8. LAND, SOILS AND GEOLOGY

8.1 Introduction

This chapter of the EIAR assesses the effects of the proposed project on the land, soils and geological environment. A full description of the proposed project is detailed in Chapter 2 (Description of the Proposed Project). The assessment was undertaken of all infrastructure, including the proposed wind farm site, the proposed grid connection route (GCR) and works areas of the proposed turbine delivery route (TDR). The proposed windfarm includes the BESS, substation, turbines and all wind farm infrastructure. The GCR includes the cable route from the proposed on-site 110 kV substation to Dallow 110 kV substation.

Details of the existing conditions of the proposed project are presented, likely significant effects are assessed, and mitigation measures are proposed where required. Residual and cumulative effects are also assessed.

8.1.1 Statement of Authority

This chapter has been prepared by John Dillon (BSc, MSc, MCIWM, PGeo), an environmental and hydrogeological specialist with over 18 years of experience in geological and hydrogeological assessment for Environmental Impact Assessment (EIA)s. He holds a Master's degree in Environmental Engineering from Imperial College London and is a Chartered Member of the Chartered Institution of Wastes Management (MCIWM) and a Professional Geologist (PGeo). John's expertise includes soils, geology, and water environments, with a focus on soil contamination, groundwater development, and hydrogeological risk assessment. He has contributed to over 30 EIARs across sectors such as infrastructure, extractive industries, renewable energy, and land development.

Marzena Nowakowska (BSc., MSc., PGeo) is a hydrogeologist with 17 years of professional experience in geological and hydrogeological assessment, groundwater monitoring, and environmental consultancy in both Poland and Ireland. Her expertise includes groundwater resource evaluation, land and soil assessment, and the management of agricultural pressures on groundwater quality. She has supported a range of projects through the preparation of technical reports, spatial analysis, and regulatory liaison. Marzena has contributed to national groundwater monitoring programs and has extensive experience authoring Land, Soil, and Geology chapters for EIARs. Marzena contributed to this report and the Spoil and Peat Management Plan (SPMP).

The peat stability report was completed by Ciaran Reilly. He is a chartered geotechnical engineer, holding a PhD in geotechnical engineering from Trinity College Dublin and a BE in civil, structural & environmental engineering from National University of Ireland, Galway. He has strong specialist experience in geotechnical design and a wide range of experience in general civil engineering design and construction management, having worked with consultants, contractors, and clients in the design, checking, construction and project management of a range of geotechnical and civil engineering projects. Ciaran's project experience includes peat stability assessment, site investigation, landfill remediation, bridges, water and wastewater treatment schemes, flood relief schemes, road, rail, and cycleway/greenway infrastructure, reinforced soil, structural repair, offshore structures, and wind farms.

8.2 METHODOLOGY

8.2.1 Impact Assessment Methodology

The baseline environment, including the proposed wind farm site, the proposed grid connection route (GCR) and works areas of the proposed turbine delivery route (TDR) was reviewed through extensive desk studies and field inspections.

The study area for the land, soils and geology assessment is presented in Figure 8-1 below, and has been defined on the basis of a 2 km radius from the proposed wind farm site, as recommended in the Institute of Geologists (IGI) 'Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements' (IGI, 2013). The study area for the works area of the proposed temporary TDR and proposed GCR uses a 200 m buffer, based on the limited works and excavations and best practice. Limited works are required on the proposed TDR, with the majority of these at roundabouts. The TDR works predominantly comprises temporary removal of street furniture and layout of hardcore within the public road corridor. Temporary offroad works for the TDR occur at Sharavogue Cross Roads, located 2 km to the east of the proposed wind farm.

The assessment in this chapter has considered the mitigation that has been embedded into the design to avoid or reduce environmental effects. Embedded mitigation is integral to the project design and therefore the assessment of effects assumes all embedded design measures are in place. Relevant embedded mitigation for this topic is detailed in Section 8.5.1. Embedded measures included in the Construction Environmental Management Plan (CEMP) such as fuel bunding were accounted for as part of this assessment. As part of the proposed project a Spoil and Peat Management Plan will be implemented.

The assessment in this EIAR takes account of the design flexibility parameters (varying turbine dimensions) set out in Chapter 2 (Description of the Proposed Project). The assessment has taken account of the likely significant environmental effects from this defined flexibility. None of the design flexibility options will have a significant effect on land, soils and geology due to the limited variation in turbine types considered i.e. tip height of 179.5 m versus 180 m, hub height of 98.5 m or 105 m.

A peat stability risk assessment (PSRA) has been undertaken for the proposed wind farm site. 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

8.2.2 Legislative and Guidance

8.2.2.1 Relevant Legislation

The methodology adopted for this assessment takes account of the following legislation:

- European Communities (Water Policy) Regulations 2003 [S.I. No. 722/2003];
- Planning and Development Act 2000 as amended;
- Planning and Development Regulations, 2001 (S.I. No. 600 of 2001), as amended;
- Waste Management Act 1996 as amended;
- Circular Economy Act 2022 (S.I. 22 of 2022)
- Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.

8.2.2.2 Relevant Guidance

This chapter was prepared using the following geological specific guidance published including the Institute of Geologists of Ireland (IGI) and Transport Infrastructure Ireland. The nomenclature set out in the EPA 2022 guidance was used to assign significance of effect (EPA, 2022);

- Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA 2008b);
- Department of Communications, Climate Action and Environment (2020). National Waste Management Plan for a circular economy. Ireland's National Waste Policy 2024-2030.
- Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements (IGI 2013);
- Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments - Second Edition (Natural Scotland Scottish Executive, 2017);
- Review of Wind Energy Development Guidelines "Preferred Draft Approach" (Department of Housing, Planning, Community and Local Government, 2019); and
- Scottish Natural Heritage (2013) Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms Commissioned Report No. 591/ SNH, Stirling.

8.2.3 Desk Review

A desk study of the study area, as shown in Figure 8-1, was carried out to gather and review existing information on the receiving environment. The following publicly available data sources and datasets were consulted as part of this review (accessed May 2025):

- Geological Survey Ireland (GSI) datasets, including bedrock geology, quaternary geology, and extractive industry data [1];
- Environmental Protection Agency (EPA) datasets on soils, subsoils, and land cover[2];
- National Parks and Wildlife Service (NPWS) data on designated conservation sites[3];
- GeoHive platform for mapping, topographic, and base imagery data[4];
- Lidar data and other publicly available digital elevation models (DEMs) to support interpretation of topography and geomorphology;[5]

Desk study information collated for the study area is detailed in Section 8.3.

8.2.4 Field Surveys

As part of the assessment of the proposed project, a series of structured field investigations and site walkovers were undertaken to evaluate site conditions, both at the surface and subsurface level. These field activities were informed by desk study findings and designed to validate desktop assumptions, assess geomorphological features, and characterise underlying ground conditions.

A total of five general walkover surveys were conducted across the proposed wind farm site in February 2022, July 2023, November 2023, July 2024, and April 2025. These walkovers were completed to assess topography, surface drainage patterns, site accessibility, and geomorphological characteristics. Observations were used to guide the placement of exploratory locations and further investigative works.

A peat depth assessment was undertaken using handheld peat probes, focusing on areas identified during the desk study as potentially underlain by peat.

Following on from the desk-study and field surveys of the baseline environment, the collated data is utilised to identify and categorise likely significant effects on the land, soils and geological environment as a result of the proposed project.

A ground investigation (GI) of the proposed wind farm site was carried out in April 2024 and April 2025 – See Appendix 8-1. All works were completed using Ground Investigation Ireland (GII) plant and logging was completed by a GII engineering geologist. Works included:

- Completion of 23 trial pits to a maximum depth of 3.9 m below ground level (BGL);
- Completion of three rotary core boreholes to a maximum depth of 18.8 m BGL;
- Geotechnical and environmental laboratory testing of samples taken.

1 Geological Survey Ireland (GSI). Accessed Nov 2025: Available at: https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx
2 Environmental Protection Agency (EPA) Maps and Data. Accessed Nov 2025Nov 2025 Available at: https://gis.epa.ie/EPAMaps/
3 National Parks and Wildlife Service (NPWS) Map Viewer. Accessed Nov 2025 Available at: https://www.npws.ie/maps-and-data
4 GeoHive Public Mapping Platform. Ordnance Survey Ireland. Accessed Nov 2025 Available at: https://www.geohive.ie/
5 Lidar and Digital Elevation Models from Geological Survey Ireland and Ordnance Survey Ireland via GeoHive. Accessed Nov 2025 Available at: https://www.geohive.ie/

The rotary coring boreholes locations are shown on Figure 8-9 and results discussed in Section 8-3. Shear vanes test were carried out at the locations and included in Appendix 8-1. Where excavator access to the turbine location was not possible (due to forestry), the trial pit was excavated at the nearest accessible location and gouge augers were undertaken at the turbine locations to check for the presence of peat. Gouge augers are manually operated stainless-steel corkscrew shaped filling type sampler. Trial pits and gouge augers, as shown in Figure 8-9, were undertaken at the accessible locations that were representative of proposed infrastructure, including the turbines, roads, construction compounds, borrow pits and the substation.

8.2.5 Overview of Impact Assessment Process

The importance/sensitivity of the land, soils and geological receptors was assessed on receptors present within the study areas. Criteria for determining land, soils and geological receptor sensitivity follows Appendix C of the NRA Guidelines (2008), as set out in Table 8-1. Details on the site specific receptors is included in section 8.4. The NRA guidelines are considered best practice for use in the assessment of wind farms.

Table 8-1 : Criteria to Determine the Magnitude of Impact and Examples.

Sensitivity	Criteria	Typical Example sensitive receptor
Very High	Receptor has a high quality, significance or value on a regional or national scale. Degree or extent of soil contamination is significant on a national or regional scale. Volume of peat and / or soft organic soil underlying route is significant on a national or regional scale.	Geological feature rare on a regional or national scale (geological -Natural Heritage Areas (NHA). Large existing quarry or pit. Proven economically extractable mineral resource
High	Receptor has a high quality, significance or value on a local scale. Degree or extent of soil contamination is significant on a local scale. Volume of peat and / or soft organic soil underlying site is significant on a local scale.	Contaminated soil on site with previous heavy industrial usage (i.e., fuel farm). Large recent landfill site for mixed wastes. Geologically feature of high value on a local scale (County Geological Site). Well drained and / or high fertility soils. Moderately sized existing quarry or pit. Marginally economic extractable mineral resource
Medium	Receptor has a medium quality, significance or value on a local scale. Degree or extent of soil contamination is moderate on a local scale. Volume of peat and / or soft organic soil underlying site is moderate on a local scale.	Contaminated soil on site with previous light industrial usage. Small recent landfill site for mixed wastes. Moderately drained and / or moderate fertility soils. Small existing quarry or pit.

Sensitivity	Criteria	Typical Example sensitive receptor
		Sub-economic extractable mineral resource
Low	Receptor has a low quality, significance or value on a local scale. Degree or extent of soil contamination is minor on a local scale. Volume of peat and / or soft organic soil underlying site is small on a local scale.	Large historical and / or recent site for construction and demolition wastes. Small historical and / or recent site for construction and demolition wastes. Poorly drained and / or low fertility soils. Uneconomically extractable mineral resource.

The significance of effects of the proposed project on the land, soils and geological environment has been assessed in accordance with the EPA EIAR Guidelines (2022). These guidelines are detailed in Chapter 1 (Introduction) of this EIAR.

Magnitude of Impacts

The magnitude of any impact considers the likely scale of the predicted change to the baseline conditions, resulting from the predicted impact and considers the duration of the impact i.e., temporary or permanent. The criteria for determining magnitude of impact for the purpose of the land, soils and geology assessment are provided in Table 8-2.

Table 8-2 : Criteria to Determine the Magnitude of Impact and Examples.

Magnitude[6]	Criteria	Typical Example Receptor [7]
High Negative	Results in loss of Receptor	Loss of high proportion of future quarry or pit reserves. Irreversible loss of high proportion of high fertility soils. Removal of entirety of geological heritage feature. Requirement to excavate / remediate entire waste site. Requirement to excavate and replace high proportion of peat, organic soils and/or soft mineral soils, i.e. Active raise bog
Medium Negative	Results in impact on integrity of Receptor or loss of part of Receptor	Loss of moderate proportion of future quarry or pit reserves. Removal of part of geological heritage feature. Irreversible loss of moderate proportion of local high fertility soils. Requirement to excavate / remediate significant proportion of waste site. Requirement to excavate and replace moderate proportion of peat, organic soils and/or soft mineral soils.
Low Negative	Results in minor impact on integrity of Receptor or loss of small part of Receptor	Loss of small proportion of future quarry or pit reserves. Removal of small part of geological heritage feature. Irreversible loss of small proportion of local high fertility soils and/or high proportion of local low fertility soils.

[6] As per EPA EIAR Guidelines (2022)
[7] Adapted from Box 5.1 from the NRAs Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes

Magnitude[6]	Criteria	Typical Example Receptor [7]
		Requirement to excavate / remediate small proportion of waste site. Requirement to excavate and replace small proportion of peat, organic soils and/or soft mineral soils beneath alignment.
Negligible	Results in an impact on Receptor but of insufficient magnitude to affect either use or integrity	No measurable changes in Receptors
Low Beneficial	Results in minor improvement of Receptor quality	Minor enhancement of geological heritage feature Remediation of a small, contaminated site (<1ha)
Medium Beneficial	Results in moderate improvement of Receptor quality	Moderate enhancement of geological heritage feature Remediation of a medium, contaminated site (<2.5ha)
High Beneficial	Results in major improvement of Receptor quality	Major enhancement of geological heritage feature Remediation of a large, contaminated site (>2.5 ha)

Significance of Effect

An assessment matrix is used to determine the significance of an effect, sourced from the EPA EIAR Guidelines (2022) and presented as Table 8-3 below. In basic terms, the likely significance of an effect is a function of the sensitivity of the receptor and the magnitude of the impact as shown in Table 8-3.

The matrix provides levels of significance of effects ranging from Imperceptible to Profound. For the purposes of this assessment, effects rated as being Significant/Moderate or above are considered to be significant in EIA terms – See Table 8-3. Effects rated as being Moderate are subject to professional judgement in terms of significance, with a rationale provided for this in the main assessment. Effects identified as less than moderate significance are not considered to be significant in EIA terms.

Table 8-3 Impact assessment matrix for determination of significance of effect

Sensitivity of Receptor	Magnitude of Effect			
	High Negative/ Beneficial	**Medium Negative/ Beneficial**	**Low Negative/ Beneficial**	**Negligible**
Very High	Profound	Profound/ Significant	Significant/ Moderate	Not Significant
High	Profound/ Significant	Significant/ Moderate	Slight/ Not Significant	Imperceptible
Medium	Significant	Moderate	Slight	Imperceptible
Low	Moderate/ Slight	Slight/ Not Significant	Not Significant	Imperceptible

8.2.6 Consultation

The EIA Scoping and consultation activities were carried out as set out in Chapter 1 (Introduction) and includes a summary of the consultees and responses received (or not received).

As part of the EIA scoping process, an Environmental Scoping Report was prepared and submitted to relevant statutory and non-statutory bodies in March 2024 for review and comment. The Scoping Report was updated with the latest project details and resubmitted to relevant statutory and non-statutory bodies in September 2025 for review and comment. The Environmental Scoping Report was accompanied by a cover email introducing the proposed project and inviting comments or observations within a period of six weeks from the date of the email. A copy of the Scoping Report is provided in Appendix 1-2 of this EIAR.

Consultation with various state agencies and environmental Non-Governmental Organisations (NGO's) was undertaken to inform the EIAR. All project consultation is detailed in Chapter 1 (Introduction). Consultees were informed of updates as the proposed project developed. No significant issues were identified during stakeholder consultation.

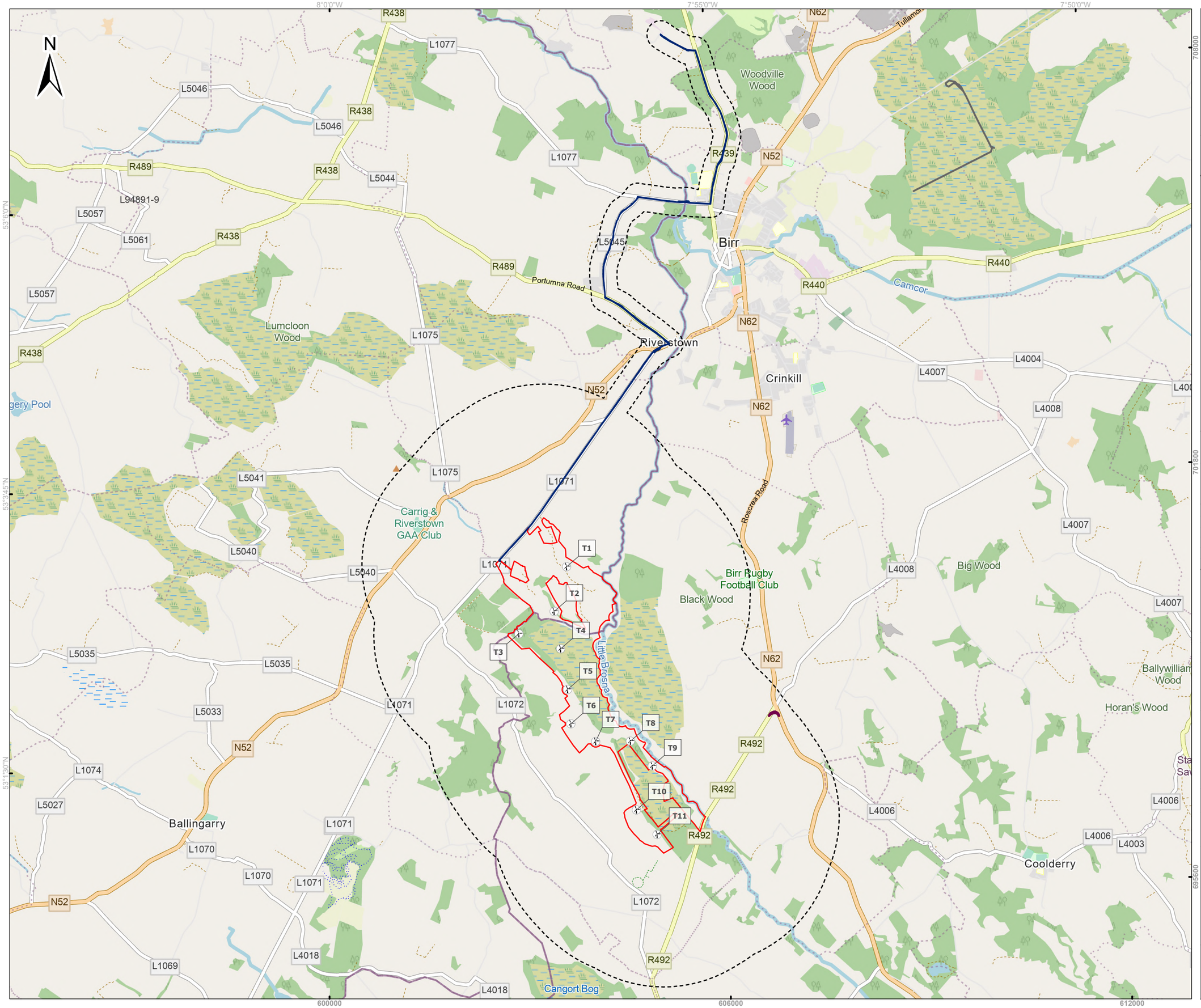
8.2.7 Assumptions and limitations

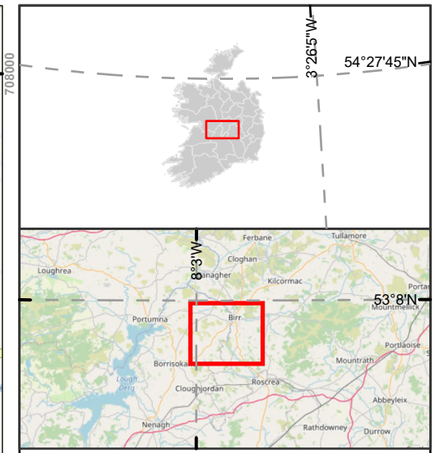
No overarching assumptions or limitations have been identified that apply to the assessment for land, soils and geology. Areas of active peat extraction are located outside of the planning application area. Where direct access was limited due to the presence of afforestation, trial pits were relocated to the nearest suitable locations, with peat probes and augers installed directly at turbine locations. Where routine assumptions have been made in the course of undertaking the assessment, these are noted in the following sections.

8.3 RECEIVING ENVIRONMENT

The existing environment is described in terms of geomorphology (landscape and topography), superficial and solid geology. The wind farm study area is described in Section 8.3.1 and shown in Figure 8-1. Detailed site layout (Drawing 11333-2005) is included with the planning drawings. The regional review of geological conditions covers a 2 km zone from the proposed wind farm site.

The receiving environment includes descriptions of the Land, Soils, underlying subsoils and bedrock geology, areas of geological heritage, areas of economic interest with respect to geological resources, potential for soil contamination. This section also includes a summary of site-specific information obtained during walkover surveys and intrusive investigations undertaken as part of the baseline assessment works. This section describes the conceptual site model (CSM) based on the description of the baseline environment. The CSM summarises source-pathway-receptor (SPR) linkages and flags the risk factors associated with the Proposed Project on land soils and environment. Section 8.4 forms the basis of the CSM for the proposed project, detailing the interactions between the different receptors. Particular emphasis is given to peat which are discussed in section 8.3.1.9 and 8.4.2 of this chapter.





Legend

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

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 8-1
Site location and study area

Scale @ A3: 1:52,000

Prepared by:	Checked by:	Date:
S.Pezzetta	J.Dillon	October 2025

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

Map Ref: 11333-001-P.App.BO-St.A-TOB-D01

Draft: D01

8.3.1 Desk Study

8.3.1.1 Site Topography and Geomorphology

The topography of the proposed windfarm site comprises mostly cutover bog, wet grassland, mixed broadleaved woodland, coniferous woodland and scrub. General elevation in the area ranges from 45 m AOD (Above Ordinance Datum) to 60 m AOD.

Low-lying area of bog is located one to the east and one to the west of the proposed wind farm either side of elevated ridge. The area to the south of the proposed wind farm can be described as having a drumlin and ribbed moraine topography which is shown by the rolling hills dominating the landscape.

The area to the east of the proposed wind farm can be classified as having rolling to gently undulating hills comprising glacial sediments. The eastern boundary of the proposed wind farm is marked by the north westerly flowing Little Brosna River.

Localised anthropogenic changes to the topography in the form of areas of shallow excavation are also present due to the historic turf cutting in the area as well as farming and forestry drainage. Plate 8-1 (Near T4) and Plate 8-2 (Near T5) below shows an example of the general topography of the proposed wind farm site with contours included on the planning drawings.

The proposed GCR remains relatively consistent in elevation between the proposed onsite substation (50 m AOD) and the existing Dallow 110 kV substation (50 m AOD), with elevations along the route ranging from a minimum of 40 m AOD to a maximum of 60 m AOD. The proposed GCR spans approximately 12.23 km, most of which is located within the public road corridor with the remainder being located within private lands. As detailed in Chapter 2 (Description of the Proposed Project), it is proposed that the turbine components will be delivered to the proposed wind farm via Foynes port in County Limerick as shown in Figure 2-3. TDR works are required at 15 locations to allow delivery of the turbine components to the proposed wind farm site. The proposed works along this route are minor in nature and limited to a few localised

Plate 8-1: Topography of Ballincor near T4

places, most of which are previously disturbed ground (e.g. within roundabouts, at the edge of road surfaces and within tilled fields). Additional works are required one location at Sharavogue Cross roads as detailed in Chapter 2 and Appendix 2-1. The proposed temporary works for the TDR at Sharavogue Cross roads are located at an elevation of 90 m AOD, 2 km north east of the proposed wind farm site entrance.

Plate 8-2: Aerial view west to T6 with Skehanagh and Carrig (Lacka) wind farm in the background.

8.3.1.2 Land-Use

The proposed wind farm site measures 355 ha and comprises predominantly improved grassland with cutover bog, grassland, mixed broadleaved woodland, and coniferous forest. The entirety of this site comprises private owned lands. There are a number of existing internal access tracks across the proposed wind farm site to facilitate access to farmlands. Turbary is undertaken on the wind farm site due to the presence of a number of existing turbary rights to the north and south of T4. Due to the proposed wind farm, turbary extraction will no longer take place on six turbary plots at T4. Peat extraction is undertaken outside of the wind farm boundary (southwest of T9), however the proposed wind farm has avoided these areas. The BESS and substation site comprise of improved agricultral lands.

The proposed GCR is 12.23 km and primarily within local roads with short sections through forestry and agricultural lands. The final 0.5 km section of the grid connection route will mainly run in the private farmland to the east side of the L-70152 local road that leads to the existing Dallow 110 kV substation.

The proposed works area for the TDR runs along the national road network until it gets close to the proposed wind farm, when it turns onto the local road network. The majority of works required for this are located within the public road corridor. A short temporary off road section is proposed at Sharavogue Cross roads.

8.3.1.3 Soils and subsoils

Reference to the Teagasc Soils Data maps (www.epa.ie) indicates that the proposed wind farm site is predominantly covered by well drained soils and cutover peat. The soils present at the proposed wind farm site and study area are listed below and their distribution shown in Figure 8-2. Soils on the proposed wind farm site comprise of:

- Cut – Cutover/Cutaway Peat
- BminDW – Deep Well Drained Mineral (Mainly Basic)
- BminSW - Shallow well drained mineral (Mainly basic)
- BminPD – Poorly Drained Mineral (Mainly Basic)
- BminPDPT – Peaty Poorly Drained Mineral (Mainly Basic)
- BminSRPT- Predominantly shallow soils derived from calcareous rock or gravels with/without peaty surface horizon
- BminSP- Shallow poorly drained mineral (Mainly basic)
- AlluvMIN – Mineral Alluvium

The eastern boundary, delineated by the Little Brosna River, comprises fertile alluvial soils formed from clay, silt, and sand deposits along the river's floodplain. Additionally, a section in the northeast of the proposed wind farm, approximately 0.4 km east of Turbine 2, comprises glaciofluvial sands and gravels and esker sands and gravels. The BESS and substation are underlain by peaty podzols and shallow brown earths.

General information concerning the Quaternary geology was obtained from GSI online maps and database, which contain subsoil information from the Teagasc/EPA soil and subsoil mapping project. Subsoils are a layer or horizon which immediately underlie the surface soil. Subsoil present within the proposed wind farm site are shown in Figure 8-4.

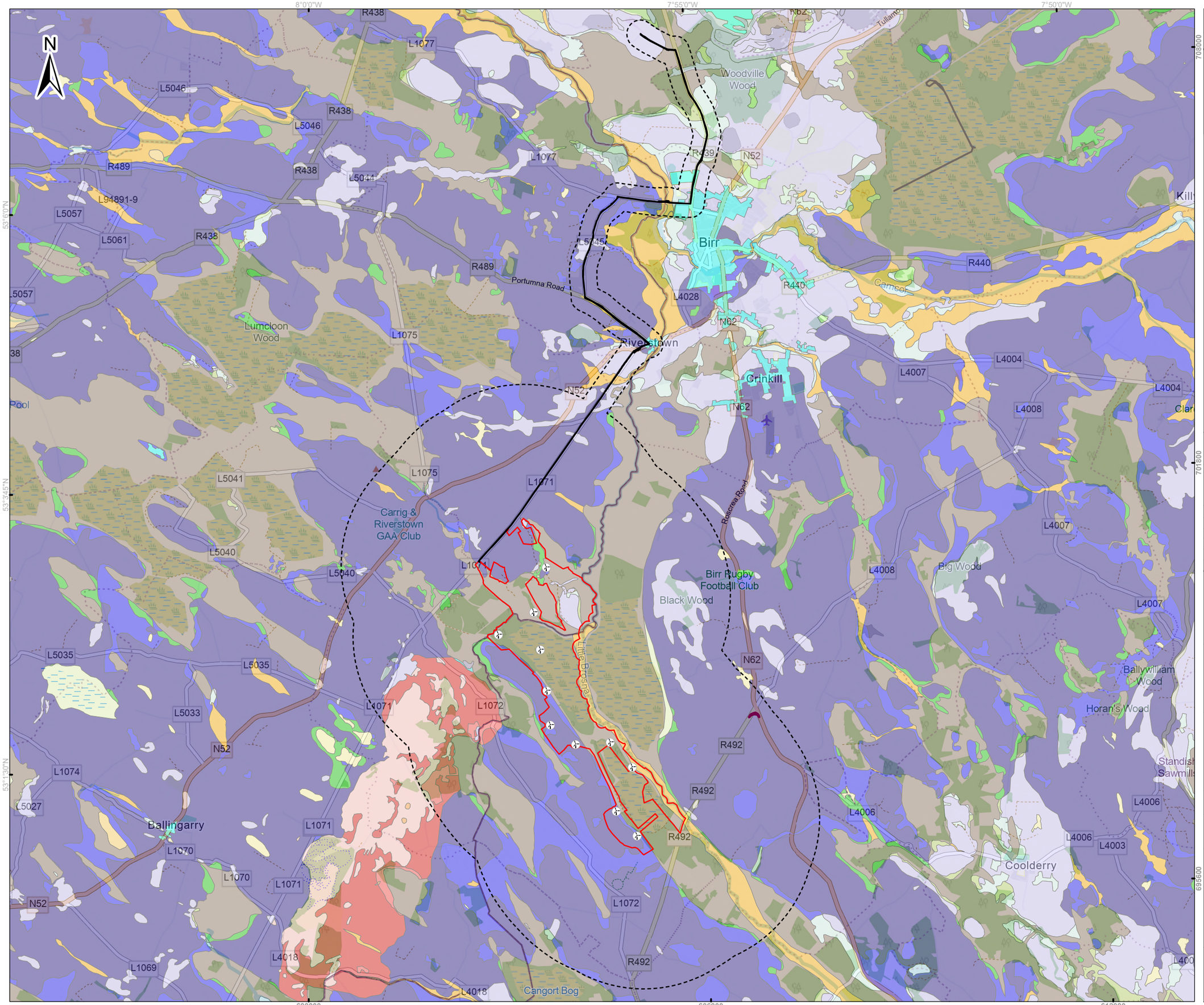
The following subsoils are present within the proposed windfarm site:

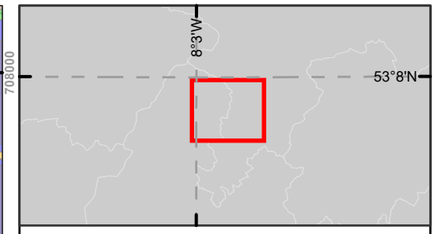
- Cut – Cutover Raised Peat
- TLs – Till derived from Limestones
- A – Alluvium
- GLs- Gravels derived from Limestones
- BasEsk-Eskers comprised of gravels of basic reaction

Given the influence of glacial deposition on the landscape around the proposed wind farm site, the subsoils are relatively consistent with the Teagasc soils. The Quaternary deposits comprise cutover raised peat covering majority of the wind farm site, till derived from limestones along the western boundary and to the north of the proposed wind farm, alluvial soils along the Little Brosna River at the eastern boundary, together with a pocked of Gravels derived from limestone and Esker ands and gravels in the northeast of the proposed wind farm . The peat has developed on glacial soils since the last glaciation. Glacial till refers to the poorly sorted soils deposited by glacial processes, often encountered as boulder clay, which consists of a mixture of gravel, cobbles, and boulders within a clay matrix. The subsoils is illustrated in Figure 8-2.

The subsoils present along the proposed GCR and works area for the TDR are shown on Figure 8-3. The proposed GCR is along local roads (Made Ground). In terms of quaternary sediments,

till derived from limestone underlies a portion of the proposed GCR as per Figure 8-4. There are also areas of gravel derived from limestone and alluvium near the townlands of Croghan and Birr, with the proposed GCR passing through urban areas in Birr. The GCR traverses areas of gravels derived from limestone before reaching the Dallow 110 kV substation. The proposed works area for the TDR comprise of BminDW – Deep Well Drained Mineral (Mainly Basic). The remainder of the TDR is along regional and local road corridors (Made Ground).





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

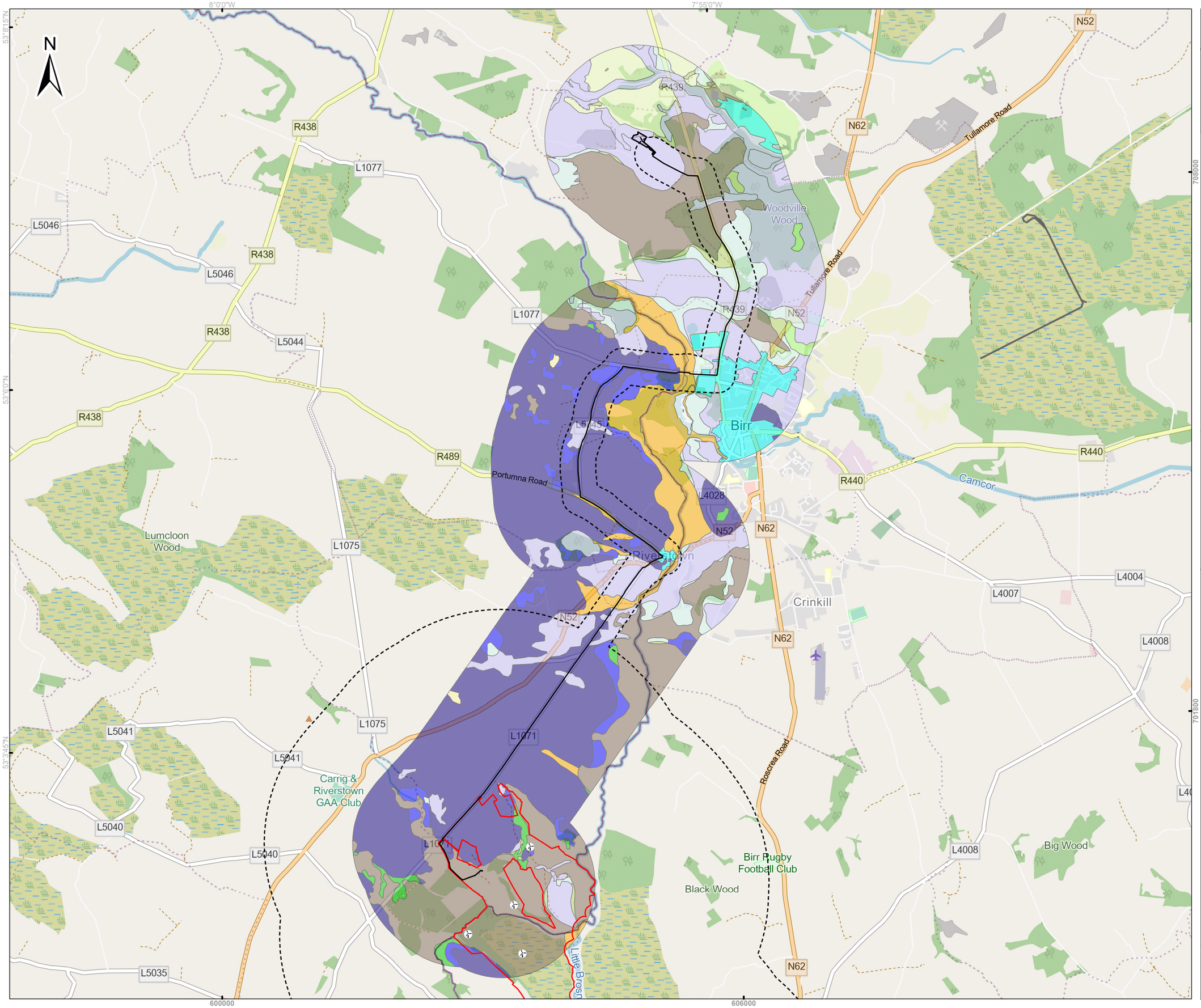
Scale @ A3: 1:52,000

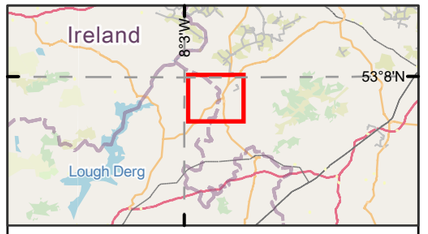
Prepared by:	Checked by:	Date:
S.Pezzetta	J.Dillon	October 2025

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

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

Draft: D01





Legend

- Wind Farm Boundary
- Proposed Turbine locations
- Proposed Grid Connection Route
- Study Area

Soils

- AlluvMIN - Mineral alluvium
- 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.
A	15/04/2026	First issue	S.P	J.D

Client: RWE

Project:
Ballincor Wind Farm

Title:
Figure 8-3
Cable Route Soils Map

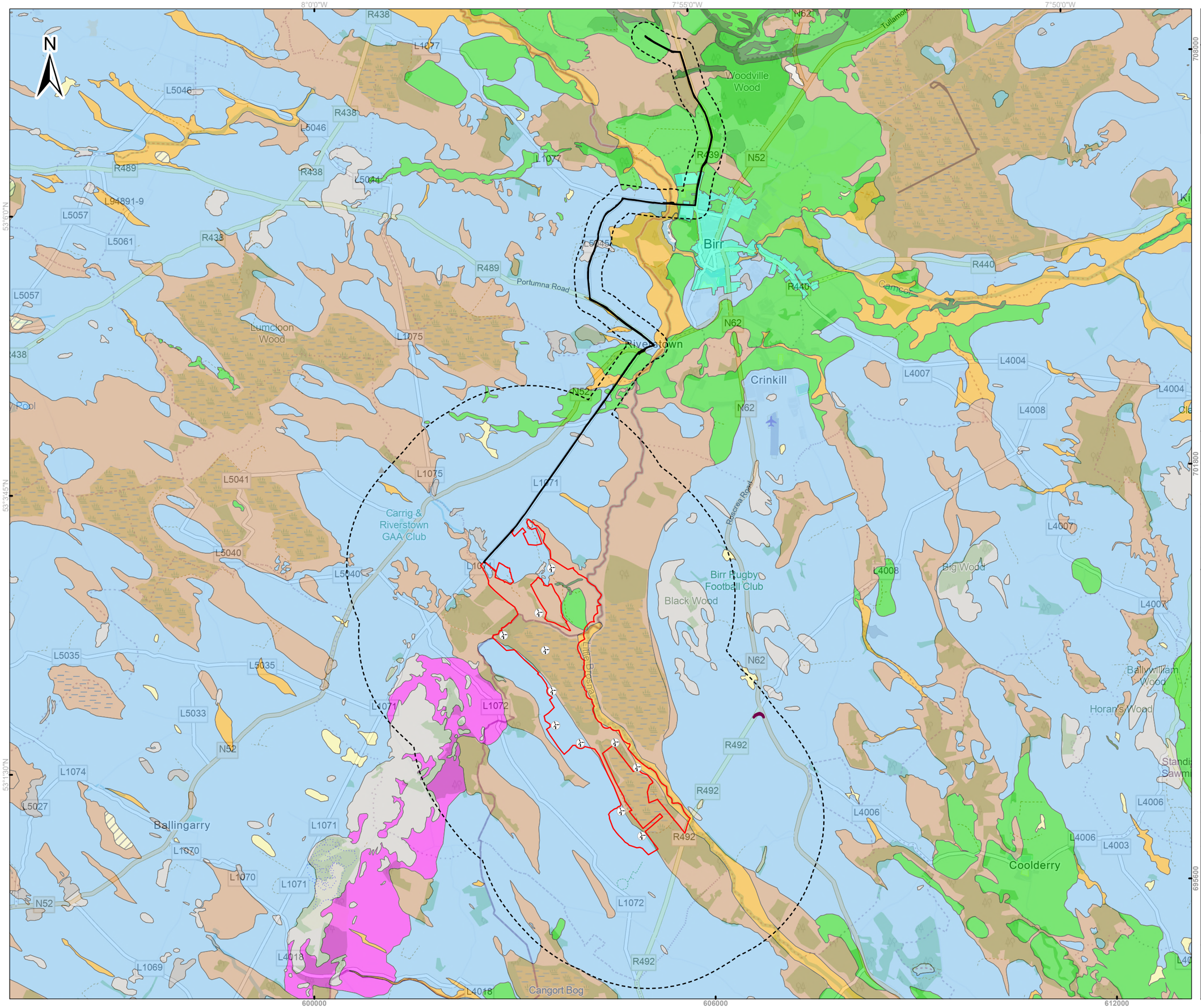
Scale @ A3: 1:40,000

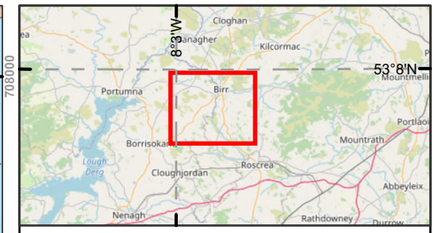
Prepared by:	Checked by:	Date:
S.Pezzetta	J.Dillon	April 2026

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

Map Ref: 11333-003-SO-GCR-TOB-A

Draft: A





Legend

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

Subsoils

- A, Alluvium
- BasEsk, Eskers comprised of gravels of basic reaction
- Cut, Cut over raised peat
- FenPt, Fen Peat
- GLs, Gravels derived from Limestones
- KaRck, Kartsified bedrock outcrop or subcrop
- L, Lacustrine sediments
- Mrl, Lake marl
- Rck, Bedrock outcrop or subcrop
- TLPDSs, Till derived from Lower Palaeozoic and Devonian sandstones
- TLs, Till derived from limestones
- Urban
- 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 8-4
Subsoils Map

Scale @ A3: 1:52,000

Prepared by:	Checked by:	Date:
S.Pezzetta	J.Dillon	October 2025

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

Map Ref: 11333-004-SSO-P.App.BO-TOB-D01

Draft: D01

8.3.1.4 Bedrock Geology

Information on the bedrock geology was obtained from the Geology of Galway-Offaly, Sheet No. 15 (1:100,000)[8], that is now available in the Geological Survey of Ireland (GSI) Web Viewer. The bedrock geology underlying the proposed wind farm site is show below in Figure 8-5.

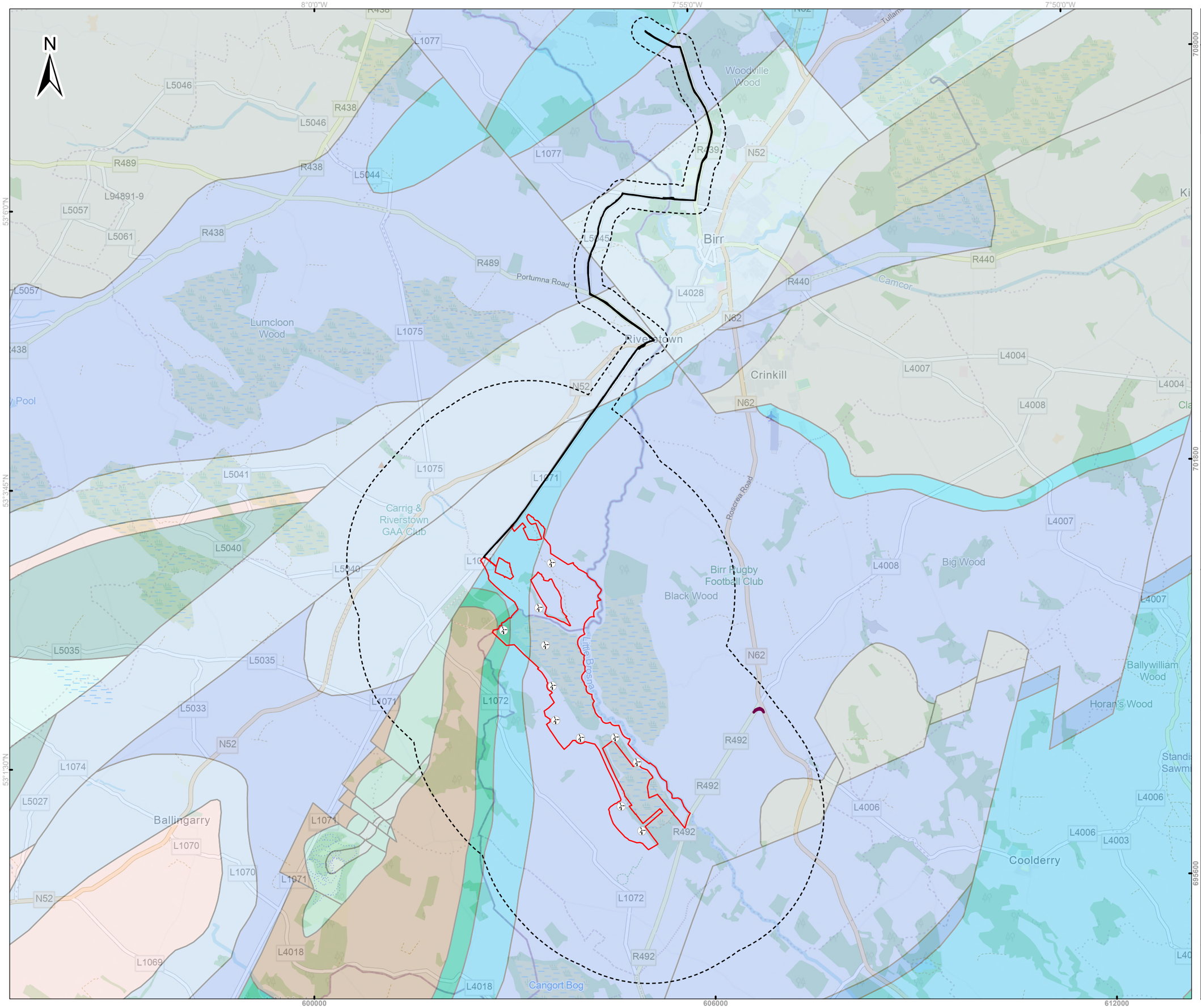
Waulsortian Limestones, described as massive, unbedded lime-mudstones underlie the majority of the proposed wind farm site. A small portion to the north and northwest of the wind farm site is underlain by the Ballysteen Formation, described as dark muddy limestone and shale. The Lower Limestone Shale Formation is also found in the northwest, specifically beneath Turbine 3, described as sandstone, mudstone and thin limestone.

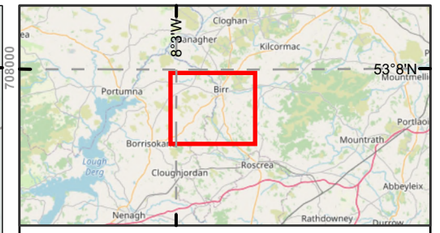
There is one fault plane running through the northern section of the proposed windfarm site oriented in a northeast southwest direction. There are also bedding strikes within the bedrock structure in the northern section of the proposed windfarm, with bedding dip angles of 30 and 75 degrees.

The proposed GCR is underlain by a number of different bedrock types that vary from southwest to northeast as shown in Figure 8-5. These include the Terryglass formation, characterised by grey calcarenitic & oolitic limestone; followed by the Ballysteen Formation, described as dark muddy limestone and shale. The route then re-crosses the Terryglass formation, before crossing briefly into Waulsortian Limestones and subsequently into Visean Limestones (undifferentiated). The proposed GCR then transverses back into the Waulsortian Limestones and concludes in the Ballysteen formation at the Dallow 110 kV Substation. The proposed GCR also crosses a number of fault planes with bedding dip angles ranging from 5 to 20 degrees.

The proposed works area for the TDR at Sharavogue crossroads are underlain by the Waulsortian Limestones.

[8] S. Gatley, I. Somerville, J.H. Morris, A.G. Sleeman & G.Emo (2005) Geology of Galway-Offaly Sheet 15 Book & Map Geological Survey of Ireland.





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

Prepared by:	Checked by:	Date:
S.Pezzetta	J.Dillon	October 2025

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

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

Draft: D01

8.3.1.5 Natural Resources (Mineral/Aggregates)

The GSI database indicates that there are no active quarries, and no mineral locations present within the proposed windfarm site or study area.

The ground investigations at the proposed borrow pit areas comprise of peat probes, trial pits and borehole locations. The trial pit and borehole logs show peat material overlying predominantly sandy GRAVEL material in Borrow Pit 1, and Greyish brown slightly silty subangular to subrounded fine to coarse GRAVEL to Firm brown slightly sandy slightly gravelly CLAY in borrow pit 2 and 3.

There are no active quarries within the area of the proposed GCR or works area for the TDR. A number of inactive sand and gravel pits occur 0.3 km from Dallow 110 kV substation, Co. Offaly.

8.3.1.6 Contaminated Land

An evaluation was undertaken to determine the presence and extent of potentially contaminated land in the study area (using EPA historical data and Section 22 register). This evaluation is based on the identification of potential sources, pathways and receptors. As the proposed wind farm is predominantly covered in peatland with some forestry, the potential for contamination is very low. No evidence of hydrocarbons were encountered during the proposed wind farm investigations works.

A review of the EPA website for existing and historic licenced and illegal waste activities, mines and industries was carried out to identify any potential contamination sources present in the area and to identify any potential contaminating activities near the proposed wind farm. The EPA online maps (www.epa.ie) contain a point dataset of Industrial Emissions Licensing facilities. The EPA is the competent authority for granting and enforcing Industrial Emissions (IE) licences for specified industrial and agriculture activities listed in the First Schedule to the Environmental Protection Agency Act 1992 as amended. There are no waste facility licences within the proposed study area.

The EPA/WFD online water maps contain a points dataset of Integrated Pollution Control (IPC) sites. The EPA has been licensing certain activities since 1994.

Site investigation works across the site did not record any areas of made ground with evidence of contamination, or other records of contamination observations such as odours or visual evidence of staining or hydrocarbon impacts on the proposed windfarm site.

In summary it is considered that there is a low risk of contamination within the site, based on the historical use, and that the expected ground conditions were corroborated by the intrusive investigation.

There are no IE/IPC licenced sites within the proposed windfarm site. The desk study indicated that no illegal waste activities were known within the proposed wind farm site. No on-site evidence of contamination was detected. There are no IPC sites within the proposed windfarm site, along the proposed GCR or at the proposed works area for the TDR.

8.3.1.7 Geohazards

Karst features

The GSI Karst database was consulted for records of locations and types of reported karst features. There are no karst features reported to be located within the proposed windfarm site. Karst surface features were not observed on site walkovers. While karst features have not been encountered within the proposed wind farm site boundary, it is possible that karst features (highly weathered zones) are located below the proposed wind farm site extents which have not been identified due to the thick cover of peat and subsoils.

There are two springs located within the study area of the proposed GCR route. One unnamed spring is located approximately 20m to the east of the GCR, in the townland of Cornhill, Co Tipperary, while the other spring, namely the Toberkeen Birr, is located approximately 130m to the west of the GCR, also in the townland of Cornhill Co. Offaly.

There are no known karst features within the vicinity of the works area for the TDR.

8.3.1.8 Peat and Slope Stability

There are no known peat instability issues within the proposed wind farm site. The GSI's online data base (www.gsi.ie), does not report any historic landslides within the proposed windfarm site or in the study area. Based on the GSI landslide susceptibility mapping[9], the majority of the proposed windfarm site has low landslide susceptibility, with small pockets of moderately low and low (inferred) landslide susceptibility located to the east of the proposed wind farm. All areas of degraded raised bog were avoided. There is no active raised bog on the site.

A peat probe survey was undertaken on the 3rd Nov 2023, 14th July 2024 and 5th April 2025. Findings from the peat probe survey indicates that peat occurs within the low lying areas along the eastern side of the proposed wind farm site. The minimum, maximum and mean peat depth recorded out of 124 peat probe locations were 0.0 m, 4.1 m and 1.2 m respectively. Deeper peat was encountered at T4, T8 and T9, with shallower peat were encountered on the flanks of the mapped peat deposits. Approximately 26% of peat depths recorded as part of the peat probe survey were less than 0.5m.

No peat was encountered at T1, T6, T7, T10 or T11. All peat areas are relatively flat (<1 degree slope) and cutover. Around the proposed substation site, peaty soils varied between 0.2 m and 0.6 m. At T2, peat depths ranged from 0.3 m to 1.2 m. A T3, peat depths from 0.5 m to 3.1 m was encountered. At T4, deep peat was encountered with depths extending to 2.8 m. T5 revealed a peat depth extending to 1.2 m. Peat depths of 2.1 m were recorded at T8, and 3.2 m at T9. A peat depth of 2.6 m was encountered towards the south of the proposed wind farm site within the vicinity of the proposed meteorological mast. Peat depths ranging from 0.8 m to 2.8 m were encountered towards the south of the proposed wind farm site along the proposed internal site roads.

Areas of moderately high landslide susceptibility are located approximately 1.3 km to both the east and west of the proposed wind farm site.

[9] https://www.gsi.ie/ga-ie/programmes-and-projects/geohazards/projects/pages/landslide-susceptibility-mapping.aspx

A peat stability risk assessment (PSRA) has been undertaken for the proposed project. The full report is outlined in Appendix 8.2 with peat depths recorded from site surveys outlined in Figure 8-6. The GSI landslide susceptibility classification is shown on Figure 8-7.

Similarly, there are no reported historical landslides along the proposed GCR or TDR. The GCR primarily crosses areas of low and low (inferred) landslide susceptibility. The northern section of the proposed GCR crosses a minor portion of moderately low landslide susceptibility, located approximately 0.6 km to the southeast of the Dallow 110 kV substation.

The temporary works area for the TDR are located in an area of low landslide susceptibility.

Legend

- Wind Farm Site Boundary
- Proposed Turbine locations
- Site Layout
- Proposed Grid Connection Route

Peat Depth (m)

- < 2.0
- 2.1 - 3.9

0 0.5 1
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 8-6
Peat Depths

Scale @ A3: 1:20,000

Prepared by:	Checked by:	Date:
S.Pezzetta	J.Dillon	October 2025

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

Map Ref: 11333-006-Peat.D-P.App.BO-TOB-D01

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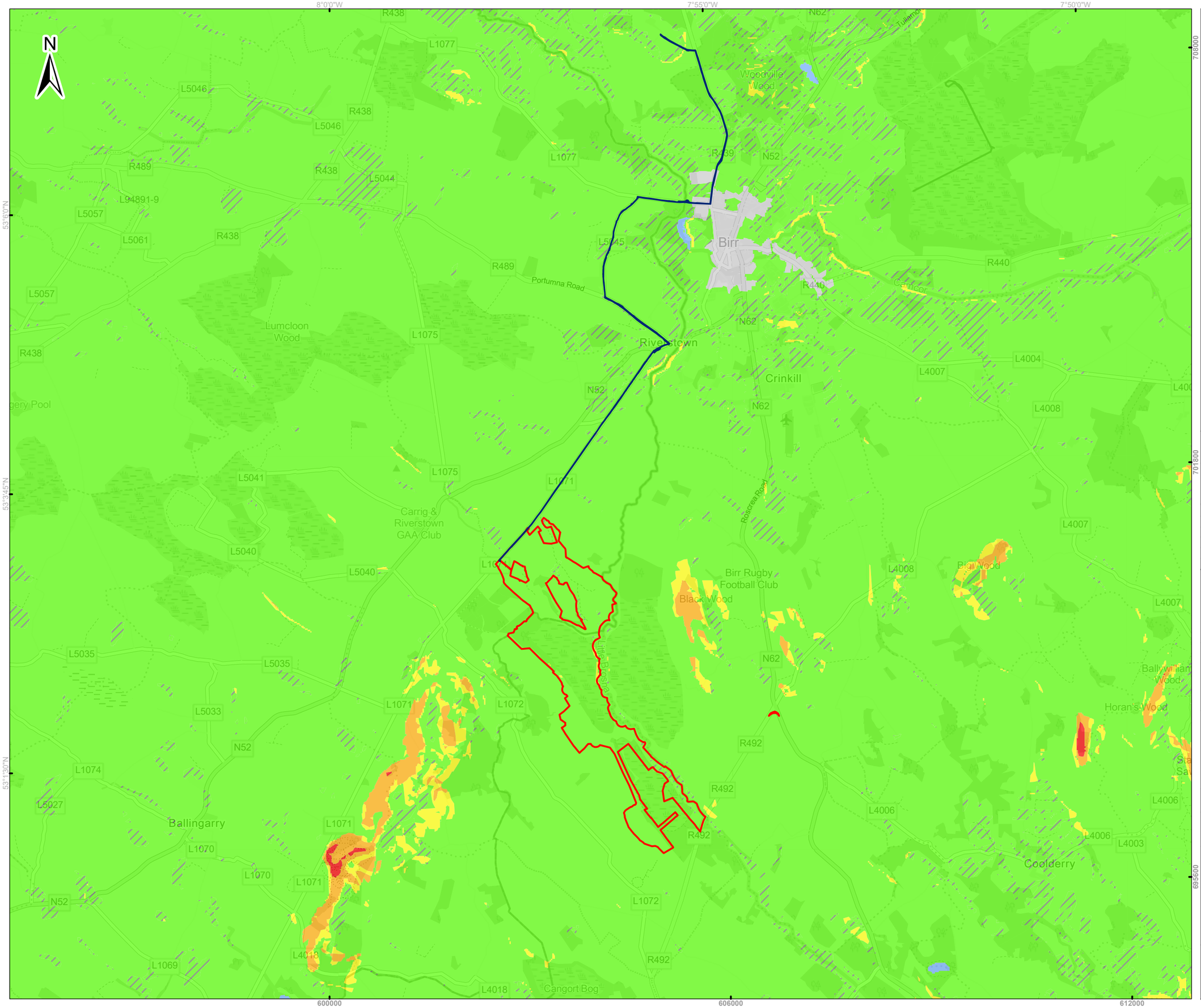


Legend

- 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:
K.Kale	J.Dillon	September 2025

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

Map Ref: 11333-027-LDS.S-P.App.BO-TOB-D01

Draft: D01

8.3.1.9 Geological Heritage

The GSI provides scientific appraisal and interpretative advice on geological and geomorphological sites, and is responsible for the identification of important sites that are capable of being conserved as Natural Heritage Areas (NHA).

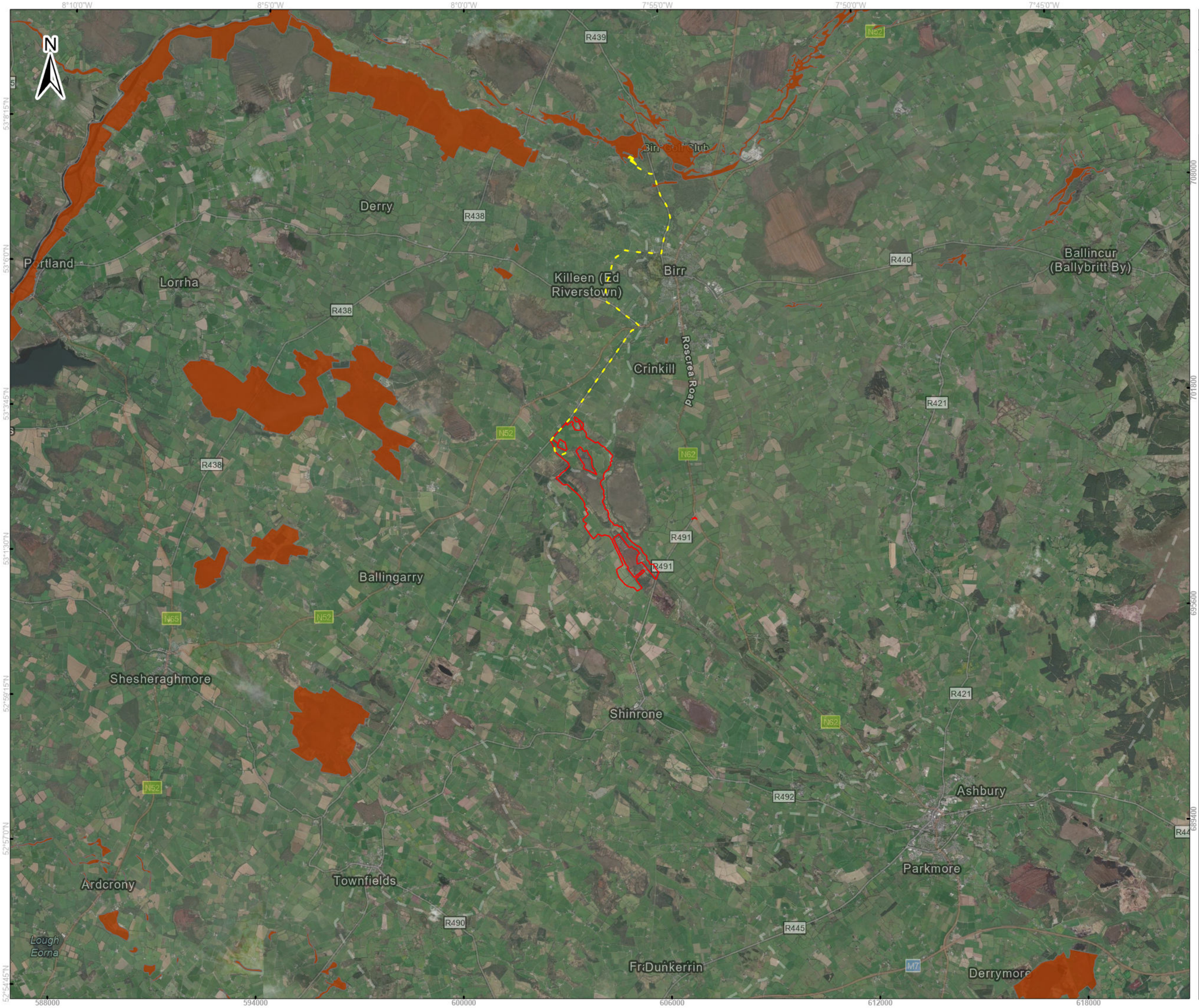
According to the GSI data, there are no Geological Heritage Sites within the proposed 2 km wind farm study area.

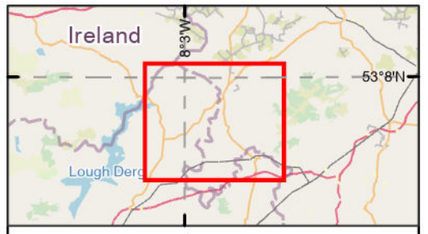
The GCR crosses the Kilcormac Esker, located approximately 1.5km to the southeast of the Dallow 110 kV substation – See Figure 8-8. This esker forms as small part of the much larger Killimor-Birr-Fivealley-Kilcormac Esker System (Kilcormac Esker). This Killimor-Birr-Fivealley-Kilcormac Esker System is a good example of a deglacial, meltwater-deposited complex, deposited under the ice or at the margin. The Kilcormac Esker is also located beneath the northern section of the Dallow 110 kV substation, comprising a large section to the north of the GCR. A site report of the Kilcormac Esker is available on the GSI website [10]. No additional Geological Heritage Sites have been identified in the GCR study area. The proposed GCR is located in the R439 and there is no surface expression of the esker to the east or west of the R439 – See Photo 1.

Photo 1 – Location of Killimor-Birr-Fivealley-Kilcormac Esker System – looking east along R439

There are no Geological Heritage Sites within the study area for the works area for the TDR.

[10] GSI Geological Site report of Kilcormac Esker
https://secure.dccae.gov.ie/GSI_DOWNLOAD/Geoheritage/Reports/OY018_Kilcormac_Esker.pdf





Legend

- Wind Farm Site Boundary
- Proposed Grid Connection Route
- Geological Heritage

0 2 4
Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

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Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community,

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A	19/01/2026	First issue	K.K	J.D

Client: RWE

Project:

Ballincor Wind Farm

Title:

Figure 8-9:
Geological heritage sites

Scale @ A3: 1:100,000

Prepared by:	Checked by:	Date:
K.Kale	J.Dillon	January 2026

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

Map Ref: 11333-043-GEO.H-P.App.BO-TOB-A

Draft: A

8.3.2 Field Surveys

8.3.2.1 Proposed wind farm site

The ground investigation (GI) methodology is described in Section 8.2 above. The GI results are included in Appendix 8-1 and summarised in Table 8-4. The proposed wind farm site investigation locations are shown in Figure 8-9. The proposed wind farm site walkovers confirmed the presence of peat and peaty topsoil of varying depths throughout the proposed windfarm site.

Granular deposits were encountered to the north and west of the proposed wind farm site at BH 02, Trial Pit (TP) 01, TP01A, TP02, TP03, TP05, TP06, TP07, TP10, TP14, TP15, TP16, TP17 TP18, TP21 and TP23 and were typically described as greyish brown clayey sandy subangular to subrounded fine to coarse GRAVEL with cobbles and boulders or greyish brown clayey gravelly fine to coarse SAND – see Figure 8-6 for site investigation locations.

Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling. The procedures used in this GI are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015. Geotechnical testing consisting of moisture content, Atterberg limits, Particle Size Distribution (PSD).

The geotechnical testing carried out on soil samples recovered generally confirm the descriptions on the logs with the primary constituent of the cohesive deposits found to be a CLAY of intermediate plasticity or a SILT of high plasticity. The Particle Size Distribution tests confirm that generally the cohesive deposits are well-graded with percentages of sands and gravels ranging between 27% and 40% generally with fines contents of 30 to 36%.

The Particle Size Distribution tests confirm that generally the granular deposits are well-graded with percentages of sands and silt/clay typically between 6% and 41% with a gravel content of typically 46% to 61%.

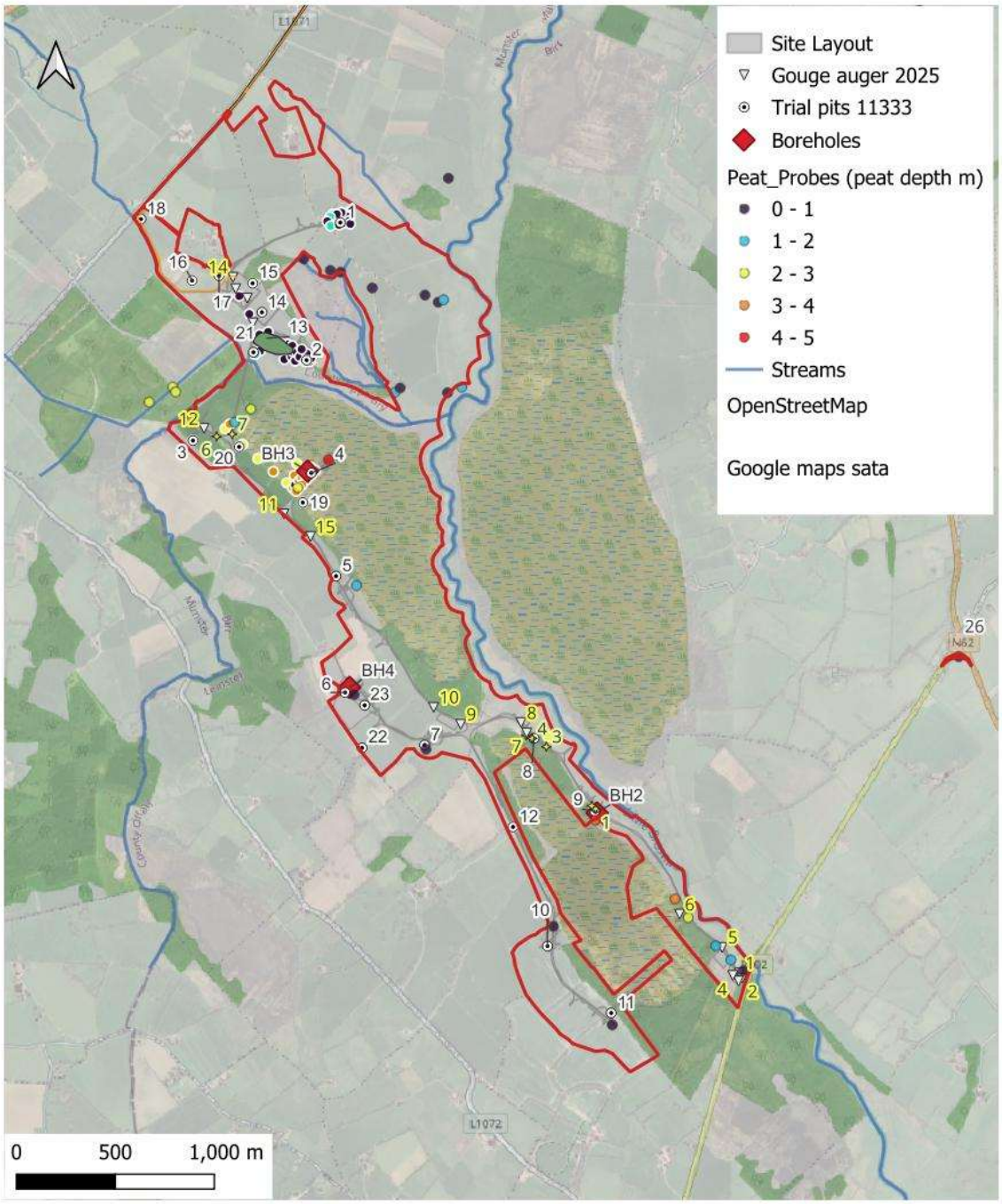

Figure 8-9 Site investigation locations

Table 8-4 Turbine Locations-Soil and subsoil descriptions

Turbine	Topsoil Depth	Description	Subsoil
1	0.20	TOPSOIL: Brown slightly sandy slightly gravelly Clay with rootlets.	Firm to stiff grey slightly sandy slightly gravelly CLAY with medium cobble and boulder content overlying dense grey slightly clayey slightly sandy medium to coarse angular to subangular GRAVEL with medium cobble and boulder content.
2	0.45	Soft black PEAT with low organic content	Firm grey slightly clayey SILT overlying grey slightly clayey sandy subangular to subrounded medium to coarse GRAVEL with low cobble content.
3	0.70	Soft black PEAT with rootlets	Firm grey mottled yellowish brown sandy slightly gravelly CLAY with cobble content overlying grey to brown slightly sandy slightly clayey angular to subangular fine to coarse GRAVEL with medium cobble content.
4	0.20	Soft dark brown organic PEAT with rootlets.	Soft brown highly organic PEAT with rootlets.
5	0.15	TOPSOIL: Brown slightly sandy slightly gravelly Clay with tree roots and rootlets.	Firm brown slightly sandy slightly gravelly CLAY with low cobble and boulder content overlying layers of SAND and GRAVEL with low cobble and boulder content .
6	0.25	TOPSOIL: Brown slightly sandy slightly gravelly Clay with rootlets.	Firm brown slightly sandy slightly gravelly CLAY with low cobble and boulder content overlying a layer of greyish brown slightly clayey slightly gravelly SAND with low cobble and boulder content.
7	0.30	TOPSOIL: Brown slightly sandy slightly gravelly Clay with rootlets.	Firm reddish brown slightly sandy slightly gravelly CLAY with low cobble content. Gravels are subrounded to rounded fine to coarse overlying a layer of greyish brown slightly clayey slightly gravelly SAND with low cobble and boulder content.
8	0.40	Soft black PEAT with rootlets.	Soft brown PEAT overlying soft light grey slightly peaty/sandy SILT.

Turbine	Topsoil Depth	Description	Subsoil
9	1.20	Soft black PEAT with rootlets	Soft brown PEAT overlying light grey to white slightly peaty SILT.
10	0.20	TOPSOIL: Brown slightly sandy slightly gravelly Clay with rootlets.	Medium dense greyish brown mottled orangish brown slightly clayey slightly gravelly SAND with low cobble content.
11	0.50	MADE GROUND: Brown slightly sandy slightly gravelly CLAY with low cobble content. (ploughed land)	Firm greyish brown slightly sandy slightly gravelly CLAY with low angular to subangular cobble content.

The GCR is primarily within the existing local and regional road network. Two off-road Horizontal Directional Drilling (HDD) locations are proposed to avoid a former railway bridge structure at Ballyloughane, Riverstown, County Tipperary and at Little Brosna crossing at Croghan Bridge, Birr on the Tipperary/Offaly county border. Sand and gravel subsoils are encountered at Ballyloughane Bridge and alluvial deposits are present at the HDD crossing at Croghan Bridge.

Limited works are required for the TDR with the exception of the off-road section near Sharavogue Cross Roads. Soils at the off-road section comprise well drained brown earths, underlain by stiff brown slightly gravelly SILT.

8.4 LIKELY SIGNIFICANT EFFECTS

The likely significant effects of the proposed project are discussed and assessed in the following sections. The 'do-nothing' scenario is presented, and likely significant effects are assessed for three stages of the proposed project life cycle; (i.e., construction, operation, and decommissioning) in addition to the cumulative scenario. A Conceptual Site Model (CSM) is a representation of the characteristics of the site. It shows the possible relationships between sources, pathways and receptors. As per the IGI's Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements (IGI, 2013), an initial CSM has been developed to highlight the Source-Pathway-Receptor model for assessing likely significant effects and described below.

8.4.1 Future Baseline

The future baseline situation presents the future baseline of the land, soils and geological environment as if the proposed project did not proceed. Within the proposed wind farm site, agricultural management, turf cutting, forestry management, including thinning, felling, extraction, and replanting, and would be expected to continue in a manner similar to the current activity. Turbary activities are likely to continue however the resource will diminish over time along with the cessation of peat harvesting.

Agricultural and limited forestry management would also be expected to continue as per current practices in the short to medium term.

No likely significant effects are predicted to the land, soils and geology conditions based on a future baseline scenario.

This would result in a slight, long term, negative potential effect to the existing land, soils and geology conditions in the wind farm study area.

There are no likely significant effects to the existing land, soils and geology conditions along the proposed GCR and works area for the works area for the TDR based on a future baseline scenario. Existing activity will be maintained in accordance with current management in the medium to long term on the TDR.

Agricultural activity and forestry management (along the 0.5km off road section of the proposed GCR) will be maintained in accordance with current management in the short to medium term.

8.4.2 Likely Significant Effects – Construction Phase

The direct and indirect effects of the construction activities on land, soils and geology are assessed further in the following sections. This section presents an assessment in the absence of any mitigation measures, with the exception of embedded mitigation that has been incorporated into the design (e.g. avoiding sensitive features through the siting of the proposed turbines during the scoping and initial assessment). Additional mitigation measures (above the embedded design measures) have been proposed in Section 8.5 to mitigate any likely significant effects, and the residual effects after the application of mitigation measures are reported in Section 8.6. Embedded measures included in the Construction Environmental Management Plan (CEMP) such as fuel bunding were accounted for as part of this assessment.

8.4.2.1 Land use

The proposed wind farm site measures 355 ha and comprises predominantly improved grassland with cutover bog, grassland, mixed broadleaved woodland, and coniferous forest. Existing access tracks within the proposed wind farm site boundary will be utilised.

Soils present within the proposed wind farm site and study area will need to be stripped for the construction of turbine foundations. Excavated soils and peat will be used to reinstate borrow pit 2 and 3 or placed within the peat deposition area 1 to provide habitat enhancement. The peaty topsoils will be placed adjacent to the proposed tracks will be restricted flat areas (<1 deg slope) and a depth of 1 m over a 10 m wide corridor on both sides of the proposed tracks. Peat will only be reused in stretches of low longitudinal track gradient and in the deposition areas for habitat enhancement and restoration of the borrow pits. A spoil and peat management plan is included in Appendix 8-3. Due to the land take for the proposed wind farm and change in land use at the wind farm, it is considered that there will be a slight (low sensitive, low magnitude), negative and permanent effect due to soil stripping and reinstatement/landscaping works.

There will be a change in land use associated with the proposed wind farm. A total of 34 ha will be utilised for the construction phase on the proposed wind farm site, with 20 ha utilised for the operational phase.

The land uses in the proposed wind farm site and study area are not economically important on a regional scale and considered to be low sensitivity. The sensitivity of the land use is low and the magnitude is low. Therefore, the effect of the proposed wind farm with regard to land use change, is considered not significant, negative, certain and long-term.

Limited works are required in terms of land use for the GCR. The proposed GCR is predominantly in the existing road corridor. The GCR lands require a small section off road agricultural land for two HDD crossings and parallel to the L-70152 local road to Dallow 110 kV substation. The land use for the proposed GCR is therefore classified as a negligible sensitivity receptor as they are predominantly within the road network. The magnitude of impact is assessed as low negative. Therefore, given the low sensitivity and the low magnitude rating, the effect on land use due to the construction of the GCR is considered not significant, negative, certain, and permanent.

Limited works are required to undertake the works are on the proposed TDR, with the majority of works involving street furniture at roads and roundabouts. Offroad works for the TDR at Sharavogue Cross Roads. Due to the limited and temporary land take for the works areas on the proposed TDR at Sharavogue (changing a small area from agricultural use to transportation temporarily), it is considered that the sensitivity is low and the magnitude is negligible.

Therefore, there will be an imperceptible, negative and temporary effect, due to land use change i.e. soil stripping and reinstatement/landscaping works. There are no likely significant effects due to land use change.

8.4.2.2 Effects on Contaminated Sites/Potential for contamination

An evaluation was undertaken to determine the presence and extent of potentially contaminated land in the proposed study area. No contaminated sites were identified. Pre-mitigation potential effects are neutral.

Wherever there are vehicles and plant in use, there is the potential for hydrocarbon release which may contaminate the soil and subsoil. A spill has the potential to indirectly pollute water, if the soil and subsoil act as a pathway from any source of pollution. A spill of fuel or oil would potentially present a slight, direct, long-term negative effect on the soil and geological environment.

The proposed project will comply with Priority Pathway Action Plans (PPAP) relating to invasive species, soils and spoil. Further details are included in Chapter 6 Biodiversity.

Potential for contamination

Construction machinery and equipment contain various vehicle fluids/ oils and fuels (hydrocarbons) which have the potential to contaminate the proposed wind farm through leaks and/ or spills. The components of the proposed infrastructure (including turbines, roads, substation and construction compounds) will be excavated and moved using excavators, wheeled dumpers, HGVs and bulldozers. Fuel will be required to supply the required machinery and will be stored at the construction compounds. Potential leaks or spills from construction activities within the proposed wind farm have the potential to pollute the soils and geology environment. The sensitivity of the soils and subsoils is medium and the magnitude is low.

Wherever there are vehicles and plant in use for the GCR and works area for the TDR, there is the potential for hydrocarbon release which may contaminate the soil and subsoil. The potential for soil contamination is low on a local scale based on the embedded design. The sensitivity is low and the magnitude is low. A spill of fuel or oil would therefore potentially present a slight/not significant direct, short-term, negative effect on soil and subsoils along the proposed GCR and works area on the proposed TDR route.

Pre-mitigation potential effects are therefore considered to be slight, localised and short term on the potential for contamination of soils and subsoils within the proposed wind farm site and study area. There are no likely significant effects due to contamination.

8.4.2.3 Effects on Mineral/Aggregate Resources

A number of turbary peat banks are located within the proposed wind farm site. Areas of turbary bank (high bank) were avoided as part of the project design. Part of the laydown area for the turbary will not be available during the construction phase at T4. The potential effect is temporary and slight. Peat is present on the proposed wind farm site as detailed in Section 8.3.

The main effect of the proposed project with regard to mineral/aggregate resources is the removal of topsoil and excavation of the borrow pits. Excavated soils will be either reused locally alongside the proposed access roads on site or to reinstate the borrow pits or in the Peat Deposition Area 1 pending re-use off site under Article 27 notifications or transfer to an appropriately licensed facility. A Spoil and Peat Management Plan is included in Appendix 8-3. Table 8-5 below provides a summary of the volumes required for proposed infrastructure.

Table 8-5: Volume Summary

Area	Volume required -compacted m³[11]	Potential site volume excavated (bulked in brackets)
Hardstanding Foundations	37,100	
Turbine Foundations	13,950	
Substation, BESS and Compounds	22,900	
Access Tracks	39,675	
Total volume required	113,625	
Total (potential) volume available from borrow pits 1-3		103,100 (113,400)
Total peat excavated		87,600 (91,950)
Potential peat reuse areas identified (PDA, borrow pit 2, 3) and along access track		143,700

There are no active mineral/aggregate resources on the proposed wind farm study area and therefore low sensitivity. Therefore there is no significant loss of mineral resources. The sensitivity is low and the magnitude is low negative. There is anticipated to be a not significant, negative, certain, permanent effect on mineral and aggregate resources due to the relocation of material within the proposed wind farm.

There are no significant effects anticipated on mineral/aggregate resources along the proposed GCR or the works area for the TDR. There will be some movement of soils, subsoils and stone required for the construction of the proposed GCR and works area on the proposed TDR. The potential extraction of mineral/aggregate resources is very limited and localised and therefore low sensitivity. The sensitivity is low and the magnitude is negligible. Pre-mitigation potential effects on mineral and aggregate resources along the proposed GCR and the works area for the TDR are therefore considered to be imperceptible. There are no likely significant effects on mineral/aggregate resources.

8.4.2.4 Effects on Soil Compaction and Erosion

The sensitivity of the underlying soils to soil compaction and erosion from the construction works is considered as low-moderate on a local scale in the study area. Compaction and or erosion of soils can occur on construction sites. Access tracks/roads will be needed to accommodate the construction works and provide access to turbine locations for the life cycle of the proposed wind farm. The access tracks will be constructed using borrow pit material as

[11] Volume calculations provide an approximate estimation of fill that will be required for foundations. It is estimated as 10,000m³ of compacted material which is equivalent to 11,500 m³ of un-compacted material allowing for bulking during transportation.

subbase and unbound crushed aggregates and they will incorporate drainage to maintain the performance of the pavement during wet weather. Access tracks will be constructed as floating and founded roads. Founded roads are excavated down to and constructed up from a competent geological stratum. The access tracks will be constructed to average height of 0.3 m above existing ground level.

Surfacing material (41,000 m^3 unbulked) will be imported from locally approved commercial quarries. The importing of material from external quarries will place additional pressure on transport routes, as discussed in Chapter 14 (Traffic and Transport).

Peat will be removed for the wind turbine foundations. Deeper excavations to more competent material may be required to construct the turbine foundations. Based on the ground investigation, the proposed foundations will be a combination of gravity and piled foundations. For gravity type turbine foundations, unsuitable material will be excavated and replaced by structural fill and excavated material will be placed in the deposition areas i.e. the borrow pits or reused on site for landscaping and habitat enhancement (i.e. Peat Deposition Area 1). For the piled turbine foundations, the piling type and configuration, as shown on Planning Drawing 11333-2041 and 11333-2042, of c.60 No. 300 mm x 300 mm square concrete driven piles or up to 16 no. 1200 – 1600 diameter bore piles.

Due to the cutover peat on site the sensitivity is low and the magnitude is low negative. No raised bog or degraded raised bog is located within the proposed project footprint. The likely significant effects on soils as a result of soil compaction and erosion are considered to be not significant, certain, permanent and negative.

The potential sensitivity of soil compaction and erosion is low and on a local scale for the GCR and works area for the TDR. There are limited off roads areas (<1.5ha) along the proposed GCR and works area for the TDR. No peat was encountered on the GCR (off road section) or works area for the TDR. The sensitivity is low and the magnitude is low negative. Pre-mitigation the likely effects on soil compaction and erosion along the proposed GCR and the works area for the TDR are not significant, short term and reversible.

8.4.2.5 Effects on Geohazards - Peat and Soil Stability

A planning stage Peat Stability Risk Assessment (PSRA) has been undertaken for the proposed project and is included in Appendix 8-2. The assessment has considered the PSRA and is consistent with the PSRA conclusions.

The assessment has taken account of the drained, i.e. previously harvested areas. The stability analysis was completed with characteristic loads and soil strength parameters. Due to the limited slopes and the PSRA results, the magnitude is low negative and within the accepted Eurocode standards. Likely effects are considered, slight/not significant, long term, negative, direct and indirect with very low probability.

No karst was identified during the site walkovers. While piling depths will depend on localised ground conditions as discussed, the drawings detail a piling depth of 25 m. For gravity type

turbine foundations, unsuitable peat and till material will be excavated and replaced by granular fill (6N) and unsuitable excavated material will be utilised near the proposed turbines or placed temporarily in the peat deposition areas pending re-use under Article 27 notifications or transfer to an appropriately licensed facility.

If a void, conduit or highly weathered zone is identified below a foundation which the initial design cannot accommodate, the solution is likely to consist of filling the feature with grout /concrete. The potential for this having a negative environmental effect on the soil and geology of the site is considered to be low. Where weathered features may be present, the resultant effect on soils and geology is considered to be not significant, permanent and negative.

No peat or karst is identified on the off-road section of the proposed GCR or works area for the TDR study area. The GCR is located mainly in the local roads with short offroad sections near Dallow 110 kV substation. There are no direct or indirect potential effects on areas of peat or karst.

8.4.2.6 Geological Heritage Sites

There are no Geological Heritage sites within the proposed wind farm site, substation/BESS and study area. No direct or indirect effects were therefore identified on Geological Heritage sites. The sensitivity is therefore considered to be low and magnitude is considered to be negligible.

There is one Geological Heritage site within the study area of the proposed GCR. This is mapped as part of the long distributed esker system – the Kilcormac esker. Based on the site walkover of the GCR route, there is no surficial expression of the esker near the R439. Based on a low sensitivity (GCR located in the road) and a negligible magnitude, no likely significant direct or indirect effects were identified on Geological Heritage sites as the GCR will be located within the R439 regional road.

There is no Geological Heritage Sites on the proposed works area for the TDR. Pre-mitigation potential effects on Geological Heritage Sites at the works area for the TDR are therefore, considered to be neutral – effects will not occur.

8.4.3 Likely Significant Effects – Operational Phase

8.4.3.1 Effects on Land Use

No significant land use changes will occur during the operational phase; therefore the sensitivity is considered low and the magnitude is considered negligible. Pre-mitigation potential effects on land use at the proposed wind farm site and study area are considered imperceptible i.e. Not Significant.

For the proposed GCR which is mainly located within public road corridors, there will be no change of land use during the operational phase- i.e. not significant.

The works area on the proposed TDR will be reinstated at the end of the construction phase, so that the lands will revert to their original land uses of agriculture and transport respectively. It is therefore anticipated that the effects on land use at the works area for the TDR is not likely to be significant during the operational phase.

8.4.3.2 Effects on Contaminated Sites/ Potential for Contamination

Contaminated Sites

No contaminated sites were identified in the study area of the proposed wind farm site.

The sensitivity of the soils and subsoils is low and the magnitude is negligible. Pre-mitigation potential effects on previously contaminated sites are therefore considered to be imperceptible.

Potential for contamination

Any localised hydrocarbon or oil spills related to the maintenance of the proposed wind farm (access tracks, substation, BESS, turbines, etc.) has the potential to negatively affect the ground directly. The bunded transformers in the substation and BESS and in each turbine are oil cooled. There is potential for spills and leaks of oils from this equipment resulting in contamination of soils and subsoils.

Occasionally, machinery will access the proposed wind farm for maintenance of access tracks, substations and turbines. The presence of machinery on the proposed wind farm site and study area has the potential to result in minor accidental leaks or spills of fuels/ oils contaminating the soils and subsoils.

The sensitivity of the soils and subsoils is medium and the magnitude is negligible. Pre-mitigation likely significant effects are therefore considered to be not significant due to the limited maintenance expected to be required and the proposed design standards applied i.e. bunding.

No significant works are required on the proposed GCR or works area for the TDR for the operational phase. Minor excavation of soils, subsoils and bedrock may be required where a grid fault is detected. These works will result in temporary disturbance of road surfaces and cable trenches/joint bays. Any surplus excavated material associated with the trench and access tracks will be removed off-site to a licenced facility or reused as article 27 material. The GCR cables do not contain free phase hydrocarbons and do not therefore pose a risk. The sensitivity is low and the magnitude is low, the pre-mitigation likely effects relating to contamination along the proposed GCR and works area for the TDR are considered not significant, short term and negative.

8.4.3.3 Effects on Mineral/Aggregate Resources

Small volumes of additional unbound crushed aggregate material may be required during the operational phase for access track maintenance and to resurface unbound roads. This will place occasional demand on local aggregates. It is expected that only small quantities of unbound crushed aggregates may be needed.

The sensitivity is low and the magnitude is negligible , the likely effects on mineral and aggregate resources at the proposed wind farm site and study area are therefore considered to be imperceptible and long-term and not significant.

There are no anticipated operational phase effects associated with mineral/aggregate resources for the proposed GCR and the works area for the TDR therefore there are no likely significant effects.

8.4.3.4 Effects on Soil Compaction and Erosion

The sensitivity of the soils and subsoils during operation is low and the magnitude is negligible. The likely effects on soils as a result of soil compaction and erosion during operation are considered to be not significant, certain, permanent and negative.

There are no likely significant effects on the soils and subsoils as a result of soil compaction/erosion during the operational phase.

8.4.3.5 Effects on Geohazards - Peat and Soil Stability

A peat stability risk assessment (PSRA) sets out the methodology used to assess the peat stability risk, the activities undertaken, and the results of the peat stability assessment. There are no likely significant operational phase effects associated with geohazards for the proposed wind farm. The PSRA is included in Appendix 8-2. The operational phase sensitivity is considered moderate due to the presence of peaty soils and peat. As the sensitivity is moderate and the magnitude is negligible, there is potential for an imperceptible and long-term negative effects for geohazards (peat and soil stability).

There are no anticipated operational phase effects associated with geohazards for the proposed GCR and the works area for the TDR therefore there are no likely significant effects.

8.4.3.6 Effects on Geological Heritage Sites

There are no Geological Heritage Sites present within the proposed wind farm study area. No direct or indirect potential effects are predicted on Geological Heritage Sites.

As there are no construction works proposed during the operational phase there are no potential for , no direct or indirect potential effects identified on Geological Heritage Sites.

8.4.4 Likely Significant Effects – Decommissioning

The likely effects associated with decommissioning will be similar to those associated with construction but of reduced magnitude because of limited excavations. Turbine foundations and hardstands will remain in place and would be allowed to revegetate or reseed as appropriate. The proposed access tracks will remain in situ for forestry and agricultural access.

In most cases, and certainly for granular-based tracks (but also concrete and asphalt) these materials are inert and stable over the long-term, so will not pose a contamination risk if left in situ. The substation will be retained as a permanent structure and will not be decommissioned.

Below ground infrastructure will remain in place during the decommissioning phase. No road improvements will be required along the works area for the TDR, while the proposed GCR will not be decommissioned.

8.4.4.1 Effects on Geological Heritage Sites

There are no Geological Heritage Sites within the proposed wind farm study area. There are no significant direct or indirect effects identified for the GCR.

8.4.4.2 Effects on Land Use

The proposed wind farm site and study area is predominantly covered in agricultural lands, forestry and cutover peatland. There will be a change in land use associated with the decommissioning phase. The sensitivity on the wind farm site is low and the magnitude is low. Therefore, the effect of the decommissioning phase with regard to land use change, is considered not significant, negative, certain and permanent. There are no indirect effects anticipated on land use as a result of the decommissioning.

There are no proposed works on the GCR or the works areas of the proposed TDR during the decommissioning phase therefore no likely significant effects associated with same.

8.4.4.3 Effects on Contaminated Sites/Potential for contamination

Contaminated sites

No contaminated sites were identified in the wind farm study area. The sensitivity of the soils and subsoils is low and the magnitude is negligible. Pre-mitigation likely effects on previously contaminated sites are therefore considered to be imperceptible. There are no significant direct or indirect effects anticipated as a result of the decommissioning of the proposed project.

Potential for contamination

Decommissioning machinery and equipment which contain various vehicle fluids/oils and fuel have the potential to contaminate the proposed wind farm through leaks and/or spills. The soils and subsoils on site are of low to moderate productivity. The sensitivity of the soils and subsoils is medium and the magnitude is medium negative. Pre-mitigation likely effects are therefore considered to be slight, localised and short term on the potential for contaminating land at the proposed wind farm site and study area. There are no significant direct or indirect effects anticipated as a result of the decommissioning of the proposed project.

8.4.4.4 Effects on Mineral/Aggregate Resources

There are no likely significant effects on mineral/aggregate resource during the decommissioning phase.

8.4.4.5 Effects on Soil Compaction and Erosion

The potential sensitivity of soil compaction and erosion is low on a local scale. Access tracks will remain in place. The sensitivity is low and the magnitude is low negative. The likely effects of decommissioning on soil compaction and erosion are considered to be not significant, certain, permanent and negative.

The potential sensitivity of soil compaction and erosion is low on a local scale. There are limited off roads areas (<1ha) along the proposed GCR and the proposed TDR. The sensitivity is low and the magnitude is low negative. Pre-mitigation likely effects on soil compaction and erosion along the proposed GCR and the works area for the TDR are not significant, short term and reversible. There are no proposed works on the GCR or the works area for the TDR during the decommissioning phase.

8.4.4.6 Effects on Geohazards - Peat and Soil Stability

Existing below ground works and roads will remain in place following decommissioning. Likely effects on geohazards are considered slight/not significant, long term, negative, direct and indirect, and very low probability.

No peat or karst is identified on the proposed GCR or the works area for the TDR study area. There are no proposed works on the proposed GCR or the works area for the TDR during the decommissioning phase and therefore no likely significant effects on geohazards.

8.4.4.7 Summary

A summary of the likely effects discussed in the previous subsections is provided in Table 8-6 to Table 8-8.

Table 8-6: Summary of likely effects of proposed project during the construction phase

Environmental Attribute	Potential Effects– Construction	Significance
Geological heritage sites	None as no geological heritage site within the proposed wind farm site. One section of Esker IGH mapped along GCR however only excavations are in the public road	Not Significant
Land Use	Temporary too long term loss of soils –Not Significant, direct effects	Not Significant
Contaminated sites/Potential for contamination	Slight/not significant, localised, short term	Not Significant
Mineral/Aggregate Resources	Not significant, long term effect	Not Significant
Soil Compaction and erosion	The potential effect on land soils and geology is negative, certain, direct, not significant and long term.	Not Significant
Geohazards/Peat and Soil Stability	No karst feature. Peat and soft sediments present and assessed via PSRA. Potential effects are long term, negative, not significant, direct and indirect, very low probability.	Not Significant

Table 8-7: Summary of likely effects of proposed project during the operational phase

Environmental Attribute	Potential Effects – Operational	Significance
Geological heritage sites	Neutral - None as no geological heritage site are affected.	Not Significant
Land Use	Imperceptible, certain, direct and long term.	Not Significant
Contaminated sites/Potential for contamination	Imperceptible, unlikely, negative, direct and long term.	Not Significant
Mineral/Aggregate Resources	Slight, certain, direct and long term.	Not Significant
Soil Compaction and erosion	Slight to Not significant, certain, permanent and negative.	Not Significant
Geohazards/Peat and Soil Stability	Long term, negative, imperceptible, direct and indirect, very low probability.	Not Significant

Table 8-8: Summary of likely effects of proposed project during the decommissioning phase

Environmental Attribute	Potential Effects –Decommissioning	Significance
Geological heritage sites	None as no geological heritage site affected	Not Significant
Land Use	Slight, certain, direct and long term.	Not Significant
Contaminated sites/Potential for contamination	Not significant, certain, direct and long term.	Not Significant
Mineral/Aggregate Resources	Imperceptible, certain, direct and long term.	Not Significant
Soil Compaction and erosion	Imperceptible, certain, direct and long term.	Not Significant
Geohazards/Peat and Soil Stability	Long term, negative, imperceptible, very low probability.	Not Significant

8.5 MITIGATION MEASURES

Mitigation measures for the construction, operation and decommissioning of the proposed project, in order to avoid or reduce identified significant likely effects are described in the following sections. Standard design or embedded measures are included in Section 8.5.1. A Construction Environment Management Plan (CEMP) has been developed and can be viewed in Appendix 2-3.

8.5.1 Embedded Mitigation

The design teams integrated mitigation measures into the project's design (referred to as *embedded mitigation*). Hazardous substances (fuel, oils, chemicals) will be stored in bunded areas (110% capacity) with impermeable bases;

- Fuel storage and fuelling facilities will be required at several fixed locations and at mobile locations around the proposed wind farm. Fuel storage and any oil storage will be carried out in accordance with the Enterprise Ireland Best Practice Guide BPGCS005 Oil Storage Guidelines.
- Fuel and oil storage at fixed locations will be in a fixed tank, undercover and within a steel or concrete bund.
- A dedicated impermeable bunded refuelling area will be constructed adjacent to the fixed fuel storage areas.
- Double skinned plastic tanks will not be acceptable for any purpose unless they are placed within fixed concrete or steel bunds.
- Each fixed fuel and oil storage bunds will be sized to hold 110 % of the volume of the largest tank therein. The rainwater pumped from each bund will be discharged to the surface water drainage system via an oil interceptor.
- Spill response protocols include secondary containment, drip trays, supervised refuelling, and impermeable refuelling zones;
- Contractors will be required to provide a designated bin for washing down the chutes of concrete lorries on site at the construction compounds;
- Wash down and washout of concrete transporting vehicles will not take place on site. It is proposed to washout at the (offsite) source concrete batching site to prevent cementitious material and water entering the surface water network;
- Any waste material will be removed from site to a permitted waste management facility; and
- Disposal of excess concrete on any part of the construction site will be prohibited, and
- Topsoil & subsoil will be stored separately (max. 3m height), protected from contamination, and handled in dry conditions.

Operational Phase Embedded Measures include the following:

- Fuel stored in bunded areas (110% capacity); and
- Oil interceptors at the substation.

8.5.2 Construction Phase

8.5.2.1 Mitigation - Land-Use

Based on the pre-mitigation level of effect (Not significant effect), additional mitigation is not required. The measures included in the CEMP and SPMP will be implemented.

8.5.2.2 Mitigation - Contaminated Sites/Potential for contamination

Based on the pre-mitigation level of effect (not significant effect), additional mitigation is not required. However, the following measures will be implemented as a matter of best practice.

These measures are outlined in Chapters 2 of the EIAR and included in the following:

- CEMP (Appendix 2-3) and Spoil and Peat Management Plan (Appendix 8-3) to ensure proper handling, storage, and reuse of soils.

The contractor's yard/maintenance yard will incorporate a bund for the storage of small items of plant and oil filled equipment, such as hand portable generators, pumps, etc. Storage of small volume oils or chemicals, in barrels, IBCs, etc, will be confined to a covered bunded area. Where barrels or other containers are required at work locations these will be stored in enclosed bunded cabinets, and drip trays will be used where distribution of the material is required.

The main storage areas for oil filled equipment, vehicles, plant, etc, will be on an impermeable surface and the discharge of surface water from these areas will be via oil interceptors. An oil spill response plan will be developed for the construction works and appropriate containment equipment will be available at work locations in the event of a spillage. Oil spill response will form part the induction and training of site personnel.

All wastes generated on site will be segregated and appropriate materials re-used on site. Residual materials will be collected by licensed waste hauliers for appropriate reuse (Article 27/article 28) sorting, recycling and disposal.

8.5.2.3 Mitigation - Mineral/Aggregate Resources

Based on the predicted level of effect, additional mitigation is not required. No significant effects were identified in Section 8.5.1 and therefore no additional mitigation measures are required.

8.5.2.4 Mitigation - Soil compaction and erosion

Based on the pre-mitigation level of effect (not significant effect), additional mitigation is not required. However, the following measures will be implemented.

Landscaping areas will be sealed and levelled using the back of an excavator bucket to minimise the potential for erosion. The upper vegetative layer will be stored with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface. to prevent erosion.

The construction traffic will utilise the permanent access track network for access and egress, and this access will be constructed in advance of other ground works in a sequential manner.

A Spoil and Peat Management Plan (SPMP) was developed as part of the planning application – See Appendix 8-3. This plan documents how spoil will be managed on site for re-use of materials, the design for on-site re-use and disposal options, and a scheme for the tracking and recording of soil movements. These measures will prevent the erosion of soil in the short and long term. Soils, overburden, and rock will be reused on site to reinstate any excavations where appropriate.

Access tracks will be constructed first to allow for access within the proposed wind farm. Vehicular movements will be restricted to the footprint of the proposed wind farm, particularly with respect to the newly constructed access tracks. This means that machinery must be kept to the tracks and aside from advancing excavations do not move onto areas that are not permitted for the development, such as areas which have not been designated for access or infrastructure.

Construction of internal electricity transmission cables will present similar, but lower-level risks, to the construction risks outlined above, and the same mitigation measures will be adopted as above. Surplus material from the onsite roads will be reused on site in the borrow pits or on road upgrades.

Based on the pre-mitigation level of effect (not significant effect), additional mitigation is not required. The following measures however will be implemented.

The majority of the proposed GCR cabling will be laid in the public road. Construction method statements and templates will be implemented to ensure that the proposed GCR infrastructure is installed in accordance with the correct requirements, materials, and specifications of ESBN and EirGrid. The ducts will be installed and the trenches will be reinstated in accordance with ESBN/EirGrid, private third-party landowners and County Council specifications. Once all are satisfied, then the cables are pulled through the installed ducts in approximately 500 to 850 m sections.

For concrete and asphalt/bitmac road sections, it is proposed to carry out immediate permanent reinstatement in accordance with the specification and to the approval of the local authority and/or private landowners, unless otherwise agreed with the local authority. Surplus excavated bitmac material shall be notified as Article 27 material or sent to appropriately licensed facility in accordance with the circular economy approach

For offroad i.e access tracks/grass sections at HDD locations, the cable section will be laid within an existing access track. Silt fences will be utilised along the offroad sections. Short sections (<50m) will be excavated and reinstated on a phased basis with suitable excavated material to ground level and finish in a gravel track as per the EirGrid/ESBN specification. By limiting the excavated sections, the potential for compact or erosion is limited.

8.5.2.5 Mitigation - Geohazard/Peat and Soil Stability

Based on the pre-mitigation level of effect (not significant effect), additional mitigation is not required. The following measures however will be implemented as per best practice.

Peat or peaty soils on the proposed wind farm are shallow. Given the scale of the project, a major consideration for its development is the management of the materials excavated as part of the

construction works. To this end and in order to further mitigate against any risk of peat instability, it is proposed to use any excavated peat in the extant borrow pit areas, within 10m of access tracks and PDA. A Spoil and Peat Management Plan is provided in Appendix 8-3.

The site is relatively flat lying with cutaway/cutover peat overlying a soft to very soft glacial lacustrine marls and firm to stiff glacial till materials overlying limestone bedrock. Due to the relatively flat, drained cutaway nature of the site, the risk of a regional scale landslide is low. Due to the nature of the peat and subsoils at the site, construction of the proposed wind farm will require deep excavations at the turbine locations. Instability of soils will be localised to the extent of excavations for the various infrastructure locations. Identified temporary works will be put in place to successfully mitigate this risk. This is likely to be in the form of a battering back of excavations to a safe angle (as determined by a detailed slope stability assessment by a competent temporary works designer) or temporary granular berm or sheet pile wall. Following a peat stability assessment, the risk of long-term instability is considered low. It should be noted that the excavations will be backfilled to the existing ground level.

Following mitigation, the PSRA hazard ranking of the development is considered to be "low" for all areas. It is concluded that the proposed wind farm site and study area, works area for the TDR and proposed GCR is suitable for the proposed project.

The management of peat stability will be ongoing throughout the construction and operational stages of the project and will be managed through the use of a geotechnical risk register. Following application of mitigation measures, including consideration to the siting of infrastructure to minimise the risk, the findings of the planning stage PSRA indicate a *"low"* to *"negligible"* hazard ranking for instability related to the requirement for excavations on the proposed wind farm.

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 *"low"* to *"negligible"* hazard rankings assigned.

A physical barrier will be implemented between the excavations and the potentially unstable material at unstable conditions, in the form of a granular berm or sheet piles. The long-term stability of the area around the wind turbine foundations will be achieved by filling the area back up to existing ground level following installation of the foundation.

A suitably qualified and experienced geotechnical engineer or engineering geologist will monitor excavation works. The earthworks will not be carried out during severe weather conditions.

Based on the predicted level of effect, additional mitigation is not required for the GCR or TDR.

8.5.2.6 Mitigation - Geological Heritage Sites

No Geological Heritage Sites exist within the extent of the proposed wind farm, and there are no direct or indirect likely significant effects. The GCR crosses a small section of the Killimor-Birr-Five Alley Esker GHS however no geological features are present within the construction area and therefore, no mitigation is required. No off road construction works are required at the GHS.

8.5.3 Operational Phase

Operational activities at the proposed project will focus on the maintenance of wind turbines and associated infrastructure. Oil containing components of the wind turbines will be periodically refurbished and replaced.

8.5.3.1 Mitigation - Land Use

Based on the predicted level of effect, additional mitigation is not required for the proposed project.

8.5.3.2 Mitigation - Contamination

Fuel and oil storage and handling requirements will be as detailed for construction, with permanent fuel and oil storage located within permanent covered bunds.

As detailed in section 8.5.1, transformers will be required within the substations. Surface water discharges from permanent storage areas and substation bunds will be to surface water via an oil interceptor. The oil interceptors at the proposed wind farm will be subject to a regular inspection and de-sludging to ensure that they retain full operational efficiency.

Site operatives will receive appropriate training and materials will be available on site to immediately respond to any fuel or oil spill.

Welfare facilities will be provided at the substation location. These welfare facilities will produce foul effluent and these effluents will be stored in an alarmed holding tank prior to removal to an approved treatment facility.

8.5.3.3 Mitigation - Mineral/Aggregate Resources

Based on the predicted level of effect, additional mitigation is not required. No significant direct or indirect effects were identified in Section 8.4.3 and therefore no additional mitigation measures are required.

8.5.3.4 Mitigation - Soil Compaction and Erosion

Based on the predicted level of effect, additional mitigation is not required. No significant direct or indirect effects were identified in Section 8.4.3 and therefore no additional mitigation measures are required.

8.5.3.5 Mitigation - Geohazard /Peat and Soil stability

No significant effects were identified in Section 8.4.3 and therefore no additional mitigation measures are required. The following outlines an overview of the tasks for the operation and maintenance phase:

- Communication of any peat risk to appropriate site operatives;
- Ongoing monitoring of risks and maintenance if required.

Monitoring will consist of regular inspection of drains to prevent blockages and inspections of specific areas after a significant rainfall events.

8.5.3.6 Mitigation - Geological Heritage Sites

No Geological Heritage Sites exist within the proposed wind farm, therefore no mitigation is required. There are no significant effects of the proposed GCR or TDR.

8.5.4 Decommissioning Phase

No significant likely effects were identified for the decommissioning phase.

A fuel management plan to avoid contamination by fuel leakage during decommissioning works will be implemented as per the construction phase mitigation measures. Any BESS waste from the site will require disposal/recycling in accordance with the circular economy and associated legislation.

The risks arising from the decommissioning of the proposed wind farm would be less than those for construction. Any best practice measures for decommissioning would conform to those given for construction (Section 8.5.1) and would be anticipated to be fully protective of the environment.

There are no works proposed in relation to decommissioning phase works for the proposed GCR or on the works areas of the proposed TDR.

8.6 RESIDUAL EFFECTS

The replacement of natural soil, subsoils, and rock with gravels and concrete for the construction of the infrastructure (temporary and permanent) will result in a change in ground conditions within the proposed wind farm site and study area. Overall, due to the relatively low sensitivity of the land, soils and geology conditions locally, the residual effect is not significant and neither permanent nor negative as summarised in Table 8-9 to Table 8-11 below.

The residual effect in relation to peat stability will be not significant, short-term, negative and will be localised to excavations carried out during the construction, operational and decommissioning phases.

Table 8-9: Summary of post-mitigation effects on the receiving environment during the construction phase

Environmental Attribute	Residual Effects– Construction	Significance
Geological heritage sites	None as no geological heritage site within the proposed study area.	Not Significant
Land Use	Temporary long term loss of soils –Not Significant, direct effects	Not Significant
Contaminated sites/Potential for contamination	Slight/not significant, localised, short term	Not Significant
Mineral/Aggregate Resources	Imperceptible, long term effect	Not Significant
Soil Compaction and erosion	The potential effect on land soils and geology is negative, certain, direct, not significant and long	Not Significant

	term.	
Geohazards/Peat and Soil Stability	No karst feature. Peat and soft sediments present and assessed via PSRA. Potential effects are long term, negative, not significant, direct and indirect, very low probability.	Not Significant

Table 8-10: Summary of post-mitigation effects on the receiving environment during the operational phase

Environmental Attribute	Residual Effect – Operational	Significance
Geological heritage sites	None as no geological heritage site within the study area.	Not Significant
Land Use	Imperceptible, certain, direct and long term.	Not Significant
Contaminated sites/Potential for contamination	Imperceptible, unlikely, negative, direct and long term.	Not Significant
Mineral/Aggregate Resources	Slight, certain, direct and long term.	Not Significant
Soil Compaction and erosion	Slight to Not significant, certain, permanent and negative.	Not Significant
Geohazards/Peat and Soil Stability	Long term, negative, imperceptible, direct and indirect, very low probability.	Not Significant

Table 8-11: Summary of post-mitigation effects on the receiving environment during the decommissioning phase

Environmental Attribute	Residual Effect –Decommissioning	Significance
Geological heritage sites	None as no geological heritage site within the proposed study area.	Not Significant
Land Use	Imperceptible, certain, direct and long term.	Not Significant
Contaminated sites/Potential for contamination	Not significant, certain, direct and long term.	Not Significant
Mineral/Aggregate Resources	Imperceptible, certain, direct and long term.	Not Significant
Soil Compaction and erosion	Imperceptible, certain, direct and long term.	Not Significant
Geohazards/Peat and Soil Stability	Long term, negative, imperceptible, very low probability.	Not Significant

8.7 CUMULATIVE EFFECTS

The potential for cumulative effects of the proposed project with other existing and proposed projects in the region has been undertaken. A list of proposed projects reviewed as part of this section are listed in Chapter 4 of this EIAR.

Information on the relevant projects within 5 km of the proposed project is described in Chapter 1 – Introduction. As listed in Chapter 1, there are a number of relevant applications for renewable energy projects including BESS, wind farms and grid uprate works in the region of the proposed wind farm site. The footprint of the proposed wind farm site does not overlap with other wind farms and therefore the potential for significant cumulative effects is limited. If construction for these projects overlap or run concurrently with the proposed project, there may be a supply issue with local quarries providing imported aggregate.

The information was sourced from a search of the local authorities planning registers (Tipperary and Offaly County Council, August 2025), the EIA portal (EIA, August 2025), planning applications (My Plan, August 2025), EIAR documents and planning drawings which facilitated the identification of past and future projects, their activities and their potential environmental effects.

All projects listed in Chapter 1 of this EIAR were reviewed as part of the cumulative effects assessment. Key projects with the potential for cumulative effects are described further below.

8.7.1.1 Existing Projects

Skehanagh and Carrig Windfarms - Planning reference 5123495 and 5123496

The nearest operational wind farms to the proposed wind farm are Skehanagh and Carrig (lacka) Wind Farms respectively, located 1.7 km and 2.7 km west of the nearest proposed turbine (T6). Considering the site is operational, there is no potential for significant cumulative effects on Land Soils and Geology.

Stonestown Cable Application- ACP Ref. 304056

The proposed wind farm cable route was approximately 12.5 km of 38 kV electricity transmission line from the permitted (windfarm) substation in Stonestown, Croghan, County Offaly to the Dallow 110 kV substation in Clondallow, County Offaly. This application was granted by Offaly County Council and is appealed to An Coimisiún Pleanála (ACP). Based on a review of the cable route, there are no likely significant cumulative effects.

8.7.1.2 Proposed/Granted Projects

Carrig Wind Farm - Tipperary County Council Ref 2360763, ACP Ref. 318689 (Granted by ACP in June 2025) and 2360140 (granted by Offaly County Council in October 2024)

The proposed turbines for Carrig Wind Farm are located 3.9 km to 5.3 km northwest of the T1 and T3. The Carrig wind farm includes a 38 kV substation and 38kV cable to Dallow 110 kV substation via an underground cable. The site was granted in June 2025. The cable route utilises a similar route to Dallow 110 kV substation along the N52, R489. As the proposed wind farm is located >3.9 km west of the proposed wind farm, there is no potential for significant cumulative effects on Land Soils and Geology. A separate application was made to Offaly County Council (Ref 2360140) for the 38kV grid connection in Offaly. The routing of the Carrig 38kV was considered as part of the proposed project. Due to the presence of the existing cables and the proposed Carrig 38kV within the L-70152 local road, the GCR for the proposed project is located parallel to the L-70152 local road. Based on a review of the cable route, there are no significant cumulative effects likely.

Clondallow BESS- Planning Ref 2560367

Birr Renewable Ltd. have applied for a 100MW Battery Energy Storage Station with 53 battery containers and associated equipment, with a control room container, site entrance, and all associated works. The application was submitted in August 2025 and is located 50m to the southwest of Dallow 110 kV substation. Based on a review of the cable route, there are no significant cumulative effects likely.

Other Developments

The Proposed Water Supply Project for the Eastern and Midlands Region (PA92.323980) is located 2.1 km to the southeast of T11. Construction works are anticipated to commence in Q1 2028, subject to planning approval from An Coimisiún Pleanála. The construction works for the pipeline are localised to a 50 m corridor along the pipeline with construction planned for 2029. The main construction works are associated with the water treatment plant in Birdhill, 20 km to the south west. There is no proposed overlap with the construction area and therefore no likely significant potential effects on lands, soils and geology.

A review of the Offaly and Tipperary County Council planning portal revealed a number of small scale residential and rural developments (e.g., residential one-off housing and agriculturally based developments) proposed in areas between Carrig, Birr and Riverstown in proximity to the proposed project. Considering the small scale residential and rural developments, there is no potential for significant effects on Land Soils and Geology.

A full list of planning applications within the wider area of the proposed project is provided in Chapter 4 (Policy, Planning & Development Context) Appendix 4-1 of this EIAR.

8.8 CONCLUSION

Overall, the development of the proposed project will not have a likely significant effect on the soil and geological environment.

Given the fact that the proposed wind farm is located within agricultural lands and cutover peat and forestry, various measures will need to be taken in order to ensure a safe and successful development. Peat will need to be stripped away in order to construct foundations on more solid and competent material. A Spoil and Peat Management Plan is proposed in order to safely store and use materials obtained during excavations during the construction phase of the proposed project.

The proposed wind farm is flat with little to no changes in elevation. Landslide risk is low on site however given the nature of peat soils, care must be taken during soil stripping. The outline design of the proposed wind farm has sought to minimise peat stability risks and these risks will be further investigated and considered at the detailed design stage.

The principal risks associated with soil and geology at the proposed wind farm are the management of soils, particularly with regard to the generation of silty waters, and the loss of construction and operational materials (concrete, fuel and oil, etc) to water. It is expected that these risks can be fully mitigated through the adoption of construction and operational good practice.

Hence, it is not expected that the project will give rise to any significant residual effects with regard to land, soils and geology.