Proposed Ballincor Wind Farm Planning Stage Peat Stability Risk Assessment

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Status	**Description**	**Revision Code**
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S0	Work In Progress	P01.01, etc
Shared (Non-Contractual)		
S1	Suitable for Coordination. The file is available to be 'shared' and used by other disciplines as a background for their information.	P01, P02, etc
S2	Suitable for Information	P01, P02, etc
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S6	Suitable for PIM Authorisation (Stages 2a, 2b and 3)	P01, P02, etc
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WIP to Published Unauthorized and (Non-contractual) use at risk.		
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A1, A2, A3, etc	Approved and accepted as stage complete (C= Contractual/Complete)	C01, C02, etc
B1, B2, B3, etc.	Partially signed-off: with minor comments from the Client. All minor comments should be indicated by the insertion of a cloud and a statement of 'in abeyance' until the comment is resolved, then re-submitted for full authorization.	P01.01, etc
Published for AIM Acceptance		
CR	As Construction Record documentation, PDF, Models etc.	C01, C02, etc

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1. Executive Summary

The proposed development is located 5 km south of Birr and 9 km north of Shinrone. Ciaran Reilly & Associates was instructed by TOBIN on behalf of RWE Renewables Ireland Ltd. (hereinafter referred to as "RWE") to carry out a planning stage peat stability risk assessment (PSRA) as part of the environmental impact assessment for the proposed Ballincor Wind Farm site. RWE wish to apply to An Coimisiún Pleanála for planning permission to develop a wind farm in the townlands of Clonfree, Castletown, Cronekill in County Tipperary and Cloonaheen, Ballincor Demesne, and Curralanty in County Offaly.

The PSRA was carried out in accordance with Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments – Second edition (Scottish Government, 2017). The report sets out the methodology used to assess the peat stability risk, the activities undertaken, and the results of the peat stability assessment. The report should be read along with the Land, Soils and Geology chapter of the overall Environmental Impact Assessment Report (EIAR) and its appendices.

Following application of mitigation measures (consideration to the siting of infrastructure to minimise the risk, site-specific temporary works designs for areas of deeper peat, and common-place mitigation measures such are careful detailed design and construction supervision for the other areas of the site), the findings of the planning stage PSRA indicate a "negligible" hazard ranking for instability related to the requirement for excavations on the site.

Deterministic stability assessments indicate that the materials are considered to be stable in the short (undrained) and long (drained) term, including under the influence of extreme weather events, hence justifying the *"negligible"* hazard rankings assigned.

Routine and common place mitigation measures will be put in place during the detailed design and construction of the scheme to reduce the likelihood of a failure. Best practice guidance regarding the management of peat stability must be inherent in the construction phase of the project and further recommendations are provided in the following section.

2. Introduction

In accordance with planning guidelines compiled by the Department of the Environment, Heritage and Local Government (DoEHLG) (2016), where peat is present on a proposed wind farm development, a peat stability assessment is required as part of the environmental impact assessment. Ciaran Reilly & Associates has been instructed by TOBIN. The proposed development is located 5 km south of Birr and 9 km north of Shinrone.

This report sets out the methodology used to assess the peat stability risk, the activities undertaken and the results of the peat stability assessment. This report should be read along with Chapter 8 (the Land, Soils, and Geology chapter) of the Proposed Ballincor Wind Farm Environmental Impact Assessment Report (EIAR) and its appendices.

2.1. Description of the Development

A summary of the proposed project is as follows:
Assembly of 11 WTG's (including tower sections, nacelle, hub, rotor blades) with an estimated capacity of MW and a blade tip height between 179.5 and 180m, rotor diameter of up to 149 to 163m, hub height of between 98.5 and 105m metres.

- Associated hardstanding at each turbine location;
- Turbine foundations;

Upgrading of existing access tracks, construction of new founded access roads and floating roads within the proposed wind farm.
Construction upgrades of two site entrances on R492 and L1071;
Erection of 104m permanent meteorological mast and including lightening pole;
Installation of new clear span watercourse or drain crossings on proposed wind farm site;
All associated excavation, earthworks and spoil management, Surface water drainage system and sediment control;
Three Borrow pits (Borrow pit 1 to Borrow Pit 3);
Peat deposition in Peat Deposition Area 1, Borrow Pit 2 and Borrow Pit 3;
All electrical plant and infrastructure and grid ancillary services equipment;
All associated infrastructure and services including site works and temporary construction signage;
Operational stage site signage

- Works along the public road for a turbine delivery route;
- All related site works and ancillary development including berms, landscaping, and soil excavation;

A full description is included in Chapter 2 of the EIAR. An overview of the proposed project is shown in EIA Figure 11333-2005.

The proposed wind farm site encompasses approximately 420 hectares, primarily consisting of agricultural land with forestry and peatland. The proposed wind farm site is situated west of the Little Brosna River, with elevations ranging from 45 to 65 meters above ordnance datum (OD). The surrounding landscape is predominantly low-lying,

except for Knockshigowna Hill to the southwest. To the east of the Little Brosna River lies the Sharavogue Bog Special Area of Conservation (SAC), which is characterised by peatland habitats.

The site predominantly comprises cutover bog, raised bog, wet grassland, mixed woodland, oak-birch-holly woodland, bog woodland, and scrub. The N62 is located approximately 2 km to the east, and the proposed wind farm site has good access via the local road network. The proposed wind farm site is situated on lands owned by local landowners, who have consented to the planning application. The primary site entrance is located approximately 2.5km to the South-East of the Sharavogue N62 and R492. Access to the site will be at this location along the R492.

2.2. Statement of Authority

Ciaran Reilly & Associates is a specialist geotechnical engineering practice delivering a range of consultancy services to the private and public sectors across Ireland and the UK. Ciaran Reilly & Associates was established in 2016 and is based in Co. Westmeath.

This report was prepared by Dr Ciaran Reilly. Dr Reilly (BE, PhD, PGDip, CEng, MIEI, Registered Ground Engineering Specialist (UK RoGEP)) is a geotechnical engineer with over 15 years' experience in civil and geotechnical engineering consultancy, contracting, and research. He worked for several years in industry before completing his PhD in Trinity College Dublin in 2014. Since then, he has undertaken a diverse range of environmental impact assessment and engineering design projects as senior engineer and more recently as director of Ciaran Reilly & Associates.

2.3. Peat Failures

Peat landslides represent one end of a spectrum of natural processes of peat degradation. They have potential to cause fatalities, injury and damage to infrastructure and farmland. They also have the potential to cause significant damage to peatland habitats.

Excavations works on electricity infrastructure construction sites can induce slope failures due to the low basal strength in peat, even in relatively flat sites. These peat failures induced by excavations can extend significantly beyond the excavations, likely due to seepage forces caused by intentional or accidental drainage of the peat.

The potential for peat failure at this site is examined with respect to the proposed works as outlined in Section 2.1.

2.4. Methodology

The evaluation of the peat stability at the site was carried out in accordance with the document "Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments – Second edition" (Scottish

Government, 2017). The geotechnical and peat stability assessment at the site included the following activities:

- Desk Study,
- Site reconnaissance including peat strength measurement,
- Review of ground investigation carried out at the site by Ground investigations Ireland (GII) and TOBIN,
- Review of digital terrain model data,
- Peat stability assessment using a qualitative approach, and
- Peat stability assessment using a deterministic approach.

The risk assessment approach is discussed in detail in Section 5 of this assessment report.

3. Ground Investigation

3.1. Desk study

A desk study was undertaken to collate and review background information in advance of the site survey. The desk study involved the following:

- Examination of the Geological Survey Ireland (GSI) datasets pertaining to geology, landslide susceptibility, and the GSI borehole database,
- Examination of Environmental Protection Agency (EPA) data, and
- Preparation of site maps and suitable field sheets for the site survey.

The desk study information obtained is referenced below. Following the desk study and the site survey, geological maps were generated in GIS and are included in Chapter 8, the Land, Soils and Geology chapter, of the main EIAR and reproduced in Appendix 1 of this report. The ground investigation information is included in the Land, Soils and Geology chapter of the main EIAR.

Publicly available sources of mapping, aerial photography and satellite imagery were consulted to establish the expected ground conditions, topography, and condition of the site in the past. The following sources were referred to:

- Ordnance Survey historical mapping,
- Geological Survey Ireland mapping,
- EPA mapping,
- Publicly available satellite photography (Google Maps & Bing Maps), and
- LiDAR digital terrain model data.

3.2. Field work

Site surveys relating to the soil and geological environment and ground investigations were undertaken between September 2024 and April 2025. These surveys included:

- Ground investigation by Ground Investigations Ireland between July and September 2024, comprising:
    - 3 nr rotary core boreholes including standard penetration testing,
    - 23 nr machine-dug trial pits, and
    - 17 nr peat augers,
- Site walkover by Ciaran Reilly & Associates staff on 24 September 2024 to review the ground conditions and assess the topography and geomorphology, and
- 41 nr hand vane tests by Ciaran Reilly & Associates staff throughout the site.

The logs and records of the investigations can be found in Appendix 8-1 to the Land, Soils and Geology chapter of the main EIAR. The locations of investigations and a resulting peat depth map are provided as Figure 8-6 of the main EIAR, reproduced as 11303-023-P. DEP-S.BO-TOB-A in Appendix 1 of this report. The observations made

during the walkover survey are used to prepare the Peat Stability Risk Register included as Appendix 3 of this report.

A number of photographs taken during the walkover survey are presented in Figure 1 to Figure 5 as an aid to describing the general topography and landscape character of the site.

Figure 1 – Grassland and forestry on cutover peat near proposed Turbine 3

Figure 2 - Location of proposed Turbine 4

Figure 3 - Location of proposed Turbine 8

Figure 4 - Location of proposed Turbine 9

Figure 5 - Location of proposed Turbine 11

4. Detailed Site Assessment

4.1. Site Topography and Geomorphology

The site topography and geomorphology are discussed in detail in the Land, Soils & Geology Chapter of the EIAR and reference is made to the chapter herein. The proposed wind farm site is situated west of the Little Brosna River, with elevations ranging from 45 to 65 meters above ordnance datum (mOD). The surrounding landscape is predominantly low-lying, except for Knockshigowna Hill to the southwest. To the east of the Little Brosna River lies the Sharavogue Bog Special Area of Conservation (SAC), which is characterized by peatland habitats. The proposed wind farm site encompasses approximately 355 hectares, primarily consisting of agricultural land, forestry, and peatland. Several small streams or ditches cut through the site, draining towards the Little Brosna River.

LiDAR digital terrain model data were obtained and interrogated to provide a generalised ground profile for peat stability assessment. The site layout is shown in 11333-001-P.App.BO-St.A-TOB-D01 included in Appendix 1.

4.2. Local Bedrock Geology

Geological Survey Ireland bedrock mapping shows that the site is underlain by bedrock of the Terryglass Formation, Ballysteen Formation, Waulsortian Limestones, and Lower Limestone Shale. One fault crosses the site access road and other faults are located within 600m of the site. The bedrock geology beneath the site is illustrated in drawing 11333-005-B.GEO-P.App.BO-TOB-D01 attached in Appendix 1.

4.3. Local soils and subsoils

Geological Survey Ireland (GSI) quaternary mapping, representing the top 1.0 m of the soil column but excluding the topsoil, shows the site is underlain by cutover peat, till derived from limestones, and alluvium with an isolated area of Bedrock outcrop or subcrop near proposed Turbine 1. Teagasc Soil Information System soils mapping shows the upper layer of soil at the site is characterised as "Raised Bog cutaway/cutover", "Grey Brown Podzolics / Brown Earths", "Basic Surface water Gleys / Ground water Gleys Basic" and "Mineral alluvium", with the areas mapped as such corresponding with the areas mapped with similar descriptions as per the GSI quaternary mapping.

The quaternary geology (subsoil) is shown in drawing 11333-004-SSO-P.App.BO-TOB-D01 included in Appendix 1 and the Teagasc topsoil mapping is shown in 11333-002-SO-P.App.BO-TOB-D01 also included in Appendix 1.

The findings of the site walkover survey were largely in line with the GSI mapping.

4.4. Water courses

The proposed wind farm is located within the Shannon Water Framework Directive catchment (hydrometric area) in Offaly and Tipperary. These waters are of low gradient near the proposed wind farm, representing natural watercourses typical depositing rivers. The Little Brosna River flows in a northerly direction to the east of the proposed wind farm site. The site and adjacent lands also include man-made drains which flow into the watercourses mentioned above. These are primarily used to assist in the drainage of forestry, peatland and agricultural land-use. The more significant mapped watercourses are shown in Figure 6 and a typical existing man-made drain is shown in Figure 7.

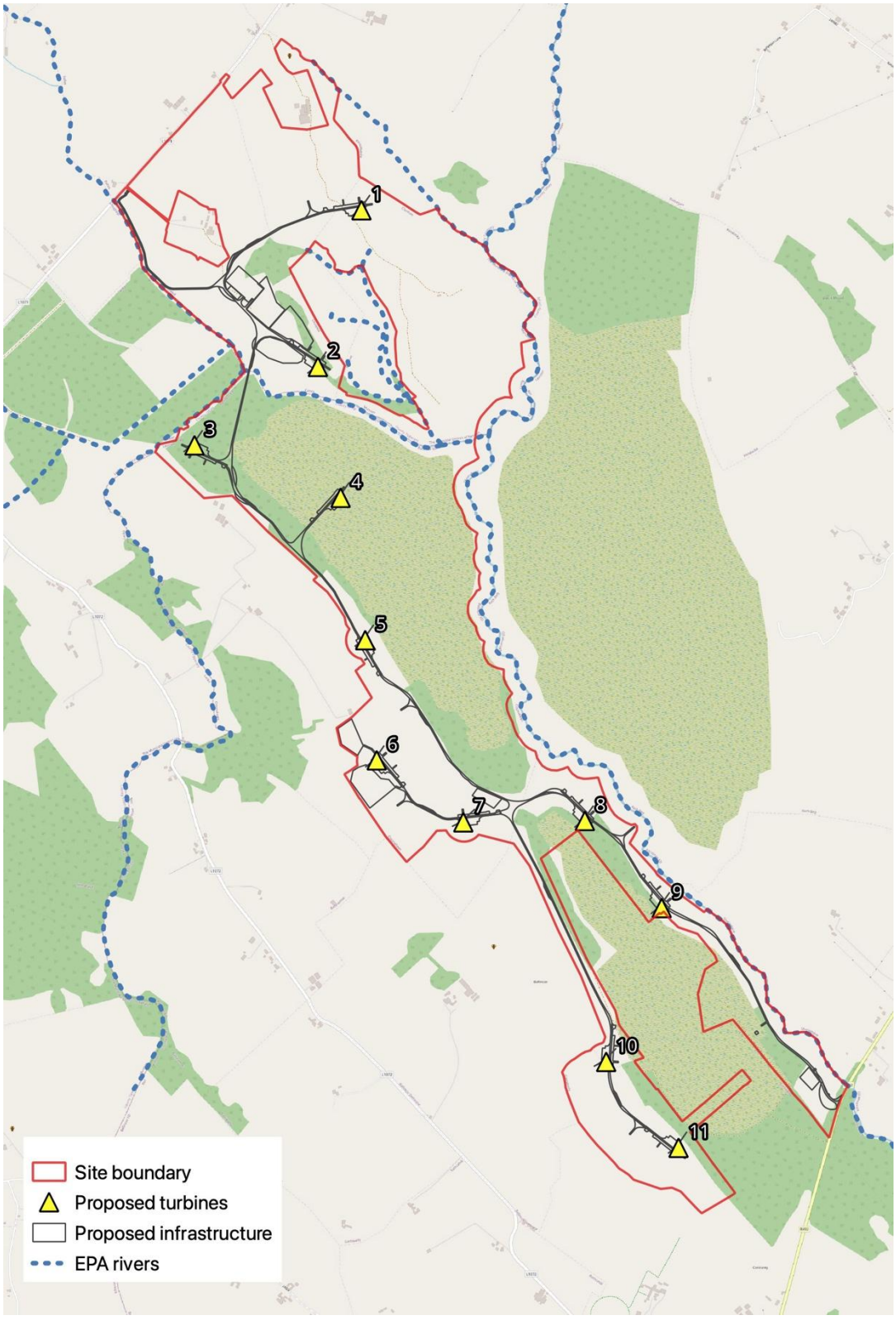

Figure 6 - EPA river networks (EPA, 2022)

Figure 7 - Typical existing drain cut into peat at the site (photo taken between Turbine 8 and 9 and intended to show a typical existing feature, not future construction)

4.5. Previous failures

A review of the landslide information on the GSI Irish Landslides Database indicated that there are no records of peat failure within 2 km of the Proposed wind farm. The nearest recorded landslide occurred more than 7.6km northeast of the site (GSI_LS03-0054) at Lisheen, close to Birr. This was a landslide on cutover bog in the early 20th Century (c.1920) and had an impact on infrastructure, with the narrative description "an old road was swallowed in the bog" being recorded. A map showing this event is provided in Figure 8.

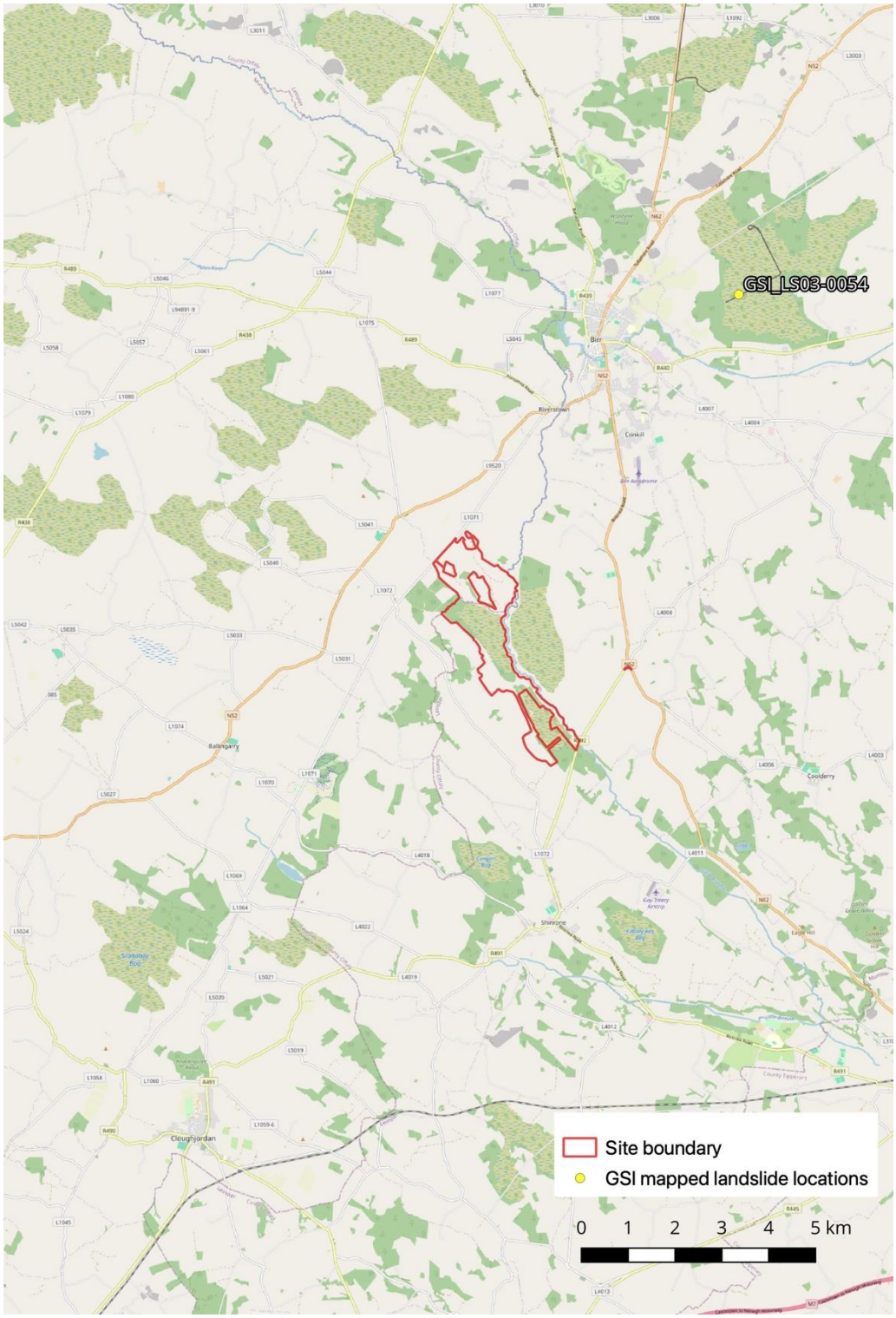

Figure 8 – Mapped landslide event (Source: GSI National Landslide Susceptibility Mapping, 2021)

4.6. Landslide susceptibility

Geological Survey Ireland (2021) publish a national landslide susceptibility map based on a risk assessment approach taking various factors such as topography and soil type into account. It should be noted that the GSI risk assessment is an initial indicative view which is useful to highlight areas for further assessment and is taken account of to

assess the risk of peat stability at individual infrastructure elements in Section 5 of this report. Further, the GSI risk assessment only accounts for the current site topographic and hydrological conditions. The development of wind farm and BESS infrastructure can alter these parameters in the temporary and/or permanent case.

The mapped landslide susceptibility for the site is shown in Figure 9 and summarised in Table 1. All of the proposed infrastructure including turbines are in areas mapped as "low" to "moderately low" landslide susceptibility. All of the turbine sites are in areas mapped as "low" landslide susceptibility.

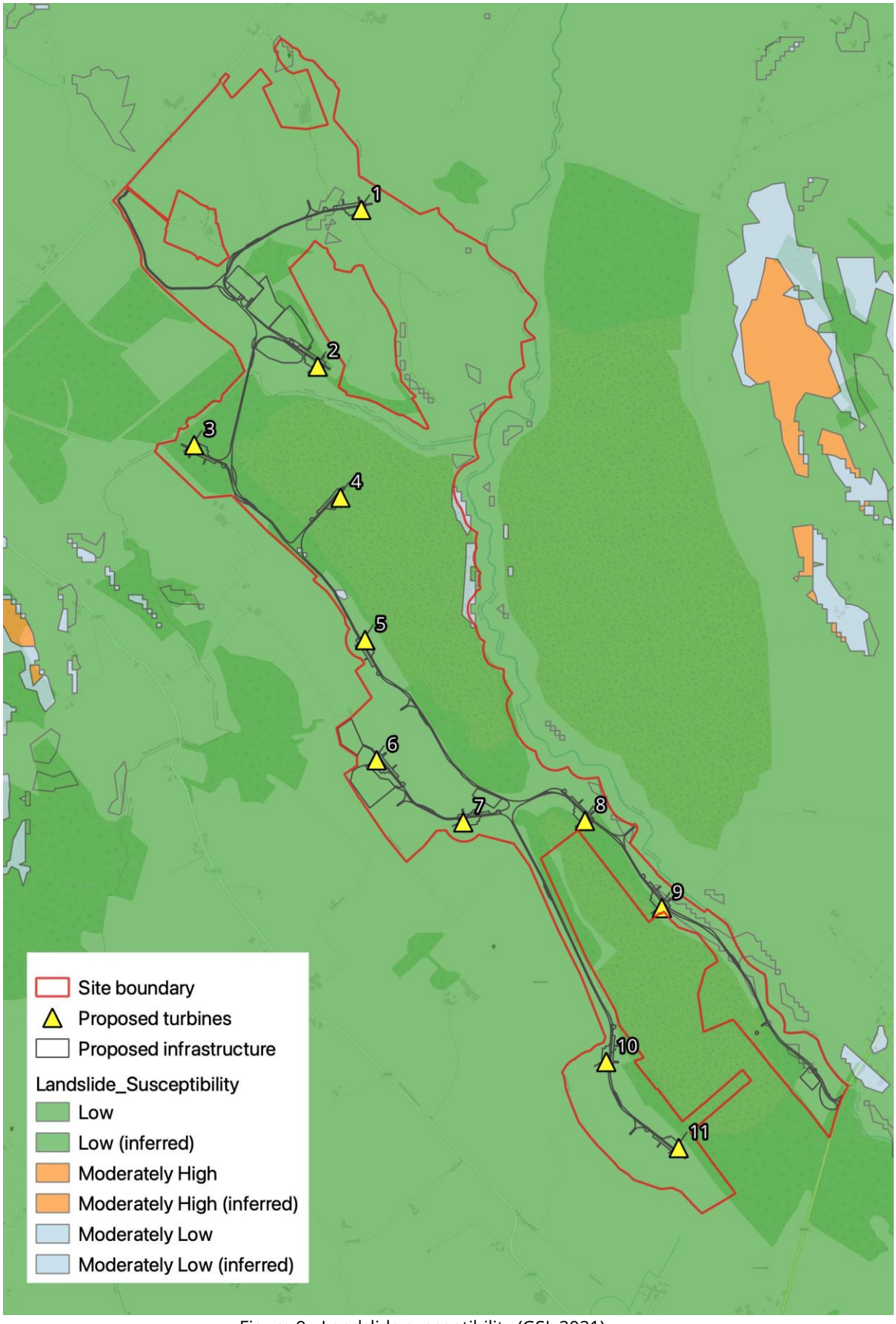

Figure 9 - Landslide susceptibility (GSI, 2021)

Table 1 – Landslide susceptibility (from GSI data, 2021)

Feature	Susceptibility
Turbine 1	Low
Turbine 2	Low
Turbine 3	Low
Turbine 4	Low
Turbine 5	Low
Turbine 6	Low
Turbine 7	Low
Turbine 8	Low
Turbine 9	Low
Turbine 10	Low
Turbine 11	Low
110kV substation	Low
BESS	Low
Peat Deposition Area 1	Low
Borrow pit A	Low
Borrow pit B	Low
Borrow pit C	Low
Met mast	Low

No evidence of historic peat failure was identified during the site walkover survey on 24 September 2024.

During the geotechnical investigation, 23 trial pits were carried out and 12 of these found peat to depths between 0.2 and >3.8m bgl. The trial pits are summarised in Table 2 below. Of the trial pits with peat present, sidewall collapse or spalling was encountered in 9 of the 12. This suggests that peat excavations at the site will likely be unstable in the short term.

Table 2 - Trial pit summary

Trial pit	Peat present?	Sidewall stability
TP01	No	Sidewalls spalling
TP01A	0.2m peaty TOPSOIL	Collapse >1.4m bgl
TP02	0.45m PEAT	Sidewalls collapsing >3.1m bgl
TP03	0.7m PEAT	Spalling & collapsing >1.2m bgl
TP04	>3.8m PEAT	Collapsing >1.5m bgl
TP05	No	Spalling & collapsing >2.6m bgl
TP06	No	Stable
TP07	No	Stable
TP08	2.1m PEAT	Sidewalls collapsing
TP09	2.7m PEAT	Spalling & collapsing >3.7m bgl
TP10	No	Spalling & collapsing >2.6m bgl
TP11	No	Spalling & collapsing >1.7m bgl
TP12	0.9m PEAT	Spalling & collapsing >3.2m bgl
TP14	No	Sidewalls collapsing
TP15	0.6m PEAT	Sidewalls collapsing
TP16	2.4m PEAT	Stable

TP17	0.7m PEAT	Collapsing >1.9m bgl
TP18	No	Collapsing >1.4m bgl
TP19	3.1m PEAT	Stable
TP20	1.1m PEAT	Stable
TP21	No	Sidewalls collapsing
TP22	No	Stable
TP23	No	Stable

4.7. Ground Investigation

Two phases of ground investigation (GI) were carried out at the site of the proposed Ballincor Wind Farm as outlined in the previous section. These investigations showed that peat was absent over the western and southwestern portion of the site (Turbines 5, 6, 10, 11) and present over the eastern portion (Turbines 3, 4, 8 and 9). Locations of the ground investigations and a peat depth map generated from the data are shown in 11303-023-P. DEP-S.BO-TOB-A provided in Appendix 1. The relevant ground investigation reports and data are presented in Appendix 8-1 to the Land, Soils and Geology chapter of the EIAR.

In general, the ground investigation results align with the desk study results, with depths of peat between 0.45m and 4.2m being recorded in areas mapped as “peat” and peat soils being absent in areas mapped as glacial till or gravel. Individual findings for assessment areas are presented in the qualitative peat stability risk assessment presented in Appendix 3.

5. Qualitative Peat Stability Assessment

5.1. Material properties

For the purposes of the peat stability assessment, material properties are assessed for Peat at the site. The results of the Ground Investigations Ireland (2025) investigation are used along with comparable experience to derive the required properties.

The correlation of Amaryan et al (1973) as cited by Carlsten (2000) is used, along with comparable experience, to derive a conservative characteristic undrained shear strength value for the Peat. 10 nr moisture content tests were carried out on samples of Peat. The moisture content of the Peat ranged from 44% to 946%. Taking the median moisture content of 774% and assuming an R value of 4, an undrained shear strength of 17.0kPa is assessed. A conservative view is taken on this, and based on comparable experience, a characteristic undrained shear strength of 10kPa is assessed for the Peat at the site. Where relevant, local strengths are assessed based on local field vane measurements, with a vane correction of 0.5 used (Edil, 2001 and Mesri & Ajlouni, 2007).

Based on a range of published guidance including Long (2005) and O'Kelly and Zhang (2013), the Peat was assumed to have effective stress parameter values φ′ = 28° and c′ = 4kPa.

A bulk weight of 10kN/m^3 is assumed for the Peat based on comparable experience and published data (e.g. Osorio-Salas (2012), O'Kelly (2017), and Trafford and Long, 2019).

The derived and assumed characteristic parameter values for the Peat are summarised in Table 3.

Table 3 – Characteristic parameter values

Material / Parameter	Peat
Bulk Weight (γ_k) [kN/m^3]	10
Undrained shear strength ($c_{u,k}$) [kPa]	10
Effective cohesion (c'_k)	4
Effective angle of shearing resistance (Φ'_k) [degrees]	28

5.2. Qualitative risk assessment procedure

The guidelines set out four categories of risk and recommends various mitigation / avoidance actions for each category. The categories of risk are:

1. Insignificant;
2. Significant;
3. Substantial; and
4. Serious.

The concept of risk analysis for a particular hazard presented in the guidelines referred to the publication entitled "Scottish Road Network Landslides Study" by Winter et al. (2005) and is presented as follows:

Hazard Ranking = Hazard x Exposure

Where:

- Hazard = The likelihood of the landslide event occurring
- Exposure = The effect and consequences that the event may have

Table 4 presents the scale of the likelihood and Table 5 presents the classification of exposure ratings based on a percentage of total project cost/time. These classifications are taken from the report entitled Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments – Second edition (Scottish Government, 2017).

Table 4 – Qualitative assessment of peat landslide Hazard over the lifetime of the development (Scottish Government, 2017)

Scale	Likelihood	Probability of occurrence
5	Almost certain	> 1 in 3
4	Probable	1 in 10 – 1 in 3
3	Likely	1 in 10^2 – 1 in 10
2	Unlikely	1 in 10^7 – 1 in 10^2
1	Negligible	< 1 in 10^7

Table 5 – Qualitative assessment of peat landslide Exposure over the lifetime of the development (Scottish Government, 2017)

Scale	Exposure	Impact as % damage to (or loss of) receptor
5	Extremely high effect	> 100% of asset
4	Very high effect	10% - 100%
3	High effect	4% - 10%
2	Low effect	1% - 4%
1	Very low effect	< 1% of asset

Using Table 4 and Table 5 it is possible to assign a hazard ranking for each zone by multiplying the hazard by the exposure. This will result in a hazard ranking between 1 to 25 (Table 6). Following the result, mitigation measures can be targeted and a revised assessment, post-control measures, is carried out. Through the various design iterations initial control measures implemented a mitigation by design approach where turbines were moved to lower risk areas. Further control measures are listed in Section 8 and the Peat Stability Risk Register in Appendix 3. This report is therefore an assessment of the final turbine locations.

Table 6 – Hazard ranking and suggested actions (Scottish Government, 2017)

Hazard Ranking	Designation	Action suggested
17-25	High	Avoid project development.
10-16	Medium	Project should not proceed unless the hazard can be avoided or mitigated without significant environmental effect, in order to reduce hazard ranking to low or negligible.
5-9	Low	Project may proceed pending further investigation to refine assessment and mitigate hazard through relocation or re-design.
1-4	Negligible	Project should proceed with monitoring and mitigation of peat landslide hazards as appropriate.

The proposed wind farm and associated infrastructure is located in a flat landscape and the entire site is mapped as "low" landslide susceptibility (Geological Survey Ireland, 2021). It should be noted that the GSI assessment only accounts for the current site topographic and hydrological conditions and is not intended to be used in isolation to determine actual onsite risk.

During the geotechnical investigation by trial pits, sidewall collapse or spalling was encountered in 9 of the 12 trial pits where peat was present. This suggests that peat excavations at the site will likely be unstable in the short term and the likelihood of an excavation collapsing during construction is generally in the range "likely" to "probable" in the absence of mitigation. A non-exhaustive listing of possible proposed mitigation measures is provided in Section 8 of this report.

The significance of a collapse in terms of cost and programme is likely to be in the range "very low effect" to "extremely high effect" as the affected area due to a collapse could range from a very localised area up to a major peat slide event feeding into a watercourse.

Mitigation measures can be put in place during the design and construction of the scheme to reduce the likelihood of an excavation collapsing. Possible mitigation measures include stepping or battering back of excavations to a safe angle (as determined through a slope stability assessment by a competent temporary works designer) or construction of a temporary sheet pile wall or rock fill berm to support the peat during construction.

The assessment process described above was applied to discrete areas of the site, with common topography and ground conditions, and is summarised in Table 7. This assessment is based on information from geological maps from GSI, the available aerial and satellite mapping, walkovers, and the site-specific ground investigation undertaken. The Peat Stability Risk Register that this summary table is derived from is presented in Appendix 3, where detailed risk registers for each assessment area are provided.

Table 7 – Peat Stability Risk Register Summary

Assessment Area	Pre-control measure risk rating	Post-control measure risk rating
Turbine 1	Negligible	Negligible
Turbine 2	Low	Negligible
Turbine 3	Low	Negligible
Turbine 4	Low	Negligible
Turbine 5	Negligible	Negligible
Turbine 6	Negligible	Negligible
Turbine 7	Negligible	Negligible
Turbine 8	Low	Negligible
Turbine 9	Low	Negligible
Turbine 10	Negligible	Negligible
Turbine 11	Negligible	Negligible
110kV substation	Low	Negligible
BESS	Low	Negligible
Peat Deposition Area 1	Low	Negligible
Borrow pit A	Negligible	Negligible
Borrow pit B	Negligible	Negligible
Borrow pit C	Negligible	Negligible
Met mast	Negligible	Negligible

Notes: Assessment based on mitigation measures suggested in Section 7 and the Peat Stability Risk Register in Appendix 3.

Eight of the assessment areas resulted in "low" risk ratings prior to mitigation measures. Following mitigation, all assessment areas are rated as "negligible" risk.

Based on all assessment areas falling into the "negligible" risk category, it is concluded that the site is suitable for the proposed electricity generation development.

6. Deterministic peat stability assessment

In addition to the qualitative assessment carried out in Section 5, a deterministic peat stability assessment was carried out based on the results of the ground investigation carried out on the site.

Stability of a peat slope is dependent on several factors working in combination. The main factors that influence peat stability are slope angle, shear strength of peat, depth of peat, pore water pressure, and loading conditions. An adverse combination of factors could potentially result in a peat slide. An adverse condition of one of the above-mentioned factors alone is unlikely to result in peat failure.

6.1. Methodology

To assess the factor of safety for a peat slide, an undrained and drained analysis has been undertaken to determine the stability of the peat slopes on site. The undrained case examines the stability in the short term, while the drained case examines the long term, including the effects of extreme weather events.

The infinite slope model (Skempton and DeLory, 1957) is used to combine these factors to determine a factor of safety for peat sliding. This model is based on a translational slide, which is a reasonable representation of the dominant mode of movement for peat failures.

The formula used to determine the factor of safety for the undrained condition is as follows (Bromhead, 1986):

$$ODF = \frac{c_{u,d}}{\gamma z \sin\beta \cos\beta}$$

Where:

- ODF = Overdesign Factor (analogous to Factor of Safety, however ODF > 1.0 indicates satisfactory stability.
- $c_{u,d}$ = Design value of undrained shear strength
- γ = Bulk unit weight of material
- z = Depth to failure plane assumed as depth of peat or soft soil
- β = Slope angle

The formula used to determine the factor of safety for the drained condition is as follows (Bromhead, 1986):

$$ODF = \frac{c'_d + (\gamma z - \gamma_w h_w)\cos^2\beta \tan\phi'_d}{\gamma z \sin\beta \cos\beta}$$

Where:

- ODF = Overdesign Factor (analogous to Factor of Safety, however ODF > 1.0 indicates satisfactory stability.
- c'_d = Effective cohesion, assumed as

γ = Bulk unit weight of material
z = Depth to failure plane assumed as depth of peat (minimum 0.3m assumed, higher local values used if found
γ_w = Unit weight of water
h_w = Height of water table above failure plane
β = Slope angle
φ' = Effective stress friction angle

6.2. Effects of peat deposition

The possible effects of peat deposition both in the long term in the case of reuse of peat at peat Deposition Area 1 and the short term in the case of temporary storage of peat has been considered by the application of a 1m surcharge loading of peat in the calculations.

The reuse of peat to landscape peat Deposition Area 1 will be limited to 1.0m above the existing landscape and the landscape area shall be designed and constructed by suitably qualified and experienced personnel. Side slopes shall be determined at detailed design and construction stage but will likely vary from 1v:3h to 1v:2h.

6.3. Effects of weather events

The drained loading condition applies in the long term. This condition examines the effect of the change in groundwater level because of rainfall on the stability of the peat slopes. For the drained analysis the level of the water table above the failure surface is required to calculate the factor of safety for the peat slope. In order to represent varying water levels within the peat slopes, a sensitivity analysis is carried out which assesses varying water level in the peat slopes i.e. water levels ranging between 0 and 100% of the peat depth is conducted, where 0% equates to the peat being completely dry and 100% equates to the peat being fully saturated. By carrying out such a sensitivity analysis with varying water level in the peat slopes, the effects of intense rainfall and extreme dry events were analysed.

6.4. Results and discussion

The results of the analysis are shown in Appendix 2. The assessment takes account of:

1. Slope angle, as derived from LiDAR digital terrain model data,
2. Material strength, as derived from site-specific ground investigation and comparable experience,
3. Likely loadings during the construction period, and
4. Extreme weather events.

The calculations are formulated in accordance with Eurocode 7, where partial factors are applied to soil strength parameters and loadings to achieve a satisfactory level of reliability in the design. The peat surcharge loading has been factored as a variable loading in the calculations, which will be conservative in the long-term case.

All overdesign factors (ODF) were greater than 1.0, indicating that the stability is satisfactory in both short term (undrained) and long term (drained) condition. Hence, a "negligible" risk rating for peat instability is appropriate for the proposed development.

Following application of mitigation measures (consideration to the siting of infrastructure to minimise the risk, site-specific temporary works designs for areas of deeper peat, and common-place mitigation measures such are careful detailed design and construction supervision for the other areas of the site),

7. Recommendations

7.1. Detailed Design

The following outlines an overview of the tasks for the detailed design phase:

- Develop a design stage PRSA to include detailed descriptions of mitigations at specific locations.
- Mitigations to be implemented at detailed design shall include but are not limited to:
    - Detailed design of drainage system.
    - Hydrological assessment of stream flows to inform culvert sizing.
    - Detailing of monitoring regime for peat movement.
    - Identification of areas requiring site-specific temporary works design.
    - Specification of additional site investigations inclusive of in situ testing and laboratory testing in specific risk areas on the site.
- Update the Peat Stability Risk Register.

7.2. Construction Phase:

The following outlines an overview of the tasks for the construction phase:

- Client's Geotechnical Engineer to provide a Geotechnical Induction to all contractor supervisory staff.
- Client to appoint a Site Geotechnical Supervisor to carry out supervision of site works as required. The Site Geotechnical Supervisor will be required to inspect that works are carried in accordance with the requirements of the PSRA, identifying new risks and ensuring all method statements for works are in place and certified.
- Retain a Site Geotechnical Folder which contains all the information relevant to the geotechnical aspects of the site including but not limited to Geotechnical Risk Register, Peat Stability Risk Register, site investigation information, method statements etc.
- Contractor to develop a Method Statement for the works to be carried out in each of the PSRA areas cognisant of the required mitigating measures.
- Mitigations to be implemented at construction stage shall include but are not limited to:
    - Measures to maintain hydrology of area as far as possible (refer to Chapter 9 of the EIAR).
    - Limiting heights of stockpiling of materials.
    - Excavated material to be removed to designated deposition areas.
    - Stepping or battering back of excavations to a safe angle (as determined through a detailed slope stability assessment by a competent temporary works designer) or construction of a temporary sheet pile wall or rock fill berm to support the peat during construction.
    - Implementation of monitoring regime for peat movement.
    - Frequent monitoring and inspection during construction and operation of floating roads.
    - Provision and management of a robust drainage system.

    - Site-specific temporary works design by competent temporary works designer.
    - If required, carry out additional site investigations inclusive of in situ testing and laboratory testing in specific risk areas on the site.
- Client's Geotechnical Engineer/Site Geotechnical Supervisor to approve the method statement.
- Contractor to provide toolbox talks and on-site supervision prior to and during the works.
- Daily sign off by supervising staff on completed works.
- Implementation of emergency plan and unforeseen event plan by the contractor.

7.3. Operation and Maintenance Phase:

The following outlines an overview of the tasks for the operation and maintenance phase:

- Communication of residual peat risk to appropriate site operatives.
- Ongoing monitoring of residual risks and maintenance if required. Such items would consist of regular inspection of drains and culverts to prevent blockages and inspections of specific areas such as settlement ponds, peat deposition areas, and floated access roads after a significant rainfall event.

8. Summary and Conclusions

Ciaran Reilly & Associates was instructed by TOBIN on behalf of RWE Renewables Ireland Ltd. (hereinafter referred to as "RWE") to carry out a planning stage peat stability risk assessment (PSRA) as part of the environmental impact assessment for the proposed Ballincor Wind Farm site. RWE wish to apply to An Coimisiún Pleanála for planning permission to develop a wind farm in the townlands of Clonfree, Castletown, Cronekill in County Tipperary and Cloonaheen, Ballincor Demesne, and Curralanty in County Offaly. The proposed development is located 5 km south of Birr and 9 km north of Shinrone. The assessment includes an assessment of BESS/Substation, turbines and all onsite infrastructure.

The PSRA was carried out in accordance with Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments – Second edition (Scottish Government, 2017). The report sets out the methodology used to assess the peat stability risk, the activities undertaken, and the results of the peat stability assessment. The report should be read along with Chapter 8, the Land, Soils and Geology chapter, of the overall Environmental Impact Assessment Report (EIAR) and its appendices.

Following application of mitigation measures (consideration to the siting of infrastructure to minimise the risk, site-specific temporary works designs for areas of deeper peat, and common-place mitigation measures such are careful detailed design and construction supervision for the other areas of the site), the findings of the planning stage PSRA indicate a "negligible" hazard ranking for instability related to the

requirement for excavations on the site. Routine and common place mitigation measures will be put in place during the detailed design, construction, operation, and decommissioning of the scheme to reduce the likelihood of a failure. Required mitigation measures include stepping or battering back of excavations to a safe angle (as determined through a slope stability assessment by a competent temporary works designer) or construction of a temporary sheet pile wall or rock fill berm to support the peat during construction or decommissioning. It is concluded that the site is suitable for the proposed development.

Deterministic stability assessments indicate that the materials are considered to be stable in the short (undrained) and long (drained) term, including under the influence of extreme weather events, hence justifying the *"negligible"* hazard rankings assigned.

Best practice guidance regarding the management of peat stability must be inherent in the construction phase of the project and further recommendations are provided in the following section.

9. References

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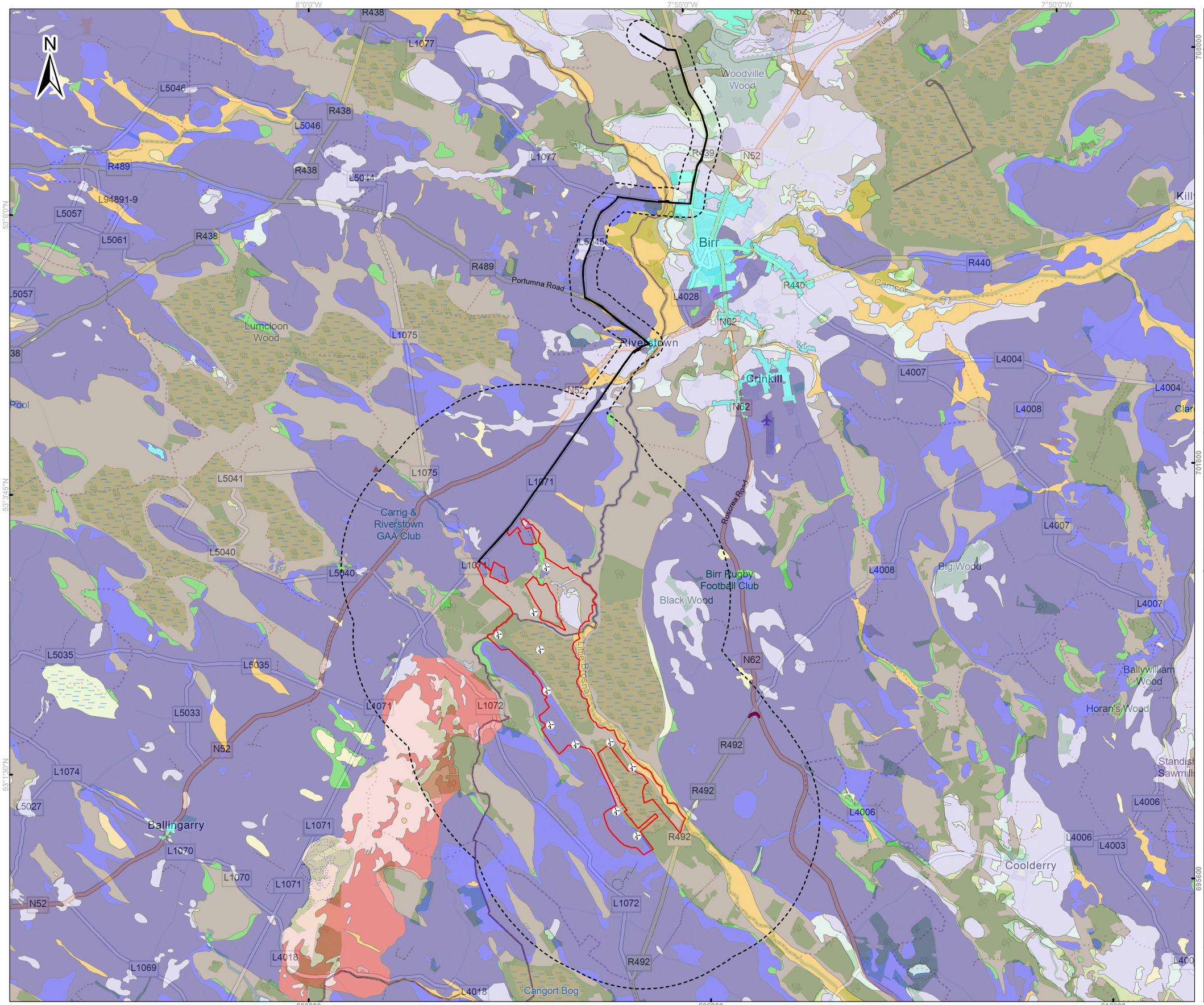
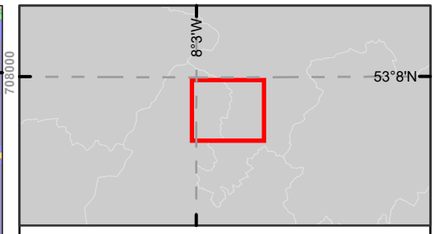
APPENDIX 1: GEOLOGICAL MAPS AND GROUND INVESTIGATION LOCATIONS





Legend

- Wind Farm Site Boundary
- Proposed Turbine locations
- Proposed Grid Connection Route
- TDR Works Areas
- Study Area

Soils

- AlluvMIN - Mineral alluvium
- AlluvMRL - Marl type soils
- AminDW - Acid Brown Earths / Brown Podzolics
- AminPD - Surface water Gleys / Ground water Gleys Acidic
- AminPDPT - Peaty Gleys Acidic
- AminSP - Surface water Gleys / Ground water Gleys Shallow
- AminSRPT - Podzols Peaty
- AminSW - Lithosols / Regosols
- BminDW - Grey Brown Podzolics / Brown Earths Basic
- BminPD - Surface water Gleys / Ground water Gleys Basic
- BminPDPT - Peaty Gleys Basic Parent Materials Basic
- BminSP - Surface water Gleys / Ground water Gleys Shallow
- BminSPPT - Peaty Gleys Shallow
- BminSRPT - Lithosols Peats
- BminSW - Renzinas / Lithosols
- Cut - Raised Bog cutaway/cutover
- FenPT - Fen peat
- Lac
- Made
- Water

0 1 2
Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

Rev	Date	Description	By	Chkd.
D01	20/10/2025	Draft issue	S.P	J.D

Client: RWE

Project:
Ballincor Wind Farm

Title:
Figure 8-2
Soils Map

Scale @ A3: 1:52,000

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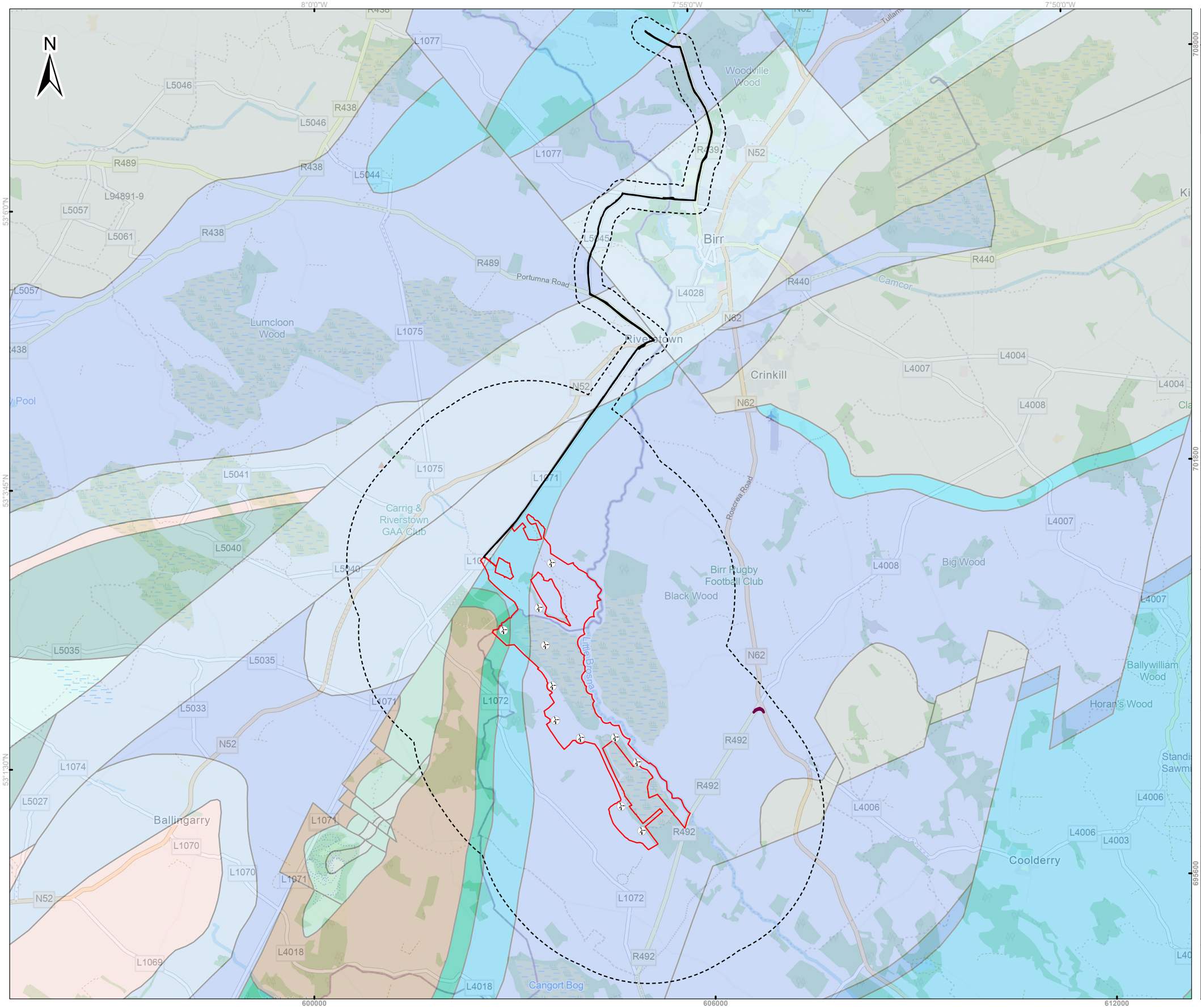
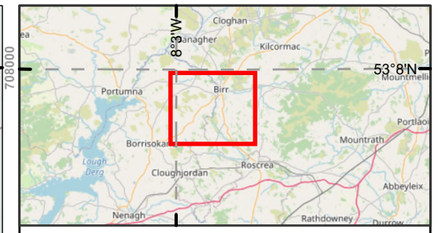
Map Ref: 11333-002-SO-P.App.BO-TOB-D01

Draft: D01





Legend

- Wind Farm Site Bounday
- Proposed Turbine locations
- Proposed Grid Connection Route
- TDR Works Areas
- Study Area

Bedrock Geology

- Ballysteen Formation
- Ballynash Member
- Borrisokane Formation
- Lismaline Micrite Formation
- Lower Limestone Shale
- Lucan Formation
- Oldcourt Cherty Limestone Formation
- Slevoir Formation
- Terryglass Formation
- Visean Limestones (undifferentiated
- Waulsortian Limestones
- Lacka Sandstone Formation
- Fairy Hill Conglomerate Formation
- Knockshigowna Formation

0 1 2
Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

Rev	Date	Description	By	Chkd.
D01	20/10/2025	Draft issue	S.P	J.D

Client: RWE

Project:

Ballincor Wind Farm

Title:

Figure 8-5
Bedrock Geology Map

Scale @ A3: 1:52,000

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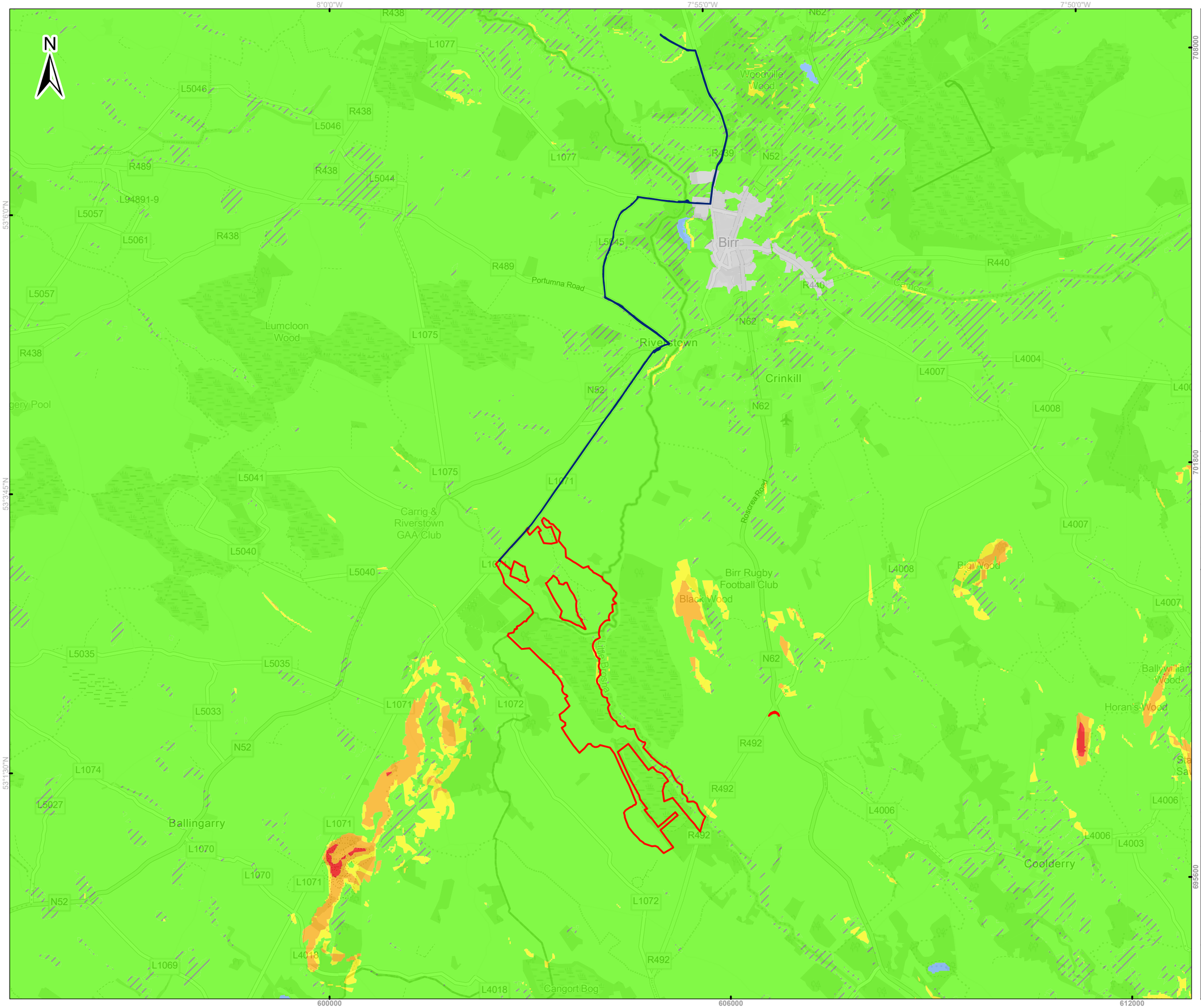
Map Ref: 11333-005-B.GEO-P.App.BO-TOB-D01

Draft: D01



Legend

- Wind Farm Site Boundary
- Proposed Grid Connection Route

Landslide Susceptibility

- Low
- Low (inferred)
- Moderately Low
- Moderately Low (inferred)
- Moderately High
- Moderately High (inferred)
- High
- High (inferred)
- Made
- Water

0 1 2
Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

Rev	Date	Description	By	Chkd.
D01	24/09/2025	Draft issue	K.K	J.D

Client: RWE

Project:
Ballincor Wind Farm

Title:
Figure 8-7:
Landslide susceptibility map

Scale @ A3: 1:52,000

Prepared by:	Checked by:	Date:
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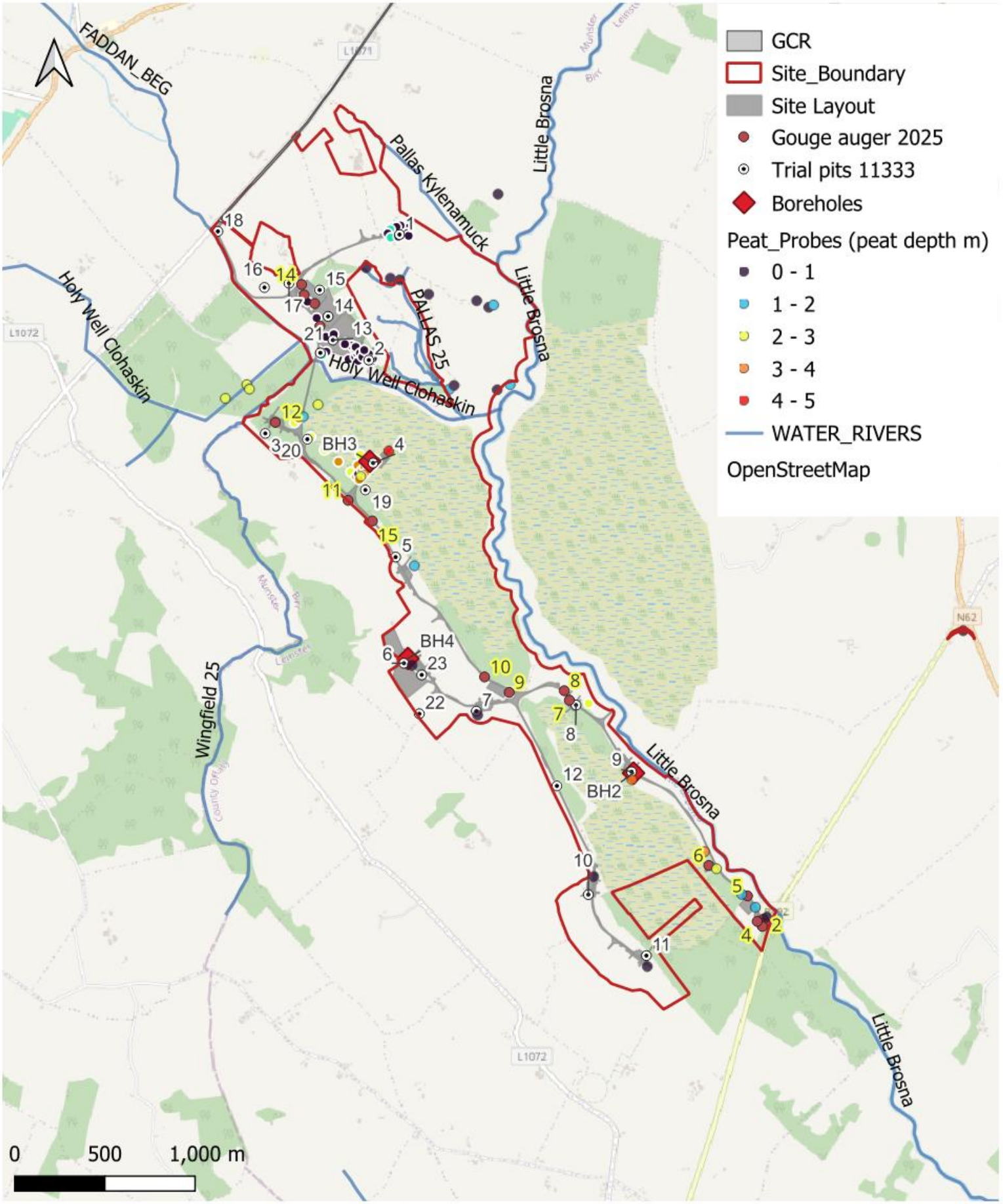
Draft: D01


GCR
Site_Boundary
Site Layout
Gouge auger 2025
Trial pits 11333
Boreholes
Peat_Probes (peat depth m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
WATER_RIVERS
OpenStreetMap
FADDAN_BEG
Pallas Kylenamuck
Little Brosna
Holy Well Clohaskin
PALLAS 25
BH3
BH4
BH2
Wingfield 25
L1072
N62
0
500
1,000 m

APPENDIX 2: PEAT STABILITY CALCULATIONS

Peat stability calculations for proposed Ballincor Wind Farm
Deterministic stability calculcation outputs
Undrained Case 1 and Case 2

Nr	Assessment area	Land use	Relevant GI	Description	$c_{u,fv,avg}$ *kPa*	Vane correction	$c_{u,k}$ *kPa*	$c_{u,d}$ *kPa*	Peat depth *m*	Slope *deg*	Surcharge *m*	Design surcharge *m*	Unit weight *kN/m³*	Case 1 *ODF*	Case 2 *ODF*
1	Turbine 1	Grazing land	TP01	Topsoil over soft to stiff CLAY, GRAVEL	-	0.5	-	-	0	1.8	-	-	-	-	-
2	Turbine 2	Rough grazing/peatland	TP02	0.45m soft PEAT	-	0.5	10.0	7.1	0.5	0.4	1	1.3	10	230.5	64.0
3	Turbine 3	Forestry (cutover peat)	TP03, TP20, GA12, CRA vanes, TOBIN probes	0.7m PEAT in TP & GA, >2.1m in probes	47	0.5	10.0	7.1	2.1	0.3	1	1.3	10	73.1	45.2
4	Turbine 4	Peatland	BH03. TP04. TP19, CRA vanes, TOBIN probes	4.2m PEAT from probes, vanes, TP4, 5.3m very soft in BH03	32	0.5	10.0	7.1	5.3	3.5	1	1.3	10	2.2	1.8
5	Turbine 5	Grazing land	TP05, TOBIN probes	1.2m PEAT in probes, 0m in TP05	-	0.5	10.0	7.1	1.2	2.6	1	1.3	10	13.1	6.3
6	Turbine 6	Arable land	BH04, TP06, TP23, TOBIN probes	Topsoil over firm CLAY, SAND	-	0.5	-	-	0	2.3	-	-	-	-	-
7	Turbine 7	Arable land	TP07, TOBIN probes	Topsoil over firm CLAY, SAND	-	0.5	-	-	0	3.4	-	-	-	-	-
8	Turbine 8	Peatland	TP08, GA07, GA08, CRA vanes	3.2m PEAT in GA08, 3.1m peaty SILT in TP08	27	0.5	10.0	7.1	3.2	0.6	1	1.3	10	20.2	14.3
9	Turbine 9	Peatland	BH02, TP09, TOBIN probes, CRA vanes	3.2m PEAT in probes, >3.7m peaty SILT in TP09, 12m very soft material in BH02.	22	0.5	10.0	7.1	12.8	0.9	1	1.3	10	3.8	3.4
10	Turbine 10	Arable land	TP10, TOBIN probes	Topsoil over med dense SAND	-	0.5	-	-	0	3.2	-	-	-	-	-
11	Turbine 11	Arable land	TP11, TOBIN probes	Topsoil over soft to stiff CLAY	-	0.5	-	-	0	3.2	-	-	-	-	-
12	110kV substation	Rough grazing/peatland	TP15, GA13, GA14, GA16	0.85m PEAT over soft to firm CLAY, GRAVEL, SAND	-	0.5	10.0	7.1	0.85	1.2	1	1.3	10	38.6	15.3
13	BESS	Rough grazing/peatland	TP14, TP15, GA16	0.85m PEAT over soft to firm CLAY, GRAVEL, SAND	-	0.5	10.0	7.1	0.85	0.7	1	1.3	10	70.1	27.7
14	Deposition area A	Rough grazing/peatland	TP14, GA17, TP02	0.45m PEAT/Topsoil over soft to firm CLAY, GRAVEL, SAND		0.5	10.0	7.1	0.45	0.5	1	1.3	10	195.3	50.2
15	Borrow pit A	Rough grazing/peatland	TP14, TP21	Topsoil over soft to firm CLAY, GRAVEL	-	0.5	-	-	0	0.4	-	-	-	-	-
16	Borrow pit B	Arable land	BH04, TP06	Topsoil over firm CLAY, SAND	-	0.5	-	-	0	0.9	-	-	-	-	-
17	Borrow pit C	Arable land	TP06, BH04, TP23, TOBIN probes	Topsoil over firm CLAY, SAND	-	0.5	-	-	0	1.2	-	-	-	-	-

	Case 1	Case 2
Minimum	2.2	1.8
Average	71.9	25.3
Maximum	230.5	64.0

Notes:

Undrained shear strength of peat is limited to 10kPa (characteristic value) or local values if less than 10kPa.
Condition 1 relates to no surcharge loading.
Condition 2 takes account of a surcharge equivalent to fill depth of 1m of peat or typical construction traffic i.e. 10kPa.
Slope inclination (β) based on analysis of LiDAR data.
Peat depths based on desk study, walkover, trial pits, boreholes, and gouge augers at the site.

24/09/2025

Peat stability calculations for proposed Ballincor Wind Farm
Deterministic stability calculcation outputs
Drained Case 1 and Case 2

Nr	Assessment area	Land use	Relevant GI	Description	φ'_k	φ'_d	c'k	c'd	Peat depth	Water level in peat	Slope (deg)	Surcharge	Design surcharge	Unit weight	Case 1	Case 2
					deg	*deg*	*kPa*	*kPa*	*m*	*m*	*deg*	*m*	*m*	*kN/m³*	*ODF*	*ODF*
1	Turbine 1	Grazing land	TP01	Topsoil over soft to stiff CLAY, GRAVEL	28	23.0	4.0	2.9	0	0	1.8	-	-	-	-	-
2	Turbine 2	Rough grazing/peatland	TP02	0.45m soft PEAT	28	23.0	4.0	2.9	0.5	0	0.4	1	1.3	10	160.83	94.24
3	Turbine 3	Forestry (cutover peat)	TP03, TP20, GA12, CRA vanes, TOBIN probes	0.7m PEAT in TP & GA, >2.1m in probes	28	23.0	4.0	2.9	2.1	2.1	0.3	1	1.3	10	30.98	54.09
4	Turbine 4	Peatland	BH03. TP04. TP19, CRA vanes, TOBIN probes	4.2m PEAT from probes, vanes, TP4, 5.3m very soft in BH03	28	23.0	4.0	2.9	5.3	5.3	3.5	1	1.3	10	1.01	2.17
5	Turbine 5	Grazing land	TP05, TOBIN probes	1.2m PEAT in probes, 0m in TP05	28	23.0	4.0	2.9	1.2	1.2	2.6	1	1.3	10	5.41	7.45
6	Turbine 6	Arable land	BH04, TP06, TP23, TOBIN probes	Topsoil over firm CLAY, SAND	28	23.0	4.0	2.9	0	0	2.3	-	-	-	-	-
7	Turbine 7	Arable land	TP07, TOBIN probes	Topsoil over firm CLAY, SAND	28	23.0	4.0	2.9	0	0	3.4	-	-	-	-	-
8	Turbine 8	Peatland	TP08, GA07, GA08, CRA vanes	3.2m PEAT in GA08, 3.1m peaty SILT in TP08	28	23.0	4.0	2.9	3.2	3.2	0.6	1	1.3	10	8.79	17.35
9	Turbine 9	Peatland	BH02, TP09, TOBIN probes, CRA vanes	3.2m PEAT in probes, >3.7m peaty SILT in TP09, 12m very soft material in BH02.	28	23.0	4.0	2.9	6	6	0.9	1	1.3	10	3.74	8.17
10	Turbine 10	Arable land	TP10, TOBIN probes	Topsoil over med dense SAND	28	23.0	4.0	2.9	0	0	3.2	-	-	-	-	-
11	Turbine 11	Arable land	TP11, TOBIN probes	Topsoil over soft to stiff CLAY	28	23.0	4.0	2.9	0	0	3.2	-	-	-	-	-
12	110kV substation	Rough grazing/peatland	TP15, GA13, GA14, GA16	0.85m PEAT over soft to firm CLAY, GRAVEL, SAND	28	23.0	4.0	2.9	0.85	0.85	1.2	1	1.3	10	15.80	18.05
13	BESS	Rough grazing/peatland	TP14, TP15, GA16	0.85m PEAT over soft to firm CLAY, GRAVEL, SAND	28	23.0	4.0	2.9	0.85	0.85	0.7	1	1.3	10	28.70	32.79
14	Deposition area A	Rough grazing/peatland	TP14, GA17, TP02	0.45m PEAT/Topsoil over soft to firm CLAY, GRAVEL, SAND	28	23.0	4.0	2.9	0.45	0.45	0.5	1	1.3	10	79.11	59.22
15	Borrow pit A	Rough grazing/peatland	TP14, TP21	Topsoil over soft to firm CLAY, GRAVEL	28	23.0	4.0	2.9	0	0	0.4	-	-	-	-	-
16	Borrow pit B	Arable land	BH04, TP06	Topsoil over firm CLAY, SAND	28	23.0	4.0	2.9	0	0	0.9	-	-	-	-	-
17	Borrow pit C	Arable land	TP06, BH04, TP23, TOBIN probes	Topsoil over firm CLAY, SAND	28	23.0	4.0	2.9	0	0	1.2	-	-	-	-	-

Minimum	1.01	2.2
Average	37.2	32.6
Maximum	160.8	94.2

Notes:

Characteristic drained shear strength of peat used.

Condition 1 relates to no surcharge loading.

Condition 2 takes account of a surcharge equivalent to fill depth of 1m of peat or typical construction traffic i.e. 10kPa.

Slope inclination (β) based on analysis of LiDAR data.

Peat depths based on desk study, walkover, trial pits, boreholes, and gouge augers at the site.

24/09/2025

APPENDIX 3: PEAT STABILITY RISK REGISTER

PROPOSED BALLINCOR WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 1
Location: Turbine 1

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	Topsoil over soft to stiff CLAY, GRAVEL	1	1	**1**	1	1	**1**
Peat strength (kPa)	-	1	1	**1**	1	1	**1**
Visible surface geology	Topsoil	1	1	**1**	1	1	**1**
Topography							
Elevation (mOD)	45.3 to 51.1	1	1	**1**	1	1	**1**
Slope angle (deg.)	1.8	3	3	**9**	3	3	**9**
Evidence of previous slips	No	2	2	**4**	2	2	**4**
Landslide susceptibility	Low	2	2	**4**	2	2	**4**
Hydrology							
Distance from watercourse	> 100m	2	2	**4**	2	2	**4**
Evidence of surface water flow	No	1	3	**3**	1	3	**3**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	-	1	1	**1**	1	1	**1**
FOS - undrained	-						
Total (pre / post control measures)			**32**			32	
Max possible			**275**			**275**	
Overall hazard assessment (pre / post control measures)			**3**			3	
Overall hazard ranking			**Negligible**			**Negligible**	

Control Measures	
1	No control measures required for peat stability as peat is absent at location.

PROPOSED BALLINCOR WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 2
Location: Turbine 2

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	0.45m soft PEAT	3	3	**9**	2	2	**4**
Peat strength (kPa)	10	4	3	**12**	2	2	**4**
Visible surface geology	Peaty topsoil, cutover peat	3	3	**9**	2	2	**4**
Topography							
Elevation (mOD)	46.1 to 47.4	1	1	**1**	1	1	**1**
Slope angle (deg.)	0.4	2	2	**4**	2	2	**4**
Evidence of previous slips	No	2	2	**4**	1	1	**1**
Landslide susceptibility	Low	2	2	**4**	1	1	**1**
Hydrology							
Distance from watercourse	> 100m	2	2	**4**	1	1	**1**
Evidence of surface water flow	Yes	3	3	**9**	2	3	**6**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	160.8	2	3	**6**	1	2	**2**
FOS - undrained	64.0						
Total (pre / post control measures)				**65**			**31**
Max possible				**275**			**275**
Overall hazard assessment (pre / post control measures)				**6**			**3**
Overall hazard ranking				**Low**			**Negligible**

Control Measures	
1	Develop design stage Peat Stability Risk Assessment.
2	Maintain hydrology of area as far as possible, including adequate sizing of watercourse diversion routes & culverts.
3	Installation of interceptor drains upslope to divert any surface water away from works.
4	Use of experienced geotechnical staff for detailed design & temporary works design.
5	Engage experienced contractors and trained operatives to carry out the work.
6	Inspection regime for access roads during works.

PROPOSED BALLINCOR WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 3
Location: Turbine 3

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	0.7m PEAT in TP & GA, >2.1m in probes	3	4	**12**	2	3	**6**
Peat strength (kPa)	10	4	3	**12**	2	2	**4**
Visible surface geology	Forestry, peat	3	3	**9**	2	2	**4**
Topography							
Elevation (mOD)	45.8 to 46.2	1	1	**1**	1	1	**1**
Slope angle (deg.)	0.3	2	2	**4**	1	1	**1**
Evidence of previous slips	No	2	2	**4**	1	1	**1**
Landslide susceptibility	Low	2	2	**4**	1	1	**1**
Hydrology							
Distance from watercourse	90m	3	3	**9**	1	1	**1**
Evidence of surface water flow	Yes	3	3	**9**	2	3	**6**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	31.0	2	3	**6**	1	2	**2**
FOS - undrained	45.2						
Total (pre / post control measures)				**73**			30
Max possible				**275**			**275**
Overall hazard assessment (pre / post control measures)				**7**			3
Overall hazard ranking				**Low**			**Negligible**

Control Measures	
1	Develop design stage Peat Stability Risk Assessment.
2	Maintain hydrology of area as far as possible, including adequate sizing of watercourse diversion routes & culverts.
3	Installation of interceptor drains upslope to divert any surface water away from works.
4	Use of experienced geotechnical staff for detailed design & temporary works design.
5	Engage experienced contractors and trained operatives to carry out the work.
6	Inspection regime for access roads during works.

PROPOSED BALLINCOR WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 4
Location: Turbine 4

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	4.2m PEAT from probes, vanes, TP4, 5.3m very soft in BH03	4	5	**20**	3	4	**12**
Peat strength (kPa)	10	4	3	**12**	2	2	**4**
Visible surface geology	Peatland	3	3	**9**	2	2	**4**
Topography							
Elevation (mOD)	46.4 to 52.7	1	1	**1**	1	1	**1**
Slope angle (deg.)	3.5	5	5	**25**	4	3	**12**
Evidence of previous slips	No	2	2	**4**	1	1	**1**
Landslide susceptibility	Low	2	2	**4**	1	1	**1**
Hydrology							
Distance from watercourse	> 100m	2	2	**4**	1	2	**2**
Evidence of surface water flow	Yes	3	3	**9**	2	2	**4**
Evidence of subsurface flow	No	1	3	**3**	1	2	**2**
Quantative assessment							
FOS - drained	1.0	4	4	**16**	3	3	**9**
FOS - undrained	1.8						
Total (pre / post control measures)				**107**			**52**
Max possible				**275**			**275**
Overall hazard assessment (pre / post control measures)				**10**			**5**
Overall hazard ranking				**Low**			**Negligible**

Control Measures	
1	Develop design stage Peat Stability Risk Assessment.
2	Maintain hydrology of area as far as possible, including adequate sizing of watercourse diversion routes & culverts.
3	Installation of interceptor drains upslope to divert any surface water away from works.
4	Use of experienced geotechnical staff for detailed design & temporary works design.
5	Engage experienced contractors and trained operatives to carry out the work.
6	Inspection regime for access roads during works.
7	Due to size of excavation & likelihood it will be open for a long time, specific temporary works design required including temporary slope stability measures, e.g. rock berm, shallow slope angles, daily inspections, etc.

PROPOSED BALLINCOR WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 5
Location: Turbine 5

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	1.2m PEAT in probes, 0m in TP05	3	2	**6**	2	1	**2**
Peat strength (kPa)	10	4	3	**12**	2	2	**4**
Visible surface geology	Topsoil	2	2	**4**	1	1	**1**
Topography							
Elevation (mOD)	51 to 57.2	2	2	**4**	1	1	**1**
Slope angle (deg.)	2.6	4	2	**8**	3	1	**3**
Evidence of previous slips	No	2	2	**4**	1	1	**1**
Landslide susceptibility	Low	2	2	**4**	1	1	**1**
Hydrology							
Distance from watercourse	> 100m	2	2	**4**	1	2	**2**
Evidence of surface water flow	No	1	1	**1**	1	1	**1**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	5.4	2	2	**4**	1	1	**1**
FOS - undrained	6.3						
Total (pre / post control measures)				**54**			20
Max possible				**275**			**275**
Overall hazard assessment (pre / post control measures)				**5**			2
Overall hazard ranking				**Negligible**			**Negligible**

Control Measures	
1	Develop design stage Peat Stability Risk Assessment.
2	Maintain hydrology of area as far as possible, including adequate sizing of watercourse diversion routes & culverts.
3	Installation of interceptor drains upslope to divert any surface water away from works.
4	Use of experienced geotechnical staff for detailed design & temporary works design.
5	Engage experienced contractors and trained operatives to carry out the work.
6	Inspection regime for access roads during works.

PROPOSED BALLINCOR WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 6
Location: Turbine 6

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	Topsoil over firm CLAY, SAND	1	1	**1**	1	1	**1**
Peat strength (kPa)	-	1	1	**1**	1	1	**1**
Visible surface geology	Topsoil	1	1	**1**	1	1	**1**
Topography							
Elevation (mOD)	58 to 64.4	1	1	**1**	1	1	**1**
Slope angle (deg.)	2.3	4	3	**12**	4	3	**12**
Evidence of previous slips	No	1	1	**1**	1	1	**1**
Landslide susceptibility	Low	1	1	**1**	1	1	**1**
Hydrology							
Distance from watercourse	> 100m	2	2	**4**	2	2	**4**
Evidence of surface water flow	No	1	1	**1**	1	1	**1**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	-	1	1	**1**	1	1	**1**
FOS - undrained	-						
Total (pre / post control measures)				**27**			27
Max possible				**275**			**275**
Overall hazard assessment (pre / post control measures)				**2**			2
Overall hazard ranking				**Negligible**			**Negligible**

Control Measures	
1	No control measures required for peat stability as peat is absent at location.

PROPOSED BALLINCOR WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 7
Location: Turbine 7

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	Topsoil over firm CLAY, SAND	1	1	**1**	1	1	**1**
Peat strength (kPa)	-	1	1	**1**	1	1	**1**
Visible surface geology	Topsoil	1	1	**1**	1	1	**1**
Topography							
Elevation (mOD)	49.1 to 61.6	2	2	**4**	2	2	**4**
Slope angle (deg.)	3.4	5	5	**25**	5	5	**25**
Evidence of previous slips	No	2	2	**4**	2	2	**4**
Landslide susceptibility	Low	2	2	**4**	2	2	**4**
Hydrology							
Distance from watercourse	> 100m	2	2	**4**	2	2	**4**
Evidence of surface water flow	No	1	1	**1**	1	1	**1**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	-	1	1	**1**	1	1	**1**
FOS - undrained	-						
Total (pre / post control measures)				**49**			**49**
Max possible				**275**			**275**
Overall hazard assessment (pre / post control measures)				**4**			**4**
Overall hazard ranking				**Negligible**			**Negligible**

Control Measures	
1	No control measures required for peat stability as peat is absent at location.

PROPOSED BALLINCOR WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 8
Location: Turbine 8

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	3.2m PEAT in GA08, 3.1m peaty SILT in TP08	4	4	**16**	3	3	**9**
Peat strength (kPa)	10	4	3	**12**	2	2	**4**
Visible surface geology	Peatland	3	3	**9**	2	2	**4**
Topography							
Elevation (mOD)	45.4 to 46.7	1	1	**1**	1	1	**1**
Slope angle (deg.)	0.6	2	2	**4**	2	2	**4**
Evidence of previous slips	No	2	2	**4**	1	1	**1**
Landslide susceptibility	Low	2	2	**4**	1	1	**1**
Hydrology							
Distance from watercourse	< 10m	4	5	**20**	3	4	**12**
Evidence of surface water flow	Yes	3	3	**9**	2	3	**6**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	8.8	3	3	**9**	2	2	**4**
FOS - undrained	14.3						
Total (pre / post control measures)				**91**			**49**
Max possible				**275**			**275**
Overall hazard assessment (pre / post control measures)				**8**			**4**
Overall hazard ranking				**Low**			**Negligible**

Control Measures	
1	Develop design stage Peat Stability Risk Assessment.
2	Maintain hydrology of area as far as possible, including adequate sizing of watercourse diversion routes & culverts.
3	Installation of interceptor drains upslope to divert any surface water away from works.
4	Use of experienced geotechnical staff for detailed design & temporary works design.
5	Engage experienced contractors and trained operatives to carry out the work.
6	Inspection regime for access roads during works.
7	Due to size of excavation & likelihood it will be open for a long time, specific temporary works design required including temporary slope stability measures, e.g. rock berm, shallow slope angles, daily inspections, etc.

PROPOSED BALLINCOR WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 9
Location: Turbine 9

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	3.2m PEAT in probes, >3.7m peaty SILT in TP09, 12m very soft material in BH02.	4	5	**20**	3	4	**12**
Peat strength (kPa)	10	4	3	**12**	3	2	**6**
Visible surface geology	Peatland	3	3	**9**	2	2	**4**
Topography							
Elevation (mOD)	45.2 to 47.6	1	1	**1**	1	1	**1**
Slope angle (deg.)	0.9	2	2	**4**	1	1	**1**
Evidence of previous slips	No	2	2	**4**	1	1	**1**
Landslide susceptibility	Low	2	2	**4**	1	1	**1**
Hydrology							
Distance from watercourse	< 10m	4	5	**20**	3	4	**12**
Evidence of surface water flow	Yes	3	4	**12**	2	3	**6**
Evidence of subsurface flow	No	1	3	**3**	1	2	**2**
Quantative assessment							
FOS - drained	3.7	4	4	**16**	2	2	**4**
FOS - undrained	3.4						
Total (pre / post control measures)				**105**			50
Max possible				**275**			**275**
Overall hazard assessment (pre / post control measures)				**10**			**5**
Overall hazard ranking				**Low**			**Negligible**

Control Measures	
1	Develop design stage Peat Stability Risk Assessment.
2	Maintain hydrology of area as far as possible, including adequate sizing of watercourse diversion routes & culverts.
3	Installation of interceptor drains upslope to divert any surface water away from works.
4	Use of experienced geotechnical staff for detailed design & temporary works design.
5	Engage experienced contractors and trained operatives to carry out the work.
6	Inspection regime for access roads during works.
7	Due to size of excavation & likelihood it will be open for a long time, specific temporary works design required including temporary slope stability measures, e.g. rock berm, shallow slope angles, daily inspections, etc.

PROPOSED BALLINCOR WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 10
Location: Turbine 10

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	Topsoil over med dense SAND	1	1	**1**	1	1	**1**
Peat strength (kPa)	-	1	1	**1**	1	1	**1**
Visible surface geology	Topsoil	1	1	**1**	1	1	**1**
Topography							
Elevation (mOD)	49 to 66.6	2	2	**4**	2	2	**4**
Slope angle (deg.)	3.2	5	5	**25**	5	5	**25**
Evidence of previous slips	No	2	2	**4**	2	2	**4**
Landslide susceptibility	Low	2	2	**4**	2	2	**4**
Hydrology							
Distance from watercourse	> 100m	2	2	**4**	2	2	**4**
Evidence of surface water flow	No	1	1	**1**	1	1	**1**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	-	1	1	**1**	1	1	**1**
FOS - undrained	-						
Total (pre / post control measures)			**49**			**49**	
Max possible			**275**			**275**	
Overall hazard assessment (pre / post control measures)			**4**			**4**	
Overall hazard ranking			**Negligible**			**Negligible**	

Control Measures	
1	No control measures required for peat stability as peat is absent at location.

PROPOSED BALLINCOR WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 11
Location: Turbine 11

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	Topsoil over soft to stiff CLAY	2	2	**4**	2	2	**4**
Peat strength (kPa)	-	1	1	**1**	1	1	**1**
Visible surface geology	Topsoil	1	1	**1**	1	1	**1**
Topography							
Elevation (mOD)	49.6 to 56.6	2	2	**4**	2	2	**4**
Slope angle (deg.)	3.2	5	5	**25**	5	5	**25**
Evidence of previous slips	No	2	2	**4**	2	2	**4**
Landslide susceptibility	Low	2	2	**4**	2	2	**4**
Hydrology							
Distance from watercourse	> 100m	2	2	**4**	2	2	**4**
Evidence of surface water flow	No	1	1	**1**	1	1	**1**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	-	1	1	**1**	1	1	**1**
FOS - undrained	-						
Total (pre / post control measures)				**52**			52
Max possible				**275**			**275**
Overall hazard assessment (pre / post control measures)				**5**			5
Overall hazard ranking				**Negligible**			**Negligible**

Control Measures	
1	No control measures required for peat stability as peat is absent at location.

PROPOSED BALLINCOR WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 12
Location: 110kV substation

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	0.85m PEAT over soft to firm CLAY, GRAVEL, SAND	2	2	**4**	1	1	**1**
Peat strength (kPa)	10	4	3	**12**	2	2	**4**
Visible surface geology	Peaty topsoil, cutover peat	3	3	**9**	2	2	**4**
Topography							
Elevation (mOD)	46 to 48.9	1	1	**1**	1	1	**1**
Slope angle (deg.)	1.2	3	2	**6**	2	2	**4**
Evidence of previous slips	No	2	2	**4**	1	1	**1**
Landslide susceptibility	Low	2	2	**4**	1	1	**1**
Hydrology							
Distance from watercourse	< 10m	3	3	**9**	2	2	**4**
Evidence of surface water flow	Yes	3	3	**9**	2	3	**6**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	15.8	2	2	**4**	1	2	**2**
FOS - undrained	15.3						
Total (pre / post control measures)				**65**			**31**
Max possible				**275**			**275**
Overall hazard assessment (pre / post control measures)				**6**			**3**
Overall hazard ranking				**Low**			**Negligible**

Control Measures	
1	Develop design stage Peat Stability Risk Assessment.
2	Maintain hydrology of area as far as possible, including adequate sizing of watercourse diversion routes & culverts.
3	Installation of interceptor drains upslope to divert any surface water away from works.
4	Use of experienced geotechnical staff for detailed design & temporary works design.
5	Engage experienced contractors and trained operatives to carry out the work.
6	Inspection regime for access roads during works.

PROPOSED BALLINCOR WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 13
Location: BESS

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	0.85m PEAT over soft to firm CLAY, GRAVEL, SAND	2	2	**4**	1	1	**1**
Peat strength (kPa)	10	4	3	**12**	2	2	**4**
Visible surface geology	Peaty topsoil, cutover peat	3	3	**9**	2	2	**4**
Topography							
Elevation (mOD)	45.9 to 47.7	1	1	**1**	1	1	**1**
Slope angle (deg.)	0.7	2	2	**4**	2	2	**4**
Evidence of previous slips	No	2	2	**4**	1	1	**1**
Landslide susceptibility	Low	2	2	**4**	1	1	**1**
Hydrology							
Distance from watercourse	< 10m	3	3	**9**	2	2	**4**
Evidence of surface water flow	Yes	3	3	**9**	2	3	**6**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	28.7	1	1	**1**	1	1	**1**
FOS - undrained	27.7						
Total (pre / post control measures)				**60**			30
Max possible				**275**			**275**
Overall hazard assessment (pre / post control measures)				**5**			**3**
Overall hazard ranking				**Low**			**Negligible**

Control Measures	
1	Develop design stage Peat Stability Risk Assessment.
2	Maintain hydrology of area as far as possible, including adequate sizing of watercourse diversion routes & culverts.
3	Installation of interceptor drains upslope to divert any surface water away from works.
4	Use of experienced geotechnical staff for detailed design & temporary works design.
5	Engage experienced contractors and trained operatives to carry out the work.
6	Inspection regime for access roads during works.

PROPOSED BALLINCOR WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 14
Location: Deposition area A

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	0.45m PEAT/Topsoil over soft to firm CLAY, GRAVEL, SAND	2	2	**4**	1	1	**1**
Peat strength (kPa)	10	4	3	**12**	2	2	**4**
Visible surface geology	Peaty topsoil, cutover peat	3	3	**9**	2	2	**4**
Topography							
Elevation (mOD)	46.7 to 47.7	1	1	**1**	1	1	**1**
Slope angle (deg.)	0.5	2	2	**4**	2	2	**4**
Evidence of previous slips	No	2	2	**4**	1	1	**1**
Landslide susceptibility	Low	2	2	**4**	1	1	**1**
Hydrology							
Distance from watercourse	< 10m	3	3	**9**	2	2	**4**
Evidence of surface water flow	Yes	3	3	**9**	2	3	**6**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	79.1	1	1	**1**	1	1	**1**
FOS - undrained	50.2						
Total (pre / post control measures)				**60**			30
Max possible				**275**			**275**
Overall hazard assessment (pre / post control measures)				**5**			**3**
Overall hazard ranking				**Low**			**Negligible**

Control Measures	
1	Develop design stage Peat Stability Risk Assessment.
2	Maintain hydrology of area as far as possible, including adequate sizing of watercourse diversion routes & culverts.
3	Installation of interceptor drains upslope to divert any surface water away from works.
4	Use of experienced geotechnical staff for detailed design & temporary works design.
5	Engage experienced contractors and trained operatives to carry out the work.
6	Inspection regime for access roads during works.
7	Detailed design of deposition areas to limit height to 1m & side slopes to be determined.
8	Inspection regime for deposition areas post works.

PROPOSED BALLINCOR WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 15
Location: Borrow pit A

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	Topsoil over soft to firm CLAY, GRAVEL	1	1	**1**	1	1	**1**
Peat strength (kPa)	-	1	1	**1**	1	1	**1**
Visible surface geology	Topsoil	1	1	**1**	1	1	**1**
Topography							
Elevation (mOD)	46.6 to 47.7	1	1	**1**	1	1	**1**
Slope angle (deg.)	0.4	2	2	**4**	2	2	**4**
Evidence of previous slips	No	2	2	**4**	2	2	**4**
Landslide susceptibility	Low	2	2	**4**	2	2	**4**
Hydrology							
Distance from watercourse	75m	3	2	**6**	3	2	**6**
Evidence of surface water flow	No	1	1	**1**	1	1	**1**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	-	1	1	**1**	1	1	**1**
FOS - undrained	-						
Total (pre / post control measures)				**27**			**27**
Max possible				**275**			**275**
Overall hazard assessment (pre / post control measures)				**2**			**2**
Overall hazard ranking				**Negligible**			**Negligible**

Control Measures	
1	No control measures required for peat stability as peat is absent at location.

PROPOSED BALLINCOR WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 16
Location: Borrow pit B

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	Topsoil over firm CLAY, SAND	1	1	**1**	1	1	**1**
Peat strength (kPa)	-	1	1	**1**	1	1	**1**
Visible surface geology	Topsoil	1	1	**1**	1	1	**1**
Topography							
Elevation (mOD)	61 to 63.8	1	1	**1**	1	1	**1**
Slope angle (deg.)	0.9	2	2	**4**	2	2	**4**
Evidence of previous slips	No	2	2	**4**	2	2	**4**
Landslide susceptibility	Low	2	2	**4**	2	2	**4**
Hydrology							
Distance from watercourse	> 100m	2	2	**4**	2	2	**4**
Evidence of surface water flow	No	1	1	**1**	1	1	**1**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	-	1	1	**1**	1	1	**1**
FOS - undrained	-						
Total (pre / post control measures)				**25**			25
Max possible				**275**			**275**
Overall hazard assessment (pre / post control measures)				**2**			2
Overall hazard ranking				**Negligible**			**Negligible**

Control Measures	
1	No control measures required for peat stability as peat is absent at location.

PROPOSED BALLINCOR WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 17
Location: Borrow pit C

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	Topsoil over firm CLAY, SAND	1	1	**1**	1	1	**1**
Peat strength (kPa)	-	1	1	**1**	1	1	**1**
Visible surface geology	Topsoil	1	1	**1**	1	1	**1**
Topography							
Elevation (mOD)	63.1 to 65.1	1	1	**1**	1	1	**1**
Slope angle (deg.)	1.2	3	3	**9**	3	3	**9**
Evidence of previous slips	No	2	2	**4**	2	2	**4**
Landslide susceptibility	Low	2	2	**4**	2	2	**4**
Hydrology							
Distance from watercourse	> 100m	2	2	**4**	2	2	**4**
Evidence of surface water flow	No	1	1	**1**	1	1	**1**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	-	1	1	**1**	1	1	**1**
FOS - undrained	-						
Total (pre / post control measures)				**30**			30
Max possible				**275**			**275**
Overall hazard assessment (pre / post control measures)				**3**			3
Overall hazard ranking				**Negligible**			**Negligible**

Control Measures	
1	No control measures required for peat stability as peat is absent at location.