).
- **Geotechnical Field Reconnaissance:** Geomorphological mapping with assessment of peat undrained shear strength through in-situ hand shear vane testing across representative turbine locations within the design envelope (July and November 2025).
- **Quantitative assessment:** of slope stability based on in-situ shear strength data site as wide geospatial analysis.
- **Qualitative assessment:** of the potential risk of peat failure across the turbine infrastructure envelope.
- **Environmental Impact Assessment:** Comparison of the potential risk of peat failure with the site hydrological model including proximity to watercourses and sensitivity of those features, site wide geospatial analysis.
- **Conclusions & Recommendations:** for detailed design/construction control with specific examination the need for measures to mitigate potential peat failure as part of any future wind farm development.

1.3. Development Description

RWE Renewables is developing Deucheran Hill 2 Wind Farm (the Proposed Development) in the existing Deucheran Hill Wind Farm Proposed Wind Farm Development Area (See **Figure A.2**) on the Kintyre Peninsula in Argyll and Bute. The existing Deucheran Hill Wind Farm is a 9-turbine array which began operating in 2001 and is due to be decommissioned in 2026.

The Proposed Development is for:

- Up to 14 wind turbines with a mixed tip height of up to 220 m (current candidate turbine model specifications have hub heights of up to 135 m and rotor diameters of up to 170 m);
 - 220 m tip height: T2, T3, and T13;
 - 200 m tip height: T1, T4, T8 and T10;
 - 180 m tip height: T5, T6, T7, T9, T11, T12 and T14.
- Turbine foundations and hardstandings;
- External transformer housing;
- Crane pads;
- Access tracks;
- Underground electricity cables;
- Permanent anemometry mast;
- Temporary borrow pits;
- Temporary construction and storage compounds; and ancillary infrastructure;
- Temporary batching plant;
- Site signage;
- Onsite substation and control building;
- Office and welfare facilities;
- Habitat management area;
- Temporary construction gatehouse; and

Waste water and drainage attenuation measures (as required). The Proposed Development is accessed from the existing junction on the A83 at Killeen and will use the existing wind farm tracks to access the Proposed Wind Farm Development Area .

The Application Site Boundary includes areas of proposed habitat management and biodiversity enhancement in addition to the Proposed Wind Farm Development Area where the proposed turbines will be situated on elevated area of sloping and forested upland.

1.4. Location

The infrastructure is located on the Deucheran Hill (330 m AOD) in an area dominated by commercial forestry plantation. There is a maximum topographical height of the 336 m AOD located to the south of the existing Deucheran Hill Wind Farm.

1.5. Terrain Description

The Proposed Development infrastructure occupy elevated positions of undulating upland terrain covered by forestry. This includes commercial conifer plantation, recently felled conifer area and semi-natural woodland. Heathland, blanket bog and grassland are also present. The Proposed Wind Farm Development Area is bound to

the north by open upland terrain including Cour Wind Farm, to the east by the B842 road which traverses the eastern coastline of the peninsula, and a mix of open and forested upland terrain to the south and west.

Peat is present across the majority of the Proposed Wind Farm Development Area, with an average depth of 0.77 m recorded. Deep peat, recorded up to 6.2 m in depth, is present in the central area and as isolated patches elsewhere for example southwest of T1 and north of T12.

A topographic low of 50 m AOD is found by Carradale Water on the eastern edge of the Proposed Wind Farm Development Area. The topography rises steeply to the highest lying turbine, T9, at 305 m AOD. The Proposed Wind Farm Development Area is undulating, generally rising to the southwest, with the highest elevations found in central and southern areas (Deucheran Hill, 330 m AOD and an unnamed topographic high at 336 m AOD in the south).

Numerous watercourses intersect the Proposed Wind Farm Development Area. Several minor tributaries (Allt Breac-laraich, Alt Fheannag, Alt Deucheran) begin in the elevated regions surrounding Deucheran Hill in the centre and south of the Proposed Wind Farm Development Area and flow east and north into the Carradale Water. These watercourses are typically forested catchments with narrow incised channels. Several lochs and lochans are found within open moorland terrain within the Proposed Wind Farm Development Area such as Loch nan Eun in the south and Loch a Chromain in the northwest which do not flow out of the Application Site Boundary. However, Loch Losgainn located in the southwest corner discharges to Barr Water which eventually reaches the Irish Sea to the west.

All proposed turbines are situated on relatively elevated gentle to moderately sloping terrains occupied by land modified for commercial forestry plantation.

Photos A10.4.1 – A10.4.6 display the site conditions observed during the peat survey.



Photo A10.4.1 – Commercial forestry of various stages, view towards the east



Photo A10.4.2: Dense forestry making access on foot difficult typical across the Proposed Wind Farm Development Area



Photo A10.4.3: View onto existing turbines of Deucheran Hill Wind Farm



Photo A10.4.4: Localised soil slide and erosion noted 150 m south from proposed T10



Photo A10.4.5: Existing wind farm track with mature commercial forestry and bedrock exposed near surface



Photo A10.4.6: Windblown damaged trees, making difficult conditions for access across parts of the Proposed Wind Farm Development Area

2. Methodology

2.1. Geomorphology

Geotechnical reconnaissance and geomorphological mapping were carried out during July and November 2025. This exercise provided opportunity for geotechnical engineers to visualise the terrain, access geological and soil exposures, examine slope systems, vegetation cover and record any hydrological features impacting peat stability. The presence of forestry reduced efficacy of this activity with wide area views of the terrain units not possible.

No historical large scale peat slides were identified during the site walkover or from interrogation of aerial photographs. No evidence of peat haggling, cracking, or compression features of peat creep were identified during the site walkover. Although these features are not primarily typically associated with major peat instability, they can increase weathering rates and influence water flow pathways. It should be noted that due to the extensive forestry cover across the Proposed Wind Farm Development Area, there are areas where it was not possible to assess the condition of the peat through the desk study or site walkover.

The geomorphology - in particular riparian features - of the Proposed Wind Farm Development Area have been significantly altered by the existing commercial forestry and Deucheran Hill Wind Farm with widespread artificial drainage networks. Field observations found that the channels are typical of forested catchments with natural watercourses forming narrow and incised channels which cut into the superficial geology (where present predominantly composed of glacial till, See Section 3.1) and steepen the local topography.

From the aerial photography there was no evidence of slope instability at the Proposed Development however during the site walkover a localised peat soil slip was identified approximately 150 m south of T10 where soils are actively eroding over the shallow bedrock (BNG: E: 175902, N: 644139). This zone of instability is upslope from proposed turbines or associated infrastructure and there are no signs of the bedrock itself being unstable. Assessment of soil and rock slope stability will be important during future ground investigations including for defining temporary storage locations of overburden material. The BGS does not record any further evidence of slope instability within the site boundary.

There are no historic or modern instrument recorded earthquakes recorded by the BGS within the Proposed Wind Farm Development Area, however several low magnitude events have been recorded in the region; a Richter Scale 2 event in 1976 near the northwest Site boundary at Gleann Beag and a Richter Scale 2.1 southeast of the Proposed Wind Farm Development Area in Deucheran Wood in 1997.

The culmination of the field survey and desk-based review of aerial photographs was the production of a geomorphology map, **Figure A.3**. This map was used in the qualitative stability risk assessment and maps the major features across the development pertinent to the risk model.

2.2. Peat Survey

The soil probing coverage has allowed for:

- Development-wide peat probing survey comprising: Stage I probe survey within the turbine envelope on a grid resolution of 100 m (April 2022 and February 2025), 'Phase I Survey'.
- Detailed peat probing survey covering areas of peatland and designed infrastructure at high resolution (10 x 10 m grid) and proposed access track probing at 50 m spacing with 10 m & 20 m track edge offsets (July and November 2025), 'Phase II Survey'.

Peat/soil depths were recorded using probes inserted into the peat and measuring the depth to refusal. This provides a wide-ranging dataset but carries the following limitations:

- Peat probes may infrequently record depth to obstructions (e.g. tree roots, rock clasts).
- Peat probes may over-estimate peat depth where the underlying soil strata is very soft.

- Peat probes can underestimate peat depth in very dry deposits due to early refusal of the probe.
- Peat probes do not differentiate between peat and mineral sub-soil.
- Unable to access positions in dense forests and bogs.
- Unable to undertake peat probes within 10 m of underground services.

In-situ hand shear vane tests were conducted in conjunction with peat cores to provide additional characterisation of soil strength and boundaries. Core locations target deeper peat across the Proposed Wind Farm Development Area and at relevant turbine locations where peat was encountered deeper than 0.50 m. Peat cores provided confirmation of probe depth correlation, material classification and morphology.

Peat depth mapping is shown in **Figure A.4**. To prepare the interpolated peat depth mapping; a spatial interpolation method termed 'Ordinary Kriging' was applied.

This is a statistical interpolation function that examines point data (and weights the surrounding measured values) to derive a prediction for unmeasured locations. Ordinary Kriging is considered generally acceptable for geological / soil science applications. Limitations of the Kriging method are widely accepted to be:

- Confidence in the output related to number and density of points within the input dataset.
- Search window needs to be set to limit influence of distant data points.

The interpolation parameters and peat depth data were set and deemed suitable for informing the peat slide risk assessment. **Figure A.4** appended to this report, indicates interpolated peat depth across the Proposed Wind Farm Development Area, a total of 4,637 peat probe data points were acquired during all phases of survey.

2.3. Slope Mapping

The Slope Angle Map (**Figure A.5**) is comprised from 'NextMap' digital elevation model data, carrying a grid resolution of at least 5 m. The risk assessment considers slope angle in two aspects. Firstly, the slope angle is used to screen the Proposed Wind Farm Development Area for instability within the slope stability numerical calculation. This is adjoined to qualitative assessment of the slope in terms of a contributory factor to failure. This combined approach ensures a robust and conservative assessment of the risk.

3. Geology & Environment

3.1. Superficial deposits

The British Geological Survey (BGS) Geoindex Onshore viewer shows that the majority of the Proposed Development has no mapped superficial deposits present, presumably due to near-surface bedrock exposures. However, the northern and eastern areas show Till (Devensian – Diamicton) and sparsely distribute areas of Alluvium (Clay, Silt, Sand and Gravel).

Figure A.6 shows the BGS mapped superficial deposit cover across the Proposed Wind Farm Development Area.

NatureScot's Carbon Soil and Peatland Classification Map 2016¹ (**Volume 2a, Figure 10.3**) indicates that the majority of the Proposed Wind Farm Development Area is carbon-rich / Class 5 soil (defined by the presence of peat soil exceeding 50 cm in depth). There are several areas of Class 2 peatlands (nationally important carbon-rich soils, deep peat, and priority peatland habitat) located on Deucheran Hill, on the eastern side of the Site next to Farachen Hill and on the southern boundary of the Proposed Wind Farm Development Area between Loch Losgainn and Loch nan Eun.

Till is described by the BGS as unsorted and unstratified drift, generally over consolidated, deposited directly by and underneath a glacier without subsequent reworking by water from the glacier. It consists of a heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape (diamicton).

Alluvium is given the following description by the BGS: general term for clay, silt, sand and gravel. It is the unconsolidated detrital material deposited by a river, stream or other body of running water as a sorted or semi-sorted sediment in the bed of the stream or on its floodplain or delta, or as a cone or fan at the base of a mountain slope. Synonym: alluvial deposits. Normally soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel. A stronger, desiccated surface zone may be present.

The BGS 1:1 M Superficial Engineering Geology Map shows Fine Till on the Proposed Wind Farm Development Area, corresponding with the mapped Till deposits described above. The following information related to engineering properties is provided:

3.1.1. Fine Till

Description: Firm to very stiff or hard slightly gravelly sandy CLAY with few cobbles and boulders. Occasional medium to extremely widely spaced interbeds and lenses of sand and gravel may be present. Often fissured particularly in the upper few metres. Generally low permeability flow through fissures and lenses/interbeds of sand and gravel where present.

Foundations: Generally good foundation conditions but dependant on shear strength, consolidation characteristics and presence of water-bearing sand and silt layers/lenses. Differential settlement possible where foundations overlap fine and coarse soil.

Excavation: Easy digging. Excavations may be stable in the short term but water-bearing layers/lenses of silt, sand and gravel and the presence of fissures will significantly decrease stability.

Engineered Fill: Suitable as general cohesive fill depending on grading, plasticity and water content. Generally, should be placed as soon as possible after excavation and subject to minimum construction traffic when wet.

Site Investigation: Important to determine thickness and lithological variation, particularly the presence of laminated silts and clays and water-bearing sand/silt.

¹ Available online from: https://map.environment.gov.scot/Soil_maps/?layer=10 [Accessed 21/06/2026]

3.1.2. Peat

Determined by the Natural Power Phase I and II surveys; coverage shown in the Interpolated Peat Depth Map in **Figure A.4** appended to this report.

A total of 13 peat cores were carried out across the Proposed Wind Farm Development Area using a gouge auger. Peat cores were undertaken at turbine centres T1, T5, T6, T7, T8, T9, T10, T11, T13, two cores from an area of the ancillary/battery energy storage compound (which was subsequently removed from the project scope) and substation compound.

Each core is attributed with a general description, water content estimate (B) and Von Post rating (H) (**Table A10.4.2**). Peat accumulation characteristics vary across the Proposed Wind Farm Development Area. The core generally refused at the base of the peat. Hand shear vanes were undertaken at all turbine locations where peat was >0.50 m. Shear values are generally weak to moderate strength across the locations. An example photograph of peat from the Proposed Wind Farm Development Area is illustrated in **Photo A10.4.7** overleaf.

Peat wetness and humification ranges from semi-dry to very wet (B2 to B5) and H3 to H7 (very slightly to highly decomposed).



Photo A10.4.7: Photograph of typical peat core from T7 0.70 – 1.20 m

Table A10.4.2: Peat Core Descriptions

Location ID	Top depth	Bottom depth	Log
T1	0.00	1.00	Spongy brown fibrous PEAT (H3/B2)
	1.00	1.80	Spongy brown fibrous PEAT (H4/B2)
	1.80	2.00	Spongy brown fibrous PEAT (H5/B2)
T5	0.00	0.45	Soft, dark brown, pseudo fibrous PEAT (H4, B4)
	0.45	1.00	Plastic dark brown pseudo fibrous PEAT (H6, B2)
T6	0.00	0.45	Soft dark brown fibrous PEAT (H3/B4)
	0.45	0.90	Plastic dark brown fibrous PEAT (H5/B3)
	0.90	1.20	Plastic brown fibrous PEAT (H6/B4)
T7	0.00	0.25	Soft dark brown fibrous PEAT (H5/B5)
	0.25	0.50	Plastic dark brown pseudo fibrous PEAT (H6/B3)
T8	0.00	0.35	Spongy brown fibrous PEAT (H3/B4)
	0.35	0.50	Plastic dark brown pseudo fibrous PEAT (H6, B2)

Location ID	Top depth	Bottom depth	Log
T10	0.00	0.80	Spongy brown fibrous PEAT (H2/B3)
	0.80	1.60	Spongy brown fibrous PEAT (H5/B3)
	1.60	1.80	Plastic brown pseudo fibrous PEAT (H6/B4)
T11	0.00	0.25	Spongy brown fibrous PEAT (H4/B3)
	0.25	0.75	Plastic brown fibrous PEAT (H5/B2)
	0.75	1.00	Plastic dark brown pseudo fibrous PEAT (H6/B2)
T13	0.00	0.50	Spongy dark brown fibrous PEAT (H3/B4)
	0.50	1.00	Dark brown fibrous PEAT (H5/B2)
Battery compound (<i>scoped out</i>)	0	0.40	Spongy dark brown fibrous PEAT (H2/B3)
	0.40	1.40	Spongy brown fibrous PEAT (H4/B3)
	1.40	1.9	Spongy brown fibrous PEAT (H5/B3)
	1.9	2.40	Spongy dark brown pseudo fibrous PEAT (H6/B3)
Substation Compound	0	0.90	Spongy brown fibrous PEAT (H3/B4)
	0.90	1.1	Spongy dark brown pseudo fibrous PEAT (H6/B3)

Source: Natural Power, 2026

Bulk disturbed samples were subsampled from peat cores. These samples were sent to an independent laboratory for testing of Total Organic Carbon (TOC), Water Content, Bulk Density and Dry Density. The results from the laboratory testing showed the TOC ranged from 29 to 57%. The Water Content ranged from 347 to 1,118%. The Bulk Density and Dry Density ranged from 0.97 to 1.07 Mg/m³ and 0.08 to 0.23 Mg/m³ respectively.

3.2. Peat Depth Analysis

Natural Power carried out a total of 4,637 peat probes across the Proposed Wind Farm Development Area during the Phase I and Phase II peat surveys.

Table A10.4.3 below presents the combined data collected across both surveys.

Table A10.4.3: Peat depth data

Peat Depth	Number of probes	% (of total)
<0.50 m	2,438	52.6
0.50 m < x ≤ 1.00 m	1,070	23.0
1.00 m < x ≤ 2.00 m	798	17.2
2.00 m < x ≤ 3.00 m	263	5.7
>3.00 m	68	1.5
Total	4,637	100%

Source: Natural Power peat probing survey data, 2026

The probe data depths indicate that the majority of the Proposed Wind Farm Development Area is covered by shallow to moderately deep peat ranging from 0 to 6.20 m, an average of 0.77 m. There are numerous deep pockets of peat in excess of 3 m, notably in the area between T10, T9 and T11 west of the proposed track between T12 and T13 southwest of the proposed tracks, west of T1 and by the substation compounds. A maximum depth of 6.2 m is recorded 250 m north of T11. Proposed infrastructure locations with probing depths less than 0.50 m are classified

as peat soil or topsoil. Peat depth is integral to the peat slide risk assessment. The peat depth interpolation map is appended to this report (**Figure A.4**).

3.2.1. Peat Depth: Infrastructure Locations

Table A10.4.4 summarises the peat depths recorded across the proposed wind turbine locations, proposed borrow pit search areas, construction compound and substation.

Table A10.4.4: Peat depth at turbines and ancillary infrastructure locations

Depth Range	0.0 – 0.50 m	0.50 – 1.0 m	1.0 – 2.0 m	>2.0 m
Location	Average Peat Depth (m) Turbine Centre	Average Peat Depth (m) Hardstanding	Slope Geometry (°)	Comments
T1	2.15	1.55	4.0	Commercial forestry. Deep peat at turbine foundation and 50 m to the west of the proposed turbine centre up to 4.7 m depth.
T2	1.19	0.97	6.0	Commercial forestry. Deep peat up to 2.6 m present within turbine foundation area.
T3	0.70	0.56	8.0	Commercial forestry. Deep peat up to 2.1 m within turbine foundation area.
T4	0.15	0.30	7.0	Commercial forestry.
T5	2.1	1.65	5.0	Deep peat across turbine foundation and hardstanding areas up to 2.6 m deep.
T6	0.33	0.75	8.0	Commercial forestry. Deep peat up to 2.3 m in the hardstanding area.
T7	0.79	0.85	6.0	Commercial forestry.
T8	0.65	0.70	8.0	Commercial forestry. Deep peat up to 1.7 m within turbine foundation area.
T9	1.22	1.38	7.0	Commercial forestry. Areas of deep peat up to 1.95 m within hardstanding area.
T10	0.70	1.10	7.0	Commercial forestry. Deep peat in northeastern area of hardstanding up to 3.1 m depth.
T11	0.96	1.20	5.5	Commercial forestry. Deep peat up to 1.8 m depth recorded in turbine hardstanding area.
T12	0.30	0.49	3.0	Commercial forestry. Deep peat up to 1.3 m depth within the turbine foundation area.
T13	0.72	0.59	8.5	Commercial forestry. Peat up to 1.5 m depth recorded in hardstanding area.
T14	0.57	0.57	15	Commercial forestry.
Construction Compound	0.88		5.0	Deep peat up to 2.5 m depth in the southern area of compound.
Substation Compound	1.46		2.5	Deep peat up to 3.1 m deep in centre and northern areas of compound.

Depth Range	0.0 – 0.50 m	0.50 – 1.0 m	1.0 – 2.0 m	>2.0 m
Location	Average Peat Depth (m) Turbine Centre	Average Peat Depth (m) Hardstanding	Slope Geometry (°)	Comments
Batching Plant	0.56		3.0	Deep peat up to 4.0 m depth in central and eastern parts of infrastructure.
Borrow Pit Search Area 1	0.60		15	Deep peat up to 1.6 m in southeast area.
Borrow Pit Search Area 2	0.60		13	Commercial forestry. Deep peat up to 1.9 m in northern area
Borrow Pit Search Area 5	0.54		6.0	Commercial forestry. Deep peat up to 2.5 m in western area.
Borrow Pit Search Area 6	0.80		9.0	Commercial forestry. Deep peat up to 1.95 m in eastern area.
Borrow Pit Search Area 7	0.30		23	Partially in commercial forestry.
Borrow Pit Search Area 8	0.44		13	Commercial forestry. Peat up to 1.2 m across proposed borrow pit search areas.
Borrow Pit Search Area 9	1.13		5.5	Commercial forestry. Deep peat up to 3.25 m in the western side of the proposed borrow pit search areas.

3.2.1.1. Peat Depth: Access Tracks

Peat depth recorded beneath the proposed access tracks are generally deep, ranging from 0 to 4.30 m and on average: 0.75 m over all proposed new tracks. Notably deep areas of peat are found between proposed track sections between T13 and T10, towards T12/T11, the proposed section south of the batching plant, between T5 and T6 and southwest of T1. It is understood that due to the discretely complex topography the opportunity for floating track is limited. **Table A10.4.5** summarises the mean peat depth along discrete sections of the proposed new wind farm access tracks.

Table A10.4.5: Peat depth on access tracks

Depth Range	0.0 – 0.50 m	0.50 – 1.0 m	1.0 – 2.0 m	>2.0 m
Location	Peat Depth (Min/Max/Average, in metres)		Comments	
Track Section 1: T13 (E: 175144, N: 643578) to T14 E: 174913, N: 642988)	(0/1.8/0.71)		Peat up to 2.4 m at T14 turning head	
Track Section 2: T13 (E: 175329, N: 643669) to T10 (E: 175758, N: 643822)	(0/2.6/0.88)		Water crossings at E: 175496, N: 643680 and E: 175814, N: 643904 with deep peat up to 2.6 m along track centreline by watercourse.	
Track Section 3: Junction by existing track east of T13 (E: 175666, N: 643679) to junction to T11/T12 (E: 175947, N: 643208)	(0.2/3.5/0.92)		Deep peat up to 3.5 m along track centreline	
Track Section 4: T11 (E: 175965, N: 643327) to T12 (E: 175811, N: 642969)	(0.2/2.2/0.72)		Deep peat up to 2.5 m off sides of proposed track	

Depth Range	0.0 – 0.50 m	0.50 – 1.0 m	1.0 – 2.0 m	>2.0 m
Location	Peat Depth (Min/Max/Average, in metres)		Comments	
Track Section 5: Junction to T9 (E: 176153, N: 644544) to T9 (E: 176215, N: 644384)	(0.9/2.8/1.25)		Deep peat up to 2.8 m	
Track Section 6: Junction to T11 (E: 176201, N: 644587) to T11 (E: 176028, N: 644853)	(0.2/2.2/0.78)		Deep peat up to 2.2 m depth along track centreline	
Track Section 7: Junctions to T9 and T8 (E: 176191, N: 644580) to Batching Plant (E: 176768, N: 645055)	(0.20/2.4/1.13)		Deep peat opposite batching plant up to 4.0 m depth off edge of proposed track	
Track Section 8: Junction to T5 (E: 176707, N: 645000) to T5 (E: 176976, N: 644535)	(0.4/1.8/1.09)		Deep peat up to 1.8 m depth along track centreline	
Track Section 9: T5 (E: 176996, N: 644331) to T6 (E: 177022, N: 644062)	(0.6/1.9/1.43)		Deep peat up to 2.4 m along track centreline	
Track Section 10: T6 (E: 177025, N: 643861) to T7 (E: 176603, N: 643231)	(0/1/0.58)		Water crossing at E: 177002, N: 643753	
Track Section 11: Track to Substation Compound from the junction (E: 176864, N: 643475 to E: 176681, N: 643633)	(0.2/2/1.45)		Deep peat up to 2.6 m on track centreline	
Track Section 12: Junction to T3 (E: 176126, N: 645221) to existing track (E: 176462, N: 645605)	(0/0.8/0.53)		Water crossings at E: 176255, N: 645376 and E: 176422, N: 645587)	
Track Section 13: Junction to T1 (E: 174969, N: 644410) to T1 (E: 175006, N: 644547)	(0.2/4.3/2.30)		Deep peat on track centreline up to 4.3 m depth	
Track Section 14: Track section between junction to T3 (E: 176173, N: 645236) and junction to T4 (E: 176748, N: 645441)	(0.1/1/0.45)		Water crossings at E: 176259, N: 645275, E: 176316, N: 645303 and E: 176482, N: 645376)	
Track Section 15: T1 turning head (E: 175164, N: 644693) to track leading west (E: 174768, N: 644801)	(0.2/2.9/1.00)		Deep peat up to 4.1 m 20 m off track centreline	
Track Section 16: Existing track to T4	(0/1.9/0.38)		Deep peat up to 1.9 m	

3.2.1.2. Peat: Undrained Shear Strength

There were x13 *in situ* hand shear vane tests were carried out at peat core sample locations (T1, T5, T6, T7, T8, T9, T10, T11, T12, T13, the substation compound and the scoped-out battery storage compound. Each test was carried out using a 'Geonor H-60' Vane Tester using a 33 mm steel vane.

Diagram A10.4.1 depicts the peak undrained shear strength data.

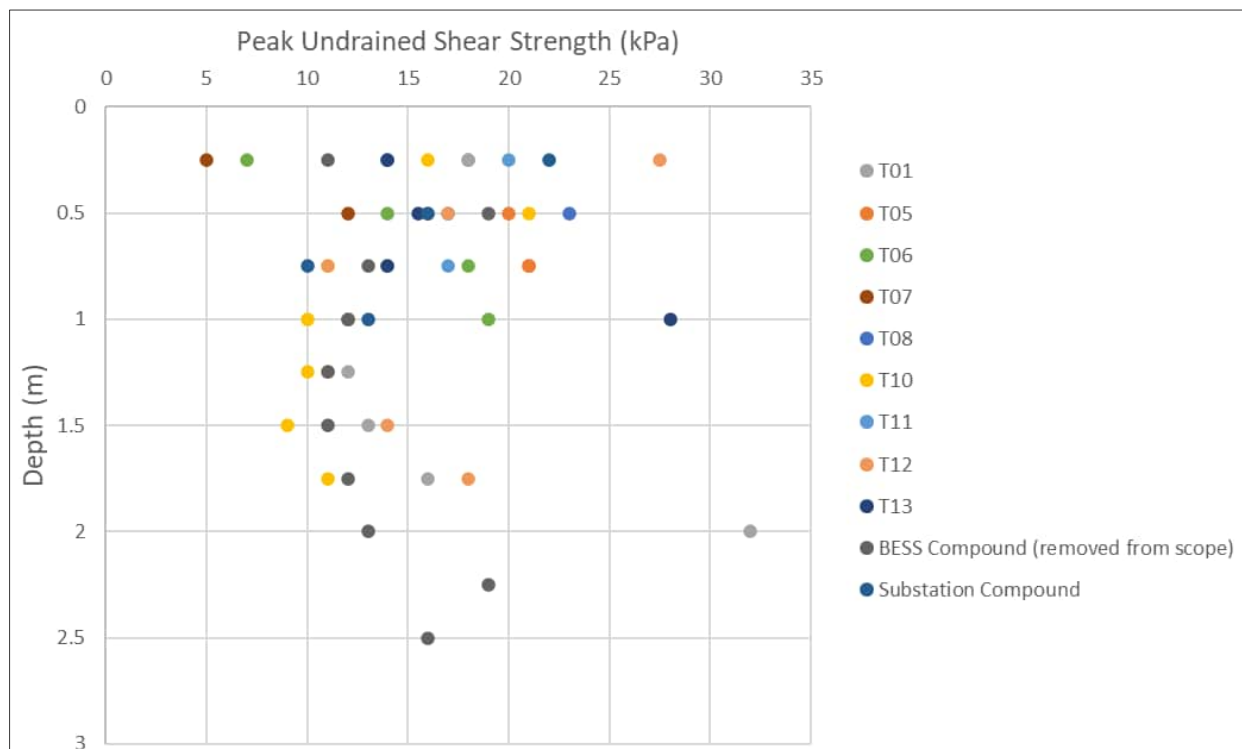


Diagram A10.4.1: Peak Undrained Shear Strength (kPa) vs Depth (m bgl)

Described in accordance with national soil description standard: (BS EN ISO 14688), the range of shear strengths recorded would be extremely low to low. Values of peak undrained shear strength ranged from **5 to 32 kPa** within the peat accumulations displaying a slight linear trend of increasing shear strength with depth. The average value for peak undrained shear strength is 15 kPa. A highly conservative site wide value of **10 kPa** is considered a suitable value for slope analysis within the Proposed Wind Farm Development Area. Residual undrained shear strength ranged from **1 to 14 kPa** and showed a site wide average of **8 kPa**. Hand shear vane results are appended to this report (**Annex B.2**).

3.2.1.3. Humification of Peat

The peat cores collected on site are presented in **Annex B.1**. The peat has been characterised according to the Von Post classification (Von Post & Granland, 1926), **Table A10.4.6** sets out the Von Post classification.

Table A10.4.6: Von Post Classification

Degree of Humification	Peat Description
H1	Completely unconverted and mud-free peat which when pressed in the hand only gives off clear water. Plant remains are easily identified.
H2	Practically unconverted and mud free peat which when pressed in the hand gives off almost clear colourless water. Plant remains are still easily identifiable.
H3	Very slightly decomposed or very slightly muddy peat which when pressed in the hand gives off marked muddy water, but no peat substance passes through the fingers. The pressed residue is thickish. Plant remains have lost some of their identifiable features.
H4	Slightly decomposed or slightly muddy peat which when presses in the hand gives off marked muddy water. The pressed residue is thick. Plant remains have lost more of their identifiable features.

Degree of Humification	Peat Description
H5	Moderately decomposed or muddy peat. Growth structure evident but slightly obliterated. Some amorphous peat substance passes through the fingers when pressed but, mostly muddy water. The pressed residue is very thick.
H6	Moderately decomposed or very muddy peat with indistinct growth structure. When pressed approximately 1/3 of the peat substance passes through the fingers. The remainder extremely thick but with more obvious growth structure than in the case of unpressed peat.
H7	Fairly well decomposed or markedly muddy peat but the growth structure can just be seen. When pressed about half the peat substance passes through the fingers. If water is also released this is dark and peaty.
H8	Well decomposed or very muddy peat with very indistinct growth structure. When pressed about 2/3 of the peat substance passes through the fingers and at times a thick liquid. The remainder consists mainly of more resistant fibres and roots.
H9	Practically completely decomposed or mud-like peat in which almost no growth structure is evident. Almost all the peat substance passes through the fingers as a uniform paste when pressed.
H10	Completely decomposed or mud peat where no growth structure can be seen. The entire peat substance passes through the fingers when pressed.

The peat encountered on site is generally homogeneous with Von Post classifications between H3 and H6 possessing a general trend of becoming increasingly decomposed within the deeper peat deposits.

3.3. Solid Geology

According to the BGS GeoIndex Onshore map viewer, the Site is underlain by the Beinn Bheula Schist Formation (Gritty Psammite and Pelite). There are also sparsely distributed units of North Britain Palaeogene Dyke Suite (Olivine-Microgabbro) trending southeast northwest and Beinn Bheula Schist Formation (Metamafite) trending southwest northeast in the centre of the Proposed Wind Farm Development Area.

No faults are mapped by the BGS within the Proposed Wind Farm Development Area. West of the area, regional fault patterns trend northeast southwest but do not reach closer than 600 m from the Proposed Wind Farm Development Area.

Limited information is available in borehole records, a borehole (NR84NW2) located approximately 6.5 km to the northeast of the Proposed Wind Farm Development Area at Carradale records 120 m of Schist and a second borehole (NR73NE10) located 8.5 km to the southeast of the Application Site Boundary at Torrisdale records approximately 110 m of grey Psammite, both of which are of the Beinn Bheula Schist Formation.

The BGS 1:1 M Bedrock Engineering Geology Map shows Slate, Granofels and Schist on the Proposed Wind Farm Development Area, corresponding with the mapped metamorphic deposits described above. The following information related to engineering properties is provided:

Slate:

Description: Strong to very strong thinly to very thickly bedded medium to widely jointed foliated fine-grained SLATE with well-marked fissility along foliations (cleavage planes). Weathers to clayey gravel. Low to very low permeability flow is through discontinuities.

Foundations: Generally good foundation conditions, depending on depth and nature of the weathered zone.

Excavation: Weathered material may be excavatable by hard digging or ripping fresh rock generally requires blasting.

Engineered Fill: Suitable as general granular fill if tabular nature of excavated material can be dealt with satisfactorily.

Site Investigation: Important to determine spacing, orientation and nature of discontinuities including cleavage planes, and depth and properties of weathered zone materials.

Schist:

Description: Very weak to strong generally widely jointed foliated, often with pronounced mineral layering, medium to coarse-grained SCHIST. Usually shows marked strength anisotropy, stronger normal to foliation. Weathers to gravelly sand or sandy clay. Medium to very low permeability flow is through discontinuities. Includes PHYLLITES.

Foundations: Generally good foundation conditions, but dependent on inherent variability of the schist rock and depth and nature of the weathered zone.

Excavation: Ripping or blasting required depending on strength along foliations and spacing and orientation of discontinuities.

Engineered Fill: Variable strengths and durability affect use as engineered fill, but generally suitable as general granular fill if care taken in selection and abstraction.

Site Investigation: Important to determine spacing, orientation and nature of discontinuities including foliations, and depth and properties of weathered zone materials.

Granofels:

Description: Strong to extremely strong medium to widely jointed non-foliated fine to coarse-grained GRANOFELS. Weathers to a sandy gravel or gravelly sand. Medium to very low permeability flow is through discontinuities. Includes QUARTZITE, GRANULITE, HORNFELS and AMPHIBOLITE.

Foundations: Potentially good foundation conditions, but may be dependent on degree of metamorphism and variability of interbedded metamorphic lithologies and associated weathering profiles.

Excavation: Highly weathered zones may be excavatable by hard digging or ripping but blasting usually required for fresher material.

Engineered Fill: Suitable as selected granular fill if care taken in selection and abstraction.

Site Investigation: Important to determine spacing, orientation and nature of discontinuities, and depth and properties of weathered zone materials.

Figure A.7 in Annex A depicts the BGS mapped solid geology over the Proposed Wind Farm Development Area.

3.4. Hydrogeology

The hydrogeology 1:625k scale BGS map shows confirms the Southern Highland Group underlies the Proposed Wind Farm Development Area. This is characterised as a low productivity aquifer with small amounts of groundwater in near surface weathered zone and secondary fractures. Compartmentalised and shallow groundwater flow is likely within the peat areas. Level and flow are likely governed by a complex interplay of the underlying soil interface, topographic setting and degree of humification. Detailed groundwater monitoring should be undertaken at the appropriate ground investigation phase during pre-construction.

3.5. Hydrology Flooding and Drainage

There are multiple natural watercourses which intersect the Proposed Wind Farm Development Area and drain towards the Carradale Water in the east and northeast which discharges into the Kilbrannan Sound on the eastern coastline of the peninsula. These watercourses typically start as shallow wet flushes in the broad upland terrain sourced to form shallow streams and associated surface water that have shallow vee or incised valley types. Many of the watercourses have been subject to considerable artificial alteration due to commercial forestry practices and the existing wind farm development infrastructure.

There are also several localised waterbodies within the Proposed Wind Farm Development Area: Loch Losgann (north of T14), Loch Chromain (northeast of T1) and Loch nan Eun (southwest of T12).

The SEPA Scottish Flood and Hazard Risk Information map indicates that there is no risk of river flooding in the Proposed Wind Farm Development Area. There are scattered areas of high (each year a 10% chance of flooding) to medium (each year a 0.5% chance of flooding) risk for surface water flooding though these are mapped areas are predominantly coincident with existing watercourses or small isolated areas of ponding away from proposed infrastructure. This mapping resource is indicative only and does not constitute a detailed flood risk assessment, out-with the scope of this report.

SEPA reported average monthly rainfall for the region is 140 mm based on the nearest recorded station at Tarbert to the north. The risk assessment considers relevant factors such as surface water infiltration. However extreme rainfall events are challenging to predict and model as part of the assessment and are considered a potential factor for peat instability.

3.6. Designated Sites and Receptors

The Kintyre Goose Lochs Special Scientific Interest (SSSI) and Special Protection Area and Loch a' Chuirn Local Nature Conservation Site are located 1.6 km northwest and 1.8 km northeast respectively of the Proposed Wind Farm Development Area. Neither of these are hydrologically connected with the Proposed Wind Farm Development Area.

One additional SSSI is located approximately 7 km south of the Proposed Wind Farm Development Area, the Torrisdale Cliff SSSI. The Proposed Wind Farm Development Area is designated as a coastal remnant of ancient semi-natural woodland. This SSSI is not hydrologically connected with the Proposed Wind Farm Development Area.

4. Peat Slide Hazard – Risk Assessment Methodology

4.1. Process Contributing to Peat Instability

The key principals of the peat slide risk assessment are presented below. Discussions of the factors which contribute to peat failure have been presented in **Table A10.4.7**.

Table A10.4.7: Contributory factors to peat instability

Factor	Discussion
Surface to Groundwater Infiltration	Processes which may facilitate groundwater infiltration: Periods of drying, resulting in cracking of the peat surface; and Slope creep resulting in additional tension cracks. Drying out of the upper peat, particularly in areas of thinner peat, is likely to result in the development of near-surface cracks which could facilitate ingress of water into the peat.
Surface Loading	Any mechanisms which increase the surface load on a peat accumulation can increase the likelihood of failure. This can include surface water ponding and surcharge loading, for example, construction works, stockpiling and forestry operations.
Vegetation Loss	Loss of vegetation can have a negative impact, making the peat susceptible to weathering, increasing rates of infiltration and a loss of strength.
Soil Weathering / Erosion	Weathering can weaken in-situ peat materials and destabilise a slope system. This may be in the form of weathering of peat or underlying mineral soils which could reduce shear strength at the peat/ mineral soil interface.

Factor	Discussion
	Vertical cracking and slope creep may slowly break down peat structure over long periods of time. This can develop into peat 'hagging', which is a strong indication that natural weathering processes are ongoing. Peat hags expose the peat to increased weathering rates and may provide preferential surface water flow pathways. Several areas within the Proposed Wind Farm Development Area show peat hags, none were identified at proposed infrastructure positions.
Precipitation	The likely failure mechanism following a period of heavy rainfall is linked to the infiltration of surface water. There is a resulting build-up of pore water pressures within the soils and therefore reduced effective shear strength. This may be focussed within the peat accumulation or at the interface between the peat and underlying mineral soil. Secondary effects may include swelling of the peat accumulation and increased loading due to surface water ponding. Snow and subsequent melt can have a similar effect.
Slope Morphology	There are three main effects arising from slope morphology: Firstly, the concentration of tensile stress at the apex of a convex slope predisposes the slope for failure initiation at that point. In a convex slope the material lower down supports the material above which is held in compression. A concave slope has the opposite characteristics as material at the base maintains the apex in tension. Secondly, at the point of maximum slope convexity, because of favourable down-slope drainage conditions, a body of relatively well-drained and relatively strong peat material develops. This body of peat acts as a barrier providing containment for growth of peat upslope. This relatively well drained body of peat can subsequently fail due to a build-up of lateral pressure on the upslope face. In this scenario the slope is not supported from below so eventually the lateral pressures exceed the forces resisting sliding. The apex or point of convexity is also a likely initiation point for slope failure due to the slope tension being concentrated at this point. Thirdly a failure mechanism, analogous to a piping failure underneath a dam, is postulated where springs are present in locations immediately down-slope of the relatively well drained peat body. Under these circumstances high pore pressure gradients within the peat can lead to hydraulic failure and undermining of the relatively well drained peat body resulting in a breach and loss of lateral support to peat upslope. Evolving slope morphology can be significant, for example, in the case of slope undercutting by water erosion. Any mechanism by which mass is removed from a slope toe or deposited on a slope crest will contribute to instability.
Peat Depth & Slope Angle	Peat slides correspond in appearance and mechanism to translational landslides and tend to occur in shallow peat (up to 2.0 m) on slopes between (5° – 15°). A great majority of recorded peat landslides in Scotland, England & Wales are of the peat slide type. MacCulloch, (2005) highlights that a slope angle of 20° appears to be the limiting gradient for the formation of deep peat. Therefore, the risk assessment has assigned slope angles >20° to be an unlikely contributory factor to failure. Slope angle indicators and corresponding probability factors have been similarly adapted from MacCulloch, (2005).

Factor	Discussion
	Boylan et al, (2008) indicates that most peat failures occur on slope angles between 4° and 8°. It is postulated that this may correspond to the slope angles that allow a significant amount of peat to develop that over time becomes potentially unstable. Thus, for this assessment <3 degrees have been assigned a low risk.
Hydrology	Natural watercourses and artificial drainage measures have often been identified as a contributory factor of peat failure. Preferential drainage paths may allow the migration of water to a failure plane therefore triggering failure when groundwater pressures become elevated. Within a peat mass, sub surface peat pipes can enable flow into a failure plane and facilitate internal erosion of slopes. It is also noted that in some instances, agricultural works can lead to the disturbance of existing drainage networks and cause failures.
Existing / Relict Failures	The presence of relict failures and any indication of previous instability are often important, indicating that site conditions exist that are conducive to peat failure. Relict peat slides may be dormant over long periods and be re-activated by any number of the contributory factors discussed in this table.
Anthropogenic Effects	Human impact on peat environments can include a range of affects associated with wind farm construction. Activities such as drainage, access tracks across peat, peat cutting, and slope loading are all examples. Rapid ground acceleration is one such example where shear stress may be increased by trafficking or mechanical vibrations. Given the Proposed Development is located on an existing wind farm and commercial forest, previous activity is considered as part of this risk assessment.

Source: Natural Power, 2026

4.2. Peat Failure Modes

Peat failure in this assessment refers to the mass movement of a body of peat that would have a significant adverse impact on the surrounding environment or infrastructure. This definition excludes localised movement of peat, for example movement that may occur below an access track, creep movement or erosion events and failures in underlying mineral soils.

The potential for peat failure across the development is examined with respect to the activities envisaged during construction and operation of the wind farm. There are several classification systems for the mass movement of peat that were drawn together by PLHRAG, (2017).

Hutchinson (1988) defines the two dominant failure mechanisms namely peat flows and peat slides.

- **Peat Flows & Bog Bursts:** are debris flows involving large quantities of water and peat debris. These flow down slope using pre-existing channels and are usually associated with raised bog conditions.
- **Peat Slides:** comprise intact masses of peat moving bodily down slope over comparatively short distances. A slide which intersects an existing surface water channel may evolve into a debris flow and therefore travel further down-slope. Slides are historically more common within blanket bog settings.

Due to the large areas of peat recorded across the development widespread instability comprising peat flows and bog bursts are the most likely mode of slope failure and further considered by this assessment.

4.3. Geotechnical Principles

Geotechnical parameters that influence peat stability are:

- Shear strength of peat.

- Peat depth.
- Pore water pressure (PWP).
- Loading conditions.

The stability of any slope is defined by the relationship between resisting and destabilising forces. In the case of a simplified infinite slope model with a translational failure mode, sliding is resisted by the shear strength of the basal failure plane and the element of self-weight acting normal to the failure plane. The stability assessments within this report considers an undrained 'total stress' scenario when the internal angle of friction (ϕ') = zero.

An undrained peat accumulation may be destabilised by; mass acting down the slope, angle of the basal failure plane and any additional loading events. The ratio between these forces is the Factor of Safety (FoS). When the FoS is equal to unity (1) the slope is in a state of 'limiting equilibrium' and is sensitive to small changes in the contributory factors leading to peat failure.

The infinite slope model as defined in Skempton et al. (1957) has been adapted to determine the FoS of a peat slope. A modified approach has been used; assuming a minimum FoS (Typically 1.3 after, BS6031: 2009).

The slope analysis is based on a translational slide. This analysis adopts total stress (undrained) conditions in the peat. This state applies to short-term conditions that occur during construction and for a time following construction until construction induced pore water pressures (PWP) dissipate. (PWP requires time to dissipate as the hydraulic conductivity can be low in peat deposits). The following assumptions were used in the analysis of peat deposits across the Proposed Wind Farm Development Area :

- The groundwater is resting at ground level.
- Minimum acceptable factor of safety required is 1.3.
- Failure plane assumed at the basal contact of the peat layer.
- Slope angle on base of sliding assumed to be parallel to ground surface and that the depth of the failure plane is small with respect to the length of the slope.
- Thus, the slope is considered as being of infinite length with any end effect ignored.
- The peat is homogeneous.

The analysis method for a planar translational peat slide along an infinite slope was for calculated using the following equation in total stress terms highlighted by MacCulloch, (2005) and originally reported by Barnes, (2000):

$$F = C_u / (\gamma * z * \sin\beta * \cos\beta)$$

Where:

- F = Factor of Safety (FoS)
- C_u = Undrained shear strength of the peat (kPa)
- γ = Bulk unit weight of saturated peat (kN/m³)
- z = Peat depth in the direction of normal stress
- β = Slope angle to the horizontal and hence assumed angle of sliding plane (degrees)

Undrained shear strength values (C_u) are used throughout this assessment. Effective strength values are not applicable for the case of rapid loading of the peat during short term construction phase of works hence the formula cited above, has been adopted. **Figure A.8** maps out the calculated FoS for the Proposed Development when applying a conservative 10 kPa as the undrained shear strength for peat soils. This mapping includes the predicted FoS where a 20 kPa surcharge is additional applied to the surface.

4.4. Risk Assessment Method

The national guidance acknowledges risk assessment as an iterative process and as such this assessment should be updated as more information becomes available.

The semi quantitative risk assessment has been used to determine the risk of peat slide. The methodology is defined in the national guidance and has been augmented with methods set out by Clayton (2001) & MacCulloch, (2005). The considered risk factors are summarised in **Table A10.4.8**.

The assessment is multi-threaded and uses the numerical stability analysis and presents results for Factor of Safety (FoS) across the Proposed Development. The calculated FoS, is complimented with an assessment of the slope angle, peat depth and key geomorphological features. A Peat Stability Risk Zonation map has been produced using GIS computation of these factors. (**Figure A.9**). The risk map is used for screening wide areas of the study area. Additional engineering judgement has been applied according to discrete conditions within **Table A10.4.12** of this report. Where there is a peat depth of 0.30 m or below, the peat slide risk is deemed negligible, regardless of other factors in the GIS computed model shown in **Figure A.9**.

Table A10.4.8: Peat Slide Risk Factors

Factor	Comment	Criteria	Probability	Scale
Peat Depth* (A)	Peat slides tend to occur in shallow peat (up to 2.0 m) on A great majority of recorded peat landslides in Scotland, England & Wales are of the peat slide type	0 – 0.5 m	Negligible	1
		>3.0 m	Unlikely	2
		0.5 – 1.0 m	Likely	3
		2.0 – 3.0 m	Probable	4
		1.0 – 2.0 m	Almost certain	5
Slope Angle* (B)	It has been acknowledged that peat slide tends to occur in shallow peat (up to 2.0 m) on slopes between 5° and 15°. Slopes above 20° tend to be devoid of peat or only host a thin veneer deposit.	0° – 3°	Negligible	1
		>20°	Unlikely	2
		4° – 9°	Likely	3
		16° – 20°	Probable	4
		10° – 15°	Almost certain	5
FoS* (C)	Values are calculated from slope analysis model using characteristic value of 10 kPa derived from hand shear vane in-situ testing. Terrain slope angle and peat depth also input to this factor.	≥1.3	Negligible	1
		1.29 – 1.20	Unlikely	2
		1.10 – 1.19	Likely	3
		1.00 – 1.09	Probable	4
		<1.0	Almost certain	5
Cracking (D)	Visual assessment undertaken in the field during detailed probing survey and covers the same extends of this survey. Field workers examined for evidence of any major crack networks which may allow surface water to penetrate the peat mass. Reticulate cracking was not investigated as this normally requires intrusive ground investigation to remove the surface fibrous layer.	None	Negligible	1
		Few	Unlikely	2
		Frequent	Likely	3
		Many	Probable	4
		Continuous	Almost certain	5
Groundwater (E)	Challenging to evaluate without detailed mapping and/or intrusive data. Look for entry / exit points. Evidence of surface hollows, collapse features at surface reflecting evidence of sub-surface peat pipe network, audible indicators including the sound of sub-	None	Negligible	1
		Few	Unlikely	2
		Frequent	Likely	3
		Many	Probable	4
		Continuous	Almost certain	5

Factor	Comment	Criteria	Probability	Scale
	surface running ground water surrounding proposed infrastructure locations			
Surface *Hydrology (F)	Ranging from wet flushes to running burns to hags. Must be evaluated in conjunction with the season and weather preceding the site visit.	None	Negligible	1
		Few	Unlikely	2
		Frequent	Likely	3
		Many	Probable	4
		Continuous	Almost certain	5
Previous Instability (G)	Visual survey, scale and age are important as small to medium relict failures may be easy to detect but very large ones may require remote imaging. Recent failures should be obvious due to the scar left. A single, localised, soil slide on shallow rock was identified away from infrastructure east of T10.	None	Negligible	1
		Few	Unlikely	2
		Frequent	Likely	3
		Many	Probable	4
		Continuous	Almost certain	5
Land Management (H)	Anthropogenic influences: forestry operations and removal of vegetation can be associated with de-stabilising peat deposits. This can occur as a result to surface disturbance and remoulding of peat through excavation, vehicle movements and loading. Changes in land use activities may also be associated with changes in drainage conditions. Criteria based on evidence of disturbance of peat deposit, i.e. broken surface, scarring or disrupted hydrology. Given the presence of a pre-existing wind farm and both historic and active forestry operations, a land management factor of '2' (Unlikely) will be used in this assessment as there is no identifiable evidence these activities have so far increased risk of peat slide at the Site.	None	Negligible	1
		Few	Unlikely	2
		Frequent	Likely	3
		Many	Probable	4
		Continuous	Almost certain	5

Note: * Denotes where risk factor applied to GIS model only

Environmental Impact has been assessed based on proximity to the main watercourses. **Table A10.4.9** denotes the potential impact scales to the environment. The Environmental Impact Zones map for the Proposed Development is found in **Figure A.10**.

Where watercourses are ephemeral/transient or minor artificial features they were not included as direct receptors. The impact distances are based on experience and guidance values provided within MacCulloch, F. (2006).

The approach advocated by MacCulloch, (2006); is to divide the survey area into Environmental Impact Zones driven by site specific criteria and survey information. It is noted that defining a definitive distance for impact is extremely challenging due to the complex nature of terrain, peat depth, flow mechanics will all influence the flow path characteristics. At present there exists no defined method to accurately define the predicted flow/slide distances.

Table A10.4.9 provides a framework estimate for the purposes of repeatable and representative semi quantitative risk mapping. Natural Power considers this approach alongside the multitude of site-specific factors which are considered during the risk assessment a valid and robust approach for this development.

Table A10.4.9: Environmental Impact Zonation

Criteria	Potential Impact	Scale
Proposed access road/turbine within 50 m of watercourse	High	4
Proposed access road/turbine within 50-100 m of watercourse	Medium	3
Proposed access road/turbine within 100-150 m of watercourse	Low	2
Proposed access road/turbine greater than 150 m from watercourse	Negligible	1

Source: Natural Power, 2026

For each main infrastructure element, the Risk Ranking is assessed from the combined probability of occurrence for the main contributory factors (where greater than 1), multiplied by the highest impact scale. **Table A10.4.10** identifies the risk category based on the national guidance PLHRAG, (2017).

The risk to existing or proposed infrastructure has been scoped out and is not considered a determining factor to the severity of a peat slide over the Proposed Development. This is due to the distance of the Proposed Development from existing settlements.

Access track sections have screened through the GIS-based stability risk model and the elevated risk sections reviewed with further risk analysis and control measures. It is important to highlight that the full scope of the proposed infrastructure layout has been subject to field survey and review of all stability risk factors.

Table A10.4.10: Risk ranking and actions

Final Risk Score	Risk Category
17 - >25	High: Avoid project development at these locations.
11 - 16	Medium: Project should not proceed unless risk can be avoided or mitigated at these locations, without significant environmental impact, to reduce risk ranking to low or negligible.
5 - 10	Low: Project may proceed pending further investigation to refine risk assessment and mitigate hazard through relocation or re-design at these locations.
1 - 4	Negligible: Project should proceed with monitoring and mitigation of peat landslide hazards at these locations as appropriate.

5. Slope Stability Analysis

5.1. Introduction

Assessing desk study information, site layout and ground investigation data; a preliminary numerical slope stability analysis has been undertaken. Slope stability was assessed at turbine locations using slope angle measurements, peat depth, and undrained shear strength measured using an in-situ hand shear vane.

For each proposed turbine location, the recorded peak undrained shear strength values have been entered into the slope model in order to calculate the potential factor of safety against peat slide. A site wide conservative undrained shear strength of 10 kPa has been adopted for the wide scale analysis.

5.2. Numerical Slope Analysis

A preliminary numerical slope analysis has been undertaken. Numerical slope stability was assessed across the development location using slope angle measurements (5 m grid DTM derived), peat depth, and the minimum undrained shear strength measured using an in-situ hand shear vane. In addition, a 20 kPa surcharge has been modelled. Thus the sensitivity of slopes to failure is assessed under construction conditions is considered. Geospatial analysis software was used to produce a Factor of Safety (FoS) map for the Proposed Development (Figure A.8).

The existing natural slope condition on a wide scale has been calculated to be stable by the analysis and was observed to be so around the proposed wind turbine infrastructure locations. The only exceptions being shallow peat soil slides over bedrock south from T10.

In the absence of more detailed subsurface data, the surface slope angle has been used as a reference to the likely slope surface angle at the base of the peat in the analysis. Further advanced in-situ test methods should be considered as part of a detailed site investigation phase usually carried out post-consent. The potential of disturbing sensitive peat deposits during pre-construction survey access should also be considered during future phases of intrusive investigation work.

The FoS accounts for a 20 kPa surcharge representing scenarios at infrastructure such as temporary storage stockpiles. The Outline Peat Management Plan (Volume 3, Appendix 10.2) details mitigation measures for peat stockpiling. Slope stability assessments would be carried out during design phase for site tracks, hardstands and other relevant structures ensuring the proposed design results are safe, stable and environmentally compliant. It is Natural Power's view that, if during design phase structures are proposed additional numerical stability assessment should be carried out by the appointed designer.

Table A10.4.11 displays the summary results of the numerical stability assessment.

Table A10.4.11: Summary numerical stability assessment

Location	Peak Shear Strength (Cu)	Unit Weight (γ) *	Depth of peat (z)	Slope Geometry	Factor of Safety (FoS = $Cu / \gamma z \sin \beta \cos \beta$)	
	kPa	kN/m ³	metres	β°	No Applied Load	Surcharge 20kPa
T1	17	10	2.15	4	11.36	5.89
T2	10*	10	1.19	6	8.08	3.02
T3	10*	10	0.70	8	10.37	2.69
T4	10*	10	0.15	7	30.00	3.85
T5	20	10	2.1	5	10.97	5.62
T6	15	10	0.33	8	30.00	4.67
T7	9	10	0.79	6	10.96	3.10
T8	19	10	0.65	8	20.65	5.07
T9	16	10	1.22	2.5	30.00	11.40
T10	13	10	0.70	7	15.35	3.98
T11	19	10	0.96	5.5	20.75	6.73
T12	10*	10	0.30	3	30.00	8.32
T13	18	10	0.72	8.5	17.10	4.53
T14	10*	10	0.57	15	7.02	1.56

*Site wide value of 10 kPa used where no turbine specific values available.

The numerical stability analysis indicates no potential for translational peat slide at proposed turbine and infrastructure locations under current equilibrium or modelled surcharge loading conditions.

Wind Turbines: FoS values for the turbine locations, when allowing for a 20 kPa surcharge load have been derived. The lowest FoS with no applied load was calculated at 7.02 kPa for T14. The lowest FoS with a 20 kPa surcharge is 1.56 for T14. The natural slope condition has been calculated to be stable and was observed to be so around the wind turbine locations during the field survey.

6. Peat Slide Risk Assessment

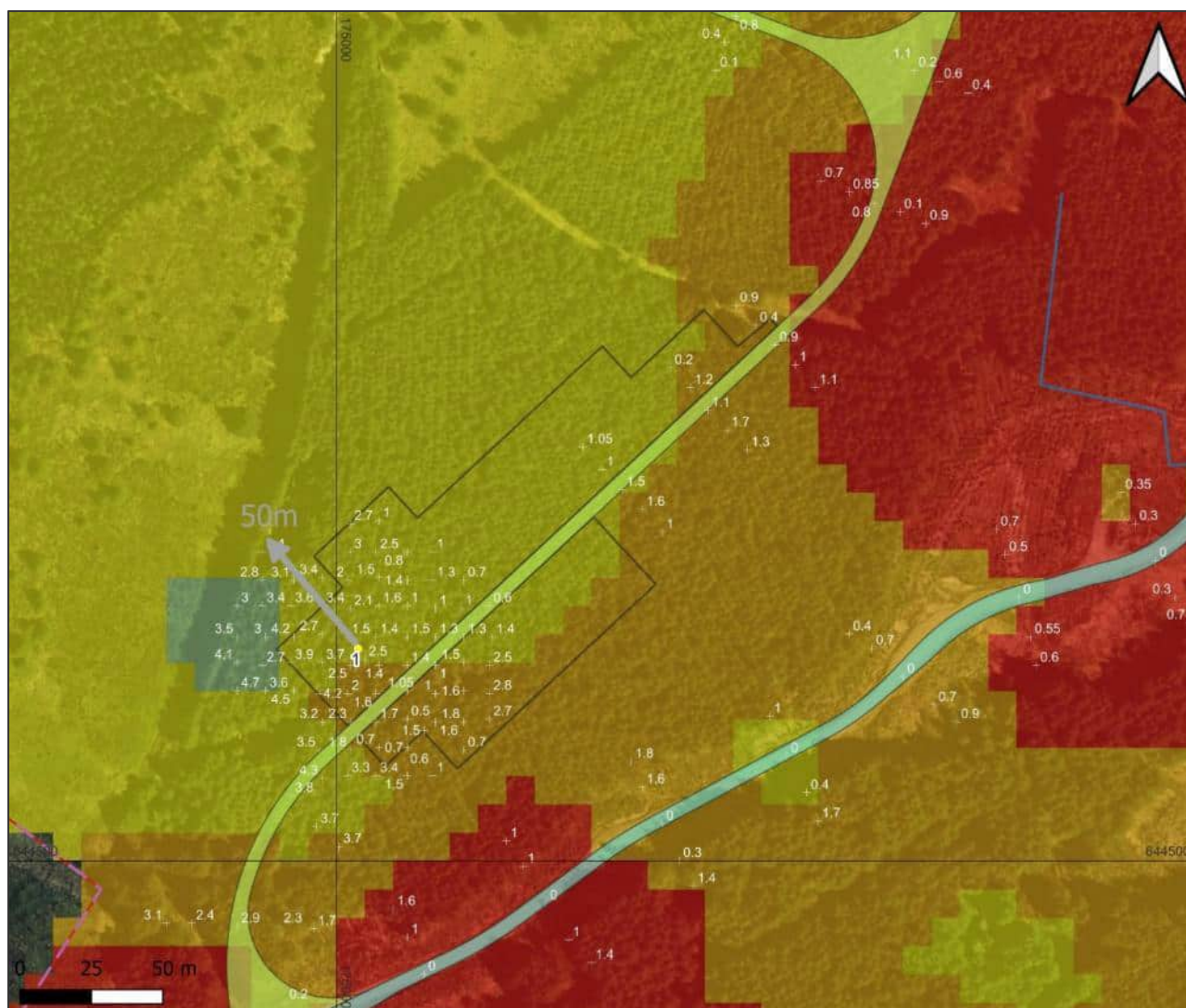
Risk rankings for the Proposed Development infrastructure positions are presented in **Table A10.4.12**. Across each turbine, the qualitative risk scoring has been provided along with key inset map information.

The Peat Stability Risk Zonation map (**Figure A.9**) provides a representation of the risk zonation across the Proposed Wind Farm Development Area and includes all infrastructure elements. The map is based on a site wide GIS analysis and should not be viewed in isolation without the narrative of this report. The Risk Mapping does not show residual risk following implementation of targeted or routine control measures during the construction phase.

The indicative residual risk rating is provided assuming implementation of appropriate mitigation measures. Further detail of the risk assessment is highlighted within the preliminary geotechnical risk register presented in **Table A10.4.15**.

Table A10.4.12: Risk ranking for proposed turbine and ancillary infrastructure locations

Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)	Risk Ranking	
T1	1	1-2	Peat Depth (Mean = 2.15 m)	4	4+3+2 = 9 x1 (Low)
			Slope Angle (4°)	3	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	1	
			Land Management	2	



T1 Location – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: This location would benefit from a microsite 50 m to the northwest (*if practicable, when considering competing constraints*) as parts of the hardstanding are within the 100 – 150 m watercourse buffer / environmental risk ranking '2'. This micro siting would reduce these areas of risk to Low.

Peat depth and slope angle are conducive for peat sliding so care should be taken when stockpiling peat around areas with steep gradients. Stockpiling should also be avoided in areas with deep peat.

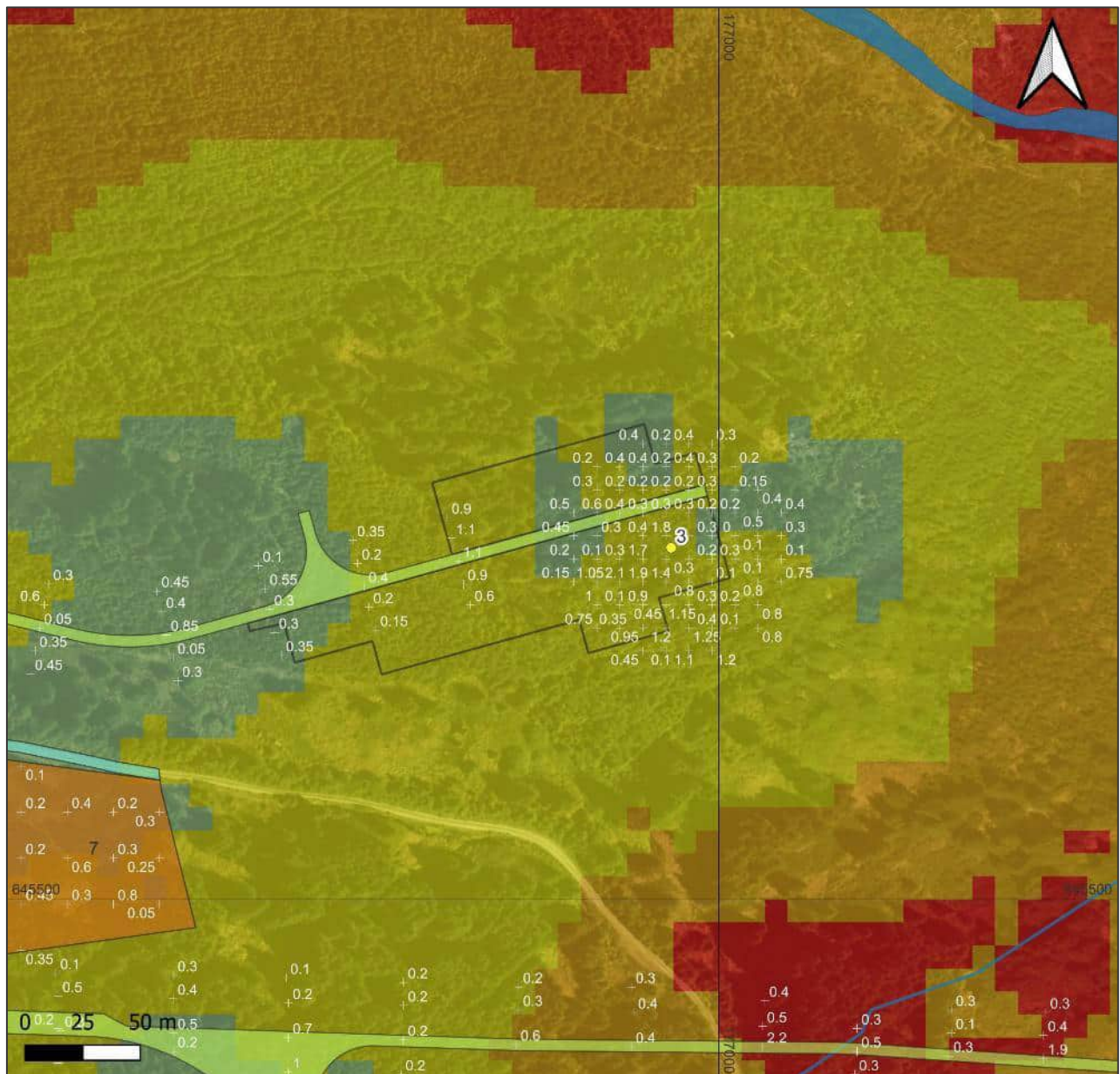
Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)	Risk Ranking	
T2	1	1	Peat Depth (Mean = 1.19 m)	5	$5+3+2 * (1) = 10$ (Low)
			Slope Angle (6°)	3	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	1	
			Land Management	2	



T2 Location – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: Care should be taken when stockpiling peat during the construction process around this turbine due to the pockets of deep peat and steeper gradients. A small portion of the southern hardstanding is within the 150 m watercourse buffer, special care should be taken here to avoid contamination to the watercourse to the south such as limiting stockpiles, drainage ditching and silt fencing.

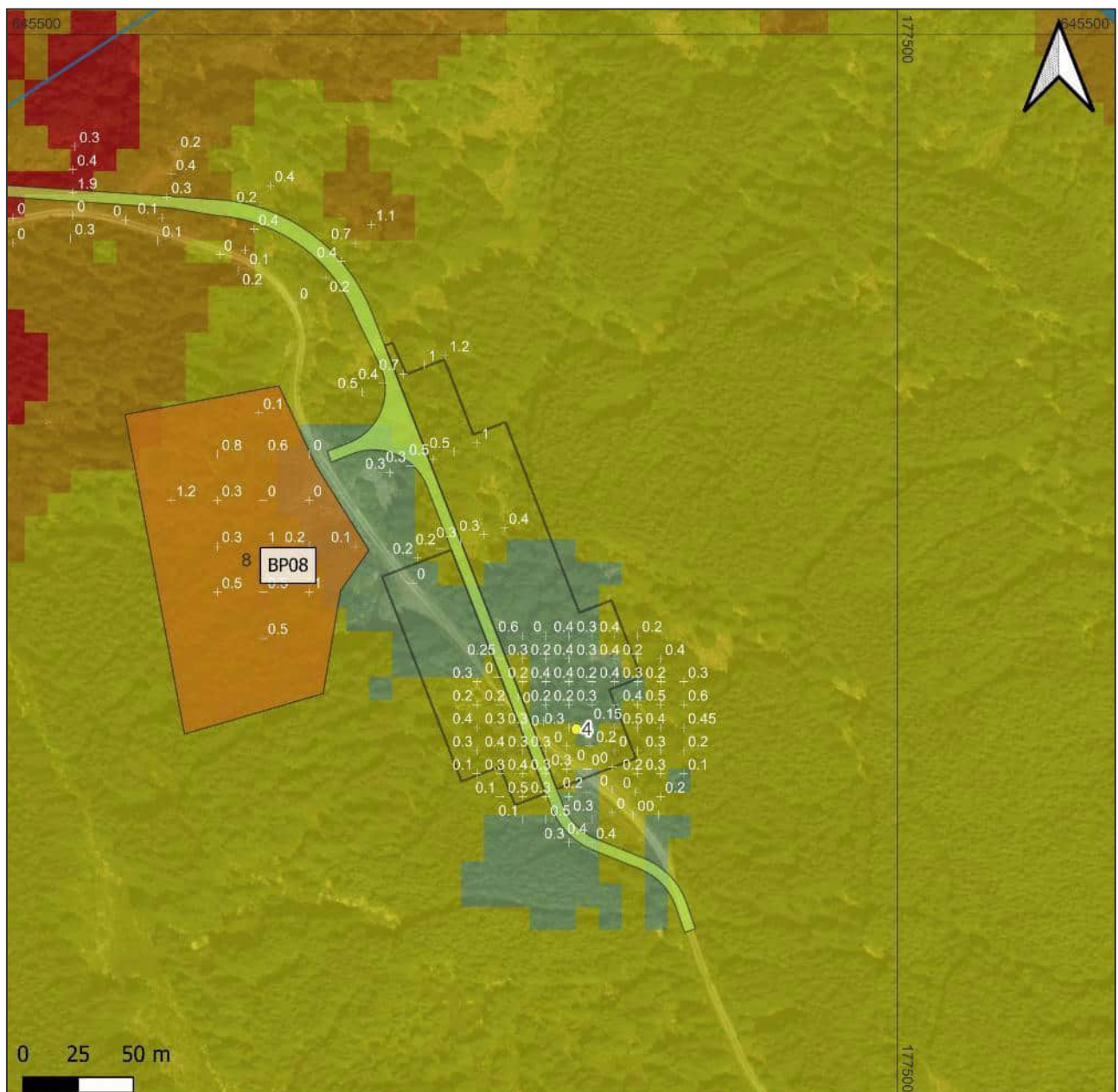
Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)	Risk Ranking	
T3	1	1	Peat Depth (Mean = 0.70 m)	3	3+3+2 = 8 (Low)
			Slope Angle (8°)	3	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	1	
			Land Management	2	



T3 Location – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: Peat probe data in the surrounding area suggest shallow peat soils with isolated deep peat to the south of the location.

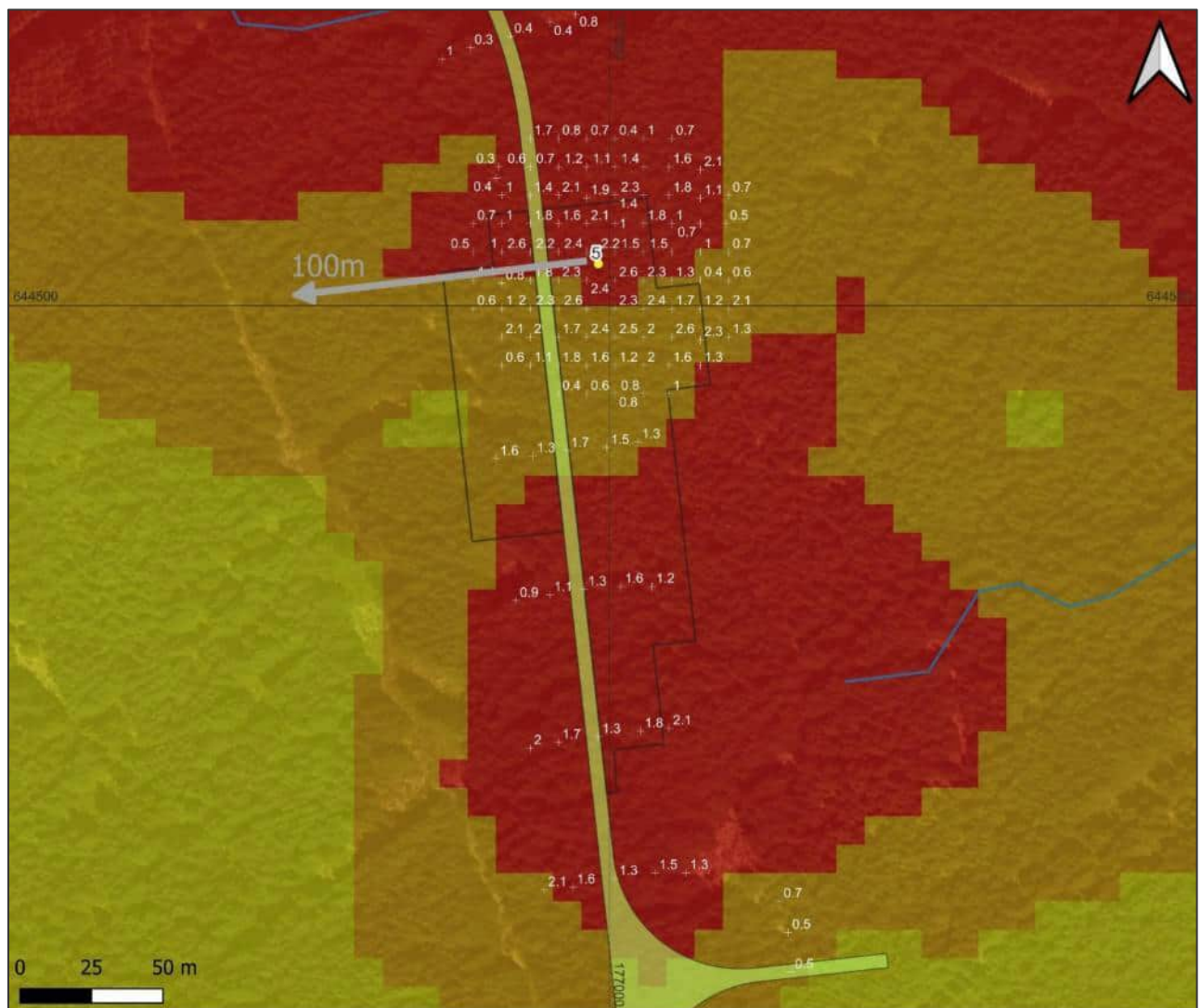
Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)	Risk Ranking
T4	1	1	Peat Depth (Mean = 0.15 m)	1
			Slope Angle (7°)	3
			FoS	1
			Peat cracking / infiltration	1
			Groundwater Flow	1
			Hydrology	1
			Previous Instability	1
			Land Management	2
				0 (No Peat) Negligible



T4 Location – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: Peat depth is negligible at the turbine location and is comprised of shallow peat soil across the surrounding area. The risk of peat slide is therefore deemed negligible.

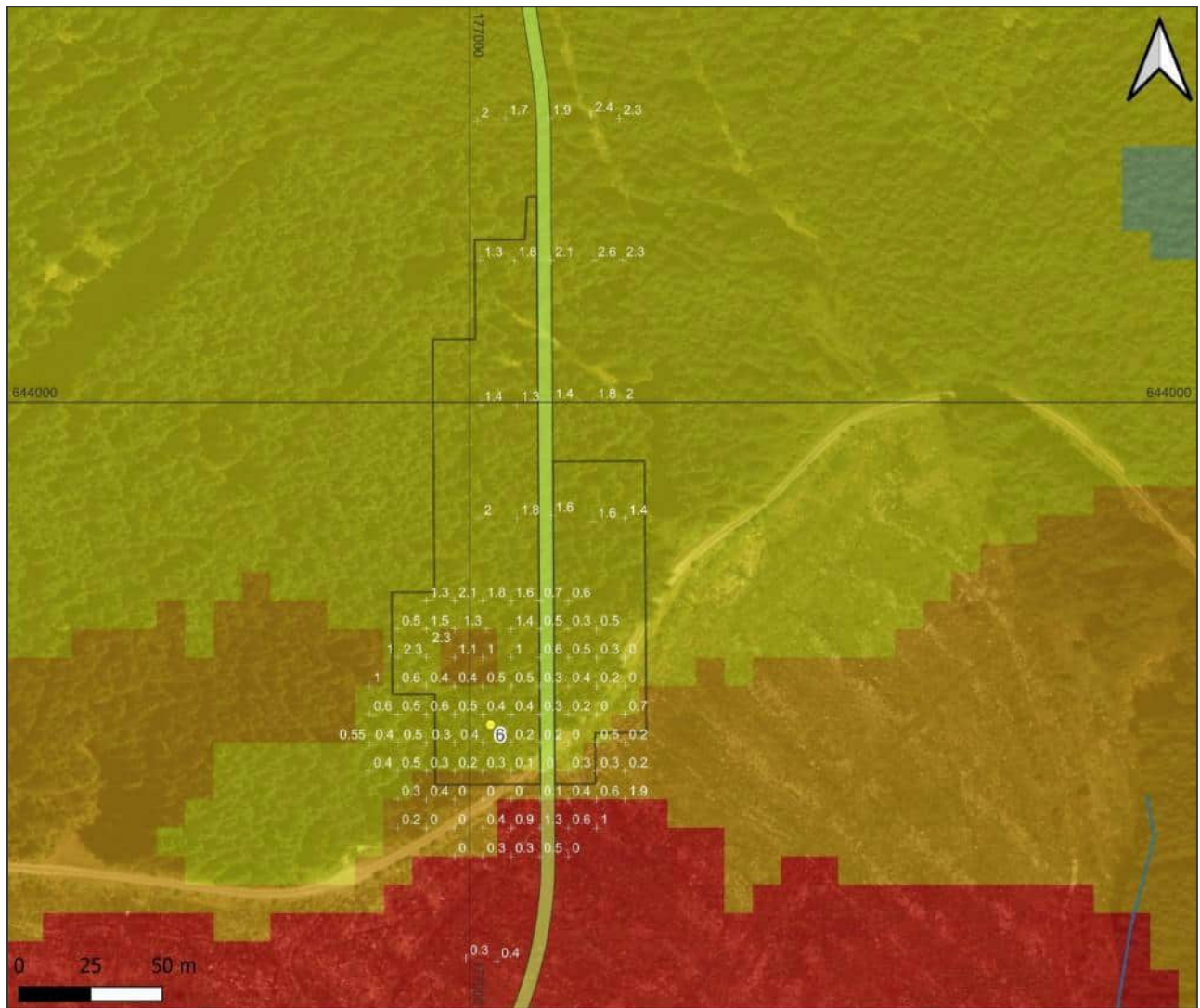
Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)	Risk Ranking	
T5	1	3	Peat Depth (Mean = 2.1 m)	4	4+3+2 *(3) = 27 High
			Slope Angle (5°)	3	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	1	
			Land Management	2	



T5 Location – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: Micro siting the turbine location to 100 m west-southwest would reduce this environmental risk ranking to '2' and the overall risk for all of the infrastructure from 'High' to 'Medium'. This could be further reduced to 'Low' through best practice and the use of special mitigation measures to avoid contamination such as limiting stockpiles, drainage ditching and silt fencing. The slope angle is conducive for peat sliding so care should be taken when stockpiling peat around areas with steep gradients. Stockpiling should also be avoided in areas with deep peat.

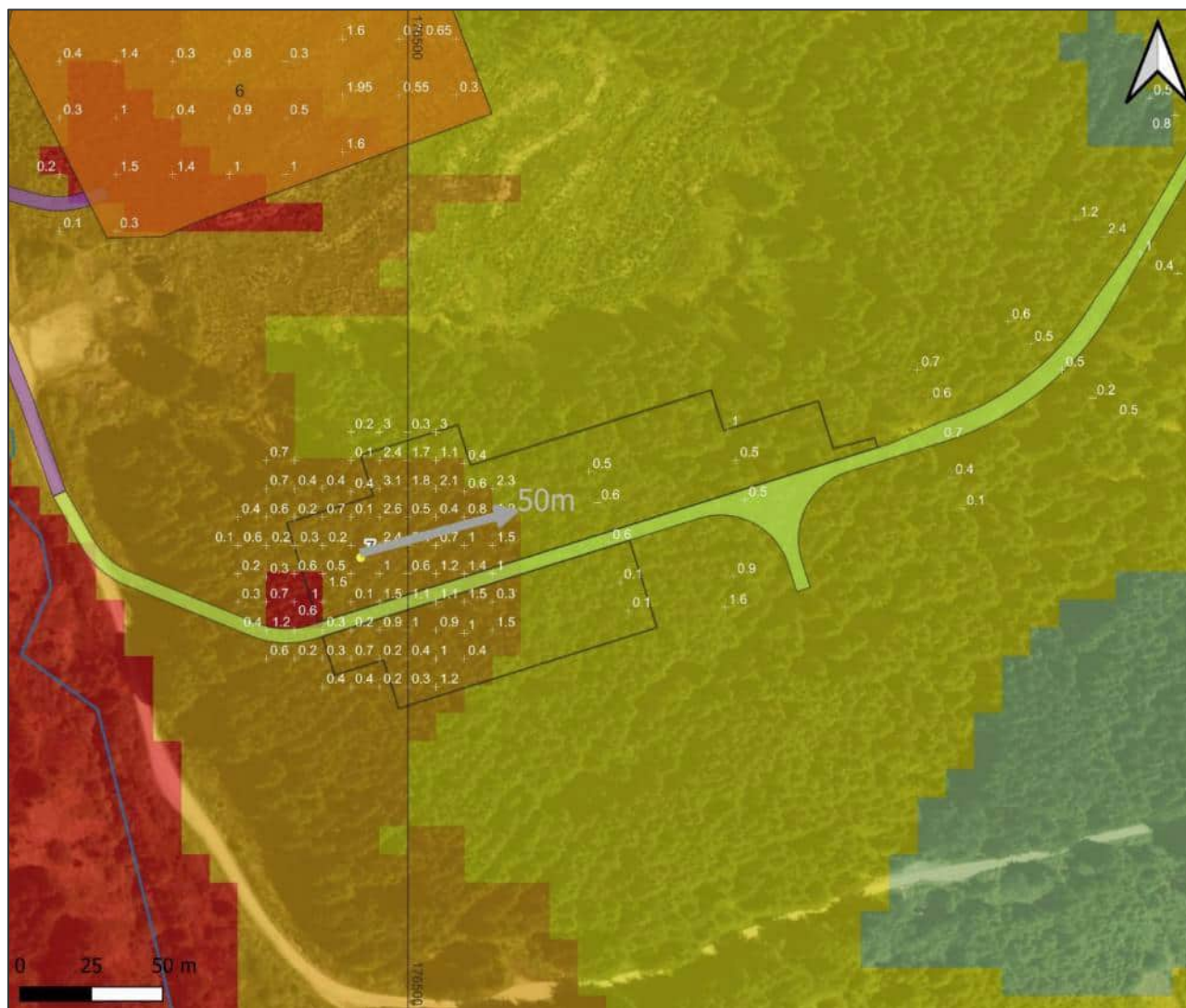
Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)		Risk Ranking
T6	1	2	Peat Depth (Mean = 0.33 m)	1	3+2 (*2) = 10 Low
			Slope Angle (8°)	3	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	1	
			Land Management	2	



T6 Location – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: The slope angle is conducive for peat sliding and there are areas of peat over 2.0 m depth within the hardstanding area so care should be taken when stockpiling during the construction process around this turbine and stockpiling should also be avoided in the peripheral area of deep peat. High risk noted to the south due to watercourse proximity.

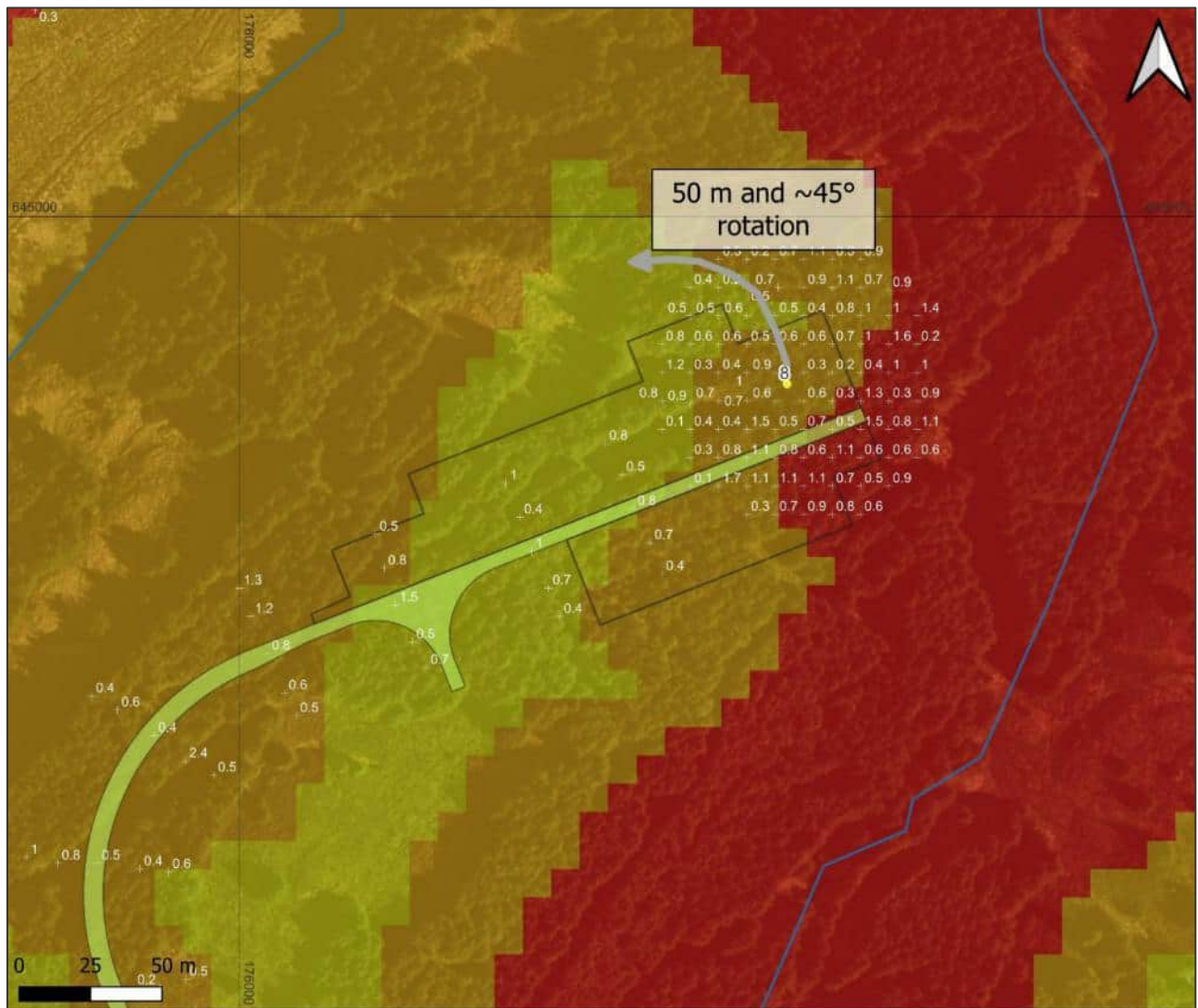
Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)	Risk Ranking	
T7	1	2	Peat Depth (Mean = 0.79 m)	3	3+3+2 *(2) = 16 Medium
			Slope Angle (6°)	3	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	1	
			Land Management	2	



T7 Location – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: This location should consider a microsite of 50 m to the northeast as parts of the hardstanding in the west are within the 100 m watercourse buffer / environmental risk ranking '2'. This micro siting would reduce this environmental risk ranking to '1' and the overall risk for all of the infrastructure to 'Low'. There are also areas of peat up to 3.1 m depth immediately northeast of the turbine centre within the hardstanding area and stockpiling should be avoided in these areas of deep peat.

Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)	Risk Ranking
T8	1	2	Peat Depth (Mean = 0.65 m)	3
			Slope Angle (8°)	3
			FoS	1
			Peat cracking / infiltration	1
			Groundwater Flow	1
			Hydrology	1
			Previous Instability	1
			Land Management	2
3+3+2 *(2) = 16 Medium				



T8 Location – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: Moving the turbine position and hardstanding 50 m to the northwest and rotating the hardstanding approximately 45° anticlockwise would place the infrastructure almost entirely in areas of 'Low' risk through moving away from the watercourse to the east. Alternatives may include engineering a downslope bund and reinforcement to protect the watercourse from any peat movement.

Care should be taken when stockpiling peat during the construction process around this turbine due to the pockets of deep peat and steeper gradients, stockpiling should be avoided in areas with deep peat.

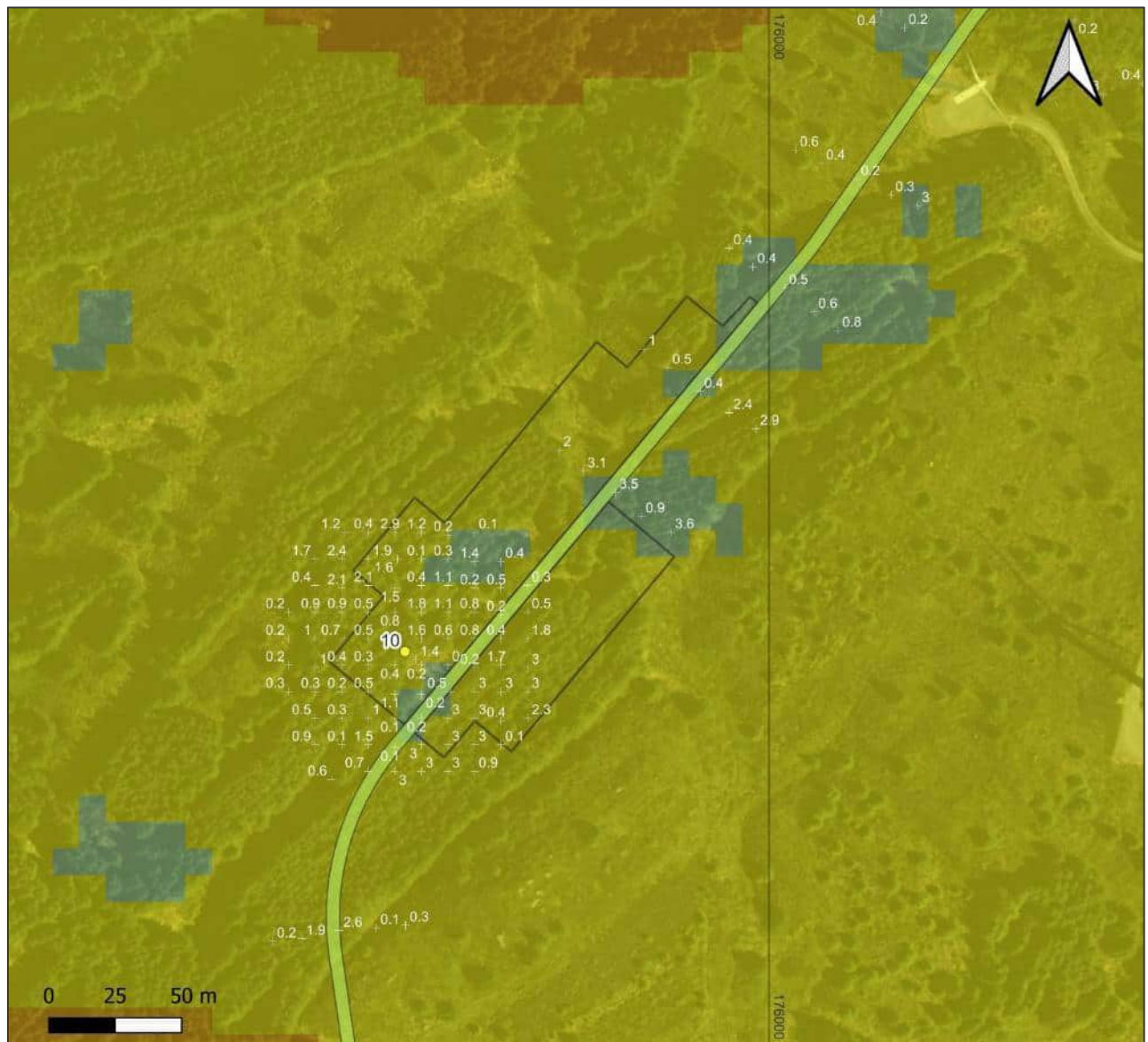
Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)	Risk Ranking	
T9	1	1	Peat Depth (Mean = 1.22 m)	3	3+3+2 = 8 (Low)
			Slope Angle (7°)	3	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	1	
			Land Management	2	



T9 Location – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: Care should be taken when stockpiling peat during the construction process around this turbine, stockpiling should be avoided in places where pockets of deep peat for example in the area directly northwest of the proposed turbine centre and where steeper gradients are located for example to the south of the proposed turbine centre location.

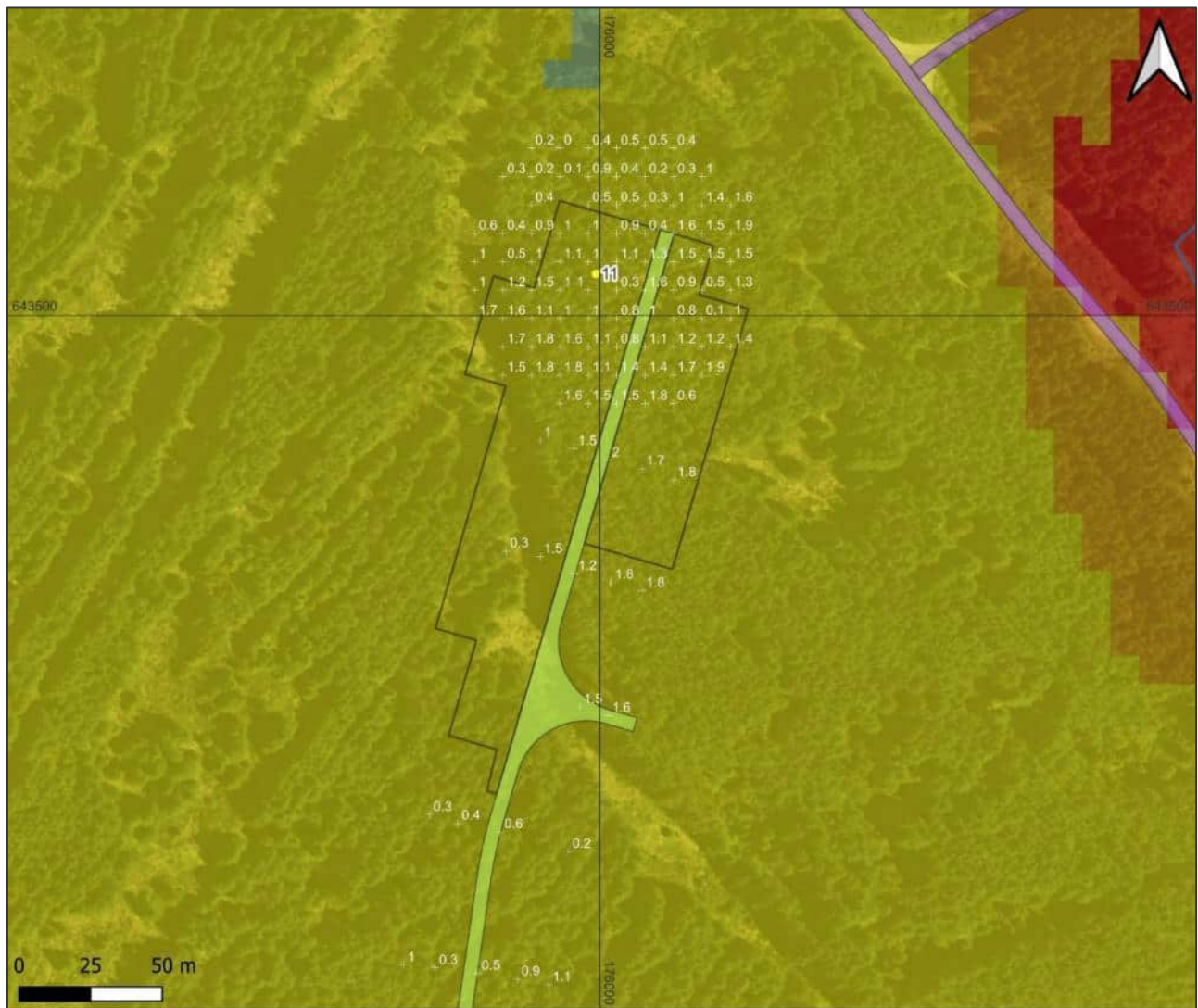
Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)	Risk Ranking	
T10	1	1	Peat Depth (Mean = 0.70 m)	3	3+3+2+2 = 10 Low
			Slope Angle (7°)	3	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	2	
			Land Management	2	



T10 Location – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: Peat depth and slope angle are conducive for peat sliding so care should be taken when stockpiling peat around areas with steep gradients. Stockpiling should also be avoided in areas with deep peat such as where peat depths are recorded as up to 3.5 m at the centre of the hardstanding location. A previous instability ranking of '2' is assigned for this location due to the localised soil slip observed on the site walkover approximately 100 m from the turbine centre (See geomorphological map, **Figure A.3**, for location on map).

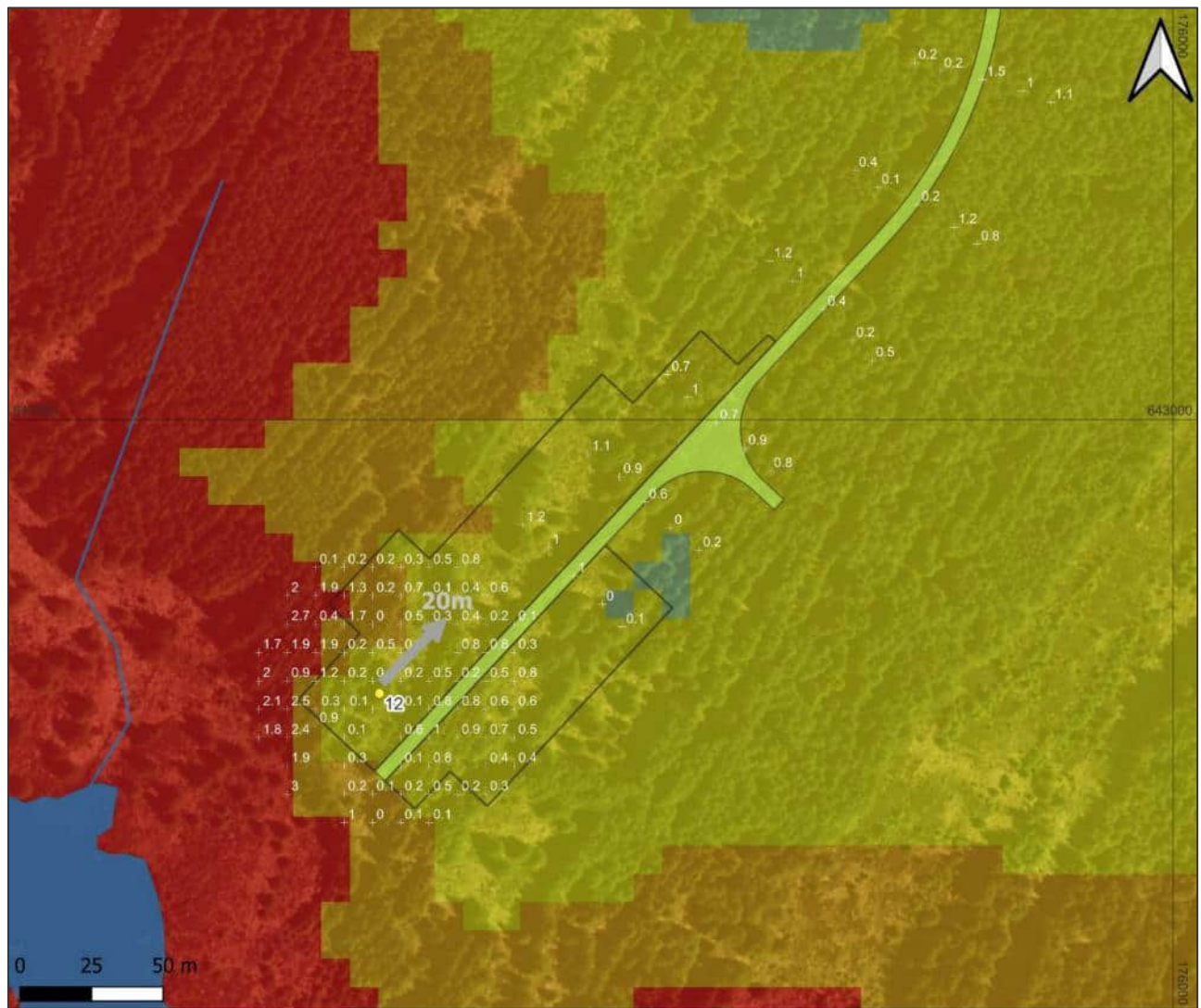
Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)	Risk Ranking	
T11	1	1	Peat Depth (Mean = 0.96m)	3	$3+3+2 = 8$ Low
			Slope Angle (5.5°)	3	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	1	
			Land Management	2	



T11 Location – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: Peat depth and slope angle are conducive for peat sliding so care should be taken when stockpiling peat around areas with steep gradients. Stockpiling should also be avoided in areas with deep peat such as in the area south of the turbine centre with peat depths up to 2.0 m recorded.

Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)		Risk Ranking
T12	1	3	Peat Depth (Mean = 0.30 m)	1	$2 * (3) = 6$ Low
			Slope Angle (3°)	1	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	1	
			Land Management	2	

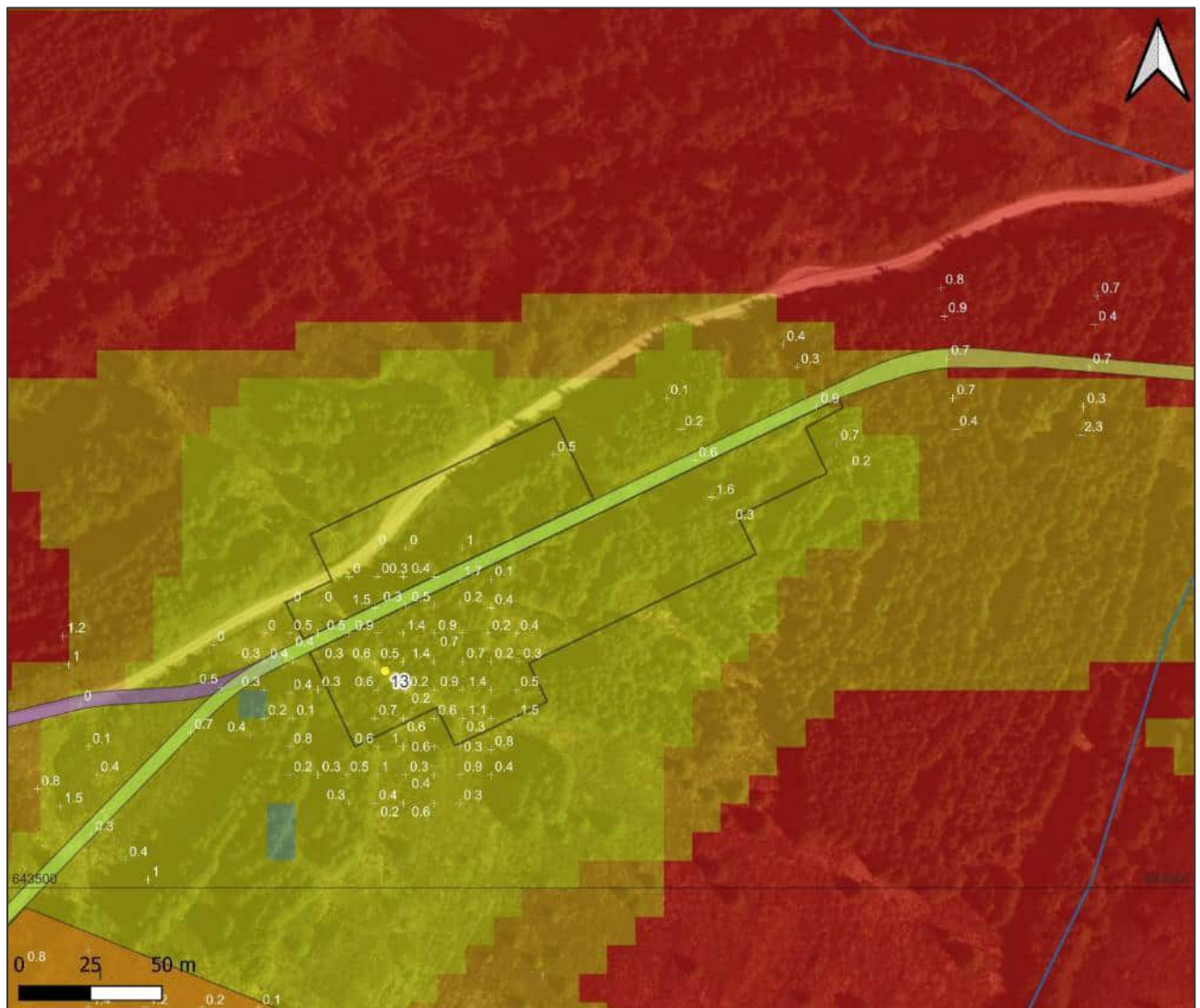


T12 Location – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: This location would benefit from a microsite of 20 m to the northeast as parts of the hardstanding in the west are within the 100 m watercourse buffer / environmental risk ranking '3'. This micro siting would reduce this environmental risk ranking to '1' and the overall risk for all of the infrastructure to 'Low'

There are areas of peat over 1.5 m depth and slope angles which are conducive to peat sliding in the hardstanding area so care should be taken when stockpiling during the construction process around this turbine and should be avoided in these areas of elevated peat slide risk. Special mitigation measures to avoid contamination such as limiting stockpiles, drainage ditching and silt fencing should be implemented due to the presence of the watercourse to the west and the lochan it feeds to the southwest.

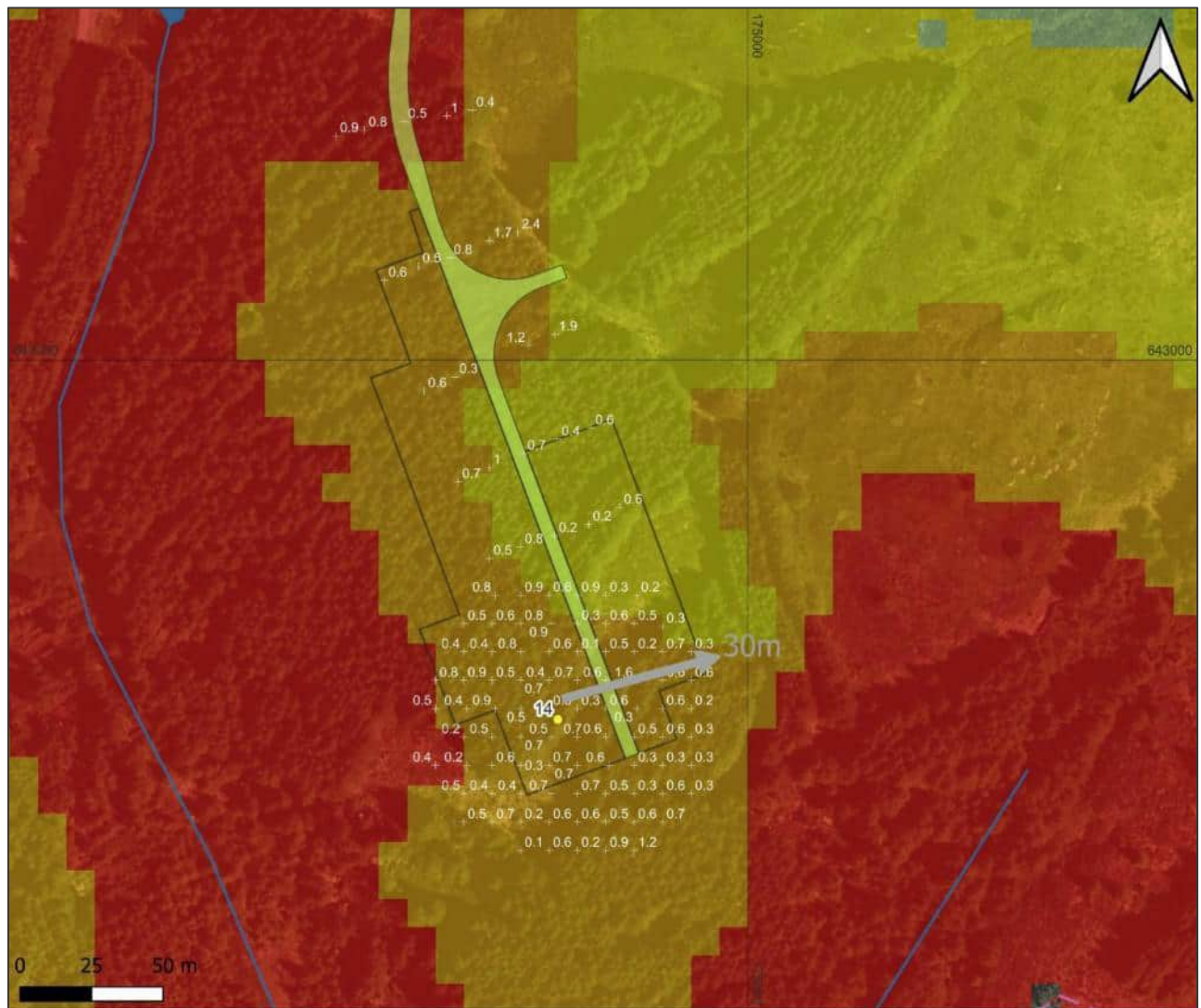
Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)	Risk Ranking	
T13	1	1	Peat Depth (Mean = 0.72 m)	3	$3+3+2 = 8$ Low
			Slope Angle (8.5°)	3	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	1	
			Land Management	2	



T13 Location – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: The slope angle is conducive for peat sliding and there are areas of peat over 1.5 m depth so care should be taken when stockpiling during the construction process around this turbine and these areas should be avoided for stockpiling where possible.

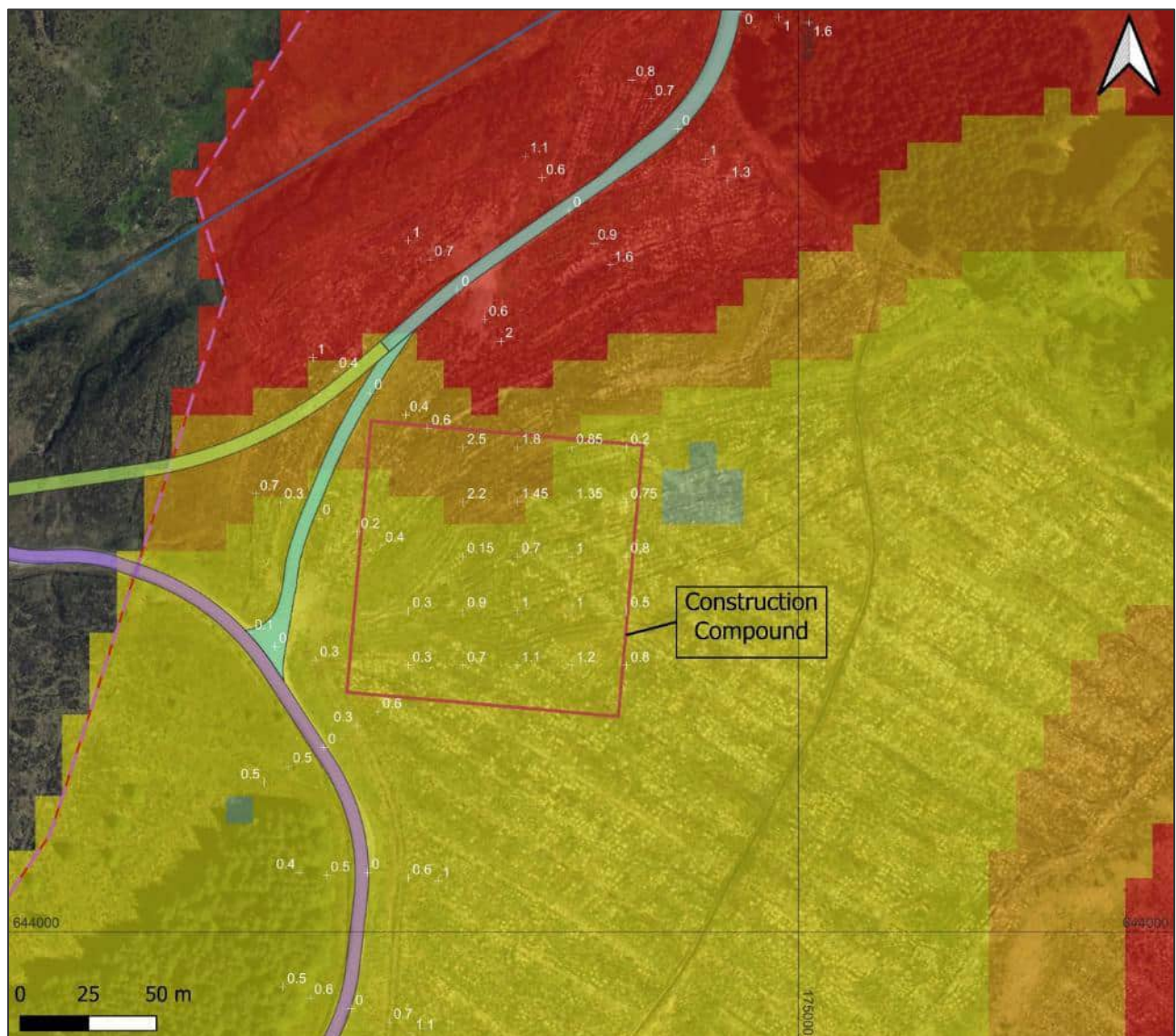
Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)	Risk Ranking	
T14	1	2	Peat Depth (Mean = 0.57 m)	3	$5+3+2 \times (2) = 20$ High
			Slope Angle (15°)	5	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	1	
			Land Management	2	



T14 Location – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: This location would benefit from a microsite of 30 m to the northeast (*if practicable, when considering competing constraints*) as parts of the hardstanding in the northwest are within the 100 m watercourse buffer / environmental risk ranking '3'. Further overall risk reduction to 'Low' could be achieved through best practice with careful stockpiling in areas of steep gradients and avoiding stockpiling in areas of deep peat.

Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)	Risk Ranking	
Construction Compound	1	1	Peat Depth (Mean = 0.88 m)	3	$3+3+2 = 8$ Low
			Slope Angle (5°)	3	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	1	
			Land Management	2	



Construction Compound – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: The northwestern area of the proposed compound is within the 100 – 150 m watercourse buffer, so special mitigation measures to avoid contamination such as limiting stockpiles, drainage ditching and silt fencing should be implemented due to the presence of the watercourse to the northwest. However, due to existing mitigation measures (such as drainage ditches) built as part of the original Deucheran Hill wind farm track construction, an environmental ranking of '2' is not considered in the calculation.

The slope angle and peat depth are conducive for peat sliding and there are areas of peat up to 2.5 m depth so care should be taken when stockpiling during the construction process around this infrastructure location.

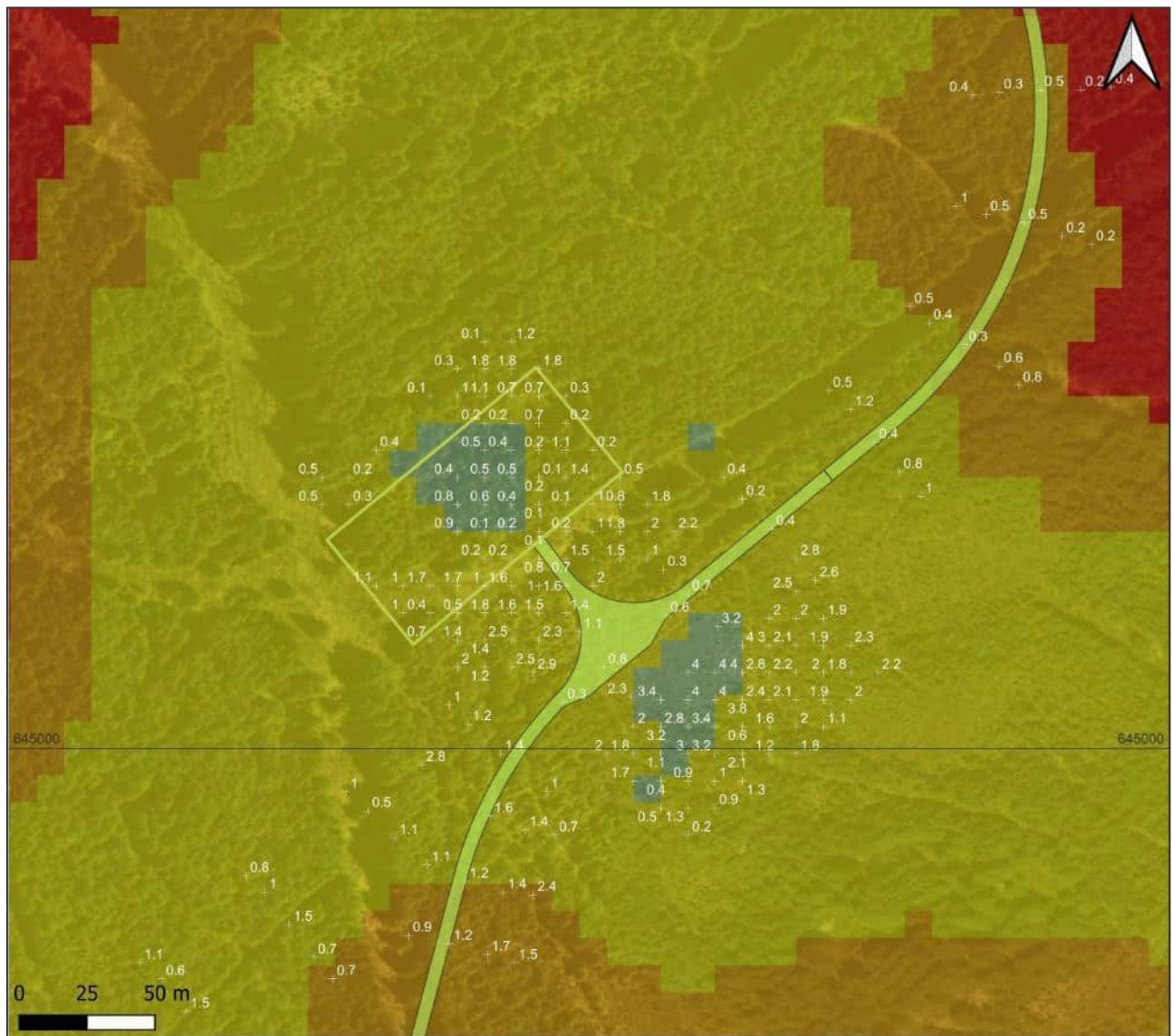
Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)	Risk Ranking	
Substation Compound	1	1	Peat Depth (Mean = 1.46 m)	5	5+2 = 7 Low
			Slope Angle (2.5°)	1	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	1	
			Land Management	2	



Substation Compound – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: The peat depth is conducive for peat sliding and there are areas of peat up to 3 m depth so care should be taken when stockpiling during the construction process around this infrastructure location. Terrain slope angle is low and therefore overriding and removed risk of large scale sliding at this location.

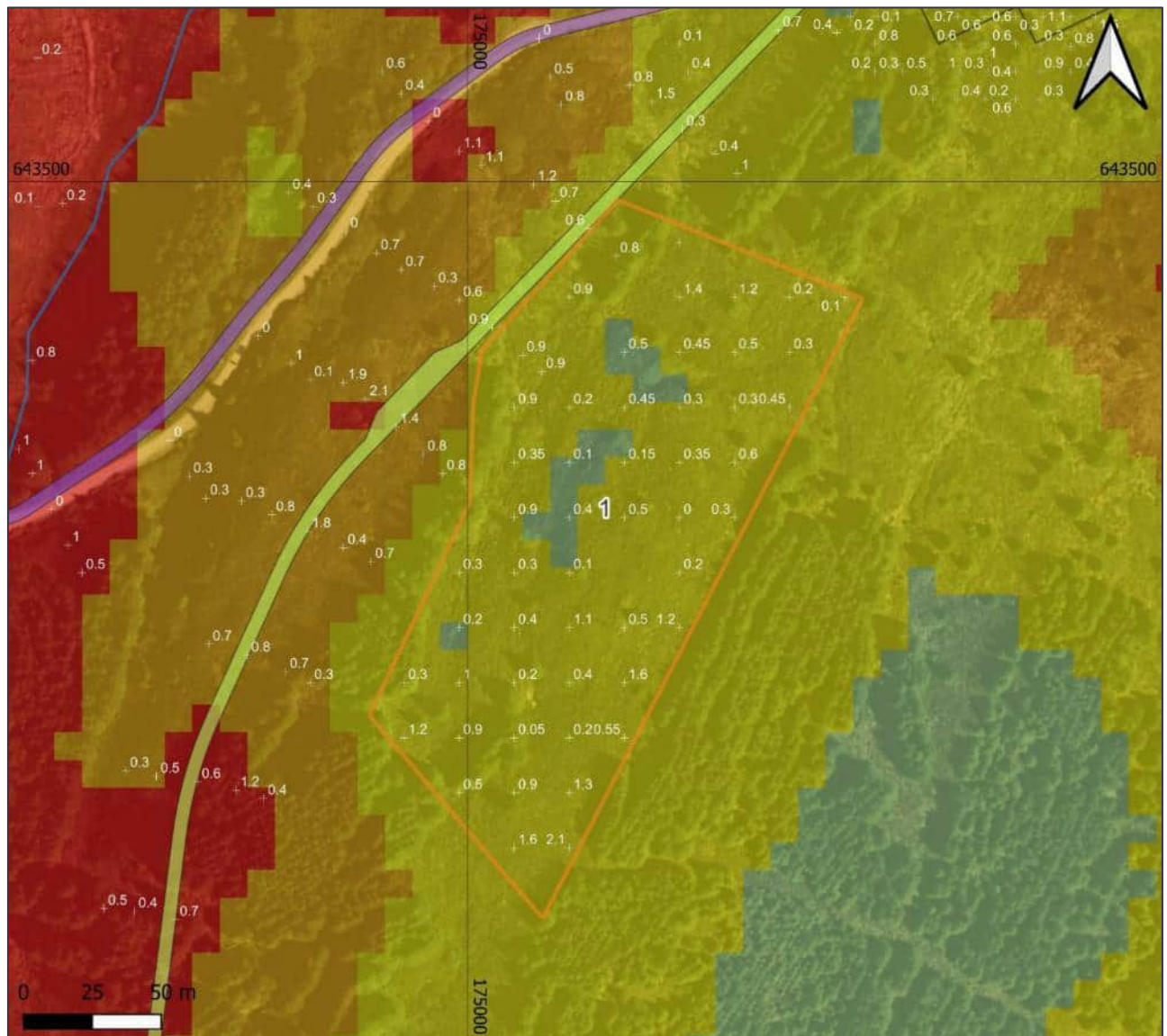
Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)		Risk Ranking
Batching Plant	1	1	Peat Depth (Mean = 0.56 m)	3	3+2 = 5 Low
			Slope Angle (3°)	1	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	1	
			Land Management	2	



Batching Plant – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: The peat depth is conducive for peat sliding and there are areas of peat up to 1.7 m depth so care should be taken when stockpiling during the construction process around this infrastructure location. Low terrain slope angle reduces overall peat slide risk at this location.

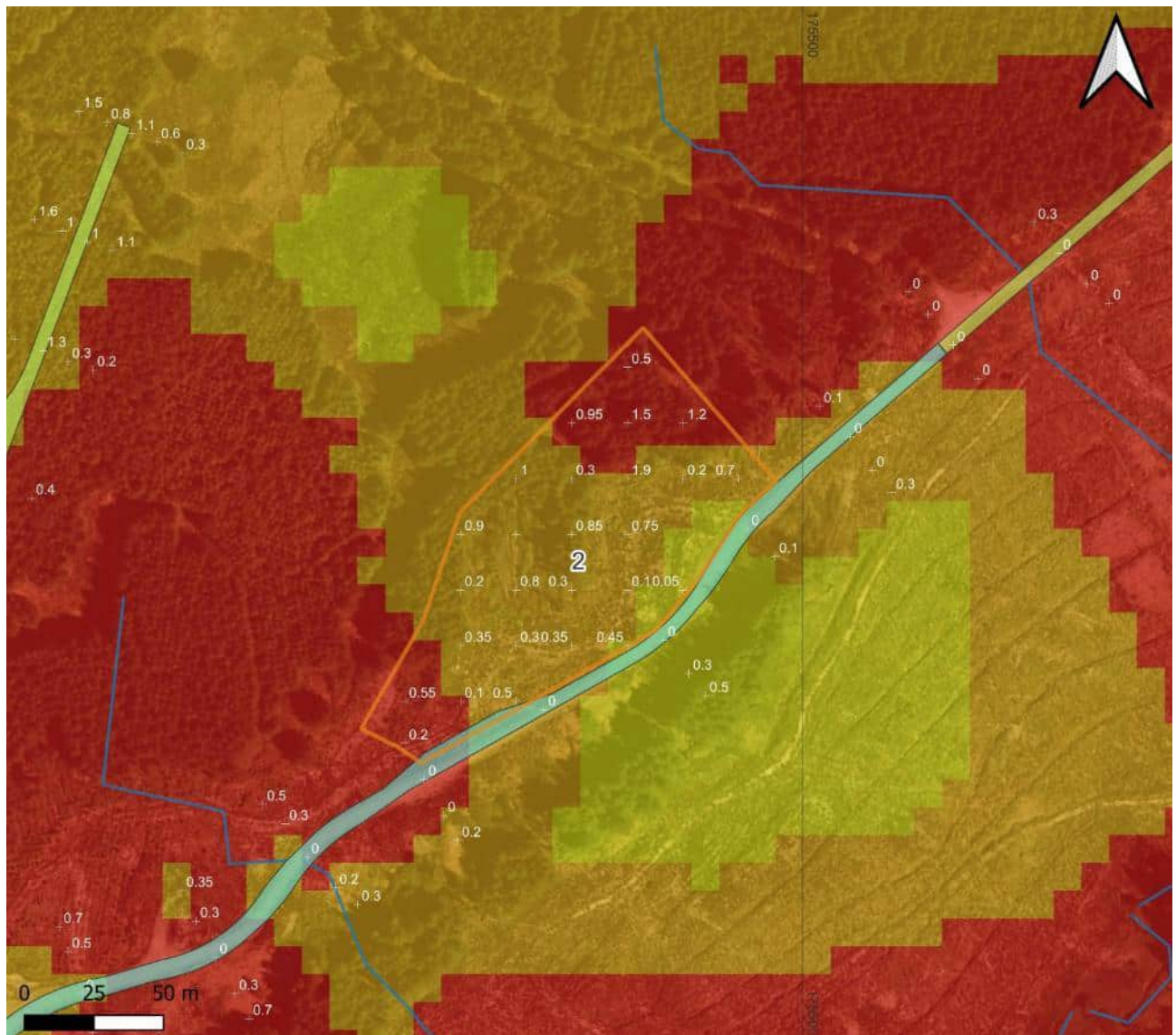
Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)		Risk Ranking
Borrow Pit Search Area 1	1	1	Peat Depth (Mean = 0.60 m)	3	3+5+2 = 10 (Low)
			Slope Angle (15°)	5	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	1	
			Land Management	2	



Borrow Pit 1 – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: Care should be taken when stockpiling during the construction process around this proposed borrow pit search area due to the steeper gradients and with some isolated deeper peat pockets to manage during excavation works. Protection of the downslope access route may need to be considered during creation of temporary spoil storage bunds.

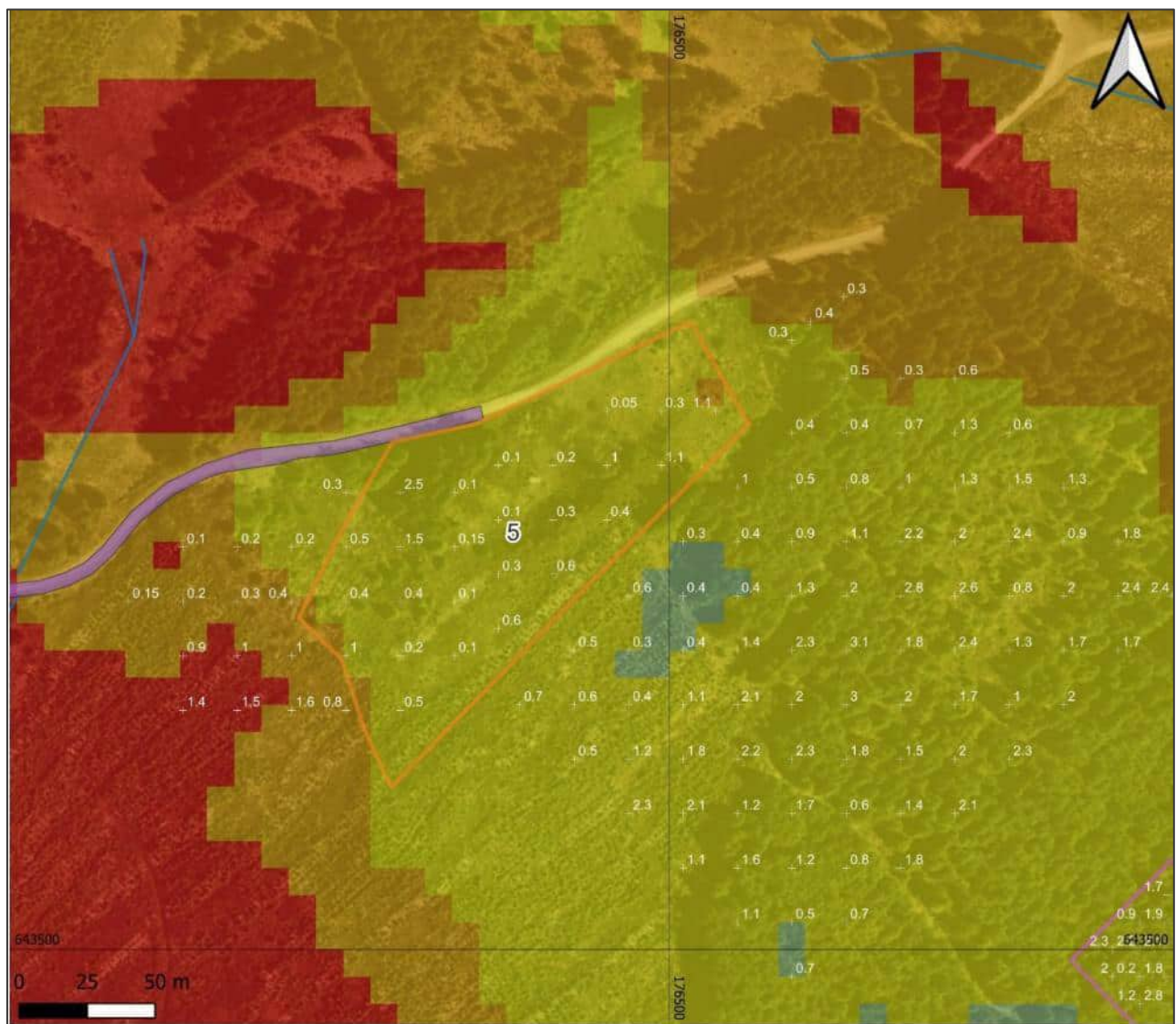
Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)		Risk Ranking
Borrow Pit Search Area 2	1	1* (Modified due to controlling slope direction is not towards watercourses)	Peat Depth (Mean = 0.60 m)	3	3+5+2 *(1) = 10 (Low)
			Slope Angle (13°)	5	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	1	
			Land Management	2	



Borrow Pit 2 – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: An overall ranking of 'Low' is calculated due to the proposed borrow pit search area being within the 150 m watercourse buffer to the northeast and southwest. Nevertheless, special mitigation measures to avoid contamination such as limiting stockpiles and cut-off drainage ditching are required in this instance.

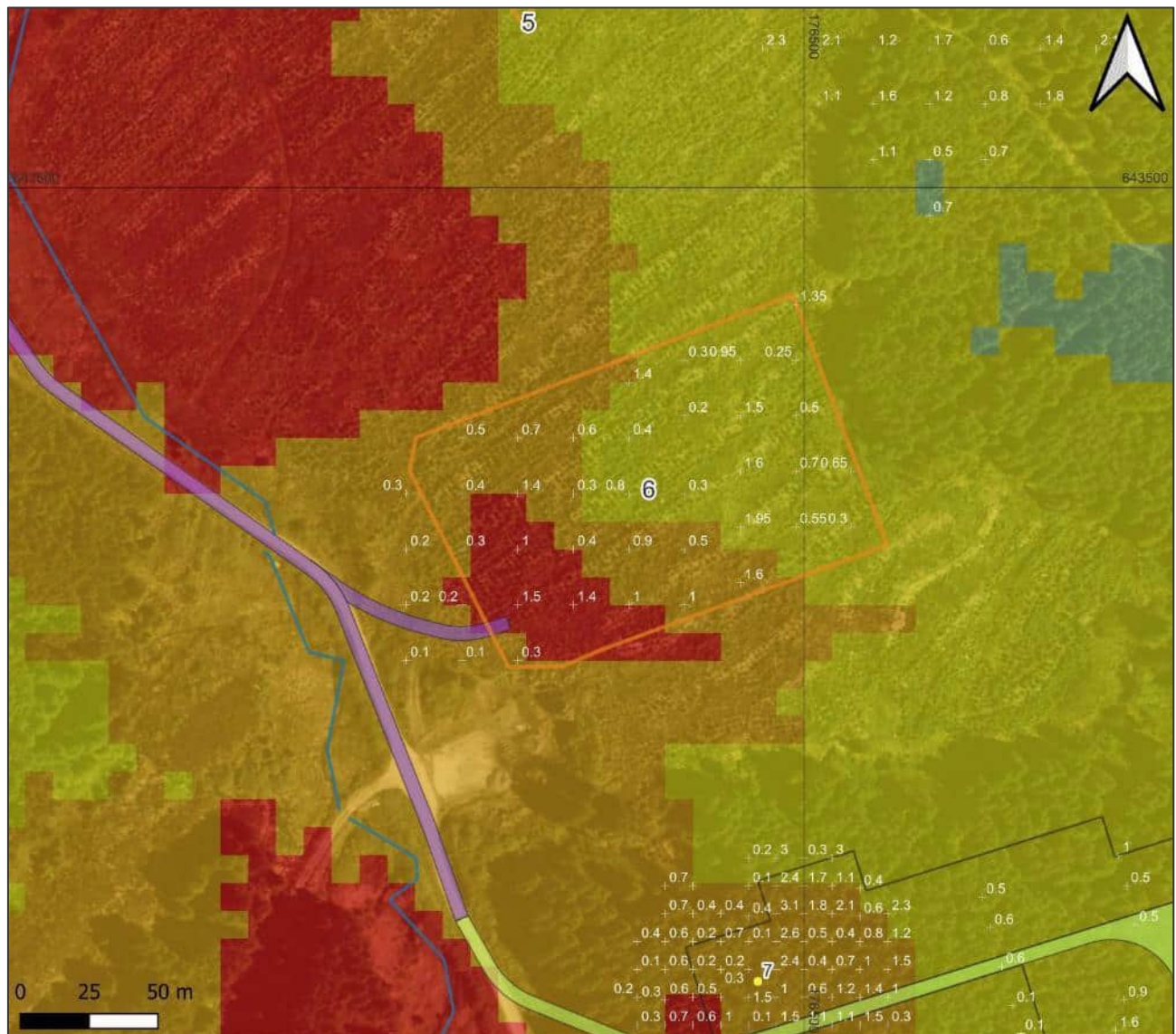
Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)	Risk Ranking
Borrow Pit Search Area 5	1	1 - 2	Peat Depth (Mean = 0.54 m)	3
			Slope Angle (6°)	3
			FoS	1
			Peat cracking / infiltration	1
			Groundwater Flow	1
			Hydrology	1
			Previous Instability	1
			Land Management	2
3+3+2 *(2) = 8 - 16 Low - Medium				



Borrow Pit 5 – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: Parts of the proposed borrow pit search area in the northeast and west are within the 150 m watercourse buffer/environmental risk ranking of '2'. Further overall risk reduction to 'Low' could be achieved through best practice with careful stockpiling in areas of steep gradients and avoiding stockpiling in areas of deep peat and special mitigation measures to avoid contamination such as limiting stockpiles, drainage ditching and silt fencing should be implemented.

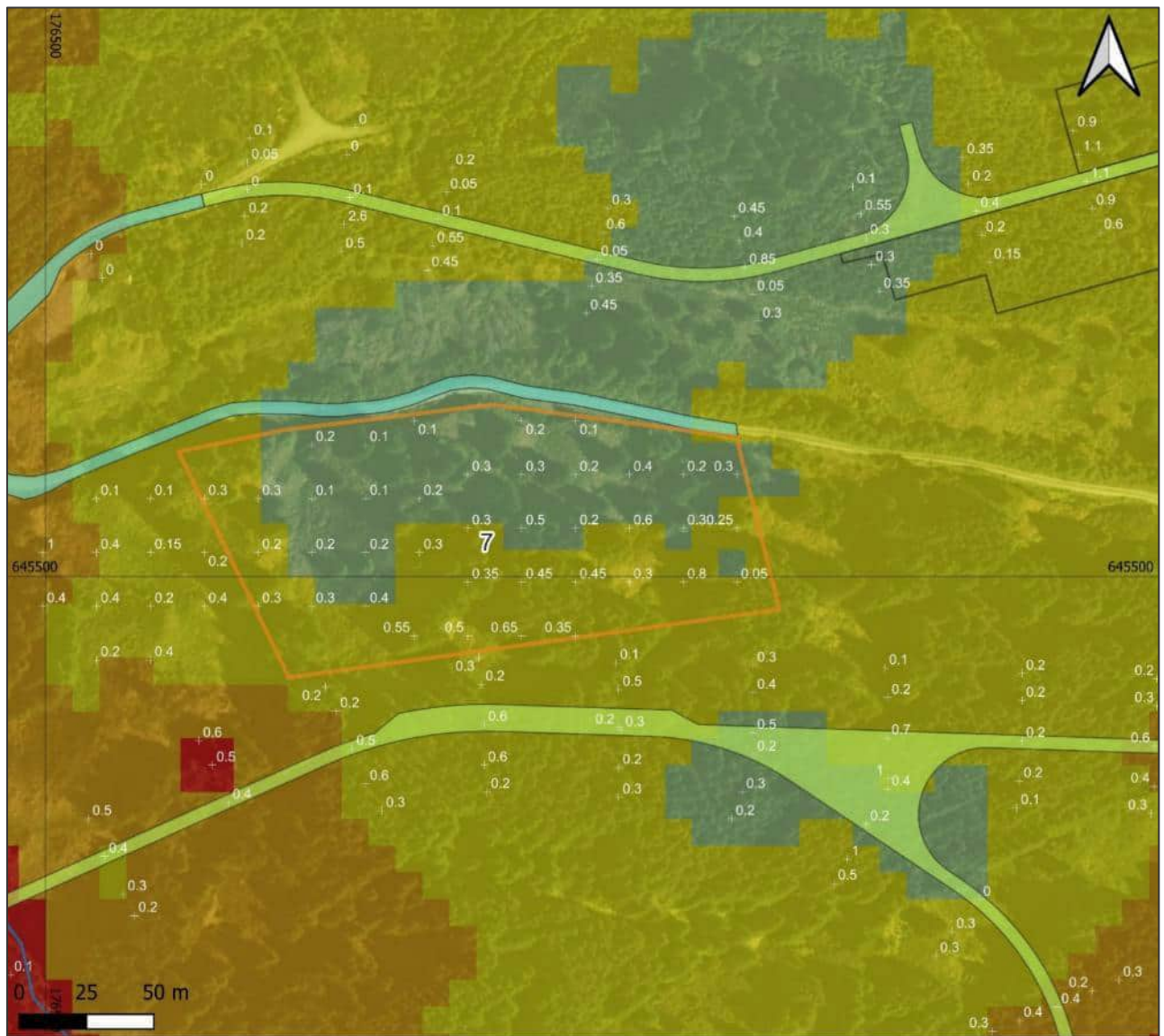
Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)	Risk Ranking	
Borrow Pit Search Area 6	1	1	Peat Depth (Mean = 0.80 m)	3	3+3+2 = 8 (Low)
			Slope Angle (9°)	3	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	1	
			Land Management	2	



Borrow Pit 6 – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: Parts of the proposed borrow pit search area in the west are within the 100 – 150 m watercourse buffer. However, due to existing mitigation measures (such as drainage ditches) built as part of the original Deucheran Hill wind farm track construction, an environmental ranking of '2' is not considered in the calculation. Overall risk reduction to 'Low' could be achieved through best practice with careful stockpiling in areas of steep gradients and avoiding stockpiling in these areas and special mitigation measures to avoid contamination such as limiting stockpiles, drainage ditching and silt fencing should be implemented.

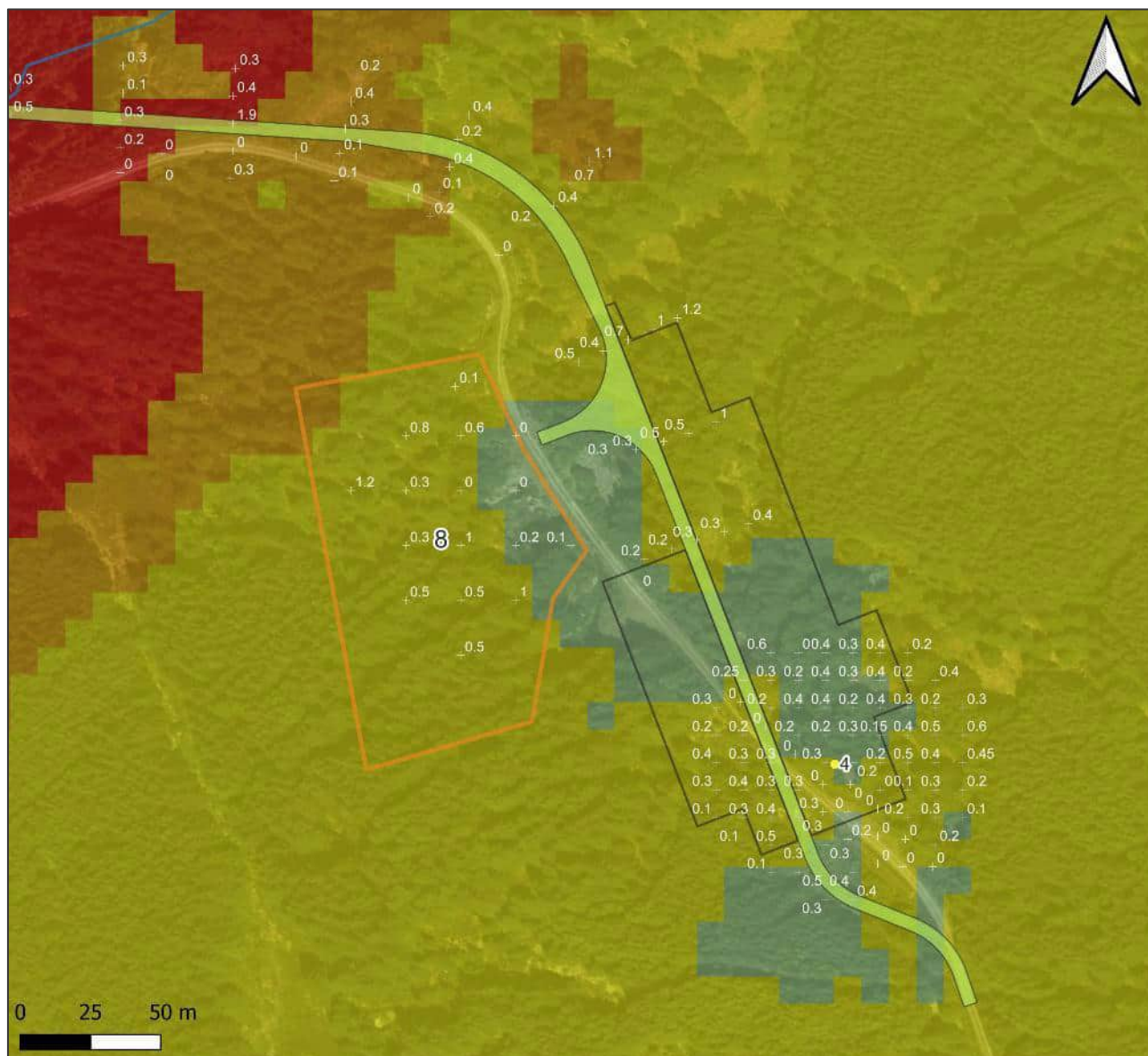
Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)	Risk Ranking
Borrow Pit Search Area 7	1	2	Peat Depth (Mean = 0.30 m)	1
			Slope Angle (23°)	2
			FoS	1
			Peat cracking / infiltration	1
			Groundwater Flow	1
			Hydrology	1
			Previous Instability	1
			Land Management	2
				Negligible (no peat)



Borrow Pit 7 – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: Care should be taken when stockpiling during the construction process around this proposed borrow pit search area due to the very steep gradients. Special mitigation measures to avoid contamination such as limiting stockpiles, drainage ditching and silt fencing should also be implemented due to the presence of the watercourse to the west.

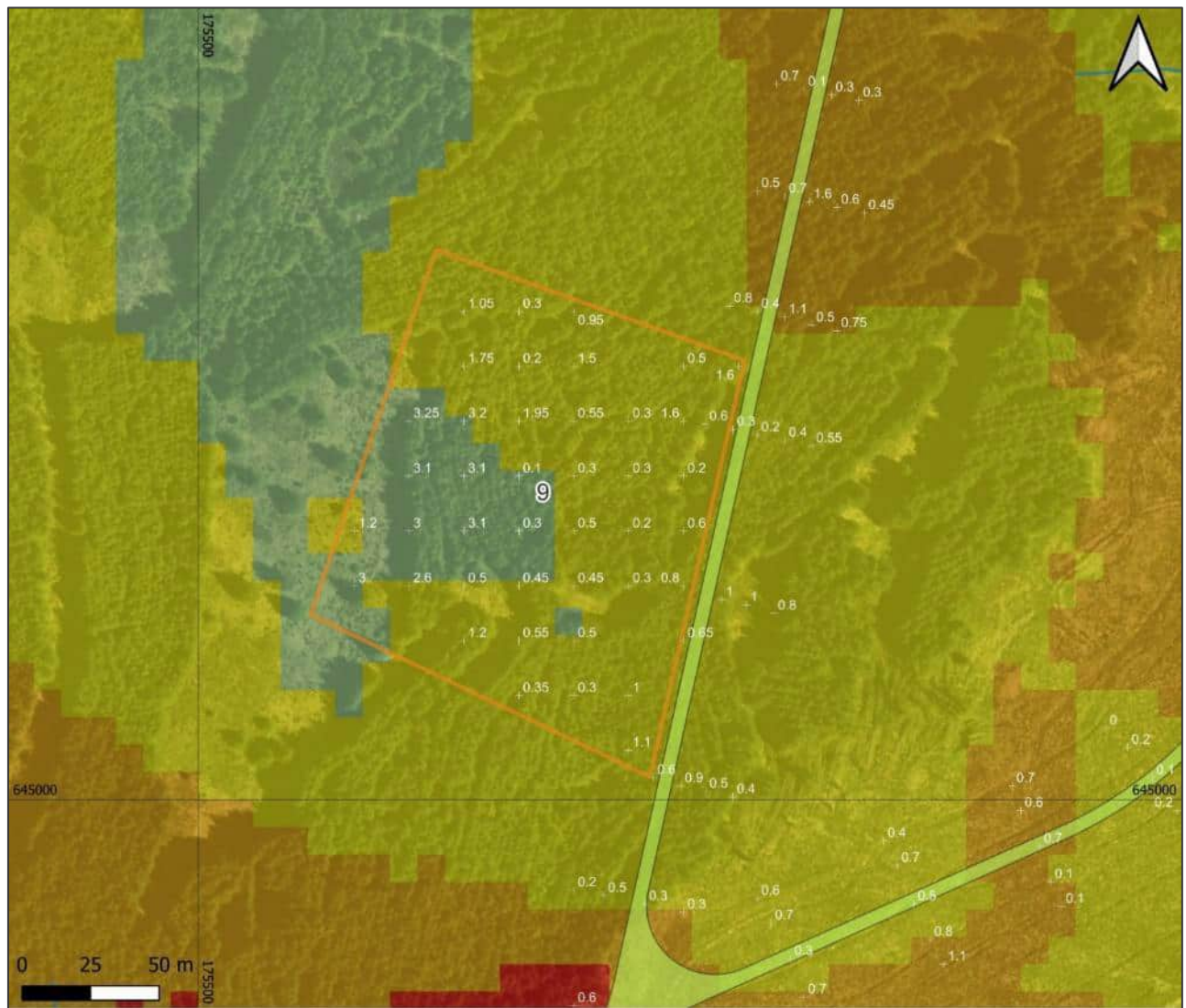
Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)	Risk Ranking	
Borrow Pit Search Area 8	1	1	Peat Depth (Mean = 0.44 m)	1	5+2 = 7 Low
			Slope Angle (13°)	5	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	1	
			Land Management	2	



Borrow Pit 8 – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: A small portion in the northwest of the proposed borrow pit search area is within the 150 m watercourse buffer. Special mitigation measures to avoid contamination such as limiting stockpiles, drainage ditching and silt fencing should be implemented due to the presence of the watercourse to the northwest. Care should also be taken when stockpiling during the construction process around this proposed borrow pit search area due to the steeper gradients.

Location	Development Infrastructure	Environmental	Contributory Factors (Probability/Exposure)	Risk Ranking	
Borrow Pit Search Area 9	1	1	Peat Depth (Mean = 1.13 m)	5	5+3+2 = 10 (Low)
			Slope Angle (5.5°)	3	
			FoS	1	
			Peat cracking / infiltration	1	
			Groundwater Flow	1	
			Hydrology	1	
			Previous Instability	1	
			Land Management	2	



Borrow Pit 9 – Bing Virtual Earth – 1:1,100 Scale

Location Specific Mitigation: Care should be taken when stockpiling during the construction process around this proposed borrow pit search area due to the steeper gradients and stockpiling should be avoided around areas of deeper peat to the western side up to 3.25 m. Borrow pit design refined after detailed ground investigation to target areas of shallowest bedrock level.

6.1. Turbine Bases and Ancillary Infrastructure

Table A10.4.13 below summarises the risk assessment outcome for each turbine and infrastructure location. The principal contributory factors and impact scales used to derive these assignments are highlighted.

Table A10.4.13: Risk Ranking for Proposed Turbine and Ancillary Infrastructure Locations

Turbine / Infrastructure ID	Risk Ranking Baseline	Principal Contributory Factors in Risk Assessment	Risk Ranking and Targeted Mitigation and Best Practice Construction
T1	Low	Peat depth, slope angle, proximity to watercourse	Low
T2	Low	Peat depth and slope angle	Low
T3	Low	Peat depth and slope angle	Low
T4	Negligible	Slope angle	Negligible
T5	High	Peat depth, slope angle, proximity to watercourse	Low
T6	Low	Slope angle and proximity to watercourse	Low
T7	Medium	Peat depth, slope angle, proximity to watercourse	Low
T8	Medium	Peat depth, slope angle, proximity to watercourse	Low
T9	Low	Peat depth and slope angle	Low
T10	Low	Peat depth and slope angle	Low
T11	Low	Peat depth and slope angle	Low
T12	Low	Proximity to watercourse	Low
T13	Low	Peat depth and slope angle	Low
T14	High	Peat, slope angle, watercourse	Low
Construction Compound	Low	Peat depth and slope angle	Low
Substation	Low	Peat depth	Negligible
Batching Plant	Low	Peat depth	Negligible
Borrow Pit Search Area 1	Low	Peat, slope angle, watercourse	Low
Borrow Pit Search Area 2	Low	Peat, slope angle, watercourse	Low
Borrow Pit Search Area 5	Low - Medium	Peat, watercourse, slope angle	Low
Borrow Pit Search Area 6	Low	Peat depth and slope angle	Low
Borrow Pit Search Area 7	Negligible (no peat)	Proximity to watercourse	Negligible (no peat)
Borrow Pit Search Area 8	Low	Slope angle	Negligible
Borrow Pit Search Area 9	Low	Peat depth and slope angle	Low

Source: Natural Power, 2026

The risk assessment reflects the probability of peat material entering the nearest main surface water course and being entrained to an offsite receptor without any mitigation. Based on the wider geomorphological assessment and evidence from recorded high variability of peat depths would indicate that a large-scale translational mass movement of peat deposits is very unlikely at proposed wind turbine location.

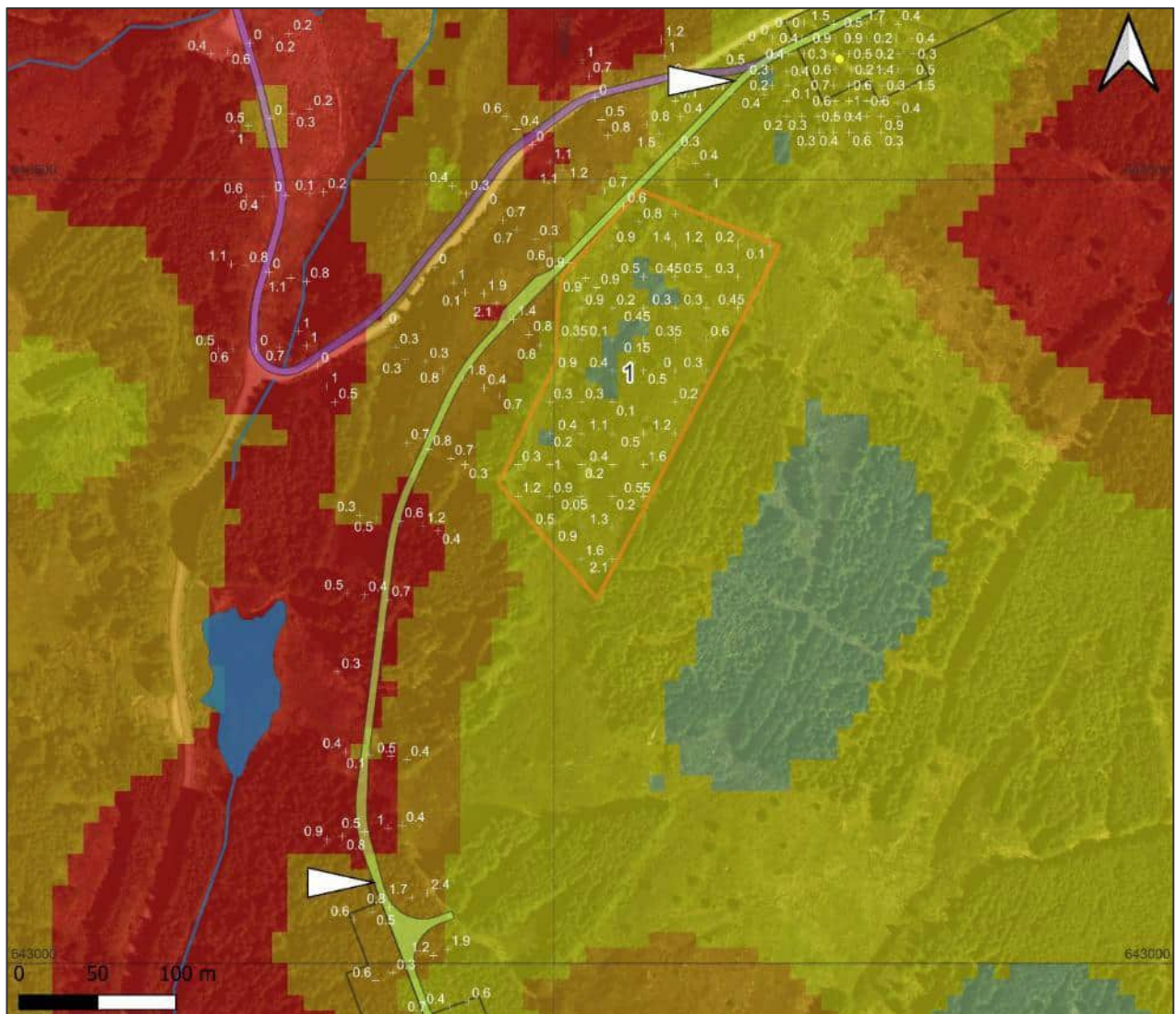
6.2. Access Tracks

In addition to the turbine locations, discrete sections of track have also been reviewed across the Proposed Wind Farm Development Area. The highest risk areas would be where track alignments cross the main watercourses and are coincident with steep slopes and increased peat depths. **Table A10.4.14** below highlights discrete track sections which indicate elevated risk of peat instability and therefore will require targeted mitigation to ensure peat slides can be prevented and risk reduced to the low category. The table uses the track sections previously outlined in **Section 3.2**. Track Sections 3, 4, 5 and 11 do not have elevated peat slide risk and therefore are not assessed further in this section.

Table A10.4.14: Access track risk summary

Track Element

Track Section 1: T13 to T14

**Contributors to elevated peat slide risk:**

- Proximity to watercourses to west
- Slope angles (7 – 22 degrees°)

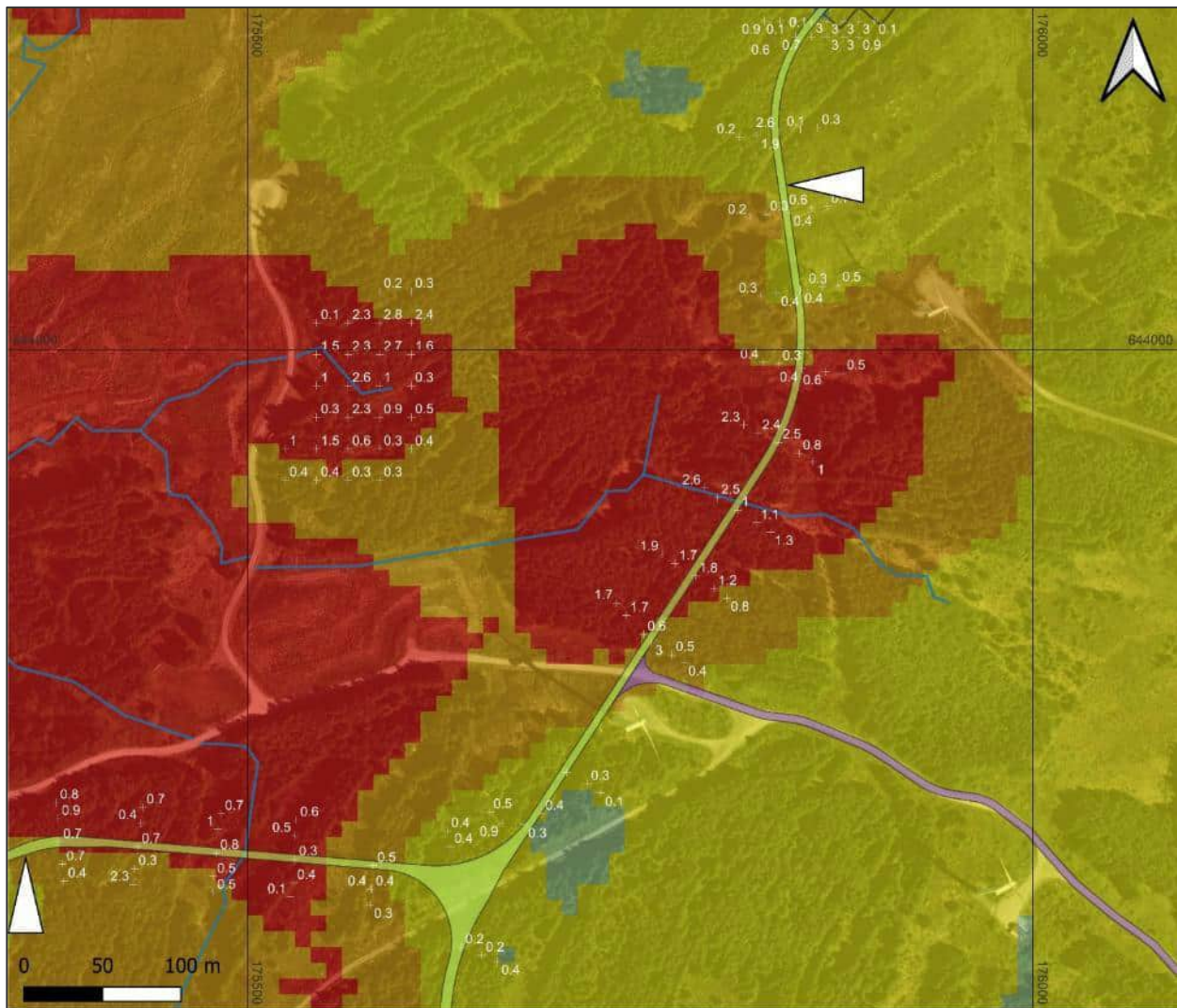
Specific Mitigation:

The following mitigation is therefore required along this track section in order to reduce the risk to low:

- Cross track drainage which prevents any ponding or build-up of groundwater pressure within the peat upslope or beneath the access infrastructure. Where possible existing drainage systems should be utilised and maintained.
- A system of ongoing monitoring throughout the construction phase should be in effect to monitor any movement in the peat. A rapid reaction strategy should be developed to ensure measures can be deployed to protect the watercourse in the event of any movement. This may include installation of downslope retaining systems to prevent peat material entering the watercourse.

Track Element

Track Section 2: T13 to T10



Contributors to elevated peat slide risk:

- Proximity to watercourse and water crossings
- Slope angle – 3 to 18°
- Peat depth - up to 2.5 m

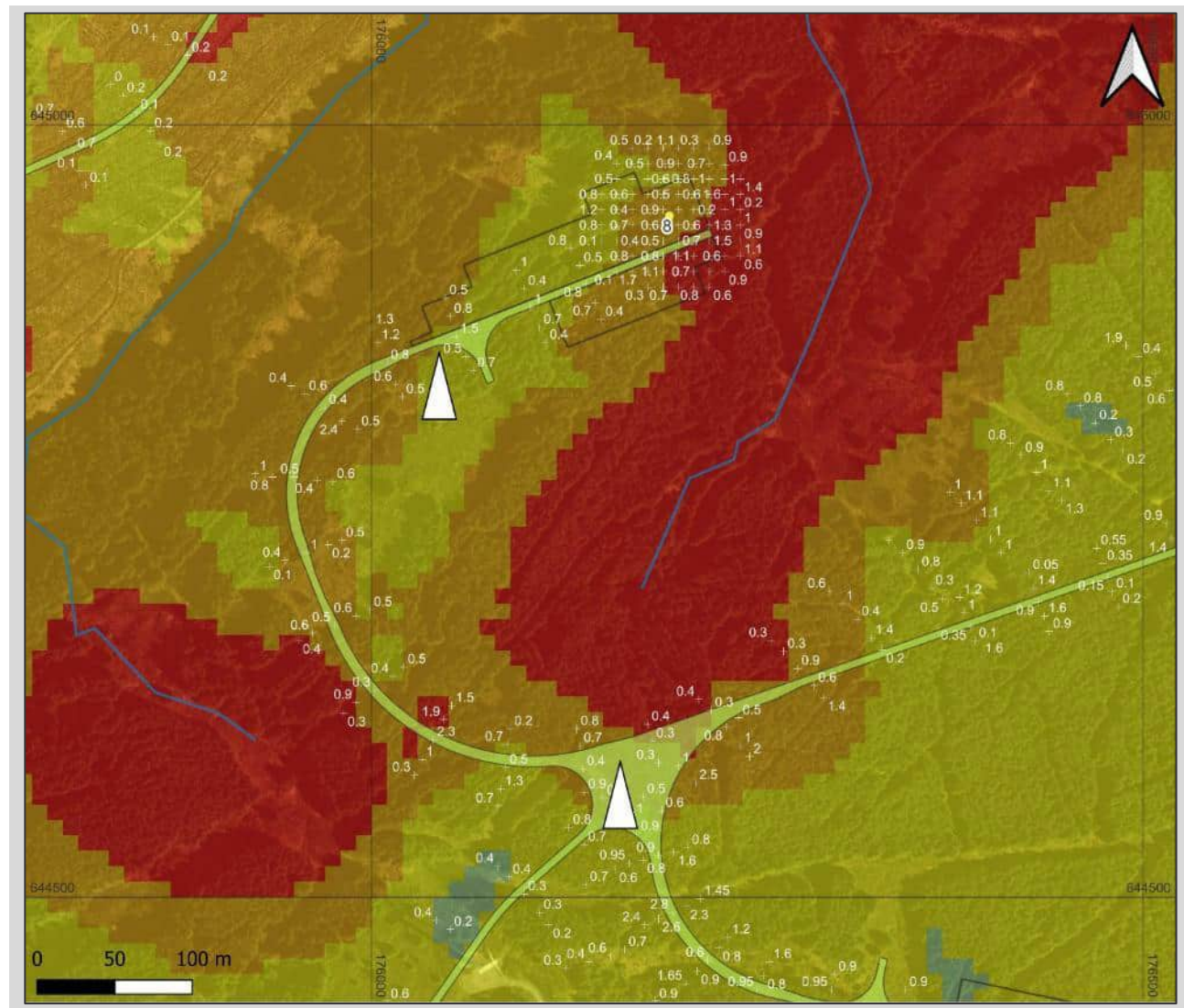
Specific Mitigation:

The following mitigation is therefore required along this track section to reduce the risk to low:

- Cross track drainage which prevents any ponding or build-up of groundwater pressure within the peat upslope or beneath the access infrastructure. Where possible existing drainage systems should be utilised and maintained.
- No stockpiling or surcharging of the peat along areas of medium to high risk on this section
- Where detail design proves floating access, track is safe to use, this should be the preferred method of track construction to reduce the impact on peatland by avoiding excavation.
- A system of ongoing monitoring throughout the construction phase should be in effect to monitor any movement in the peat. A rapid reaction strategy should be developed to ensure measures can be deployed to protect the watercourse in the event of any movement. This may include installation of downslope retaining systems to prevent peat material entering the watercourse.

Track Element

Track Section 6: Junction to T8



Contributors to elevated peat slide risk:

- Proximity to watercourse to west
- Slope angle – 2 to 17°
- Peat depth - up to 2.3 m.

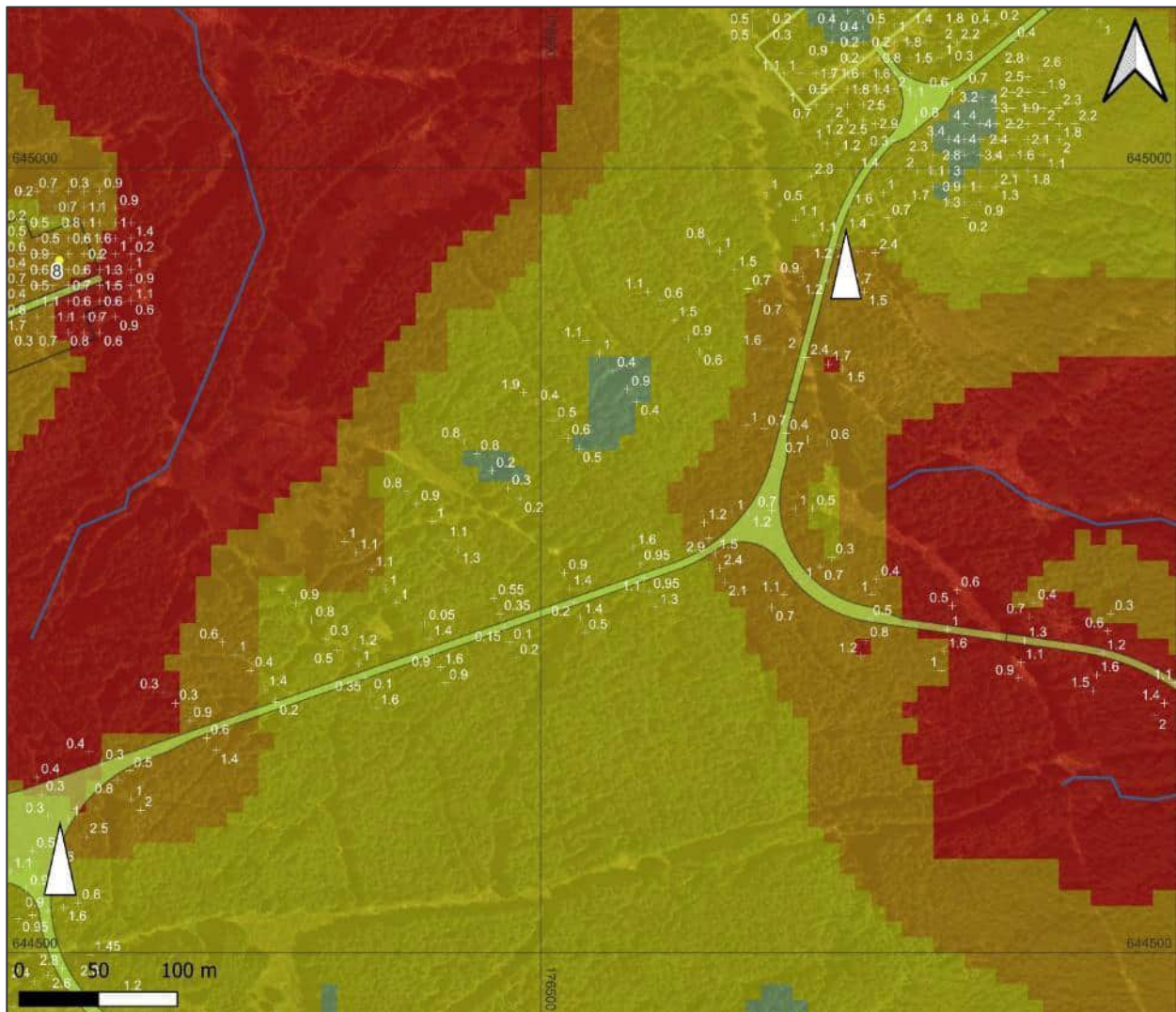
Specific Mitigation:

The following mitigation is therefore required along this track section in order to reduce the risk to low:

- Cross track drainage which prevents any ponding or build-up of groundwater pressure within the peat upslope or beneath the access infrastructure. Where possible existing drainage systems should be utilised and maintained.
- No stockpiling or surcharging of the peat along areas of medium to high risk on this section
- Where detail design proves floating access, track is safe to use, this should be the preferred method of track construction to reduce the impact on peatland by avoiding excavation.
- A system of ongoing monitoring throughout the construction phase should be in effect to monitor any movement in the peat. A rapid reaction strategy should be developed to ensure measures can be deployed to protect the watercourse in the event of any movement. This may include installation of downslope retaining systems to prevent peat material entering the watercourse.

Track Element

Track Section 7: Junctions to T8/T9 to Batching Plant



Contributors to elevated peat slide risk:

- Proximity to watercourse to northwest
- Slope angle – 2 to 15°
- Peat depth – 0.2 – 1.4 m

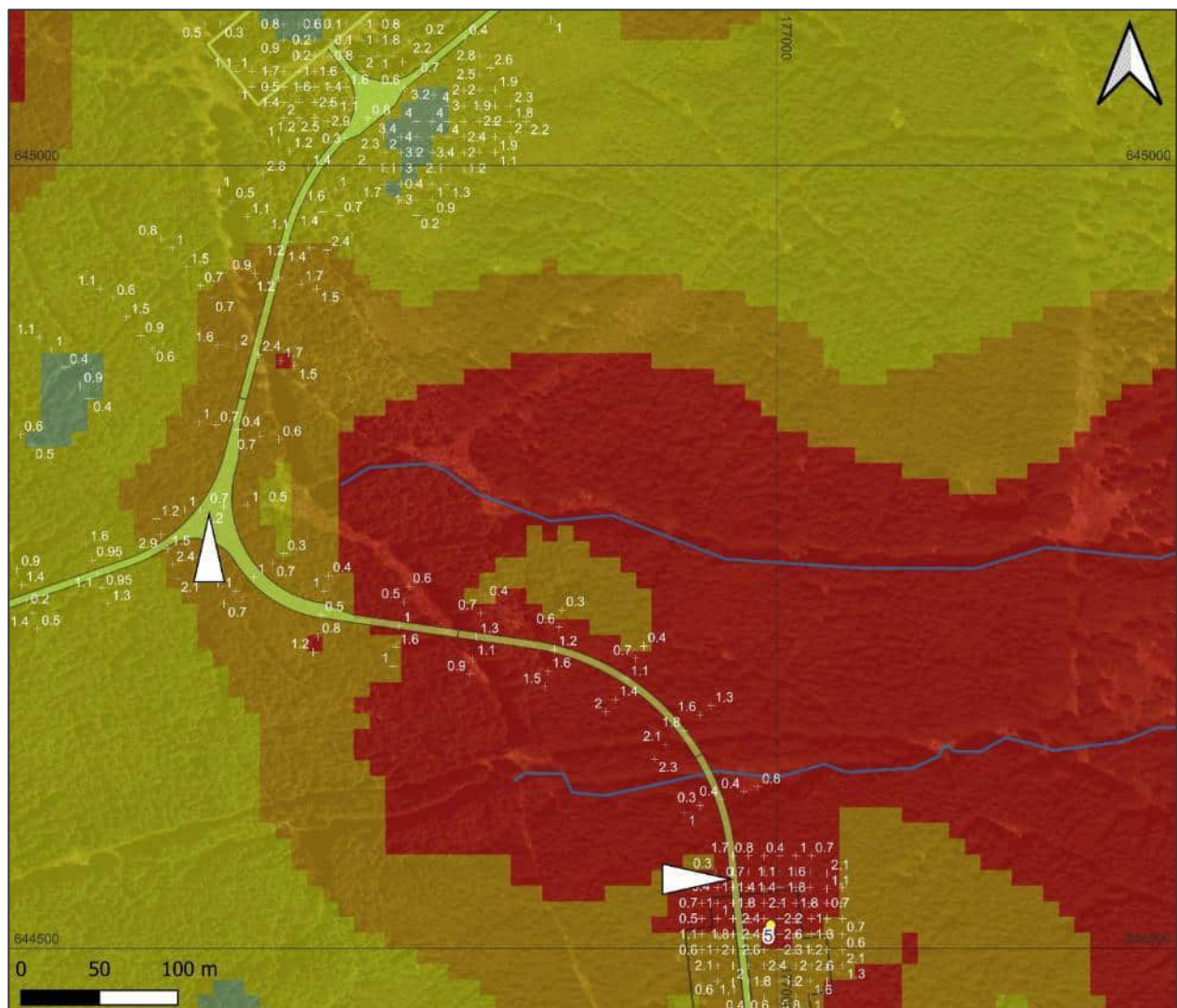
Specific Mitigation:

The following mitigation is therefore required along the track section showing medium risk in order to reduce this to low:

- Cross track drainage which prevents any ponding or build-up of groundwater pressure within the peat upslope or beneath the access infrastructure. Where possible existing drainage systems should be utilised and maintained.
- No stockpiling or surcharging of the peat along areas of medium risk on this section
- Where detail design proves floating access, track is safe to use, this should be the preferred method of track construction to reduce the impact on peatland by avoiding excavation.
- A system of ongoing monitoring throughout the construction phase should be in effect to monitor any movement in the peat. A rapid reaction strategy should be development to ensure measures can be deployed to protect the watercourse in the event of any movement. This may include installation of downslope retaining systems to prevent peat material entering the watercourse.

Track Element

Track Section 8: Junction to T5



Contributors to elevated peat slide risk:

- Proximity to watercourses to east and water crossing
- Slope angle – 3 to 20°
- Peat depth – 0.5 – 2.4 m.

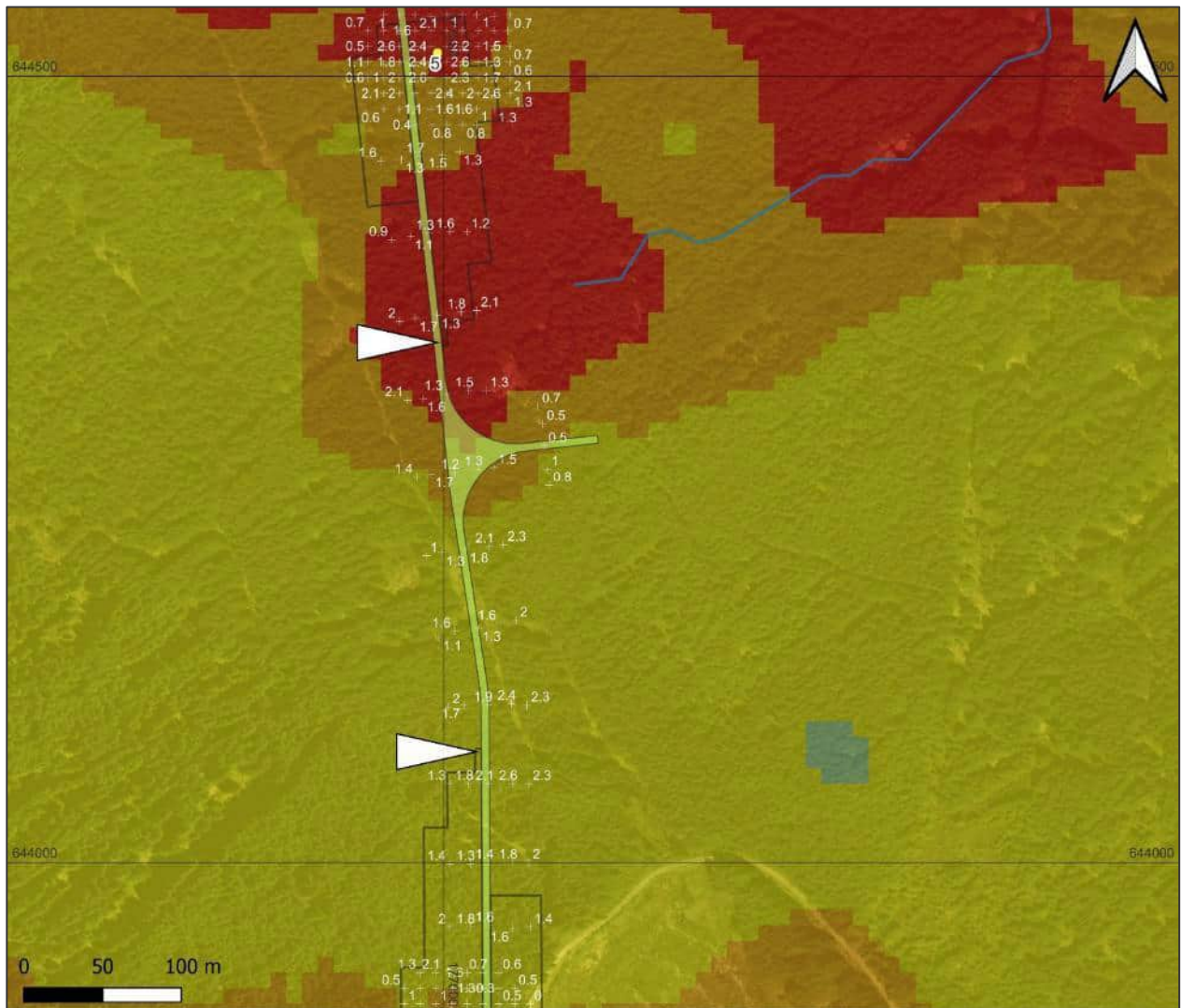
Specific Mitigation:

The following mitigation is therefore required along the track section showing medium and high risk in order to reduce these to low:

- Cross track drainage which prevents any ponding or build-up of groundwater pressure within the peat upslope or beneath the access infrastructure. Where possible existing drainage systems should be utilised and maintained.
- No stockpiling or surcharging of the peat along areas of medium to high risk on this section
- Where detail design proves floating access, track is safe to use, this should be the preferred method of track construction to reduce the impact on peatland by avoiding excavation.
- A system of ongoing monitoring throughout the construction phase should be in effect to monitor any movement in the peat. A rapid reaction strategy should be developed to ensure measures can be deployed to protect the watercourse in the event of any movement. This may include installation of downslope retaining systems to prevent peat material entering the watercourse.

Track Element

Track Section 9: T5 to T6



Contributors to elevated peat slide risk:

- Proximity to watercourse northeast
- Slope angle – 5 to 10°
- Peat depth – 0.5 – 1.7 m.

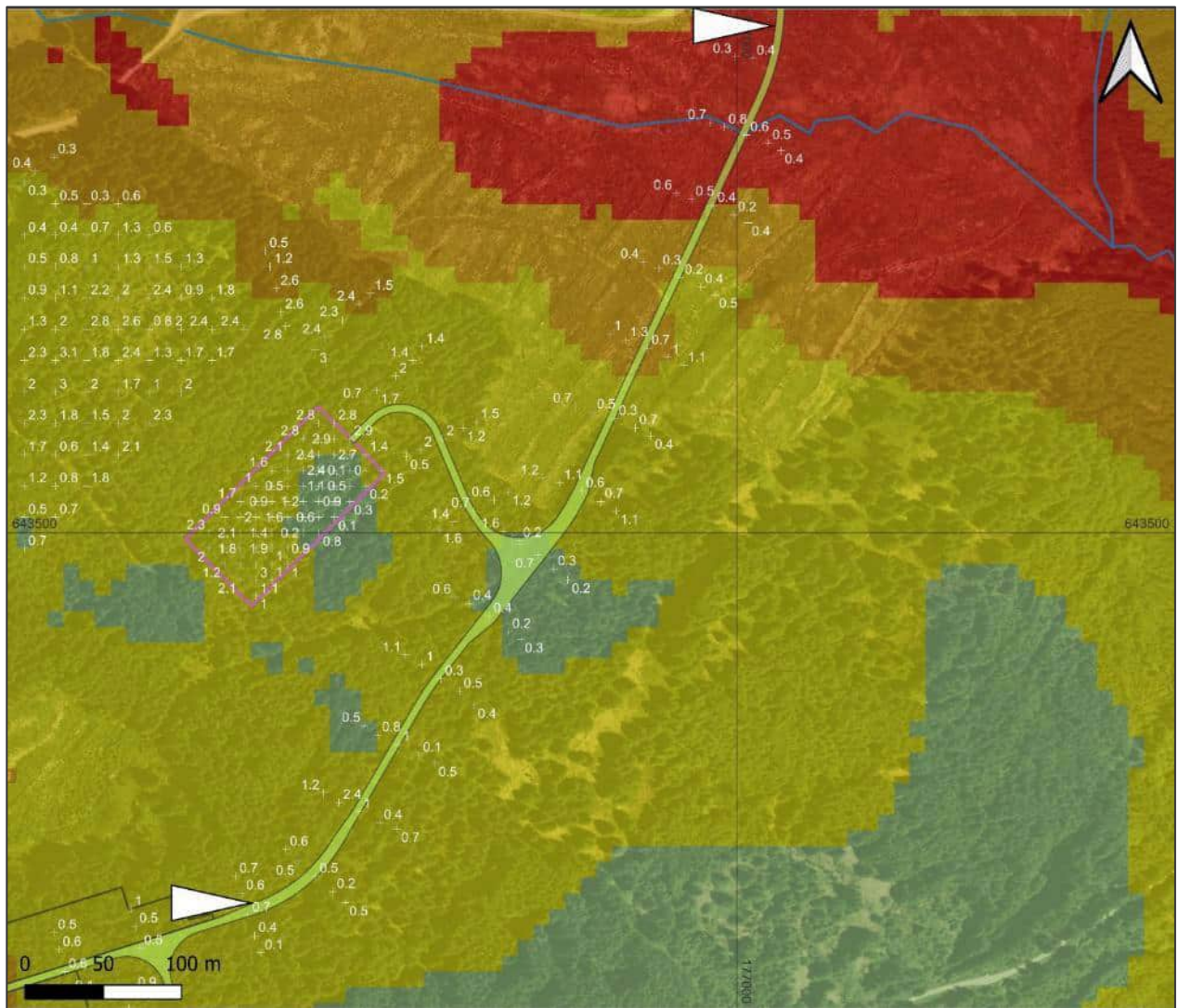
Specific Mitigation:

The following mitigation is therefore required along the track section showing medium and high risk in order to reduce these to low:

- Cross track drainage which prevents any ponding or build-up of groundwater pressure within the peat upslope or beneath the access infrastructure. Where possible existing drainage systems should be utilised and maintained.
- No stockpiling or surcharging of the peat along areas of medium to high risk on this section
- Where detail design proves floating access, track is safe to use, this should be the preferred method of track construction to reduce the impact on peatland by avoiding excavation.
- A system of ongoing monitoring throughout the construction phase should be in effect to monitor any movement in the peat. A rapid reaction strategy should be developed to ensure measures can be deployed to protect the watercourse in the event of any movement. This may include installation of downslope retaining systems to prevent peat material entering the watercourse.

Track Element

Track Section 10: T6 to T7



Contributors to elevated peat slide risk:

- Proximity to watercourse / water crossing in northern part of track section
- Slope angle – 12 to 16°

Peat depth – 0.4 – 0.80 m.

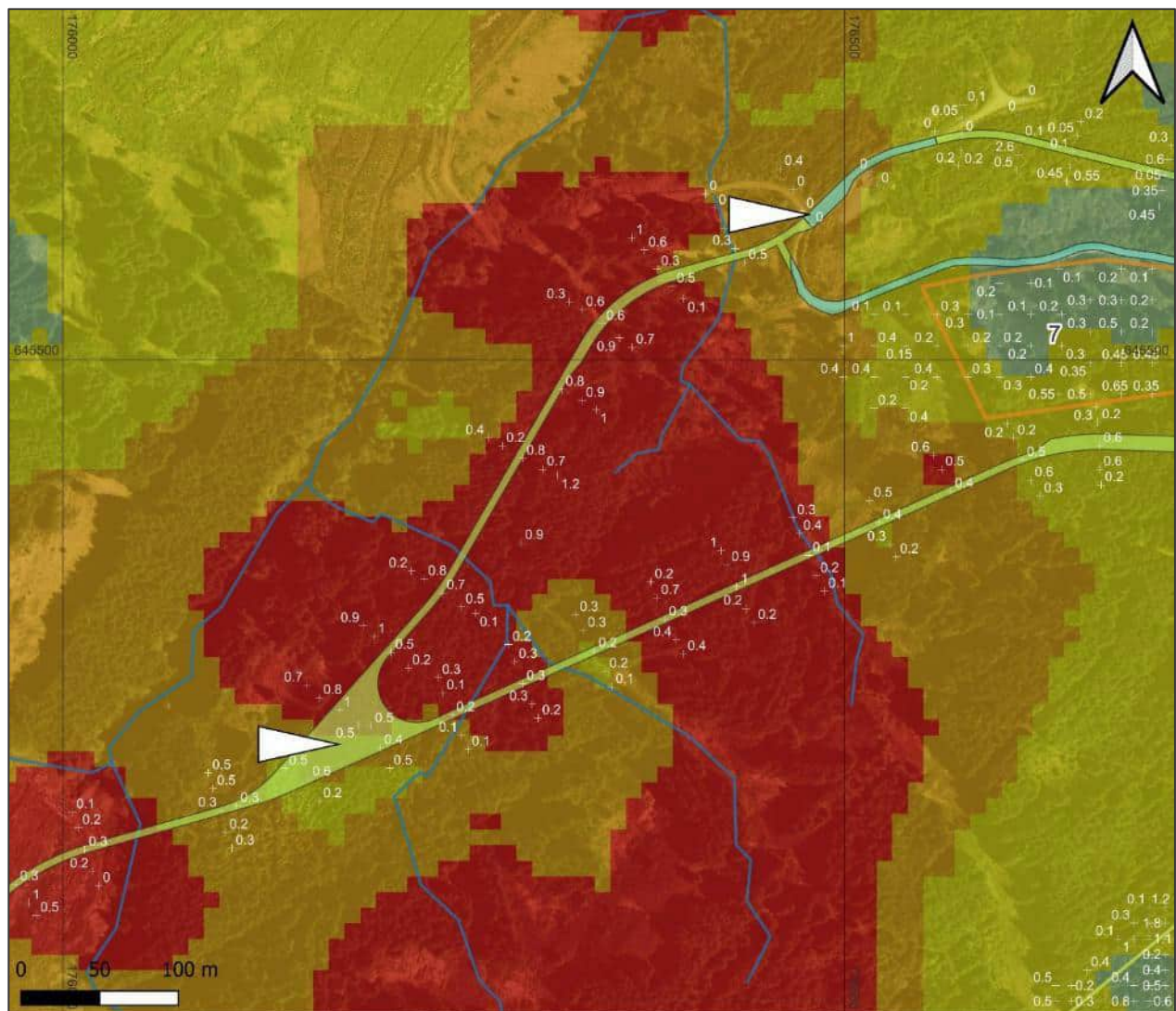
Specific Mitigation:

The following mitigation is therefore required along the track section showing medium and high risk in order to reduce these to low:

- Cross track drainage which prevents any ponding or build-up of groundwater pressure within the peat upslope or beneath the access infrastructure. Where possible existing drainage systems should be utilised and maintained.
- No stockpiling or surcharging of the peat along areas of medium to high risk on this section
- A system of ongoing monitoring throughout the construction phase should be in effect to monitor any movement in the peat. A rapid reaction strategy should be developed to ensure measures can be deployed to protect the watercourse in the event of any movement. This may include installation of downslope retaining systems to prevent peat material entering the watercourse.

Track Element

Track Section 12: Junction to T3 to existing track to northeast



Contributors to elevated peat slide risk:

- Proximity to surrounding watercourses and two water crossings
- Slope angle – 10 to 22°
- Peat depth – 0.1 – 1.0 m.

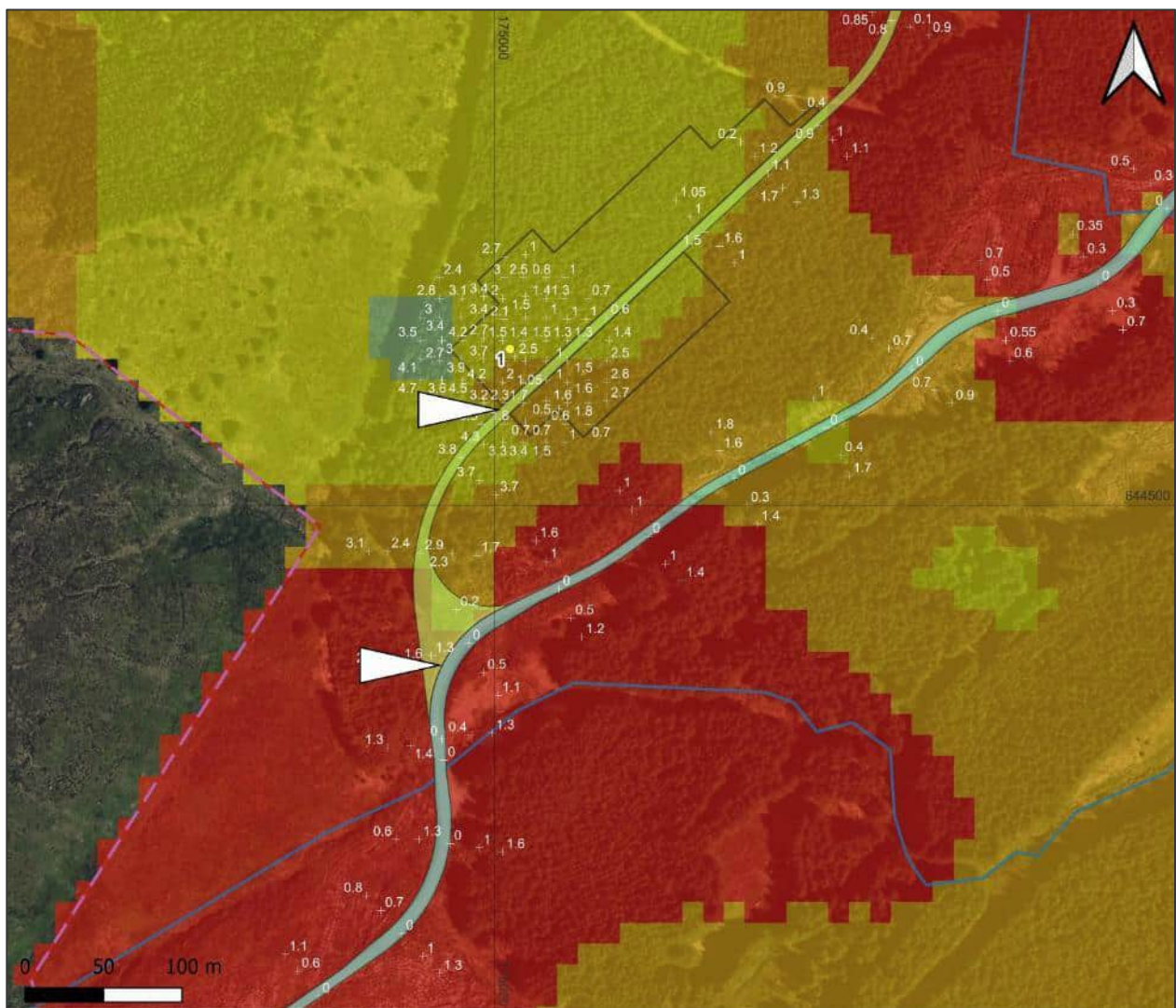
Specific Mitigation:

The following mitigation is therefore required along the track section showing medium and high risk in order to reduce these to low:

- Cross track drainage which prevents any ponding or build-up of groundwater pressure within the peat upslope or beneath the access infrastructure. Where possible existing drainage systems should be utilised and maintained.
- No stockpiling or surcharging of the peat along areas of medium to high risk on this section
- A system of ongoing monitoring throughout the construction phase should be in effect to monitor any movement in the peat. A rapid reaction strategy should be developed to ensure measures can be deployed to protect the watercourse in the event of any movement. This may include installation of downslope retaining systems to prevent peat material entering the watercourse.

Track Element

Track Section 13: Junction to T1



Contributors to elevated peat slide risk:

- Proximity to watercourse / water crossing in southern part of track
- Slope angle – 1 to 10°
- Peat depth – 1.3 – 4.3 m.

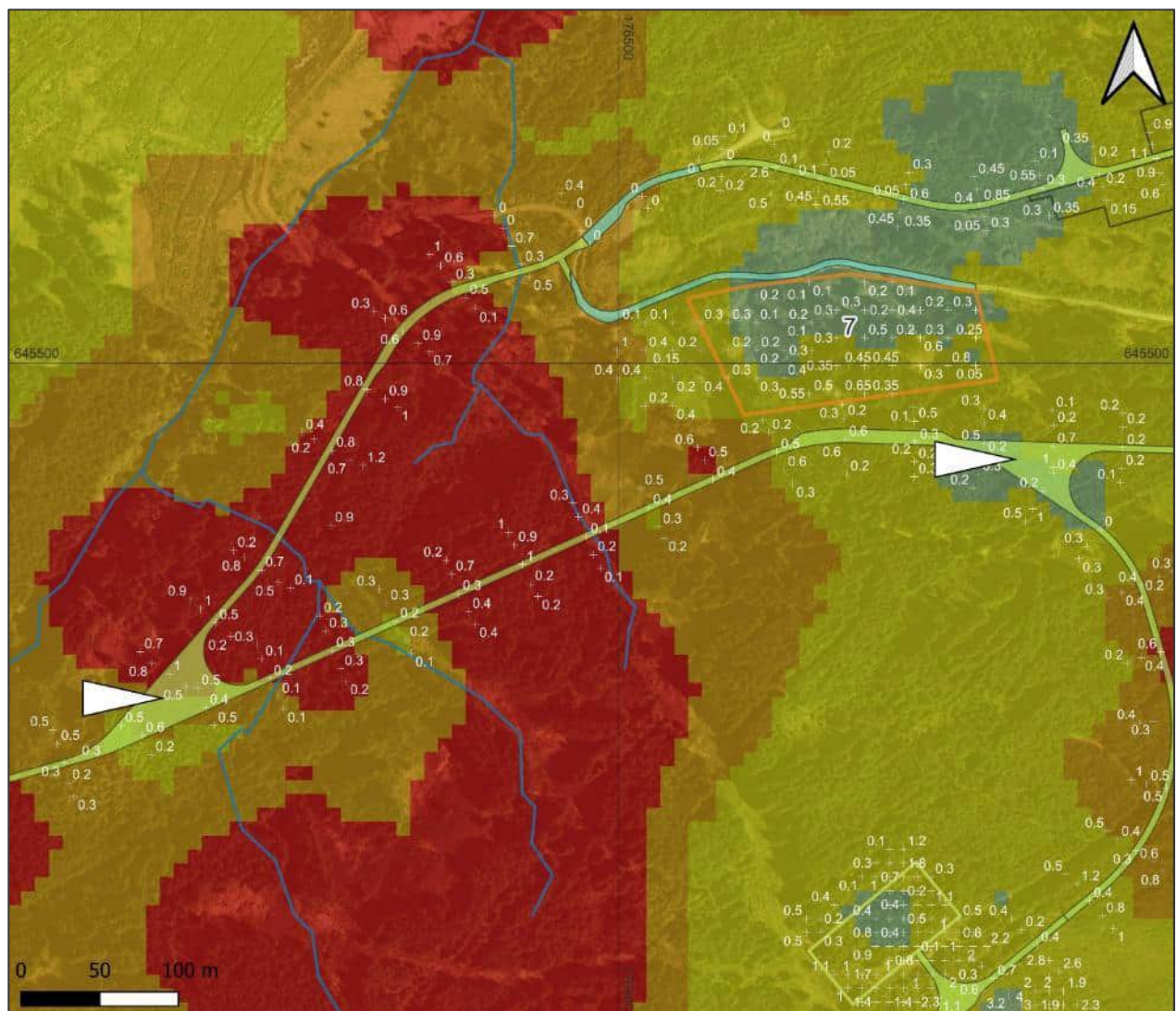
Specific Mitigation:

The following mitigation is therefore required along this track section in order to reduce the risk to low:

- Cross track drainage which prevents any ponding or build-up of groundwater pressure within the peat upslope or beneath the access infrastructure. Where possible existing drainage systems should be utilised and maintained.
- No stockpiling or surcharging of the peat along areas of medium to high risk on this section
- Where detail design proves floating access, track is safe to use, this should be the preferred method of track construction to reduce the impact on peatland by avoiding excavation.
- A system of ongoing monitoring throughout the construction phase should be in effect to monitor any movement in the peat. A rapid reaction strategy should be developed to ensure measures can be deployed to protect the watercourse in the event of any movement. This may include installation of downslope retaining systems to prevent peat material entering the watercourse.

Track Element

Track Section 14: Junction to T3 to junction to T4



Contributors to elevated peat slide risk:

- Proximity to surrounding watercourses and three water crossings
- Slope angle – 3 to 16°
- Peat depth – 0.1 – 1.0 m.

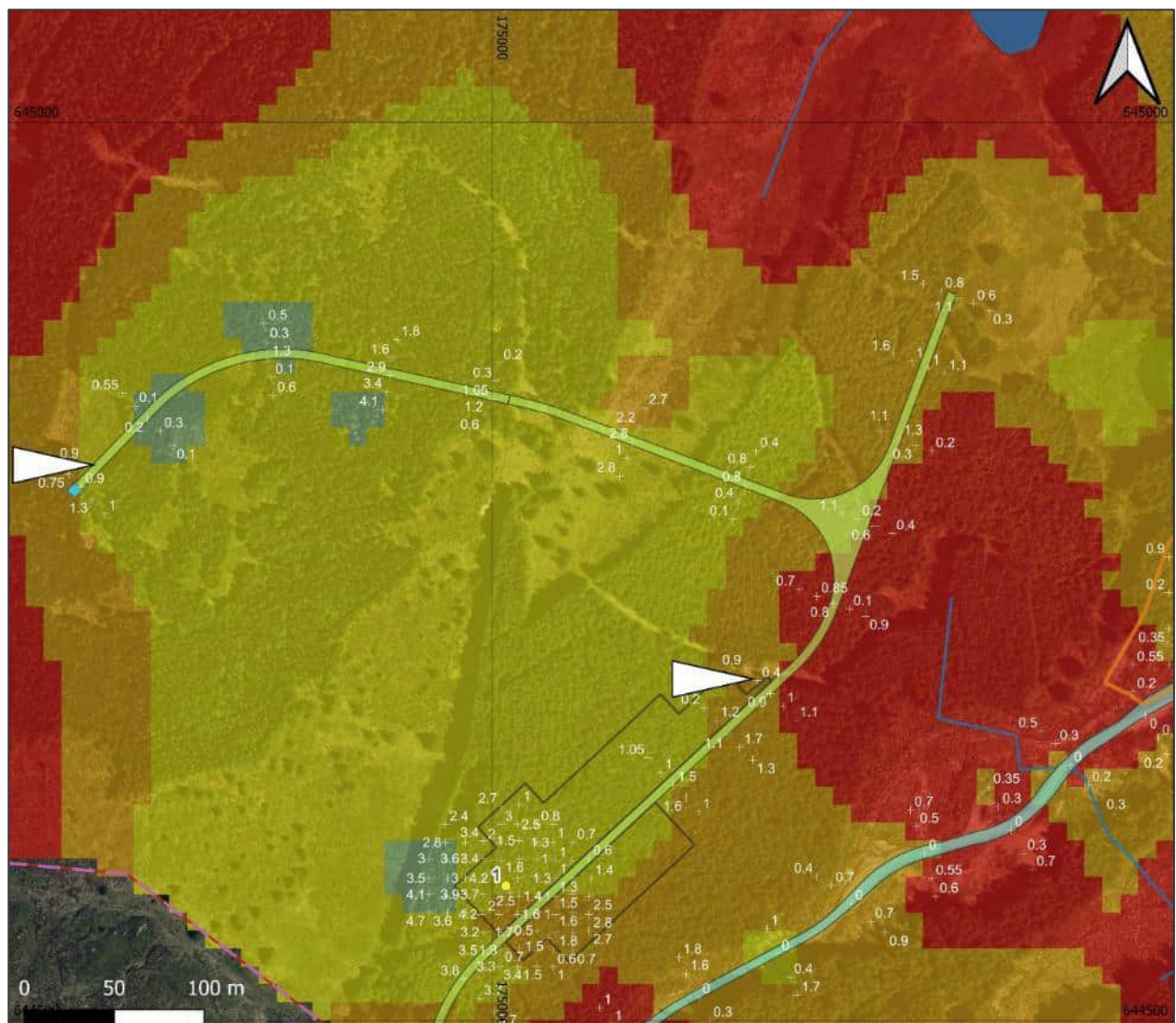
Specific Mitigation:

The following mitigation is therefore required along the track section showing medium and high risk in order to reduce these to low:

- Cross track drainage which prevents any ponding or build-up of groundwater pressure within the peat upslope or beneath the access infrastructure. Where possible existing drainage systems should be utilised and maintained.
- No stockpiling or surcharging of the peat along areas of medium to high risk on this section
- A system of ongoing monitoring throughout the construction phase should be in effect to monitor any movement in the peat. A rapid reaction strategy should be developed to ensure measures can be deployed to protect the watercourse in the event of any movement. This may include installation of downslope retaining systems to prevent peat material entering the watercourse.

Track Element

Track Section 15: T1 turning head to Anemometer Mast



Contributors to elevated peat slide risk:

- Proximity to surrounding watercourses
- Slope angle – 2 to 9 °

Peat depth – 0.1 – 4.1 m.

Specific Mitigation:

The following mitigation is therefore required along the track section showing medium and high risk in order to reduce these to low:

- Cross track drainage which prevents any ponding or build-up of groundwater pressure within the peat upslope or beneath the access infrastructure. Where possible existing drainage systems should be utilised and maintained.
- No stockpiling or surcharging of the peat along areas of medium to high risk on this section
- Where detail design proves floating access, track is safe to use, this should be the preferred method of track construction to reduce the impact on peatland by avoiding excavation.
- A system of ongoing monitoring throughout the construction phase should be in effect to monitor any movement in the peat. A rapid reaction strategy should be developed to ensure measures can be deployed to protect the watercourse in the event of any movement. This may include installation of downslope retaining systems to prevent peat material entering the watercourse.

- Proximity to surrounding watercourses water crossing
- Slope angle – 8 to 23 °

Peat depth – 0.1 – 2.2 m.

- Cross track drainage which prevents any ponding or build-up of groundwater pressure within the peat upslope or beneath the access infrastructure. Where possible existing drainage systems should be utilised and maintained.
- No stockpiling or surcharging of the peat along areas of medium to high risk on this section
- A system of ongoing monitoring throughout the construction phase should be in effect to monitor any movement in the peat. A rapid reaction strategy should be development to ensure measures can be deployed to protect the watercourse in the event of any movement. This may include installation of downslope retaining systems to prevent peat material entering the watercourse.

6.3. Peat Slide Pathways

The assessment considers environmental receptors (main watercourses) to be the primary focus of the risk assessment. Minor or ephemeral watercourses have been assessed to have very limited potential to transport material to offsite receptors. Where relevant, onsite proposed infrastructure has been assessed. The existing infrastructure of Deucheran Hill Wind Farm, turbine hardstanding areas and access tracks have also been considered in this assessment.

This report examines the terrain and the potential evolution of any triggered peat slide event. The determination has been that entrained peat flows would primarily be channelled along the main watercourse's downslope of proposed infrastructure; these locations are highlighted by the black arrows on the Peat Slide Pathways Map in **Figure A.11**. The pathways shown indicate the directions where peat flows would travel into main watercourses or waterbodies, they do not indicate risk of instability.

There are multiple locations where the existing Deucheran Hill Wind Farm tracks are located on peat slide pathways related to peat slide triggered from the new wind farm construction works. For example, directly east of T6, directly north of T13, 100 m south of T7, 100 m south of T1 and 100 m north of the new track leading to T4, all have the existing wind farm track exposed downslope.

There are several onsite environmental receptors; Loch nan Eun located approximately 80 m southwest of proposed T12 and 400 m south of the proposed new access track. A theoretical peat slide related to construction at these locations could lead to pollution of the loch. Similarly, Loch Losgainn which is located 60 m west of the new track proposed towards T14 is a receptor of peat sliding from related construction activities.

The main offsite receptors are the Carradale Water and Allt Sunadale to the east which feed into the Kilbrannan Sound.

The risk of run out and significant damage to the wider hydrological environment is deemed low, providing the relevant control measures outlined in his report are implemented at the site.

6.4. Preliminary Geotechnical Risk Register

The preliminary risk register for development wide hazards is listed in **Table A10.4.15** below. Key control measures for the hazards have also been identified. A geotechnical risk register should be utilised on an individual turbine basis throughout the construction phase and amended accordingly as new information is received.

Table A10.4.15: Preliminary Geotechnical Risk Register

Hazard	Cause	Location	Consequence
Peat Landslide / Bog Burst / Peat Flow	High rainfall, and increased surface water infiltration leading to build up of pore water pressure	T5, T7, T8, T14, BP5, Track Sections 1, 2, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16	Instability of peat deposits and underlying superficial deposits around earthworks. Contamination of natural watercourses and damage to hydrological systems. Harm to personnel and damage to plant / equipment. Destruction of built infrastructure
Mitigation	Due consideration given to prevailing ground and weather condition when scheduling construction works. I.e. avoid opening new excavation during heavy precipitation and ensure sufficient drainage measures are in place to support construction activities. Ensure a contingency is in place to concentrate on more suitable construction activities during wet weather. The drainage design should be such that its construction is in sequence with providing necessary drainage to new areas of excavation and construction in advance of works. I.e. ensure cut-off ditches are in place prior to opening new excavation. The drainage design should as far as practicable preserve the natural hydrological regime and should not inundate areas with run-off which were previously not subjected to such affects. Monitoring weather forecast with site specific weather station. Monitoring (visual) regular site inspection to detect early indications of ground movement (tension cracks, groundwater issues).		
Peat Landslide / Bog Burst / Peat Flow	Concentrated loads placed at the top of slope system or on marginally stable peat deposits	T5, T7, T8, T14, BP5, Track Sections 1, 2, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16	Contamination of natural watercourses and damage to hydrological systems. Rapid ground movement and mobilisation of material down slope of construction operations; Harm to personnel, plant and equipment. Destruction of temporary or permanent construction works;

Hazard	Cause	Location	Consequence
Mitigation	At these locations, robust and strict controls on the phasing and pace of construction must be in place. This would be most effectively managed through the CMS. Plant operatives should be briefed in detail regarding the side-casting and stockpiling of materials. Higher risk areas particularly at T5, T14 and BP2 should be demarked by high visibility ticker tape or similar as a warning not to stockpile any materials in the deeper peat and steeper areas. Ensure the peat depth contour mapping is available and has a high visibility during construction. A programme of frequent inspections should be implemented during excavation and access track construction works. This should be carried out by suitably experienced and qualified personnel. Where stockpiles are placed in suitable areas, these should be closely monitored using high accuracy GPS level and visual survey.		
Peat Landslide / Bog Burst / Peat Flow	Increased subsurface groundwater flow and 'piping' failure beneath natural peat deposits, temporary and permanent earthworks	T5, T7, T8, T14, BP5, Track Sections 1, 2, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16	Localised instability associated with temporary and permanent earthworks. Triggering of mass movement of peat material down slope causing harm to personnel, plant and equipment;
Mitigation	Ensure geotechnical design prevents blockages of groundwater flow. This may be achieved using free draining fills and ensuring temporary and permanent earthworks do not cause the build-up of groundwater pressures. A programme of geotechnical inspections should be implemented throughout construction phase. Ensuring focus extends beyond immediate areas of construction, both up-slope and down-slope to detect any unforeseen effects on stability		
Bearing Capacity Failure (Peat Surface)	Increased loading of low shear strength deep peat deposits	T5, T7, T8, T14, BP2, BP5, Track Sections 1, 2, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16	Localised instability and settlement associated with temporary and permanent earthworks. Triggering of mass movement of peat material down slope causing harm to personnel, plant and equipment. Contamination of natural watercourses and damage to hydrological systems from peat material mobilised down slope;
Mitigation	Due consideration given to the prevailing ground and weather conditions when scheduling site works Ensure detailed peat depth contour plan to be used in construction planning and design. Use of appropriate plant machinery (low ground pressure and long reach to avoid over loading peat deposits)		

Hazard	Cause	Location	Consequence
	A programme of geotechnical inspections will be implemented during excavation works Geotechnical monitoring post-construction		
Peat Failure	Mass movement of temporary storage mounds and bunds	T5, T7, T8, T14, BP2, BP5, Track Sections 1, 2, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16	Localised instability and settlement associated with temporary and permanent earthworks Triggering of mass movement of peat material down slope causing harm to personnel, plant and equipment;
Mitigation	Storage site selection and stockpile design by a suitably qualified and experienced geotechnical engineer. Routine maintenance and inspection of peat storage mounds		
Creep, long term settlement of structures	Tracks or hardstand founded on peat and/or poor or variable foundation soils	T5, T7, T8, T14, BP2, BP5, Track Sections 1, 2, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16	Ongoing settlement and damage of infrastructure, e.g. damage to access track running surface.
Mitigation	Contingency of routine maintenance of infrastructure and drainage elements to ensure longer term issues do not cause a build-up of effects leading to higher level consequences e.g. larger scale instability		

Source: Natural Power, 2026

6.5. Conclusions

The peat depths across the Proposed Wind Farm Development Area vary from very shallow (0 m) to very deep (6.2 m) with a site-wide average of 0.77 m, with the proposed infrastructure layout avoiding the deepest recorded areas of peat.

The following construction related factors to peat slide are highlighted for consideration:

- Movement can occur following over-loading of peat slopes, e.g. by placement of fill, stockpiling and end-tipping directly onto peat slopes.
- Suitability of drainage measures and the prevailing groundwater conditions are also key factors to consider during construction. Increasing pore water pressures within peat deposits decreases the stability of a slope.
- In extreme events, peat can act as a viscous fluid and travel over very shallow slopes. The re-working or excessive handling of peat can reduce the shear strength to residual levels and hence lead to 'liquid' peat behaviour.
- The rate of construction can have a major influence on the stability of peat land environments. Rapid loading and limited time for excess pore pressure dissipation can also decrease the stability state of peat slopes.
- Excavation across a side slope, a convex slope / break in slope can induce peat failure.
- Therefore, the most significant but highly unlikely impact is death or injury to site personnel. More likely is damage of the environment and disruption to the proposed infrastructure leading to time and cost impacts.

It should be noted that where peat probes indicate shallow depths 0 to 0.30 m, that the deposits are likely to be composed of a topsoil and mineral subsoil, thus the risk of peat sliding is none.

The mean un-drained shear strength determined across the Proposed Development is 15 kPa. This indicates peat of extremely low shear strength. A conservative characteristic value of 10kPa has been used in the slope stability modelling (representing the minimum recorded value).

The risk rankings produced in this report are a combination of the overall likelihood with the potential environmental/impact effect of a peat instability event. With increased proximity to watercourses exposure of such an event is vastly increased as watercourses act as a sensitive off-site receptor and can carry peat debris to further offsite receptors. In addition, where relevant the position of proposed internal site infrastructure and assets has been considered.

The initial risk rankings are based on the risk of peat failure occurring without appropriate mitigation and control measures in place during construction. It should be highlighted that through geotechnical risk management, strict construction management and implementation of relevant control measures, this shall reduce the risk of peat failure across the development to residual low levels.

The risk assessment should be reviewed prior to construction and further refined following intrusive ground investigation and detailed infrastructure design.

7. Recommendations

The peat slide risk assessment cites key control measures which are required to ensure the risk of peat slide remains at residual (low) levels. However, there should be wider consideration of these measures across all areas of the Proposed Development which may be influenced by the proposed construction. This is critical where infrastructure may impact terrain and slope conditions beyond the proposed working areas.

- Location specific mitigation has been described within **Table A10.4.12**. This includes restrictions on peat storage and stockpiling during the construction process, access track and drainage outfall design. Recommendation is made for potential micro-siting post-consent that would reduce the environmental risk rating several turbine positions, this is as follows:
 - Micro siting T1 50 m to the northwest.
 - Micro siting T5 100 m to the west-southwest.
 - Micro siting T7 50 m to the northeast.
 - Micro siting T8 50 m and rotating the hardstanding 45 degrees to the northwest.
 - Micro siting T12 20 m to the northeast.
 - Micro siting T14 30 m to the northeast.
- A detailed intrusive ground investigation would be carried out (post-consent) and as part of the pre-construction phase of development. This investigation would seek to further characterise the peat deposits with emphasis on, in-situ shear strength testing and targeted undisturbed sampling and laboratory testing. All peat samples recovered should be classified in accordance with the Von Post system, (Hobbs, 1986) and current British and Eurocode standards for site investigation. Further investigation of the peat sub-soil interface would also be carried out.
- Groundwater level information would be collated as part of any future ground investigation.
- The results of a detailed ground investigation should be assessed with respect to refining the peat stability assessment at infrastructure locations where peat slide risk is elevated. All pertinent control measures and mitigation measures should be revised, and their implementation supervised following the results of the ground investigation and construction design phase of works.
- Continued assessment and monitoring throughout the construction phase of works and at suitable intervals post construction should be implemented to ensure the control measures are suitable and are providing adequate mitigation against peat instability.
- Construction practices should be managed through the Construction Method Statement (CMS) and within the wider context of the Construction Environmental Management Plan (CEMP). The CMS should be prepared by the appointed principal contractor and reviewed by a suitably experienced geotechnical engineer who has read and understood this report. The following general recommendations are provided in line with the, Good practice during wind farm construction, (July, 2024) guidance:
 - Avoid peat arisings being placed as local concentrated loads on peat slopes without first establishing the stability condition of the ground and slope system. Stockpiling on areas of deep peat and in close proximity to steep slopes should be avoided.
 - Avoidance of uncontrolled and concentrated surface water discharge onto peat slopes as this may act as contributory factor to failure. All water discharged from excavations during construction phase should be directed away from all areas identified as susceptible to peat failure and should be managed through a suitably designed site drainage management plan.
 - All excavations where required should be adequately supported to prevent collapse and the destabilising peat deposits adjacent to excavations.
 - A system of daily reporting should be established during construction and utilised to monitor the geotechnical performance of slopes including peat, sub-soil and bedrock. This should be implemented and undertaken

by a suitable experienced and qualified geotechnical engineer. Post construction this monitoring procedure should be curtailed to allow for annual or ad-hoc inspection as required.

7.1. Cut/Fill Track Construction

Across the Proposed Wind Farm Development Area not affected by deep peat; the construction of proposed access tracks should be considered by excavation and replacement method, MacCulloch, (2006). Excavated peat is removed and targeted for suitable re-use. Aggregate would be used to form the subgrade and running surface of the track.

For 'Cut/Fill' track construction the risk of peat failure is therefore focussed on the peat deposits adjacent to the access track, and the placement of peat arisings. In these areas the following control measures are listed by MacCulloch, (2006):

- Careful excavation of peat deposits by appropriate machine excavator to limit localised peat failures which can occur on the edge of the track excavation. This is in order to prevent a minor failure triggering retrogressive peat failure affecting a larger area of peat adjacent to the track.
- Temporary drainage systems followed by establishment of a permanent drainage network. Silt traps and small retaining structures may be required especially in proximity to water crossings to prevent siltation and blockage of watercourses.
- Ongoing monitoring and on demand maintenance when silt traps require emptying and temporary drainage reinstated if blocking occurs. This will assist in maintaining hydrology baseline conditions.
- The permanent drainage system must direct surface water flow away from the 'cut' track to prevent peat failure within the track bunds.

7.2. General Earthworks

It has been identified that there is a requirement for the excavation of peat soils and superficial deposits during construction of the wind farm. Initially the vegetated peat layer and any topsoil should be stripped and temporarily stockpiled away from areas of deep peat and instability risk. The design of this stockpile must be agreed by a suitably qualified geotechnical engineer. When working in areas of deep peat (i.e. >0.5 m) no peat or overburden should be stored on such deposits as this may lead to instability. The following options for peat storage may be considered:

- Dedicated peat storage areas designed under the advisement of a suitable qualified geotechnical engineer and conform to up-to-date regulations and waste directives.
- Re-use of peat in dressing-off of batters on access tracks, finishing of cable trenching works, the landscaping of turbine bases. Peat must be re-used to ensure stability and its long terms sustainability i.e. the prevention of drying of desiccation.
- Excavated glacial till and weathered rock may be used as backfill to turbine bases should material be deemed geotechnically suitable. All related works must be carried out in accordance with an agreed CEMP and conform to site restoration plans.
- For *in-situ* and undisturbed peat; site vehicle movements must be minimised across such areas, throughout construction and post construction. Observation and monitoring for settlement, deformation, or signs of failure along access tracks and critical working areas must be implemented. This may be achieved with a network of settlement plates and survey markers which can be periodically re-surveyed, and any differential movements identified. It is recommended that all earthworks are designed in accordance with current national standards. Such measures would be focused on zones of deep peat and areas at elevated peat slide risk.

The following risk mitigation is recommended with regards to peat storage:

- Storage site selection and stockpile design would be undertaken by a suitably qualified and experienced engineer.
- Temporary storage of peat in a single dedicated area shall be avoided.

- Peat storage on areas of low / negligible peat slide risk only
- Peat storage height shall not exceed 0.5 m without dedicated stability assessment; and
- Routine maintenance and inspection of peat storage areas would be undertaken.

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